STANDARD TREATMENT GUIDELINES

2014

Department of Public Health & Family Welfare
Madhya Pradesh
Foreword

The public health system has practice seeks to improve the health and wellbeing through approaches which focus on the entire population. It’s priority is to reduce disparities in health status between different social groups. Access to affordable essential medicines is a vital component of an efficient health care system. In our resource-constrained environment with the high burden of disease, the value of the Standard Treatment Guidelines and Essential Drug List in ensuring affordable and equitable access to medicines should not be underestimated.

Standard Treatment Guidelines ensure consistency, treatment efficacy for patients. The Guidelines provide an expert consensus, quality of care standard, basis for monitoring for service providers and makes demand more predictable, allows pre-packs for supply managers. The Guidelines provide focus for therapeutic integration of special programmes, promotes efficient use of funds for policymakers.

Healthcare providers are provided information in regards to most appropriate drugs for use thus produces the best quality of care as the patients are receiving optimal therapy. Patients receive optimal drug therapy. The guidelines enable consistent and predictable treatment from all level of service providers and at all locations within the healthcare system. Consequently, drug availability or absence will contribute to the positive or negative impact on health.

The criteria for the selection of essential drugs for Primary Health Care in Madhya Pradesh are based on the WHO guidelines for drawing up a State EDL. Essential medicines are selected with due regard to disease prevalence, evidence on efficacy and safety, and comparative cost.

In keeping with the objectives of the State Drug Policy the department is trying to ensure provision of essential drugs in generic form at various levels of healthcare system i.e. Primary Health Centre, Community Health Centre, District Hospitals and Speciality centres on the basis of services offered and the competency of the staff at each facility.

This document is an effort to optimise the resources and provide quality of care to the population in the state. It will also minimise over and unnecessary medication. Provision of good quality generic drugs will also reduce the out-of-pocket expenses of the population at large.
STANDARD TREATMENT GUIDELINES (2014)

Department of Public Health & Family Welfare

Madhya Pradesh
Messages
Forward
### Expert Panel

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<td>Dr. Anna Alex, M.D.</td>
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Compilation

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**Introduction to Guidelines**

This book is an attempt to give guidelines/protocols for treatment of common diseases, keeping in mind the rational use of drugs for each clinical condition. It is assumed that the patient has been fully evaluated and all co-morbidities identified. Treatment of the patient would involve a holistic approach and would require the expertise of the treating physician in formulating a treatment plan.

We describe groups of patients and make suggestions intended to apply to average patient in each group. However, patients will differ greatly in their presentation, treatment preference and capacities in their history of response to previous treatments, their family history of response to treatment, and their tolerance for different side effects; therefore, the expert’s first line recommendations may not be appropriate in all circumstances; however, several alternatives have been suggested to meet the requirements. It begins at the point when the doctor has already diagnosed a patient suffering from that particular disease and has evaluated the patient to ascertain the presence of other concomitant disorders and other medical factors that may affect the diagnosis or treatment of the patient. We assume clinicians using these guidelines are familiar with assessment and diagnostic issues.

It is divided into twenty chapters. First two chapters deal with general diseases and emergencies which may be common to all specialties. The aim is to provide complete management of commonly encountered diseases and emergency cases with clear instructions for referral (when, where and how) to a higher centre with facilities for appropriate management. Rest of the chapters deal with common diseases in each specialty namely medicine, ENT, eye, skin, obstetrics and gynaecology, psychiatry, orthopaedics, surgery, paediatrics and dental. Paediatric section provides treatment of diseases specifically encountered in paediatric age group. Other diseases which are also commonly encountered in adults are also discussed in the respective section with doses for children.

The format of guidelines is such that it gives only few salient features of the disease and important diagnostic tests followed by
nonpharmacological and pharmacological treatment. Nonpharmacological treatment being an important aspect has been described very clearly. Pharmacological treatment includes instructions on drug use, special precautions and warnings related to therapy. Assessment of response to therapy, key assessment indicators (signs/symptoms, investigations etc.) with the monitoring interval are also incorporated. The guidelines mention the aim of therapy and in the case of no response to the preferred treatment, step-up therapy or referral to a higher centre with appropriate facilities for care.

Drugs are selected on the basis of balanced criteria of efficacy, safety, suitability and cost. Drugs are mentioned in generic names only. Combination drugs are not included in the treatment except for some topical preparation e.g. in eye, ENT and skin preparations. These combinations were selected on the basis of appropriate ingredients and availability in the market.

Wherever drug choices are given for the treatment of a disease, they are listed in order of their preference. Where there are many equi- efficacious alternatives available, preferably only 2-3 choices are mentioned to enable flexibility in the treatment. Drug choices are demarcated by ‘Or’. If several drugs are required concomitantly for treatment they are mentioned as 1, 2, 3 and so on. Only drugs with best available evidence in support are listed in the text. Use of particular drug, if not supported by good acceptable level of evidence or is obsolete but still prescribed, is not listed in the text. Drug dose is given as a range and wherever required in per kilogram dose with maximum tolerated dose. The frequency, route and special precautions are mentioned very clearly. Modification of treatment after monitoring the response is the next important step described in the pharmacotherapy. Generally, the text is given in telegraphic language and rationale for a particular choice of drug or modality of treatment is not mentioned.

If a particular treatment needed is mentioned at several places, viz. fever, shock, pain relief, in that case details are given in one section with a note ‘for details see relevant section’.

A special feature of the guidelines is a ‘section on patient education’ since no treatment is complete without a good communication with the patient. This includes details aimed to empower the patient by providing information about the nature and duration of the illness, prognosis and natural course of the disease, preventive measures, duration of therapy and
follow-up with precautions and important side-effects which might interfere with the treatment.

We have relied on expert opinion precisely because we are asking crucial questions that are not very well answered in the literature. One thing that the history of medicine teaches us is that expert opinion at any given time can be very wrong. Accumulating research will ultimately reveal better and clearer answers. Clinicians should therefore stay abreast of the literature for developments. We will continue to revise the guidelines periodically based on new research information and on reassessment of expert opinion to keep them up-to-date.

No set of guidelines can ever improve practice if read just once. These guidelines are meant to be used in an ongoing way, since each patient’s status and phases of illness will require different interventions at different times. We believe the guideline recommendations will reinforce your best judgment when you are in a familiar territory and help you with new suggestions when you are in a quandary.
Essential medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford.

The implementation of the concept of essential medicines is intended to be flexible and adaptable to many different situations. Careful selection of a limited range of essential medicines results in a higher quality of care, better management of medicines (including improved quality of prescribed medicines) and more cost-effective use of health resources.

The lists of essential medicines relate closely to guidelines for clinical health care practice, which are used for the training and supervision of health professionals. Lists of essential medicines also guide the procurement and supply of medicines in the public sector, schemes that reimburse medicine costs, medicine donations, and local medicine production.

Selection criteria

The choice of essential medicines depends on several factors, including the public health relevance, and sound and adequate data on the efficacy, safety, suitability and comparative cost-effectiveness of available treatments. Stability in various conditions, the need for special diagnostic or treatment facilities and pharmacokinetic properties are also considered if appropriate.

Most essential medicines should be formulated as single compounds. Fixed-ratio combination products are selected only when the combination has a proven advantage in therapeutic effect, safety or compliance over single compounds administered separately.

In cost comparisons between medicines, the cost of the total treatment, and not the unit cost only of the medicine, is considered. Cost and cost-effectiveness comparisons may be made among alternative treatments within the same therapeutic group, but generally should not be made across therapeutic categories (for example, between treatment of
tuberculosis and treatment of malaria). The patent status of a medicine is not considered in selecting medicines for the List. Other factors which are also considered include factors such as local demography and pattern of disease, treatment facilities, training and experience of the available personnel, local availability of individual pharmaceutical products, financial resources and environmental factors.

**Quality of products**

Priority is given to ensuring that available medicines have been made according to good manufacturing practices and are of assured quality. It is recommended that medicines be purchased from known manufacturers, their duly accredited agents or recognized international agencies known to apply high standards in selecting their suppliers.

**STANDARD TREATMENT GUIDELINES**

The terms standard treatment guidelines, treatment protocols, and prescribing policies are all used to indicate systematically developed statements to help practitioners or prescribers make decisions about appropriate treatments for specific clinical conditions. Treatment guidelines exist for different levels of health care, ranging from general prescribing guidelines for rural areas to detailed protocols for tertiary health care centers.

**Advantages**

Standard guidelines benefit health officials, supply management staff, health care providers, and patients. Their development is a good opportunity to integrate the technical advices of different disease programmes into an overall training programme. Treatment guidelines should be used as the basis for undergraduate medical and paramedical training, for in-service training, for supervision, and for medical audit to assess and compare quality of care. For Health Care Managers it provides expert consensus on most effective, economical treatment for a specific setting and gives opportunity to the health care providers to concentrate on correct diagnosis. For patients it offers and encourages adherence to treatment through consistency among prescribers, provision of most cost-effective treatments; improvement in availability of drugs and better treatment outcome.
Key features

**Simplicity.** The number of health problems is limited and for each health problem, a few key diagnostic criteria are listed. Drug and dosage information is clear and concise.

**Credibility.** Guidelines developed by the most respected clinicians in the country and revisions based on actual experience.

**Use of same standard for all levels of health care.** Doctors and other health care providers use the same standard treatment as it is a referral criterion which differs, and the first choice treatment for a patient depends on the patient’s diagnosis and condition—not on the prescriber.

**Provision of standards to drug supply.** Most importantly drug supply should be matched to the recommended treatments and drugs on the list of essential drugs. **Regular updating.** As bacterial resistance patterns change or other factors alter therapeutic preferences, the standards are revised to reflect current recommendations.

**RATIONAL PRESCRIBING AND PRESCRIPTION WRITING**

Once a patient with a clinical problem has been evaluated and a diagnosis has been reached, the practitioner can often select from a variety of therapeutic approaches. Medication, surgery, psychiatric treatment, physical therapy, health education, counseling, further consultation, and no therapy are some of the options available. Of these options, drug therapy is by far most commonly chosen. Drugs should only be prescribed when they are necessary, and in all cases the benefit of administering the medicine should be considered in relation to the risks involved. Bad prescribing habits lead to ineffective and unsafe treatment, exacerbation or prolongation of illness, distress and harm to the patient, and higher cost. Like any other process in medicine, writing a prescription should be based on a series of rational steps. The following steps will help to remind prescriber of the rational approach to therapeutics:

1. **Define the patient’s problem.** Whenever possible, making the right diagnosis is based on integrating many pieces of information: the complaint as described by the patient; a detailed history; physical examination; laboratory tests; X-rays and other investigations. This will help in rational prescribing, always bearing in mind that diseases are evolutionary processes.
2. **Specify the therapeutic objective.** Doctors must clearly state their therapeutic objectives based on the pathophysiology underlying the clinical situation. Very often physicians select more than one therapeutic goal for each patient.

3. **Selecting therapeutic strategies.** The selected strategy should be agreed with the patient; this agreement on outcome, and how it may be achieved, is termed concordance. The selected treatment can be non-pharmacological and/or pharmacological; it also needs to take into account the total cost of all therapeutic options.

**Non-pharmacological treatment**

It is very important to bear in mind that the patient does not always need a drug for treatment of the condition. Very often, health problems can be resolved by a change in lifestyle or diet, use of physiotherapy or exercise, provision of adequate psychological support, and other non-pharmacological treatments; these have the same importance as a prescription drug and instructions must be written, explained and monitored in the same way.

**Pharmacological treatment**

**Selecting the correct group of drug.** Knowledge about the pathophysiology involved in the clinical situation of each patient and the pharmacodynamics of the chosen group of drugs, are two of the fundamental principles for rational therapeutics.

**Selecting the drug from the chosen group.** The selection process must consider benefit/risk/cost information. This step is based on evidence about maximal clinical benefit of the drug for a given indication (efficacy) with the minimum production of adverse effects (safety). In cost comparisons between drugs, the cost of the total treatment and not the unit cost of the drug only must be considered.

**Verifying the suitability of the chosen pharmaceutical treatment for each patient.** The prescriber must check whether the active substance chosen, its dosage form, standard dosage schedule and standard duration of treatment are suitable for each patient. Drug treatment should be individualized to the needs of each patient.

4. **Prescription writing.** The prescription is the link between the prescriber, the pharmacist (or dispenser) and the patient and it is a medicolegal document. While a prescription can be written on any piece of paper (as long as all of the legal elements are present), it usually takes a
specific form. This item is covered in more detail in the following section.

5. Giving information, instructions and warning. This step is important to ensure patient adherence and is covered in detail in the following section.

6. Monitoring treatment. Evaluation of the follow up and the outcome of treatment allow the stopping of it (if the patient’s problem is solved) or to reformulate it when necessary. This step gives rise to important information about the effects of drugs contributing to building up the body of knowledge of pharmacovigilance, needed to promote the rational use of drugs.

**PRESCRIPTION WRITING**

A prescription is an instruction from a prescriber to a dispenser. All prescriptions orders should be legible, unambiguous, dated (and time in the case of chart order), and signed clearly for optimal communication between prescriber, pharmacist, and nurse. A good prescription or chart order should contain sufficient information to permit the pharmacist or nurse to discover possible errors before the drug is dispensed or administered. The prescriber is not always a doctor but can also be a paramedical worker, such as a medical assistant, a midwife or a nurse. The dispenser is not always a pharmacist, but can be a pharmacy technician, an assistant or a nurse. The following guidelines will help to ensure that prescriptions are correctly interpreted and leave no doubt about the intention of the prescriber.

**Prescription form**

The most important requirement is that the prescription be clear. It should be legible and indicate precisely what should be given. The local language is preferred.

The following details should be shown on the form:

- The prescriber’s name, address and telephone number. This will allow either the patient or the dispenser to contact the prescriber for any clarification or potential problem with the prescription.
- Date of the prescription.
- Name, form, strength of the drug and duration of treatment. The International Nonproprietary name of the drug should always be used. If there is a specific reason to prescribe a special brand, the trade name can be added. The pharmaceutical form (for example ‘tablet’, ‘oral solution’, ‘eye ointment’) should also be stated.
The strength of the drug should be stated in standard units using abbreviations that are consistent with the System Internationale (SI). ‘Microgram’ and ‘nanogram’ should not be abbreviated since abbreviated form (“μg”) is very easily misread as “mg”, a 1000-fold overdose. Also, ‘units’ should not be abbreviated. Avoid decimals whenever possible. If unavoidable, a zero should be written in front of the decimal point.

Specific areas for filling in details about the patient including name, address and age.

**Directions**

Although directions for use are no longer written in Latin, many Latin apothecary abbreviations are still in use (and some others included below). Knowledge of these abbreviations is essential for the dispensing pharmacist and often useful for the prescriber.

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The abbreviation “OD” should be used (if at all) only to mean “the right eye”; it has been used for “every day” and has caused inappropriate administration of drugs into the eye. Acronyms such as ASA (aspirin), 5-ASA (5-Aminosalicylic acid), PCM (paracetamol), CPM (chlorpheniramine), CPZ (chlorpromazine) etc., should not be used; drug
names should be written out. Unclear handwriting can be lethal when
drugs with similar names especially brand names but very different effects
are available e.g., Daonil, Duodil and Diovil. In this situation, errors are
best avoided by noting the indication for the drug in the body of the
prescription e.g., “Daonil (Glibenclamide), for diabetes”.

Directions specifying the route, dose and frequency should be clear
and explicit; use of phrases such as ‘take as directed’ or ‘take as before’
should be avoided.

For preparations which are to be taken on an ‘as required’ basis, the
minimum dose interval should be stated together with, where relevant, the
maximum daily dose. It is good practice to qualify such prescriptions with
the purpose of the medication (for example ‘every 6 hours as required for
pain’, or ‘at night as required to sleep’).

It is a good practice to explain the directions to the patient; these
directions will then be reinforced by the label on the medicinal product
and possibly by appropriate counseling by the dispenser.

**Quantity to be dispensed**
The quantity of the medicinal product to be supplied should be stated such
that it is not confused with either the strength of the product or the dosage
directions. Alternatively, the length of the treatment course may be stated
(for example ‘for 5 days’). Whenever possible, the quantity should be
adjusted to match the pack sizes available.

For liquid preparations, the quantity should be stated in milliliters
(abbreviated as ‘ml’) or liters (abbreviated as ‘L’, since the letter ‘l’ could
be confused with the figure ‘1’).

**Narcotics and controlled substances**
The prescribing of a medicinal product that is liable to abuse requires
special attention and may be subject to specific statutory requirements.
Practitioners may need to be authorized to prescribe controlled substances;
in such cases it might be necessary to indicate details of the authority on
the prescription.

In particular, the strength, directions and the quantity of the controlled
substance to be dispensed should be stated clearly, with all quantities
written in words as well as in figures to prevent alteration. Other details
such as patient particulars and date should also be filled in carefully to
avoid alteration.
## Abbreviations

### General

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABG</td>
<td>arterial blood gas</td>
</tr>
<tr>
<td>AFB</td>
<td>acid-fast bacilli</td>
</tr>
<tr>
<td>AFP</td>
<td>acute flaccid paralysis</td>
</tr>
<tr>
<td>APH</td>
<td>antepartum haemorrhage</td>
</tr>
<tr>
<td>ASOM</td>
<td>acute suppurative otitis media</td>
</tr>
<tr>
<td>BP</td>
<td>blood pressure</td>
</tr>
<tr>
<td>CBC</td>
<td>complete blood count</td>
</tr>
<tr>
<td>CCF</td>
<td>congestive cardiac failure</td>
</tr>
<tr>
<td>CNS</td>
<td>central nervous system</td>
</tr>
<tr>
<td>COAD</td>
<td>chronic obstructive airway diseases</td>
</tr>
<tr>
<td>CPAP</td>
<td>continuous positive airway pressure</td>
</tr>
<tr>
<td>CPR</td>
<td>Cardiopulmonary Resuscitation</td>
</tr>
<tr>
<td>CSF</td>
<td>cerebrospinal fluid</td>
</tr>
<tr>
<td>CSOM</td>
<td>chronic suppurative otitis media</td>
</tr>
<tr>
<td>CVP</td>
<td>central venous pressure</td>
</tr>
<tr>
<td>DUB</td>
<td>dysfunctional uterine bleeding</td>
</tr>
<tr>
<td>EEG</td>
<td>Electroencephalogram</td>
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<tr>
<td>ERCP</td>
<td>Endoscopic retrograde cholangiopancreatography</td>
</tr>
<tr>
<td>FNAC</td>
<td>fine needle aspiration cytology</td>
</tr>
<tr>
<td>GERD</td>
<td>gastroesophageal reflux disease</td>
</tr>
<tr>
<td>GIT</td>
<td>gastrointestinal tract</td>
</tr>
<tr>
<td>Hct</td>
<td>haematocrit</td>
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<tr>
<td>HR</td>
<td>heart rate</td>
</tr>
<tr>
<td>INR</td>
<td>international normalized ratio</td>
</tr>
<tr>
<td>JVP</td>
<td>jugular venous pressure</td>
</tr>
<tr>
<td>KFT</td>
<td>kidney function test</td>
</tr>
<tr>
<td>LFT</td>
<td>liver function test</td>
</tr>
<tr>
<td>MCH</td>
<td>maternal-child health</td>
</tr>
<tr>
<td>MTP</td>
<td>medical termination of pregnancy</td>
</tr>
<tr>
<td>Mo/mth</td>
<td>month</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>nonsteroidal anti-inflammatory drugs</td>
</tr>
<tr>
<td>OCD</td>
<td>obsessive compulsive disorder</td>
</tr>
<tr>
<td>ORS</td>
<td>oral rehydration salts</td>
</tr>
<tr>
<td>ORT</td>
<td>oral rehydration therapy</td>
</tr>
<tr>
<td>PEEP</td>
<td>peak end expiratory pressure</td>
</tr>
<tr>
<td>PCR</td>
<td>polymerase chain reaction</td>
</tr>
<tr>
<td>PCWP</td>
<td>pulmonary capillary wedge pressure</td>
</tr>
<tr>
<td>PEFR</td>
<td>peak expiratory flow rate</td>
</tr>
<tr>
<td>PFT</td>
<td>pulmonary function test</td>
</tr>
<tr>
<td>PID</td>
<td>pelvic inflammatory disease</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<td>--------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>PPH</td>
<td>postpartum haemorrhage</td>
</tr>
<tr>
<td>PMS</td>
<td>premenstrual syndrome</td>
</tr>
<tr>
<td>PUO</td>
<td>pyrexia of unknown origin</td>
</tr>
<tr>
<td>RAP</td>
<td>recurrent abdominal pain</td>
</tr>
<tr>
<td>RBBB</td>
<td>right bundal branch block</td>
</tr>
<tr>
<td>RBC</td>
<td>red blood cell</td>
</tr>
<tr>
<td>RR</td>
<td>Species</td>
</tr>
<tr>
<td>STD</td>
<td>sexually transmitted Disease</td>
</tr>
<tr>
<td>USG</td>
<td>Ultrasonogram</td>
</tr>
<tr>
<td>WBC</td>
<td>white blood cells</td>
</tr>
<tr>
<td>Wt</td>
<td>Weight</td>
</tr>
</tbody>
</table>
ACUTE FEVER

The overall mean oral temperature for healthy adult individuals is 36.8 ± 0.4°C, with a nadir at 6 AM and a peak at 4-6 PM. A morning temperature of greater than 37.2°C and an evening temperature of greater than 37.7°C is often considered as fever. Fever may be continuous, intermittent or remittent. However, with frequent self-medication with antipyretics, classic patterns are not generally seen.

Diagnosis

It is important to work towards finding the cause of fever. A meticulous history of chronology of symptoms, any associated focal symptom(s), exposure to infectious agents and occupational history may be useful. A thorough physical examination repeated on a regular basis may provide potentially diagnostic clues such as rash, lymphadenopathy, hepatomegaly, splenomegaly, abdominal tenderness, altered sensorium, neck stiffness, lung crepts, etc. Drug fever should be considered when the cause of fever is elusive.

Diagnostic tests

A large range of diagnoses may possibly be the cause of fever. If the history and physical examination suggest that it is likely to be more than a simple URI or viral fever, investigations are indicated. The extent and focus of diagnostic work-up will depend upon the extent and pace of illness, diagnostic possibilities and the immune status of the host. If there are no clinical clues, the work-up should include a complete haemogram with ESR, smear for malarial parasite, blood culture, Widal test, urine analysis including urine culture. If the febrile illness is prolonged beyond 2 weeks, an X-ray chest is indicated even in the absence of respiratory symptoms. Any abnormal fluid collection should be sampled. Ultrasonography is needed in some cases of acute fever such as in amoebic liver abscess.

Treatment

Routine use of antipyretics in low-grade fever is not justified. This may mask important clinical indications. However, in acute febrile illnesses suggestive of viral or bacterial cause, fever should be symptomatically treated.
Nonpharmacological

Hydrotherapy with tepid water, rest and plenty of oral fluids.

Pharmacological

Non-specific.
Tab. Paracetamol 500-1000 mg (max 4 g in 24 hours) 6-8 hourly.
(Caution: Reduce dose in frail elderly, adults weighing <50 kg and those at risk of hepatotoxicity)
Or
Tab. Ibuprofen 400-600 mg 8 hourly.

Specific. Antibiotics/antimalarials depending upon the cause suggested by clinical and laboratory evaluation.

Outcome

In most cases of fever, patient may either recover spontaneously or a diagnosis is reached after repeated clinical evaluation and investigations. If no diagnosis is reached in up to 3 weeks, patient is said to be having fever of unknown origin (FUO) and should be managed accordingly.

Patient education

Self-medication and over-medication should be avoided.
Avoid injectable paracetamol/NSAIDs.
Antibiotics should be taken only on advice of a physician. Avoid covering the patient having high fever with blanket, etc.
Plenty of fluids should be taken. Stay in cool environment. Washing/sponging of face and limbs should be done repeatedly.

References


FEVER IN CHILDREN

Fever in children is defined as a rectal temperature of >38°C, oral temperature of >37.5°C or an axillary temperature of >37.2°C. Fever less than 41.7°C does not cause brain damage. Only 4% of children with fever develop febrile seizure.

Hyperpyrexia. Fever above 41.5°C is called hyperpyrexia and warrants aggressive antipyretic therapy because of risk of irreversible organ damage.
**Fever of unknown origin (FUO).** It is defined as fever of more than three weeks duration, documented fevers above 38.3°C on multiple occasions, and lack of specific diagnosis after 1 week of admission and investigation in a hospital setting.

**Nosocomial FUO.** This refers to hospitalized patients receiving acute care in whom infection or fever was absent on admission but in whom a fever of 38.3°C or more occurs on several occasions. Multiple readings of more than 38.3°C in a patient with less than 500 neutrophils/mm$^3$ are labelled as neutropenic FUO.

**Treatment**

**Documentation of fever**

Oral temperature is accurate provided no hot/cold drinks have been consumed in preceding 20 minutes. Axillary temperatures are least accurate and rectal thermometers are uncomfortable, especially in older children. Their use should be restricted to children < 6 months. Ear tympanic membrane thermometers are accurate reflection of inner body temperature, are safer than mercury ones.

Thermometer must be left in place for 2 minutes for rectal, 3 minutes for oral and 5-6 minutes for recording axillary temperature.

Digital thermometers may measure temperature within 2 seconds and are accurate but expensive. Liquid crystal strips applied to forehead for recording temperature are not accurate.

**Find a cause**

Try to find a focus of infection by careful history and physical examination.

Short duration fevers (less than 2 weeks) are usually due to infections. Look for any characteristic feature suggesting involvement of a particular system. Character of the fever (such as relapsing, Pel Ebstein, step ladder, etc.) may give a clue to the cause. Heat hyperpyrexia, dehydration fever, allergy to drug (drug fever), and haemolytic crisis are less common causes of short fevers.

There are 3 major categories of children presenting with fever; see respective sections for their management:

4. Fever due to infection without localized signs (Table 1.1).
5. Fever due to infection with localized signs (Table 1.2)
6. Fever with rash (Table 1.3)

Additional causes for fever lasting longer than 7 days (Table 1.4)

Long duration fevers lasting more than 2 weeks should be investigated for infections, malignancies, connective tissue disorders, autoimmune diseases and metabolic causes.

Appropriate laboratory investigations such as total and differential leucocyte count, peripheral smear, urinalysis, serological tests, radiological investigations, and cultures of blood and body fluids are carried out as indicated by the signs and symptoms related with fever.
Children with any one of the following conditions must be seen immediately: Age <3 months old, fever >40.6°C, crying inconsolably, crying when moved/touched, difficult to awaken, neck is stiff, purple/red spots are present on skin, breathing is difficult and does not get better even after clearing of nasal passages, drooling of saliva and inability to swallow, convulsions and looks or acts very sick.

Children with any one of the following should be seen as early as possible: Child is 3-6 months old (unless fever occurs within 48 hours after a DPT vaccination and has no other serious symptom), fever >40°C, burning/pain occurs during micturition, fever has been present for >24 hours and then returned, and in case of fever present for more than 72 hours.

Table 1.1. Differential diagnosis of fever without localizing signs

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>In favour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria (only in children exposed to malaria</td>
<td>Sudden onset of fever with rigors followed by sweating</td>
</tr>
<tr>
<td>transmission)</td>
<td>Blood film positive</td>
</tr>
<tr>
<td></td>
<td>Rapid diagnostic test positive</td>
</tr>
<tr>
<td></td>
<td>Severe anaemia</td>
</tr>
<tr>
<td></td>
<td>Enlarged spleen</td>
</tr>
<tr>
<td>Septicaemia</td>
<td>Seriously ill and obviously ill with no apparent cause</td>
</tr>
<tr>
<td></td>
<td>• Purpura, petechiae</td>
</tr>
<tr>
<td></td>
<td>• Shock or hypothermia in severely malnourished</td>
</tr>
<tr>
<td>Typhoid</td>
<td>Seriously and obviously ill with no apparent cause</td>
</tr>
<tr>
<td></td>
<td>• Abdominal tenderness</td>
</tr>
<tr>
<td></td>
<td>• Shock</td>
</tr>
<tr>
<td></td>
<td>• Confusion</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>Costa-vertebral angle or suprapubic tenderness</td>
</tr>
<tr>
<td></td>
<td>• Crying on passing urine</td>
</tr>
<tr>
<td></td>
<td>• Passing urine more frequent than usual</td>
</tr>
<tr>
<td></td>
<td>• Incontinence in previously continent child</td>
</tr>
<tr>
<td></td>
<td>• White blood cells and/or bacteria in urine or microscopy</td>
</tr>
</tbody>
</table>

Table 1.2. Differential diagnosis of fever with localizing signs

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>In favour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningitis</td>
<td>Fever with headache, vomiting</td>
</tr>
<tr>
<td></td>
<td>Convulsions</td>
</tr>
<tr>
<td></td>
<td>Stiff neck</td>
</tr>
<tr>
<td></td>
<td>Bulging fontanelle</td>
</tr>
<tr>
<td></td>
<td>Meningococcal rash (petechial or purpuric)</td>
</tr>
<tr>
<td>Otitis media</td>
<td>Red immobile eardrum on otoscopy</td>
</tr>
<tr>
<td></td>
<td>Pus draining from ear</td>
</tr>
<tr>
<td></td>
<td>Ear pain</td>
</tr>
<tr>
<td>Mastoiditis</td>
<td>Tender swelling above or behind ear</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>Local tenderness</td>
</tr>
<tr>
<td></td>
<td>Refusal to move the affected limb</td>
</tr>
<tr>
<td></td>
<td>Refusal to bear weight on leg</td>
</tr>
</tbody>
</table>
Septic arthritis
Joint hot, tender, swollen

Pneumonia
Cough with fast breathing
Lower chest wall indrawing
Fever
Coarse crackles
Nasal flaring
Grunting

Viral upper respiratory tract infection
Symptoms of cough/cold
No systemic upset

Table 1.3. Differential diagnosis of fever with rash

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>In favour</th>
<th>Diagnosis</th>
<th>In favour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>Typical rash (maculopapular) Cough, runny nose, red eyes Recent exposure to a measles case No documented measles immunization</td>
<td>Meningococcal infection</td>
<td>Petechial or purpuric rash Bruising Shock Stiff neck (if meningitis)</td>
</tr>
<tr>
<td>Viral infections</td>
<td>Mild transient upset Transient nonspecific rash</td>
<td>Dengue haemorrhagic fever</td>
<td>Abdominal tenderness Skin petechiae Bleeding from nose or gums or GI bleed Shock</td>
</tr>
</tbody>
</table>

Table 1.4. Additional differential diagnosis* of fever lasting longer than 7 days

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>In favour</th>
<th>Diagnosis</th>
<th>In favour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess</td>
<td>Fever with no obvious focus of infection (deep abscess) Tender or fluctuant mass Local tenderness or pain Specific signs depend on site subphrenic, liver, psoas, retroperitoneal, lung, renal, etc.</td>
<td>Infective endocarditis</td>
<td>Weight loss Enlarged spleen Anaemia Heart murmur Petechiae Splinter haemorrhages in nailbeds Microscopic haematuria Finger clubbing</td>
</tr>
<tr>
<td>Rheumatic fever</td>
<td>Heart murmur which may change over time Arthritis/arthralgia Cardiac failure Fast pulse rate Pericardial friction rub Chorea Recent known streptococcal infection</td>
<td>Tuberculosis</td>
<td>Weight loss Anorexia, night sweats Cough Enlarged liver and/or spleen Family history of TB Chest X-ray suggestive of TB Tuberculin test positive Lymphadenopathy</td>
</tr>
</tbody>
</table>
Diagnosis | In favour | Diagnosis | In favour |
---|---|---|---|
Kala-azar | Endemic area | Childhood | Weight loss |
 | Enlarged liver and/or spleen | Malignancies | Anaemia |
 | Anaemia | | Bleeding manifestations |
 | Weight loss | | Lymphadenopathy |
 | | | Enlarged liver and/or spleen |
 | | | Mass or lump in the body |

*Causes in addition to given in Tables 1.1 to 1.3

**Nonpharmacological**

Assure parents and explain that low grade fever need not be treated with antipyretics.

Give more fluids.

Dress in only one layer of light clothing.

Place in a cool and airy environment.

Sponging. Sponge with lukewarm water (never alcohol) in children with febrile delirium, febrile seizure, and fever > 41.1°C. Give paracetamol 30 minutes before sponging. Until paracetamol has taken effect, sponging will cause shivering, which may ultimately increase the temperature.

Heat stroke requires immediate and aggressive cold water sponging.

The body may be massaged gently so that the cutaneous vessels dilate and body heat is dissipated.

For children less than 3 months of age: Identify the low-risk febrile infant as per Table 1.5. These children can be managed on outpatient basis.

Hospitalize, if child appears toxic or does not fulfil the criteria in Table 1.5.

**Table 1.5. Identification of febrile infant <3 months of age at low risk for serious bacterial infection**

1. Non-toxic
2. Previously healthy
3. No bacterial focus on examination
4. Good social status
5. WBC count 5000-15,000/microlitre and <1500 band forms/microlitre
6. Urine microscopy of centrifuged specimen shows ≤ 10 pus cells/hpf
7. If diarrhoea present, stool microscopy reveals ≤ 5 pus cells/hpf

In children more than 3 months of age:

Rectal temperatures less than 39°C need not be treated. Temperatures higher than 39°C need administration of antipyretics.
**Pharmacological**

Tab/syr. Paracetamol 15 mg/kg/dose, dose can be repeated at 4 hourly interval (Paracetamol reduces fever by 1-2°C within 2 hours).

(Caution: IV paracetamol is NOT recommended in children with age <6 months and <5 kg weight)

Or

Tab/syr. Ibuprofen 10 mg/kg/dose, dose can be repeated at 8 hourly intervals. (Note: Efficacy is similar to paracetamol. Effect lasts for 6-8 hours as compared to 4-6 hours for paracetamol).

(Caution: Aspirin should NOT be used for the risk of Reye’s syndrome). Specific treatment for the cause of fever should be simultaneously undertaken.

**Monitoring**

Close monitoring of all children, especially young febrile infants, is essential.

**References**


**FEVER OF UNKNOWN ORIGIN (FUO)**

FUO is defined as the presence of fever of 38.3°C (>101°F) or more recorded on several occasions, evolving for at least 3 weeks with no diagnosis reached even after one week of relevant and intelligent investigations. FUO is usually an uncommon presentation of common diseases. FUO are classified into four main categories along with common causes in each of these categories.

1. **Classic FUO**—corresponds to the previous definition except that instead of one week of investigations, it requires up to 3 outpatient visits or 3 days in the hospital, viz. tuberculosis, abscesses, bacterial endocarditis, visceral leishmaniasis, non-Hodgkin’s lymphoma, Hodgkin’s lymphoma, acute leukaemia, and systemic lupus erythematous.

2. **HIV-related FUO**—the duration of fever is >4 weeks for inpatients or >3 days for hospitalized patients with HIV infections, viz. tuberculosis, cryptococcosis, *Pneumocystis jiroveci* pneumonia, and bacterial pneumonia.

3. **Nosocomial FUO**—fever of >38.3°C on several occasions lasting for more than 72 hours, developing after admission in a hospitalized patient and remains undiagnosed after 3 days of investigation including 2 days incubation of cultures, viz. postoperative (abscess, haematoma, foreign bodies), infected prostheses, infected catheters, *Clostridium difficile* colitis, deep vein thrombosis, pulmonary embolism, and drug fever.
4. Neutropenic FUO—similar to the previous definition, except that it occurs in a patient who has neutrophil count of less than 500/mm$^3$ or expected to fall to this level in 1-2 days, viz. Gram-negative bacterial, staphylococcal, central venous catheter infections, invasive fungal infections, dental abscesses, perianal infections, cytomegalovirus, and herpes simplex virus infections.

If patient does not fit into any of the above definition, the patient should be referred to a specialist for investigations and management.

### SALIENT FEATURES

| Prolonged unexplained fever, often with no localizing clue on history, physical examination and basic laboratory investigations. |

### Diagnostic evaluation

A detailed clinical history and repeated and meticulous physical examination are valuable in providing potentially diagnostic clues (PDC) to the cause of fever in these patients. No single algorithmic approach to diagnosis can be recommended for all patients of FUO and diagnostic approach needs to be individualized.

A complete haemogram including peripheral blood smear for malarial parasite, serum biochemistry particularly liver function tests, a tuberculin test and an X-ray of chest should be done in every patient with prolonged fever. Other investigations which are often helpful include tests related to collagen vascular disease; an ultrasonography of abdomen to localize intra-abdominal foci of infections and a contrast enhanced computed tomography (CECT) of chest and abdomen in detecting mediastinal lymph nodes and parenchymal lung abnormalities not seen on conventional chest X-ray. Further, diagnostic approach should take into consideration the PDCs from the evaluation of history, results of repeated physical examination, basic investigations and any investigation done prior to this episode. If any abnormal or doubtful lesion is detected FNAC/biopsy should be obtained.

### Treatment

Treatment will be based on the specific cause of fever. Thorough investigations generally yield a specific cause of fever in about 90% of patients. Sometimes evaluation may need discontinuation of all drugs being taken by the patient to rule out drug fever as the cause of FUO.

**Symptomatic treatment for fever** (for details see section on fever). Sponging with lukewarm water may be done, if fever produces discomfort. The emphasis in patients with classic FUO is on continued observation and examination.

*(Caution: Avoid ‘shotgun’ trials. Empirical therapies consisting of therapeutic trials commonly used in patients with FUO are: Antibiotics, antitubercular treatment (ATT) and corticosteroids).*
If on the basis of clinical evaluation and inability to reach a definitive diagnosis, a therapeutic trial is started, the following principles must be kept in mind:

- Give only one set of trial at a given time.
- The doses of drugs and period of therapeutic trial must be adequate. The patient must be followed closely for response.

The ability of glucocorticoids and NSAIDs to mask fever while permitting the spread of infection dictates that their use should be avoided unless infection has been largely ruled out.

Follow-up

In about 10% of cases, no cause may be diagnosed despite thorough evaluation. In such cases, if patient is well preserved, just a close clinical and investigative follow-up may be enough to look for any PDCs which may be evolving or appear later in the course of disease. However, if the patient is sick or is deteriorating and no diagnosis is reached, an appropriate empirical therapeutic trial is justified.

Patient education

- Self-medication should be avoided.
- Antibiotics should be taken only on advice of a physician. Avoid covering the patient with high fever with a blanket, etc.
- Plenty of fluids should be taken. Stay in a cool environment. Washing/sponging of face and limbs should be done repeatedly.

References


ANAEMIA

Anaemia is defined as a low haemoglobin level (adult males <13 g/dl; adult females <12 g/dl; pregnant women, <11 g/dl). The common causes of anaemia in India are:

- Reduced production due to deficiency of iron, folic acid, or vitamin B₁₂; or an ineffective erythropoiesis secondary to many causes (anaemia of chronic disease, secondary to infections and inflammation, endocrinal disorders, primary bone marrow disorders like infiltration or hypoplasia).
- Blood loss (which also leads to iron deficiency).
- Increased destruction of RBCs (haemolysis due to many causes of which, a thalassaemia is the commonest).
SALIENT FEATURES

Tiredness, weakness and lack of desire to work, light headedness and headache. Nails and tongue look pale. Severe anaemia produces general pallor.

Many aetiologies may be determined on the basis of MCV performed in an accurate cell counter (Fig 1.1):

- Low MCV—iron deficiency or haemoglobinopathy like thalassaemia.
- High MCV—folic acid or B12 deficiency. Less commonly alcohol intake, liver disease, haemolysis and hypothyroidism.
- Normal MCV—anaemia of chronic disease, primary bone marrow disorders, renal failure, haemolysis.

In case of associated leucocyte and platelet abnormalities or if anaemia does not respond to therapy in 4 weeks despite correcting the apparent cause, a bone marrow examination by aspiration/biopsy should be performed.

![Decreased MCV (Microcytic), Normal MCV (Normocytic), Increased MCV (Macrocytic)](image)

**Fig. 1.1.** Aetiologies for anaemia on the basis of MCV.

**Treatment**

Consider admission if possible in malignancy or infiltrative disorder; Hb <6 g/dl (including iron deficiency); hemolysis. Transfusion where possible should be deferred until a definitive diagnosis is made.

**Iron deficiency anaemia**

1. Treat the underlying cause: Menorrhagia in women, gastrointestinal blood loss in all age groups including hookworm infestation, dietary deficiency, rarely malabsorption.
2. Tab. Ferrous sulfate 200 mg 3 times a day. Reduce the dose as haemoglobin rises to over 10 g/dl. Once haemoglobin is normal, continue with 1 tablet daily for at least
three months. Other preparations of iron are not superior, but they can be tried if patient does not find ferrous sulfate suitable. These include ferrous fumarate and ferrous gluconate.

The rate of rise of haemoglobin should be 1 g/dl per week. If this does not occur, consider ongoing blood loss, noncompliance, and associated haemoglobinopathy like thalassaemia carrier status, malabsorption, or an incorrect diagnosis.

**Parenteral iron does not lead to a faster rise in haemoglobin.** It is indicated in the following situations: (i) Intolerance of oral iron, (ii) In late pregnancy to ensure that foetal stores of iron are replenished rapidly, (iii) If ongoing blood loss exceeds the capacity to absorb oral iron (like in inoperable malignancy), (iv) In noncompliant patient, (v) Malabsorption of iron. (Caution: There is danger of anaphylactoid reactions; hence facilities to manage these should be readily available).

(See also anaemia in pregnancy and anaemia in paediatric section in Chapters 15 and 19).

**Folic acid deficiency**

1. Treat the cause: Dietary deficiency, increased requirement as in pregnancy and children, haemolytic anaemia.
2. Tab. Folic acid 5 mg daily. This dose is adequate even in malabsorption syndrome.

**Vitamin B\(_{12}\) deficiency**

1. Treat the cause: Dietary deficiency in vegetarians and pernicious anaemia. Although uncommon, it is also under diagnosed due to lack of facilities.
2. Tab. Vitamin B\(_{12}\) 500 mcg thrice in a day until recovery, then 500-1000 mcg once in a day as in haematinic tablets.
   Or
   Inj. Vitamin B\(_{12}\) 1000 mcg IM, one injection on alternate days for total 5 injections, then once a week for 5 weeks, then once in 3 to 6 months will be adequate for most patients.

**Note:** Oral vitamin B\(_{12}\) is indicated only in dietary deficiency states, and not in pernicious anaemia.

**Patient education**

Educate the patient about preventive measures for worm infestation.
Inform about importance of taking adequate food with green leafy vegetables to meet the nutritional requirement and cooking food in iron utensils may increase iron content in the diet.
Iron tablets sometimes produce stomach upset, therefore, take iron tablets after meals; reduce the dose of iron, if it produces stomach ache, diarrhoea or constipation.
Iron should not be taken with milk or milk products; should be either taken one hour before or two hours after milk or milk products.
Stools would turn black during oral iron therapy.
Explain that the response to iron therapy is gradual and it takes weeks or months for haemoglobin to become normal. Continue iron tablets for 6 months. Keep iron tablets out of the reach of children. They may swallow the tablets as candies causing adverse reactions including death.

Reference

DIZZINESS AND VERTIGO

The term dizziness is used for lightheadedness, faintness, spinning, giddiness, confusion and blackouts. Dizziness is classified in three categories: (1) faintness (syncope and presyncopal symptoms), (2) vertigo and (3) miscellaneous head sensation. The common causes of vertigo include benign paroxysmal positional vertigo (BPPV), vestibular neuronitis, chronic suppurative otitis media, Meniere’s disease, cervical spondylosis, drug-induced vertigo due to administration of aminoglycosides, furosemide, etc. Systemic problems such as long-standing diabetes, hypertension may also be a causative factor. Vertigo as a psychosomatic manifestation should be ruled out. If the entire list of common causes is excluded by clinical examination and investigations, the vertigo may be termed as idiopathic.

SALIENT FEATURES

Sensation of patient spinning or the environment spinning around him in a specific and fixed direction.
Spontaneous nystagmus (most important physical sign) in primary position with eyes looking straightforward.

Important notes
Axioms for defining a dizzy spell as vestibular: If the patient in a significant spell does not have spontaneous labyrinthine nystagmus, and also if the dizziness has been non-episodic and continuous for two or three months, then this dizziness cannot be vestibular.

Treatment

Nonpharmacological
Reassure the patient and in cases where positional vertigo cannot be ruled out, advise the patient to take complete rest with minimal movements only.

Pharmacological
Tab. Cinnarizine 25 mg three times a day till resolution of symptoms.
Or
Tab. Betahistine 8 mg three times a
day. Or
Tab. Prochlorperazine 25 mg three times a day.
The duration of drug administration depends on the disease entity as well as the
persistence of symptoms.
If patient has acute, severe nausea and vomiting:
Inj. Prochlorperazine 25 mg by deep IM injection stat, may be repeated after
eight hours, if required.
If there is no response to medical treatment:
Refer to ENT specialist for Canthrone-Cooksey exercises. These are special exercises
which facilitate the process of adaptation of the vestibule.
Refer patients with Meniere’s disease for surgery to eliminate the offending
labyrinth.

Patient education

Explain that the antivertigo drugs are likely to cause sedation, therefore, patient
should avoid tasks requiring alertness.

Reference

JAUNDICE

Jaundice is defined as yellow discoloration of skin, sclera and tissues caused by increased levels of
circulating bilirubin. Approximately 250-350 mg of bilirubin is formed daily, mostly from the
breakdown of aged RBCs (70-80%) and rest from other haem proteins in the marrow and liver. It is
taken up by liver, conjugated and excreted in bile. Serum bilirubin may increase due to
derangement occurring at any level:

Increased production due to excessive haemolysis, results in unconjugated
hyperbilirubinaemia (>80% unconjugated serum bilirubin), jaundice is mild
(bilirubin <10 mg%) and associated with absence of bilirubin in urine (acholuric
jaundice).

Impaired conjugation in hepatocellular damage (usually results in increase in both
fractions of bilirubin due to impaired conjugation and associated decreased
canalicular excretion).

Impaired excretion due to intra- or extra-hepatic cholestasis, resulting in
conjugated hyperbilirubinaemia (>50% conjugated serum bilirubin), associated
with absence of urobilinogen and bile salts in urine.

Common causes of jaundice in clinical practice include acute viral hepatitis, alcoholic
hepatitis, chronic hepatitis/cirrhosis, gallstones and malignancy of gallbladder/ pancreas or
extra-hepatic biliary system. Chronic haemolytic anaemias are less common and usually
present in childhood or sometime in young adults.
Approach to diagnosis of jaundice includes initial differentiation between the three types of jaundice by appropriate clinical history, examination and investigations including full blood counts, liver function tests (LFTs), viral markers, ultrasound examination of liver and biliary tract and if indicated CT scan of abdomen/ERCP.

Treatment of acute viral hepatitis is detailed below.

**ACUTE VIRAL HEPATITIS**

Acute viral hepatitis is caused by hepatitis virus A, E (faeco-orally transmission) or B, C (parenteral transmission).

### SALIENT FEATURES

Clinically, the onset is with a prodromal phase (nausea, vomiting, anorexia, fever, dull aching pain in upper right abdomen followed by icteric phase (appearance of jaundice in 3-7 days of onset, associated with improvement in nausea and return of appetite) followed by convalescent phase, when jaundice gradually settles.

The total duration of episode usually lasts for 2-6 weeks. Convalescent phase may be complicated by cholestatic phase, when levels of conjugated bilirubin may increase and may take several weeks to improve.

Diagnosis can be confirmed by detection of IgM antibodies to different viruses (A, E and B) or detection of HCV RNA.

**Treatment**

**Nonpharmacological**

During prodromal phase, adequate intake of fluids should be maintained. Once the appetite improves, patient should be advised to take normal diet (fat restriction or giving high carbohydrate has no advantage).

Indications for hospitalization are—severe prodromal symptoms causing dehydration, presence of early signs of hepatic encephalopathy (e.g. altered sensorium, disturbed sleep pattern, flapping tremors), decreased liver span on examination.

**Pharmacological**

If patient has severe nausea or vomiting.

1. Tab. Domperidone 10 mg as and when required (maximum 3 times a day). Or
   - Tab. Mosapride 5 mg as and when required (maximum 3 times a day). Or
   - Inj. Metoclopramide 10 mg 3 times a day IM or IV.
2. IV fluids as required in case of uncontrolled nausea or vomiting.
Follow-up/monitoring

Repeat LFT at weekly interval.

Patient can resume activity, when the enzyme levels come down to less than 3-5 times normal.

In patient with HBV infection, check for disappearance of HBsAg at 3-6 months.

Hepatitis B and hepatitis C virus infections warrant long-term follow-up.

Patient education

Explain the relatives to report and hospitalize the patient, if there is alteration in behaviour or sensorium of patient.

There is no need to isolate the patient.

Patient should avoid taking alcohol for 4-6 months after recovery.

Spouse of the patient with acute viral hepatitis B, should use barrier method to prevent sexual transmission and vaccinated against hepatitis B.

(See also jaundice and acute viral hepatitis in children in Chapter 19).

References


TUBERCULOSIS AND REVISED NATIONAL TB CONTROL PROGRAMME (RNTCP)

Tuberculosis (TB) is one of the most prevalent chronic infections in our country and is responsible for high morbidity and mortality. TB is caused by Mycobacterium tuberculosis, and afflicts the lungs most commonly. In one-third or more, extra-pulmonary involvement is seen. Tubercular lymphadenopathy is the commonest form of extrapulmonary tuberculosis. All cases of TB is a notifiable disease, should be reported to the local/district/state health authorities, as it is a notifiable disease.

### SALIENT FEATURES

Pulmonary TB usually presents with fever, malaise, chronic cough with sputum production, anorexia and weight loss.

Sometimes chest pain and haemoptysis may be the presenting symptoms.

Extrapulmonary tuberculosis presents most commonly as prolonged fever and cervical, mediastinal or mesenteric lymphadenopathy.

Abdominal tuberculosis may present as ascites, chronic abdominal pain, diarrhoea, recurrent subacute intestinal obstruction, etc.

CNS tuberculosis presents as irritability, headache, vomiting, chronic meningitis, seizures or focal neurological deficits, altered sensorium.
Skeletal tuberculosis may present as Pott’s spine, tuberculous osteomyelitis, monoarticular arthritis.

Tubercular constrictive pericarditis presents with oedema/ascites.

Symptoms of genitourinary TB include tubovarian masses, secondary amenorrhoea in women, chronic epididymo-orchitis in men and painless haematuria in both the sexes. Diagnostic algorithm is given in Fig. 1.2.

Definitive diagnosis is made only by demonstration of AFB on smear or culture of the sputum or bronchial secretions. **Chest radiograph merely localizes the site of pathology and does not define an aetiology.** There are no pathognomonic radiological signs of tuberculosis. Chest X-ray is sensitive but less specific with higher inter- and intra-reader variation, should be used judiciously. Definitive diagnosis of extrapulmonary tuberculosis is made on the basis of FNAC or findings of caseous granuloma with presence of AFB in the tissue, fluid for cytology, biochemical analysis and smear examination; although ultrasonography and radiological examination of the system involved are useful investigations. CT scan is rarely necessary and is not cost and radiation effective. Chest CT scan, however, may offer an opportunity for CT guided biopsy for tissue diagnosis. Tests **not recommended** in diagnosis of tuberculosis are BCG test, serology (IgM, IgG, IgA antibodies against MTB antigens), PCR tests and Gene expert.

Childhood tuberculosis is suspected, when an ill child has a history of chronic illness that includes cough and fever, weight loss or failure to thrive, an inability to return to normal health after measles or whooping cough, and history of contact with an adult case of pulmonary tuberculosis. The diagnosis of tuberculosis in children is extremely challenging due to relative inability to demonstrate AFB-the gold standard (Figs 1.3 & 1.4).

Diagnostic algorithm for TB lymphadenitis is given in Fig. 1.5.

---

**Table 1.6. Defining and documentation of TB**

<table>
<thead>
<tr>
<th>Case definitions</th>
<th>Type of cases</th>
<th>Treatment outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smear positive pulmonary TB (PTB)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB in a patient with at least two initial sputum smear examinations (direct smear microscopy) positive for AFB, Or: TB in a patient with one sputum examination positive for AFB and radiographic abnormalities consistent with active pulmonary TB as determined by the treating medical officer (MO).</td>
<td><strong>New case</strong> A patient who has never taken treatment for TB or has taken ATT for less than 1 month.</td>
<td>Cured An initially smear-positive patient, who has completed the treatment and has negative sputum smears on at least 2 occasions (one of which is at completion of treatment).</td>
</tr>
<tr>
<td><strong>Relapse</strong></td>
<td>A patient declared cured of TB by a physician, but who reports back to the health service and is found to be bacteriologically positive.</td>
<td></td>
</tr>
<tr>
<td>Case definitions</td>
<td>Type of cases</td>
<td>Treatment outcomes</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Or: TB in a patient with one sputum specimen positive for AFB and culture positive for <em>M. tuberculosis</em>.</td>
<td>Treatment-after-default A patient who received ATT for one month or more from any source and who returns to treatment after having defaulted, i.e., not taken ATT consecutively for two months or more and found to be smear positive.</td>
<td>Treatment completed A sputum smear positive case who has completed the treatment, with negative smears at the end of intensive phase but none at the end of treatment. Or: A sputum smear-negative smears at the end of intensive phase but none at the end of treatment. Or: An extrapulmonary TB patient who has received a full course of treatment and has not become smear-positive during or at the end of treatment.</td>
</tr>
<tr>
<td>Smear negative pulmonary tuberculosis TB in a patient with symptoms suggestive of TB with at least 3 sputum examinations negative for AFB, and radiographic abnormalities consistent with active pulmonary TB as determined by an MO, followed by a decision to treat the patient with a full course of anti-tubercular therapy (ATT). Or: Diagnosis based on positive culture but existence of negative AFB sputum examinations.</td>
<td>Treatment failure A smear-positive patient, who continues to be smear-positive at 5 months or more after starting treatment. The failure also includes a patient who was initially smear-negative but becomes smear-positive during treatment.</td>
<td>Died A patient who died during treatment, regardless of the cause.</td>
</tr>
<tr>
<td>Extrapulmonary tuberculosis (EPTB) TB of organs other than the lungs, such as the pleura (TB pleurisy), lymph nodes, abdomen, genitourinary tract, skin, joints and bones, tubercular meningitis, tuberculoma of the brain, etc. The diagnosis should be based on one culture-positive specimen for an extra-pulmonary site, or histological evidence, or strong clinical evidence consistent with active extrapulmonary TB, followed by MO’s decision to treat with a full course of anti-TB therapy.</td>
<td>Chronic case A patient who remains smear-positive after completing treatment regimen for previously treated but not initiated on MDR-TB treatment..</td>
<td>Failure A smear-positive patient, who continues to be smear positive at 5 months or more after starting treatment. The failure also includes a patient who was initially smear-negative but becomes smear-positive during treatment.</td>
</tr>
<tr>
<td>‘Other’ case Includes patients who do not fit into the above-mentioned categories. The reasons for putting a patient in this category must be specified.</td>
<td>Treatment Outcome Cured Initially smear-positive who has completed treatment and had negative sputum smears, on at least two occasions, one of which was at completion of treatment.</td>
<td>Defaulted A patient who, at any time after registration, has not taken ATT for two months or more consecutively.</td>
</tr>
<tr>
<td></td>
<td>Treatment completed Sputum smear-positive case who has completed</td>
<td>Transferred out A patient has been transferred to another tuberculosis unit/ district and his/her treatment results are not known.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Switched over to MDR –TB treatment A patient who has been diagnosed as having MDR-TB by an RNTCP- MDR-TB Accredited lab prior to being declared as “failure” and is placed on MDR treatment.</td>
</tr>
</tbody>
</table>
Once a decision to treat tuberculosis has been taken, it is important to define and document the disease in order to prescribe the correct therapy and for the purpose of reporting (Table 1.6)

**Fig. 1.2. Diagnostic algorithm for TB in adults**
• Persistent fever and/or cough >2 weeks AND/OR
• Loss of weight/no weight gain AND/OR
• History of contact with infectious TB case

Sputum examination

Sputum smear positive
• Smear positive pulmonary TB
• Treat according to guidelines

Sputum smear negative/sputum not available for examination
Child has:
1. Already received a complete course of appropriate antibiotics, OR
2. Sick look, OR
3. Severe respiratory distress, OR
4. Any other reason for X-ray chest

X-ray chest (XRC) & tuberculin skin test (TST)

XRC–Suggestive of TB AND TST positive

Either or both negative
Follow flowchart 2 (Fig. 1.4)

Smear negative

Smear negative pulmonary TB
• Treat according to guidelines

Fig. 1.3. Diagnostic algorithm for TB in children.

1 History of unexplained weight loss or no weight gain in past 3 months; Loss of weight defined as loss of more than 5% body weight as compared to highest weight recorded in last 3 months.
2 Radiological changes highly suggestive of TB are Hilar/paratracheal lymphadenitis with or without parenchymal lesion, Miliary TB, fibrocavitary pneumonia.
3 If the radiological picture is highly suggestive of TB, then proceed to do further investigations irrespective of the TST result as the sensitivity of the test is not 100%.
4 All efforts including gastric lavage (GL)/induced sputum (IS) or bronchoalveolar lavage (BAL) should be made to look for acid-fast bacilli (AFB) depending upon the facilities.
Treatment
Do not start treatment for TB until a firm diagnosis has been made.

Further investigations in paediatric pulmonary TB suspect who HAS PERSISTENT SYMPTOMS and does not have highly suggestive chest skiagram

- XRC Normal TST Negative
  - Review for an alternative diagnosis

- XRC–Nonspecific shadows TST Positive/negative
  - Repeat X-ray chest after a course of antibiotic (if not already received)
    - XRC–persistent non-specific shadows
    - TST positive/negative
      - GI/IS/BAL
        - Smear positive
          - Smear positive pulmonary TB treat according to guidelines
        - Smear negative
          - Look for alternative diagnosis
            - If no alternative diagnosis found– treat as smear negative pulmonary TB

- XRC Normal TST Positive
  - Review for alternate diagnosis

Fig. 1.4. Further investigations for TB in children.

Nonpharmacological
High protein diet. However, routine use of vitamin supplements is not required. Rest, depending upon patient’s symptoms.

Pharmacological
Nonspecific. Tab. Paracetamol 500 mg 6-8 hourly till fever resolves.
Symptomatic treatment depending upon site of involvement, e.g. loperamide for chronic diarrhoea, anti-oedema measures for raised intracranial pressure.

Specific treatment of TB. DOTS is a recommended strategy for treatment of TB and all paediatric TB patients should be registered under RNTCP. Intermittent therapy
is as effective as daily therapy. Intermittent short course chemotherapy given under direct observation as advocated in the RNTCP (Tables 1.7 & 1.8).

Enlarged lymph node – matted, cold abscess with or without a discharging sinus

Lymph node enlargement of >2 cm in one or more sites

- Prescribe a course of antibiotics for 7 days (do not use quinolones).
- Review after 2 weeks

In case of non-response, suspect TB as the cause for lymphadenitis

- Smear examination for AFB by ZN Staining of the pus from discharging sinus/aspirate from lymph node
- Aspirate for fine needle aspiration for cytology (FNAC), where facilities exist

Diagnosis confirmed if the pus/aspirate from FNAC show: (i) ZN stain +ve for AFB, and/or (ii) granulomatous changes

Treat as Case

- If no granulomatous changes and no AFB, consider alternative diagnosis.
- Go for lymph node biopsy.
- Isolated Mantoux test positivity without suggestive findings on FNAC should not be treated with anti-tubercular drugs (ATT)

**Fig. 1.5.** Diagnostic algorithm for diagnosis of tubercular lymphadenitis.

**Table 1.7.** RNTCP treatment regimen in adults

<table>
<thead>
<tr>
<th>Treatment groups</th>
<th>Type of patient</th>
<th>Regimen$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intensive phase (IP)</td>
</tr>
<tr>
<td>New*</td>
<td>Sputum smear-positive</td>
<td>$2\text{H}_3\text{R}_3\text{Z}_3\text{E}_3$</td>
</tr>
<tr>
<td></td>
<td>Sputum smear-negative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extrapulmonary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>Previously Treated**</td>
<td>Smear-positive relapse</td>
<td>$2\text{H}_3\text{R}_3\text{Z}_3\text{E}_3\text{S}_3$</td>
</tr>
<tr>
<td></td>
<td>Smear-positive failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smear-positive treatment after default</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others$^2$</td>
<td></td>
</tr>
</tbody>
</table>

$H = \text{Isoniazid}, R = \text{Rifampicin}, Z = \text{Pyrazinamide}, E = \text{Ethambutol}, S = \text{Streptomycin}$

1. The number before the letters refers to the number of months of treatment. The subscript after the letters refers to the number of doses per week.
The dosage strengths are as follows: Isoniazid (H) 600 mg, rifampicin (R) 450 mg, pyrazinamide (Z) 1500 mg, ethambutol (E) 1200 mg, streptomycin (S) 750 mg.

- Patients who weigh 60 kg or more receive additional rifampicin 150 mg.
- Patients who are more than 50 years old receive streptomycin 500 mg. Patients who weigh less than 30 kg, receive drugs as per paediatric weight band boxes according to body weight.

2. In rare and exceptional cases, patients who are sputum smear-negative or who have extra-pulmonary disease can have recurrence or non-response. This diagnosis in all such cases should always be made by an MO and should be supported by culture or histological evidence of current, active TB. In these cases, the patient should be typed as 'Others' and given treatment regimen for previously treated

* New includes former categories I and III
** Previously treated is former category II.

Table 1.8. RNTCP treatment regimen in children

<table>
<thead>
<tr>
<th>Category of treatment</th>
<th>Type of patients</th>
<th>TB treatment regimens</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intensive phase</td>
</tr>
<tr>
<td>New cases</td>
<td>• New smear-positive pulmonary tuberculosis (PTB)</td>
<td>$2H_3R_3Z_3E_3^*$</td>
</tr>
<tr>
<td></td>
<td>• New smear-negative PTB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• New extra-pulmonary TB</td>
<td></td>
</tr>
<tr>
<td>Previously treated cases</td>
<td>• Relapse, failure to respond or treatment after default</td>
<td>$2S_3H_3R_3Z_3E_3 + 1H_3R_3Z_3E_3$</td>
</tr>
<tr>
<td></td>
<td>• Re-treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Others</td>
<td></td>
</tr>
</tbody>
</table>

H = Isoniazid, R = Rifampicin, Z = Pyrazinamide, E = Ethambutol, S = Streptomycin

* The number before the letters refers to the number of months of treatment. The subscript after the letters refers to the number of doses per week.

Pulmonary TB refers to disease involving lung parenchyma. Extrapulmonary TB refers to disease involving sites other than lung parenchyma. If both pulmonary and extrapulmonary sites are affected, it will be considered as pulmonary for registration purposes. Extrapulmonary TB involving several sites should be defined by most severe site.

Smear positive: Any sample (sputum, induced sputum, gastric lavage, bronchoalveolar lavage) positive for acid-fast bacilli.

New case: A patient who has had no previous ATT or for less than 4 weeks.

Relapse: Patient declared cured/completed therapy in past and has evidence of recurrence.

Treatment after default: A patient who has taken treatment for at least 4 weeks and comes after interruption of treatment for 2 months and has active disease.

Failure to respond: A case of paediatric TB who fails to have bacteriological conversion to negative status or fails to respond clinically for deteriorates after 12 weeks of compliant intensive phase shall be deemed to have failed response provided alternative diagnoses/reasons for non-response have been ruled out.

Others: Cases who are smear negative or extra-pulmonary but considered to have relapse, failure to respond or treatment after default or any other case which do not fit the above definitions.
In patients with TB meningitis on Category I treatment, the four drugs used during the intensive phase can either be HRZE or HRZS. The present evidence suggests that ethambutol can be used in children.

Children who show poor or no response at 8 weeks of intensive phase may be given benefit of extension of IP for one more month. In patients with TB meningitis, spinal TB, miliary/disseminated TB and osteoarticular TB, the continuation phase shall be extended by 3 months making the total duration of treatment to a total of 9 months. A further extension may be done for 3 more months in continuation phase (making the total duration of treatment to 12 months) on a case to case basis in case of delayed response and as per the discretion of the treating physician.

Steroids should be used initially in hospitalized cases of TBM and TB pericarditis and reduced gradually over 6 to 8 weeks. In all instances before starting a child on previously treated regimen, patient should be examined by a paediatrician or TB expert, whoever available.

Children can tolerate much higher doses than the adults so while calculating the dose, do not round off to a lower amount of drug. As children can have significant increase in body weight on treatment, the doses may be increased in proportion of increase in body weight (Tables 1.9-1.11).

Table 1.9. Drug dosage charts for the anti-tuberculosis drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulations</th>
<th>Daily therapy (mg/kg/day)</th>
<th>Thrice weekly therapy (mg/kg/day)</th>
<th>Route, frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>INH (H)</td>
<td>Tab. 100, 300 mg Syrup 100 mg/5 ml</td>
<td>10</td>
<td>15 (12-17)</td>
<td>Oral, once a day</td>
</tr>
<tr>
<td>Rifampicin (R)</td>
<td>Cap 150, 300, 450, 600 mg Susp. 100 mg/5 ml</td>
<td>10</td>
<td>15 (12-17)</td>
<td>Oral, once a day Empty stomach</td>
</tr>
<tr>
<td>Pyrazinamide (Z)</td>
<td>Tab. 500, 750, 1000 mg Syrup 300 mg/5 ml</td>
<td>25-35</td>
<td>35 (30-40)</td>
<td>Oral, once a day</td>
</tr>
<tr>
<td>Ethambutol (E)</td>
<td>Tab. 200, 400, 800, 1000 mg</td>
<td>15</td>
<td>30 (25-30)</td>
<td>Oral, once a day</td>
</tr>
<tr>
<td>Streptomycin (S)</td>
<td>Inj. 500, 750, 1000 mg</td>
<td>15</td>
<td>15</td>
<td>Intramuscular, once a day</td>
</tr>
</tbody>
</table>
Table 1.10. New weight bands and generic patient wise boxes with drug dosage delivered and pill burden

<table>
<thead>
<tr>
<th>Body weight</th>
<th>RIF</th>
<th>INH</th>
<th>PZA</th>
<th>ETB</th>
<th>mg/kg of body weight</th>
<th>PILL BURDEN</th>
</tr>
</thead>
</table>
|             |      |      |      |      | R | H | Z | E | 2 | 3 | indi-
|             |      |      |      |      | drug | drug | drug | individual drugs |
| Product 1   |      |      |      |      | 17 | 17 | 42 | 33 | 3 | 2 | 4 |
| 6           | 100  | 100  | 250  | 200  | 14 | 14 | 36 | 29 | 3 | 2 | 4 |
| 7           | 100  | 100  | 250  | 200  | 13 | 13 | 31 | 25 | 3 | 2 | 4 |
| Product 2   |      |      |      |      | 17 | 17 | 44 | 33 | 3 | 2 | 4 |
| 9           | 150  | 150  | 400  | 300  | 15 | 15 | 40 | 30 | 3 | 2 | 4 |
| 10          | 150  | 150  | 400  | 300  | 14 | 14 | 36 | 27 | 3 | 2 | 4 |
| 11          | 150  | 150  | 400  | 300  | 13 | 13 | 33 | 25 | 3 | 2 | 4 |
| Product 3   |      |      |      |      | 15 | 15 | 38 | 31 | 3 | 2 | 4 |
| 13          | 200  | 200  | 500  | 400  | 14 | 14 | 36 | 29 | 3 | 2 | 4 |
| 14          | 200  | 200  | 500  | 400  | 13 | 13 | 33 | 27 | 3 | 2 | 4 |
| 15          | 200  | 200  | 500  | 400  | 12 | 12 | 33 | 25 | 3 | 2 | 4 |
| Product 1+2 |      |      |      |      | 15 | 15 | 38 | 29 | 6 | 4 | 8 |
| 17          | 250  | 250  | 650  | 500  | 14 | 14 | 36 | 28 | 6 | 4 | 8 |
| 18          | 250  | 250  | 650  | 500  | 13 | 13 | 34 | 26 | 6 | 4 | 8 |
| 19          | 250  | 250  | 650  | 500  | 13 | 13 | 33 | 25 | 6 | 4 | 8 |
| Product 2+2 |      |      |      |      | 14 | 14 | 36 | 29 | 6 | 4 | 8 |
| 21          | 300  | 300  | 750  | 600  | 13 | 13 | 33 | 26 | 6 | 4 | 8 |
| 22          | 300  | 300  | 750  | 600  | 13 | 13 | 33 | 25 | 6 | 4 | 8 |
| 23          | 300  | 300  | 750  | 600  | 13 | 13 | 31 | 25 | 6 | 4 | 8 |
| Product 3+3 |      |      |      |      | 16 | 16 | 40 | 32 | 6 | 4 | 8 |
| 25          | 400  | 400  | 1000 | 800  | 15 | 15 | 38 | 31 | 6 | 4 | 8 |
| 26          | 400  | 400  | 1000 | 800  | 15 | 15 | 37 | 30 | 6 | 4 | 8 |
| 27          | 400  | 400  | 1000 | 800  | 14 | 14 | 36 | 29 | 6 | 4 | 8 |
| 28          | 400  | 400  | 1000 | 800  | 14 | 14 | 34 | 28 | 6 | 4 | 8 |
| 29          | 400  | 400  | 1000 | 800  | 13 | 13 | 33 | 27 | 6 | 4 | 8 |
| 30          | 400  | 400  | 1000 | 800  | 13 | 13 | 33 | 27 | 6 | 4 | 8 |
Table 1.11. Revised dosing and weight bands according to existing paediatric patientwise boxes (PWB)

<table>
<thead>
<tr>
<th>Weight</th>
<th>New</th>
<th>Tab</th>
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<th>INH del-r</th>
<th>PZA del-r</th>
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Treatment in special situations

Treatment of MDR tuberculosis (To be treated under DOTS Plus of RNTCP).

Very important to prevent MDR by avoiding monotherapy/poor compliance to treatment.

Drugs susceptibility testing should be done. If not available, treatment regimen as above. Patients with meningitis, bone and joint tuberculosis and miliary TB should receive minimum of 12 months of treatment.

Pregnant women. Avoid Pyrazinamide, Streptomycin is contraindicated. Give Isoniazid (INH), Rifampicin and Ethambutol for 2 months followed by INH and Rifampicin for 7 months. Lactating women can continue to breastfeed.

Women on oral contraceptives. Switch over to alternate methods of contraception.

Patients with renal disease.

Avoid aminoglycosides.
Avoid Ethambutol and monitor for side effects.
Reduce doses of INH and Pyrazinamide in cases of severe renal failure.

Patient with hepatic disease. Avoid INH, Rifampicin and Pyrazinamide.

Patients with HIV/AIDS. All patients diagnosed as TB cases should be referred to nearest ICTC for HIV testing. ART to be given to all patients with extrapulmonary TB (stage 4) and all those with pulmonary TB (stage 3) with CD4 count <350 cells/ cu mm (for details see section on AIDS in Chapter 7).

Patients with pericardial effusion, severe pleural effusion, meningitis. Steroid (oral/ injectable) to be given along with the antitubercular therapy.

In tubercular meningitis (see section on tubercular meningitis)

Tubercular pericarditis. In addition to ATT, Tab. Prednisolone 40-60 mg for 2 weeks with gradual tapering over next 4 weeks.

Pleural effusion. In addition to ATT, Tab. Prednisolone may be considered, in patients who are toxic or with large effusions.

Chemoprophylaxis

The dose of INH for chemoprophylaxis was recommended to be 10 mg/kg administered daily for 6 months. TB preventive therapy should be provided to:

All asymptomatic contacts (under 6 years of age) of a smear positive case, after ruling out active disease and irrespective of their BCG or nutritional status.
Chemoprophylaxis is also recommended for all HIV-infected children who either had a known exposure to an infectious TB case or are tuberculin skin test (TST) positive (≥5 mm induration) but have no active TB disease.
All tuberculin skin test (TST) positive children who are receiving immunosuppressive therapy (e.g. children with nephrotic syndrome, acute leukaemia, etc.).
A child born to mother who was diagnosed to have TB in pregnancy should receive prophylaxis for 6 months, provided congenital TB has been ruled out.

BCG vaccination can be given at birth even if INH chemoprophylaxis is planned.

**Monitoring and evaluation** (Fig. 1.6)

Paediatric focused monitoring may preferably be an integral part of programme.

Whenever possible, follow-up sputum examination is to be performed with same frequency as in adults.

![Figure 1.6: Clinical monitoring of case.](image-url)
Clinical symptomatic improvement is to be assessed at the end of intensive phase of treatment and at the end of treatment. Improvement should be judged by absence of fever or cough, a decrease in size of lymph node(s) and weight gain/no weight loss.

Radiological improvement is to be assessed by chest X-ray examination in all smear-negative pulmonary TB cases at end of treatment.

**DOTS is the recommended strategy for treatment in adults and children. All paediatric TB patients should be registered under RNTCP.** It is important to ensure completion of treatment in every case put on treatment to prevent emergence of resistance, particularly to Rifampicin. In the rare circumstances where a patient is given daily therapy, observation and completion of therapy remains as important. It is the duty of the prescriber to ensure appropriate and complete treatment in all cases.

Management of patients with treatment interruption is shown in Fig. 1.7.

**Fig. 1.7.** Management of patients with treatment interruptions.
**Recording and reporting**

In addition to the existing information, especially in relation to paediatric TB patients, the treatment card should include information on:

- Basis for starting treatment along with categorization.
- Documentation of clinical and radiological monitoring as described above. This information could be clubbed with the table for laboratory results in the present treatment card.
- X-rays should be retained until treatment completion, and a drawing of the X-ray picture with comments, entered in the remarks column.
- Provision to check correct categorization and drug dosages. A dosage table based on patient’s weight could be printed on the card to ensure correct dosage for the child.

**Assessment of response to therapy**

1. The short course chemotherapy as enlisted above leads to a rapid clinical response in most patients in 2-4 weeks. Inadequate combination or dosage of this can lead to emergence of resistance and should be avoided at all cost.

2. The response to therapy should be monitored by bacteriological conversion in positive cases and by other markers like clinical and/or radiological improvement in AFB negative cases at the end of 2 months of intensive phase. A bacteriological conversion in over 80% of cases after 2 months of therapy is expected. If the patient continues to excrete bacteria after 2 months, the intensive phase needs to be extended by a month, and also ensure patient compliance, as non-adherence is the most common cause for non-response. If a patient continues to be symptomatic or bacteriologically positive after an extended phase of IP, then the patient should be extensively re-evaluated and treatment failure/drug resistance should be suspected. The patient should be referred to a higher centre for further management. Remember persistence or recurrence of symptoms or radiological shadow could be due to secondary or coinfection with other organisms or due to a non-tuberculous lesion. Radiological response may lag behind bacteriologic cure and hence should not be the deciding factor for stopping of treatment. In patients with extrapulmonary tuberculosis, the response to treatment is assessed clinically.

3. All patients should have baseline LFTs; should be monitored regularly in patients at high risk of hepatitis, e.g. old patients, alcoholics, diabetics and malnourished.

4. Monitoring and management of side effects: The suggested therapy is usually well tolerated. However, some patients can develop GI intolerance, vomiting, etc. for which only symptomatic therapy is required. Commonest major side effect with suggested regime is drug-induced hepatitis. The easily recognizable symptom of high-coloured urine in jaundiced patient is masked due to discoloration of urine because of rifampicin. Suspect hepatitis, if vomiting is persistent and associated with anorexia. **Clinically, icterus may be evident. In all cases of jaundice, stop treatment and refer to a higher centre for evaluation.** In most patients, the drugs can be reintroduced after the hepatitis has resolved. Pyrazinamide-induced arthralgia or arthritis usually responds suitably to analgesic therapy. Drug rash and hypersensitivity is a major side effect where patient needs to be referred to a higher centre. Peripheral neuropathy due to INH is treated with oral vitamin B₆. Ethambutol can cause optic neuritis particularly when used in high doses and requires omission of the drug once this side effect occurs.

5. In case of hypersensitivity reaction, discontinue all drugs, re-challenge with individual
drug to determine the likely offending drug. Do not reintroduce rifampicin in patients who develop thrombocytopenia. Hyperuricaemia can occur due to pyrazinamide. Needs to be discontinued only in case of secondary gout.

Patient education

The patients should be impressed upon the necessity of complying with periodic follow-up sputum examination schedule as advised.

In case patients experience any unusual symptoms after initiation/during treatment, they should be instructed to approach the medical officer and report the same. On their own, they should not take a decision either to stop or to continue the drugs.

Smoking of tobacco adversely affects the treatment outcome and, therefore, give simple tips to quit smoking and refer to the smoking cessation clinic and protect from passive smoking. The environment of the patient has to be smoke free at home/office and at clinic. Check smoking status of the TB patient at every interaction.

Alcohol abuse: Elicit history of addiction to alcohol and if found alcoholic, advise to strictly refrain from alcohol as it would increase the chances of patient developing hepatitis (jaundice), irregularity in drug intake and adverse treatment outcome.

Rifampicin colours the urine as well as other body secretions orange-red. Patient must be warned about this to avoid unnecessary alarm. The patient should also be advised to take Rifampicin on an empty stomach and not to take any meals for about 1 hour afterwards for good absorption of the drug.

The patient or the primary caregiver must be advised regarding the probable side effects and explained when to contact the treating doctor.

A health functionary should preferably supervise the treatment of tuberculosis as far as possible. However, it is of utmost importance that the patient and the family are informed about the need to complete all the treatment for whole of the duration. They must be explained the need for prolonged therapy even after the sickness disappears (symptoms abate). Inadequate or incomplete treatment increases the chance of multidrug resistance which is difficult to treat.

Importance of screening symptomatic contacts and children below 6 years: Encourage patients to bring symptomatic adult contacts and all children aged six years and below for screening at health facility for early detection of cases among them and appropriate treatment. Eligible children will be administered chemoprophylaxis.

Proper sputum disposal and personal hygiene (covering the mouth while coughing) should be explained for infectious patients.

The fears of the patient and/or the caregiver regarding the disease should be addressed as this disease has a lot of social stigma.

Ethambutol is a hygroscopic drug which tends to crumble, if not properly stored, particularly during rainy season.

References

MALARIA AND NATIONAL ANTI-MALARIA DRUG POLICY (2010)

Parasitic infection due to protozoa of genus *Plasmodium* transmitted by the female *Anopheles* mosquito. There are four plasmodia species: *P. falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*.

**SALIENT FEATURES**

Malaria is an acute and chronic protozoan illness characterized by paroxysms of fever, chills, sweats, fatigue, anaemia and splenomegaly. In atypical cases, classical symptoms may not manifest.

Falciparum malaria (severe and complicated malaria) severe manifestations can develop over a short span of 12-24 hours and is associated in varying degrees with the following clinical signs:

- **Cerebral:** Mental clouding, coma, convulsions, delirium and occasionally localizing signs. Hyperpyrexia (>40.5°C), haemolysis, haematocrit <15% or Hb <5 g/dl, hypoglycaemia, oliguria, anuria, pulmonary oedema, macroscopic haemoglobinuria and jaundice.

Diagnosis is made by presence of protozoa in the blood in thick and thin smear slides. Thick smear for easy detection of parasite and thin smear for identification of species. Note that blood films may be negative even in a severe attack because of sequestration of parasites in the deep capillaries. Rapid diagnostic kits (RDK) can be used for detection of *P. falciparum* where microscopy results are not obtainable within 24 hours of sample collection.

**Treatment of malaria**

1. All fever cases suspected to be malaria should be investigated by microscopy or RDT.
2. Patients of uncomplicated malaria can be managed at primary level but patients with severe malaria with complications should be admitted and managed in a hospital where facilities for detailed investigations and blood transfusion exist.
3. *P. vivax* cases should be treated with chloroquine for three days and Primaquine for 14 days. Primaquine is used to prevent relapse but is contraindicated in pregnant women, infants and individuals with G6PD deficiency. Note: Patients should be instructed to report back in case of haematuria or high-coloured urine/cyanosis or blue coloration of lips and Primaquine should be stopped in such cases. Care should be taken in patients with anaemia.
4. *P. falciparum* cases should be treated with ACT (Artesunate 3 days + Sulphadoxine-Pyrimethamine 1 day). This is to be accompanied by single dose primaquine on day 2.
5. Pregnant women with uncomplicated *P. falciparum* should be treated as follows:
   - 1st trimester: Quinine 2nd
   - & 3rd trimester: ACT
Note: Primaquine is contraindicated in pregnant woman.

6. In cases where parasitological diagnosis is not possible due to non-availability of either timely microscopy or RDT, suspected malaria cases should be treated with full course of chloroquine, till the results of microscopy are received. Once the parasitological diagnosis is available, appropriate treatment as per the species, is to be administered.

7. Presumptive treatment with chloroquine is no more recommended.

8. Resistance should be suspected, if in spite of full treatment with no history of vomiting, diarrhoea, patient does not respond within 72 hours, clinically and parasitologically. Such cases not responding to ACT, should be treated with oral Quinine with Tetracycline/Doxycycline. These instances should be reported to concerned District Malaria/State Malaria Officer/ROHFW for initiation of therapeutic efficacy studies.

**Treatment of *P. vivax* cases** (Table 1.12)

1. Chloroquine: 25 mg/kg body weight divided over three days, i.e. 10 mg/kg on day 1, 10 mg/kg on day 2 and 5 mg/kg on day 3.
2. Primaquine: 0.25 mg/kg body weight daily for 14 days.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Tab Chloroquine (150 mg base)</th>
<th>Tab Primaquine (2.5 mg base)</th>
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<td></td>
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<tr>
<td>15 &amp; above</td>
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* Primaquine is contraindicated in infants, pregnant women and individuals with G6PD deficiency. 14 days regimen of Primaquine should be given under supervision.

**Treatment of uncomplicated *P. falciparum* cases** (Table 1.13)

1. Artemisinin based combination therapy (ACT): Artesunate 4 mg/kg body weight daily for 3 days plus Sulfadoxine (25 mg/kg body weight) -Pyrimethamine (1.25 mg/kg body weight) on first day.  
   (Caution: ACT is not to be given in 1st trimester of pregnancy).
2. Primaquine: 0.75 mg/kg body weight on day 2: 0.75 mg/kg body weight on day 2.
Table 1.13. Age-wise dosage schedule for treatment of *P. falciparum* cases

<table>
<thead>
<tr>
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<td>½</td>
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*Treatment of uncomplicated P. falciparum cases in pregnancy*

1st trimester: Quinine salt 10 mg/kg 3 times daily for 7 days (*Caution*: Quinine may induce hypoglycaemia; pregnant women should not start taking quinine on an empty stomach and should eat regularly, while on quinine treatment).

2nd and 3rd trimesters: ACT as per dosage given above.

*Treatment of mixed infections (P. vivax + P. falciparum) case*

All mixed infections should be treated with full course of ACT and Primaquine 0.25 mg per kg daily for 14 days.

*Treatment of severe malaria cases*

Severe malaria is an emergency and treatment should be given as per severity and associated complications which can best be decided by the treating physician.

Inj. Artesunate 2.4 mg/kg IV or IM given on admission (time = 0h); then at 12 h and 24 h and then once a day.

(*Caution*: Care should be taken to dilute artesunate powder in 5% sodium bicarbonate provided in the pack only)

Or

Inj. Artemether 3.2 mg/kg IM given on admission and then 1.6 mg/kg per day. Or

Inj. Arteether 150 mg IM daily for 3 days in adults only (not recommended for children).

Or

Inj. Quinine: 20 mg/kg on admission (IV infusion or divided IM injection) followed by maintenance dose of 10 mg/kg 8 hourly. The infusion rate should not exceed 5 mg salt/kg per hour. Loading dose of Quinine, i.e. 20 mg/kg on admission may not be given, if the patient has already received quinine or if the clinician feels inappropriate). NEVER GIVE BOLUS INJECTION OF QUININE. If parenteral quinine therapy needs to be continued beyond 48 hours, reduce dose to 7 mg/kg 8 hourly.

*Note*: The parenteral treatment in severe malaria cases should be given for minimum of 24 hours once started (irrespective of the patient’s ability to tolerate oral medication earlier than 24 hours) followed by a full course of ACT for 3 days.
Those patients who received parenteral Quinine therapy and can take orally should receive: Oral Quinine 10 mg/kg three times a day for 7 days (including the days, when parenteral Quinine was administered) plus Doxycycline 3 mg/kg once a day or Clindamycin 10 mg/kg 12-hourly for 7 days (Doxycycline is contraindicated in pregnant women and children under 8 years of age; instead, give clindamycin 10 mg/kg 12 hourly for 7 days).

Monitoring
Monitor core temperature (preferably rectal), respiratory rate and depth, pulse, blood pressure and level of consciousness every 4 hours; Record urine output, and look for the appearance of brown or black urine (haemoglobinuria) or oliguria; Monitor therapeutic response, both clinical and parasitological, by regular observation and blood films; Carry out regular laboratory evaluation of haematocrit or haemoglobin, glucose, urea or creatinine and electrolytes; Avoid drugs that increase the risk for gastrointestinal bleeding (aspirin, corticosteroids).

Supportive treatment
Treat fever, hypoglycaemia, electrolyte imbalance, hypotension, renal failure, anaemia, convulsions appropriately (for details see respective sections).

Chemoprophylaxis
Chemoprophylaxis should be administered only in selective groups in high P. falciparum endemic areas. Use of personal protection measures including insecticide treated bed nets (ITN) / long lasting insecticidal nets (LLIN) should be encouraged for pregnant women and other vulnerable population including travellers for longer stay. However, for longer stay of military and para-military forces in high Pf endemic areas, the practice of chemoprophylaxis should be followed wherever appropriate, e.g. troops on night patrol duty and decisions of their medical administrative authority should be followed.

Short-term chemoprophylaxis (up to 6 weeks)
Tab. Doxycycline 100 mg once daily for adults and 1.5 mg/kg once daily for children (contraindicated in children below 8 years). The drug should be started 2 days before travel and continued for 4 weeks after leaving the malarious area. Note: It is not recommended for pregnant women and children less than 8 years.

Chemoprophylaxis for longer stay (more than 6 weeks)
Tab. Mefloquine 250 mg weekly for adults and should be administered two weeks before, during and four weeks after exposure. Note: Mefloquine is contraindicated in individuals with history of convulsions, neuropsychiatric problems and cardiac conditions. Therefore, necessary precautions should be taken and all should undergo screening before prescription of the drug.

Patient education
1. To take measures to stop mosquito breeding and protection from mosquitoes, e.g.
mosquito nets, repellents, long sleeves, long trousers, etc.

2. Fever without any other signs and symptoms should be reported to nearest health facility.

3. Chloroquine should be given with plenty of water after food and not on empty stomach. If chloroquine syrup is not available for children, the tablet should be crushed and given with honey or thick syrup.

4. Watch for side effects of drugs prescribed. Chloroquine may cause nausea, vomiting and diarrhoea, mild headache and skin allergy/rash.

5. If vomiting occurs within 30 minutes of chloroquine intake, repeat the dose of chloroquine.

6. Chloroquine, primaquine and sulphadoxine + pyrimethamine should not be given, if patient is suffering from G6PD deficiency.

7. To report back if haematuria or high-coloured urine, cyanosis develops stop primaquine immediately.

8. If no improvement after 48 hours or if condition worsens, occurrence of cerebral malaria symptoms should seek medical help immediately.

References


DENGUE

Dengue is the most important emerging tropical viral disease of human beings in the world today. *Aedes aegypti*, a day time mosquito, is the principal vector in India and countries of South-east Asian region, mostly seen in rainy season or in months following rainy season. All cases of dengue fever should be reported to the local/ district/state health authorities, as it is a notifiable disease.

**SALIENT FEATURES**

- All four dengue virus types (Den 1, 2, 3 and 4) infections may be asymptomatic or may lead to undifferentiated fever, dengue fever (DF), or dengue haemorrhagic fever (DHF) with plasma leakage that may lead to hypovolaemic shock, dengue shock syndrome (DSS).

- Dengue fever is an acute febrile illness of 2-7 days duration with two or more of the following manifestations: Headache, retro-orbital pain, myalgia/arthritis, rash, haemorrhagic manifestation (petechiae and positive tourniquet test) and leucopenia.

- Confirmation of diagnosis of dengue fever is based on demonstration of IgM antibody specific for dengue virus. Total leucocytes count is either normal or decreased. Platelet count is less than normal.

- Dengue haemorrhagic fever (DHF), if one or more of the following are present: Positive tourniquet test, petechiae, ecchymosis or purpura, bleeding from mucosa, injection or
other sites, haematemesis or melaena, thrombocytopenia (platelets 100,000/mm³ or less) and evidence of plasma leakage.

• Dengue shock syndrome (DSS). All the above criteria of DHF plus signs of circulatory failure.

Note: The tourniquet test is performed by inflating a blood pressure cuff to a point midway between the systolic and diastolic pressures for 5 minutes. A test is considered positive, when 10 or more petechiae per 2.5 cm² are observed. In DHF, the test usually gives a definitive positive result (i.e. >20 petechiae). The test may be negative or mildly positive during the phase of profound shock.

Treatment

DF/DHF has an unpredictable course. Most patients have a febrile phase lasting 2-7 days followed by a critical phase (2-3 days), during this phase, the patient is afebrile and is at risk of developing DHF/DSS. A patient can progress from DF to DSS and depending on the stage of the disease when the patient reports, a mixed picture can be seen. DHF is classified into four grades of severity, where grades III and IV are considered to be DSS. The presence of thrombocytopenia with concurrent haemoconcentration differentiates grades I and II DHF from DF.

Grade I: Fever accompanied by non-specific constitutional symptoms; the only haemorrhagic manifestation is a positive tourniquet test and/or easy bruising.

Grade II: Spontaneous bleeding in addition to the manifestations of grade I patients, usually in the form of skin or other haemorrhages.

Grade III: Circulatory failure manifested by a rapid, weak pulse and narrowing of pulse pressure or hypotension, with the presence of cold, clammy skin and restlessness.

Grade IV: Profound shock with undetectable blood pressure or pulse.

DF and DHF during febrile phase

Most cases of DHF grade I can be managed on outpatient basis with instructions to report immediately, if patient develops any of the following danger signals: Severe abdominal pain, passage of black stools, bleeding into the skin or from the nose or gums, sweating and cold skin.

Nonpharmacological

Rest and plenty of oral fluids or ORS.

Pharmacological

1. Tab. Paracetamol 500 mg 6 hourly (not more than 4 times in 24 hours).
   (Caution: No role of antibiotics, steroids; do not give aspirin or ibuprofen as these medicines may aggravate bleeding).

2. ORS in patients with dehydration.
   Follow-up daily until temperature is normal. Check haematocrit daily where possible. Check for signs of severe illness.
Indications for hospitalization

Hospitalization for bolus intravenous fluid therapy may be necessary where significant dehydration has occurred and rapid volume expansion is needed because of reduced blood volume due to plasma leak. Signs in such cases include: Tachycardia, increased capillary refill time (>2 seconds), cool, mottled or pale skin, diminished peripheral pulses, changes in mental status, oliguria, sudden rise in haematocrit or continuously elevated haematocrit despite administration of fluids, narrowing of pulse pressure (<20 mm Hg), hypotension (a late finding representing uncorrected shock).

Fluid management – cases without shock (pulse pressure >20 mm Hg)
(Fig. 1.8)

1. In cases of severe dengue fever without shock, therapy should be initiated with crystalloid fluids such as 5% dextrose in normal saline 6 ml/kg/h for 1-2 h.
2. Check vital signs, urine output and haematocrit after 3 h. If there is improvement, fluid administration can be decreased to 3 ml/kg/h for 3 h. With further improvement, continue IV therapy 3 ml/kg/h for 6-12 h and then discontinue.
3. If there is no improvement with initial fluid therapy, increase IV therapy to 10 ml/kg over 2 h. In case of improvement, reduce fluid volume from 10 ml to 6 ml and further to 3 ml/kg/h accordingly.
4. In cases with no improvement with 10 ml/kg/h fluid therapy, vital signs, urine output and haematocrit should be checked. If vital signs are unstable and haematocrit is rising, fluid therapy should be changed to colloid (Dextran 40 or plasma) 10 ml/kg for 1 hour. Cases with unstable vital signs and falling haematocrit (suggesting internal bleeding), should be given whole blood 10 ml/kg over one hour. If there is improvement with colloid therapy or blood transfusion, fluid therapy can be changed to crystalloid (10 ml/kg/h) and can be gradually reduced.
5. Cases not improving with colloid therapy or blood transfusion may require vasopressor therapy.

![Flowchart](image)

Fig. 1.8. Volume replacement flowchart for patients with DHF Grades I & II.
DHF grade III (with circulatory failure) and grade IV (profound shock with undetectable blood pressure and pulse).

Immediately admit the patient to a hospital where trained personnel can manage shock and where blood transfusion facilities are available (Fig. 1.9). Refer patients with refractory shock and with major bleeding to specialized care unit.

**Monitoring**

Monitor the vital signs hourly (particularly the pulse pressure, if possible) until the patient is stable, and check the haematocrit 3 to 4 times per day. The doctor should

**UNSTABLE VITAL SIGNS**
Urine output falls, signs of shock

Immediate rapid volume replacement: Initiate IV therapy 10-20 ml/kg/h crystalloid solution for 1 h

- Improvement
  - IV therapy by crystalloid successively reducing from 20 to 10, 10 to 6 and 6 to 3 ml/kg/h
  - Further improvement
  - Discontinue IV after 24 h.

- No improvement
  - Oxygen
    - Haematocrit rises
      - IV colloid (dextran 40) or plasma 10 ml/kg/h (10 ml/kg/h) as intervenous bolus (repeat if necessary)
    - Improvement
    - IV therapy by crystalloid successively reducing the flow from 10 to 6 and 6 to 3 ml/kg/h.
    - Discontinue after 24-48 h

- Haematocrit falls rapid (Due to haemorrhage)
  - Blood transfusion (10 ml/kg/h)

**Fig. 1.9.** Volume replacement flowchart for patients with DHF Grades III & IV.
review the patient at least four times per day and only prescribe intravenous fluids for a maximum of 6 h at a time.

For children without shock, nurses should check the child’s vital signs (temperature, pulse and blood pressure) at least four times per day and the haematocrit once daily, and a doctor should review the patient at least once daily.

Check the platelet count daily, where possible, in the acute phase.

Keep a detailed record of all fluid intake and output.

During convalescent phase (2-3 days) after recovery from crucial/shock stage advise rest, normal diet. Signs of recovery are stable pulse, BP and respiratory rate, normal temperature, no evidence of bleeding, return of appetite, no vomiting, good urinary output, stable haematocrit and convalescent confluent petechial rash.

**Criteria for discharging patients**

- Absence of fever for at least 24 hours without the use of antipyretic agents.
- Return of appetite.
- Visible clinical improvement.
- Good urine output.
- Minimum of three days after recovery from shock.
- No respiratory distress from pleural effusion and no ascites.
- Platelet count of more than 50,000/mm$^3$.

**Note:**

**Improvement:** Haematocrit falls, pulse rate and blood pressure stable, urine output rises.

**No improvement:** Haematocrit or pulse rate rises, pulse pressure falls below 20 mmHg, urine output falls.

**Unstable vital signs:** Urine output falls, signs of shock.

**Patient education**

Since this disease can rapidly become very serious and lead to a medical emergency, carefully watch for danger signs and immediately report to a doctor. Do not wait.

The complications usually appear between the third and fifth day of illness.

Watch the patient for two days after the fever disappears. Arthralgia may continue longer but eventually resolves with no sequelae.

Give large amounts of fluids (water, soups, milk and juices) along with normal diet.

All control efforts should be directed against the mosquitoes and prevent mosquito bites by using appropriate full sleeved clothing, repellent creams, bed nets, etc. Efforts should be intensified before the transmission season (during and after the rainy season) and during epidemics.
CHIKUNGUNYA

Chikungunya is caused by an arbovirus and transmitted by *Aedes aegypti* mosquito. It resembles dengue fever, it is rarely life-threatening. After an incubation period of 4-7 days, symptoms last for 3-7 days. Severe cases of chikungunya can occur in the elderly, in the very young (newborns) and in those who are immunocompromised.

SALIENT FEATURES

Sudden onset of flu-like symptoms including fever, chills, headache, nausea, vomiting, severe joint pain (arthralgia) and rash. Rash may appear at the outset or several days into the illness; its development often coincides with defervescence, which takes place around day 2 or day 3 of the disease. The rash is most intense on trunk and limbs and may desquamate.

Migratory polyarthritis usually affects the small joints. The joints of the extremities in particular become swollen and painful to touch. Although rare, the infection can result in meningoencephalitis, especially in newborns and those with pre-existing medical conditions. Pregnant women can pass the virus to their foetus. Haemorrhage is rare and all but a few patients recover within 3-5 days.

Residual arthritis, with morning stiffness, swelling and pain on movement may persist for weeks or months after recovery.

Treatment

Treatment is mainly supportive as there is no specific treatment and is same as for dengue (For details see section on Dengue).

Dengue fever and chikungunya outbreaks evolve quickly, requiring emergency actions to immediately control infected mosquitoes in order to interrupt or reduce transmission and to reduce or eliminate the breeding sites of the vector mosquito, *Ae. aegypti*.

References

TYPHOID OR ENTERIC FEVER

It is caused by *Salmonella typhi* and *paratyphi*. *Salmonella typhi* causes a variety of illnesses including asymptomatic carriage, gastroenteritis, enteric fever, etc.

**SALIENT FEATURES**

The onset of fever is typically gradual, continuous (temperature up to 40°C) with constitutional symptoms like malaise, anorexia, lethargy, headache, constipation or diarrhoea (pea-soup stool), etc. which may be associated with abdominal pain and tenderness, hepatomegaly, splenomegaly, and/or change in mentation. Usually, the patient is sick and toxic looking with a coated tongue and has a soft splenomegaly. Typhoid fever can present atypically in young infants as an acute febrile illness with shock and hypothermia.

Examination may reveal a toxic look with relative bradycardia and mild soft splenomegaly. Complete blood counts in most cases with typhoid fever are normal. Leucopenia or pancytopenia is seen in 10-25% cases. Diagnosis is suggested by rising titers of ‘O’ antibodies (Widal test) and confirmed by isolation of organism in blood, bone-marrow, urine or stool. Level of 1 in 160 dilution or more is taken as positive test. Widal test may be negative in cases with fever of less than 5-7 days duration. Blood culture and sensitivity testing/ IGM.

Complications like hepatitis, peritonitis, meningitis, pneumonitis, and myocarditis can occur, usually after the first week.

**Treatment**

**Nonpharmacological**

Adequate nutrition and hydration should be maintained ensuring adequate intake either orally or with intravenous fluids (in severely ill). In-patient treatment is recommended, if patient is very sick, not accepting orally with inadequate urine output, patient has altered sensorium/drowsiness or is having very high pyrexia particularly in the second week of illness when the risk of complications increases or if the complications have already ensued.

**Pharmacological**

Management of fever (see section on fever)

Antipyretics can cause precipitous fall in temperature and even shock, in enteric fever. They should be used judiciously. Therefore, hydrotherapy is preferred for fever management in such patients.

**Specific therapy.** Multidrug resistance is prevalent among *S. typhi*. Antibiotics are recommended on the basis of available institutional culture and sensitivity pattern or epidemiological data.
Uncomplicated enteric fever

Tab. Ciprofloxacin 10 mg/kg in 2 divided doses, up to a maximum of 750 mg twice a day for 10-14 days (for 1 week after the fever subsides). Oral drug should be taken about an hour after meals and not on empty stomach.

Or
Tab. Ofloxacin 200-400 mg daily for 5-7 days. Or
Cap. Azithromycin 10-20 mg/kg (max 500 to 1000 mg/day) once daily for 5 days.

Severe enteric fever (hospitalized patients).
Inj. Ceftriaxone 50-60 mg/kg per day IV or IM in 2 divided doses or as a single dose for 7-10 days (preferred in pregnant women patients, children or patients resistant to quinolones).

Or
Tab. Cefixime 200-400 mg daily as single dose or 2 divided doses for 14 days. Or
Inj. Ciprofloxacin 200 mg IV twice a day

If there is no response after 5 days, alternative diagnosis should be considered.

Enteric fever in children

Uncomplicated enteric fever.

Tab. Cefixime 10-20 mg/kg/day in 2 divided doses for 14-21 days. Or
Tab. Chloramphenicol 50-75 mg/kg/day in 4 divided doses for 14-21 days Or
Cap. Ampicillin 75-100 mg/kg/day in 4 divided doses for 14 days Or
Tab. Cotrimoxazole (8TMP +40SMX)/day in 2 divided doses for 14 days. Or
Cap. Azithromycin 10-20 mg/kg (max 500 to 1000 mg/day) once daily for 7 days.

The usual duration of antibiotic treatment is 10-14 days or at least 7 days after the patient has become afebrile. Intravenous therapy is used during acute phase among the admitted patients. Less sick patients can be treated with oral drugs on an outpatient basis.

Severely ill hospitalized patients

Inj. Ceftriaxone 75-100 mg/kg/day IV in 2 divided doses.
Or
Inj. Cefotaxime 75-100 mg/kg/day IM or IV in 2 divided doses
**In multidrug resistant cases**

Inj. Chloramphenicol 100 mg/kg/day IV or infusion in 4 divided doses for 14-21 days.

Or

Inj. Ampicillin 100 mg/kg/day IV/IM in 4 divided doses for 14 days

Or

Inj. Cotrimoxazole-(8TMP+40SMX)/day in 2 divided doses for 14 days

Report to the physician immediately if abdominal symptoms worsen or occurrence of bleeding per rectum or alteration in sensorium and shock (severe typhoid with high risk of fatality).

Severe typhoid with shock or patients with enteric encephalopathy should be hospitalized and treated as above plus Inj. Dexamethasone 3 mg/kg IV first dose followed by 1 mg/kg IV every 6 hourly for 8 doses.

**Chronic carrier state** (1-5% patients continue to excrete bacilli in stool for more than 1 year).

Tab. Ciprofloxacin 750 mg twice a day for 28 days or Cap. Amoxicillin 100 mg/kg/d with probenecid acid 30 mg/kg/day or Tab. Cotrimoxazole 10 mg/kg/d of TMP for 4-6 weeks.

**Assessment of response to therapy**

The toxic look of the patient decreases and appetite starts returning in 72-96 hours of treatment and gradually the fever also starts responding, touches the baseline for increasing duration. The fever can take as long as 7 days to respond.

Some times the patient may apparently appear to have responded whereas patient may be developing impending shock due to complications. So a careful clinical assessment should be done, particularly, if there is a precipitous fall in temperature.

**Modification or step up therapy, if required**

The patient should be monitored for complications and usual indications for inpatient treatment are: Myocarditis (fall in perfusion and BP, arrhythmias), altered sensorium, shock (tachycardia, cold clammy skin, diaphoresis, hypotension), perforation peritonitis (acute pain in abdomen, guarding, rigidity, hypotension, bilious vomiting).

In case the patient worsens or fails to show any response to therapy in 4-7 days or so, as discussed above, then a change of antibiotics is suggested, preferably on the basis of the culture sensitivity report, where available.

**Patient/parent education**

Small frequent feeds should continue. Give plenty of oral fluids and compensate for increased fluid loss from the body due to high grade fever.

Fever usually lasts 5-7 days even after starting effective treatment in most cases. Frequent change of therapy should, therefore, be avoided.
The treatment should be completed till the patient has been afebrile for at least 7 days as incomplete treatment increases the risk of relapse and emergence of resistance. The caregivers of the patients should be informed about the complications as described above.

Ciprofloxacin and ofloxacin are very bitter and cause severe nausea and gastritis. Patient should be asked to report any missed doses due to vomiting.

Three types of vaccines are available to prevent this disease (see section on immunization for details).

**References**


**RHEUMATIC FEVER AND RHEUMATIC HEART DISEASE**

Rheumatic fever is a multi-system inflammatory disease that occurs as a delayed sequelae (2-6 weeks) to group A beta haemolytic streptococcal pharyngitis. It is commonly a disease of childhood between the ages of 5-15 years. The disorder is largely self-limited and resolves without sequelae but chronic and progressive damage to heart valves lead to rheumatic heart disease (RHD).

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis is based on presence of two major or one major and two minor Jone’s criteria in addition to evidence of recent streptococcal infection (raised ASO titer (&gt;333 units for children and &gt;250 units for adults), positive throat swab or recent scarlet fever) is necessary for diagnosis of rheumatic fever.</td>
</tr>
<tr>
<td>Major criteria: Arthritis, carditis, subcutaneous nodules, chorea, erythema marginatum.</td>
</tr>
<tr>
<td>Minor criteria: Fever, arthralgia, elevated acute phase reactants (ESR, CRP) and prolonged PR interval.</td>
</tr>
<tr>
<td>RHD most frequently affects mitral and aortic valves. Isolated aortic valve involvement is rare and tricuspid and pulmonary valve involvement is unusual. Complications of RHD are cardiac failure and infective endocarditis.</td>
</tr>
</tbody>
</table>

**Treatment (acute rheumatic fever)**

Hospitalization is needed for moderate to severe carditis, severe arthritis or chorea.
Nonpharmacological

Rest is individualized according to symptoms. For arthritis, rest for two weeks is adequate. Carditis without congestive heart failure (CHF) needs 4-6 weeks of rest. In cases of CHF, rest must be continued till the CHF is controlled.

Appropriate diet is a must for a growing child with cardiac involvement.

In severe CHF, salt restriction, fluid restriction, upright posture. Protect patient from getting injured in chorea.

Pharmacological

1. In arthritis and mild carditis without CHF.

   Tab. Aspirin 6-8 mg/kg/d in 4 divided doses for 2-3 weeks, taper doses once symptoms resolve.

   In children: 100 mg/kg/day for 3-5 days followed by 60-70 mg/kg/day and for older children 50 mg/kg/day for 4 weeks to be given after meals.

   (Caution: Avoid gastric irritants, allow frequent feeding, medicine must not be taken on empty stomach and monitor for tinnitus, deafness, respiratory alkalosis/acidosis).

   If no response in 4 days, rule out other conditions like chronic inflammatory, myeloproliferative disorders before switching over to steroids.

   In carditis with CHF. Prednisolone: 2 mg/kg/d, maximum 80 mg/day till ESR normalizes—usually 2 weeks and taper over 2-4 weeks, reduce dose by 2.5-5 mg every 3rd day. Start aspirin 50-75 mg/kg/d simultaneously, to complete total 12 weeks.

   (Caution: Monitor blood pressure and blood sugar).

   Duration of treatment for arthritis is 4-6 weeks and for carditis is 3-6 months.

   If no response to oral steroid therapy, start Inj. Methyl Prednisolone 30 mg/kg/day for 3 days.

2. For treatment of CHF (see section on cardiac failure).

3. In chorea. Mild chorea is treated with quiet environment, and sedatives like oral phenobarbitone or diazepam. If there is no response, Tab. Haloperidol 0.25-0.5 mg/kg/d in 2-3 divided doses for 2-4 weeks after clinical improvement

   Or

   Tab. Sodium valproate 15 mg/kg/day for 2-4 weeks after clinical improvement

   Or

   Tab. Carbamazepine 7-20 mg/kg/day for 2-4 weeks after clinical improvement

   Resistant cases can be treated with plasmapheresis or pimozide.

   If there are laboratory features of rheumatic activity (ESR, CRP, ASO), anti-inflammatory drugs must also be given.

4. All patients with acute rheumatic fever should be treated as if they have group A streptococci infection whether or not the organism is actually recovered from culture:

   Inj. Benzathine penicillin 1.2 MU single IM after test dose

   In children: 1.2 MU (>27 kg), 0.6 MU (<27 kg) IM single injection. Or

   Oral penicillin V 500 mg twice daily for 10 days.
In children: 125-250 mg twice daily for 10 days.
Or
Tab Azithromycin 12.5 mg/kg/day once daily for 5 days
Or
Cap Cephalexin 15-20 mg/kg/dose twice a day for 10 days.

In acute rheumatic fever, observe for appearance of valvular lesions (most common in the first four weeks of disease) and in RHD for effort intolerance, signs and symptoms of CHF, echocardiographic studies of cardiac functions.

Usually joint pains disappear within 24 to 48 hours, tachycardia settles, pericardial friction rub, if present, disappears and gradually ESR comes to normal. In established cardiac lesions with CHF not controlled by medical management, patient should be referred to a higher centre for surgical intervention.

**Monitoring**

1. Monitor blood levels of salicylates.
2. Watch for salicylate toxicity (ototoxicity, hyperventilation and metabolic acidosis).
3. Follow up for response to fever and decrease in acute phase reactants; to reduce salicylates or taper steroids.
4. Echocardiography for monitoring complications of carditis.
5. Termination of anti-inflammatory therapy may be followed by the reappearance of clinical manifestation. Usually not treated unless clinical manifestations are severe; reinstate aspirin or steroids in such cases.

**For secondary prevention (for prevention of recurrences)**

Inj. Benzathine penicillin 1.2 MU (if weight >37 kg) or 0.6MU (if weight <37 kg) IM every 3 weeks
Or
Tab penicillin V 500 mg twice a day; in children 250 mg twice a day
Or
If patient is allergic to penicillin, Tab. Erythromycin 20 mg/kg/dose (max 500 mg) 2 times a day
*(Caution: Contraindicated in liver disease.)*

**Duration of prophylaxis**

Duration of secondary prevention is individualized.

1. Rheumatic fever with carditis and residual valvular involvement at least until 40 years or lifelong.
2. Rheumatic fever with carditis and no residual valvular involvement, for 10 years or up to 25 years or whichever is later.
3. Rheumatic fever without carditis, for 5 years or until 18 years whichever is later.
Patient/parent education

Early and adequate treatment of sore throat.

Patients with RHD should avoid contact with sore throat cases and if possible environmental modifications, e.g. avoid overcrowding.

Explain consequences of rheumatic fever and ensure monitoring to rule out residual valvular involvement and compliance with prophylaxis.

Patients with valvular involvement should report to cardiologist for evaluation and further management.

Explain the importance of prophylaxis against rheumatic carditis as detailed earlier.

References


EPILEPSY

Epilepsies are a group of disorders characterized by chronic, recurrent, paroxysmal changes in neurological function caused by abnormalities in the electrical activity of the brain. Each episode of neurologic dysfunction is called a seizure. Isolated non-recurrent seizures may occur in otherwise healthy individuals for a variety of reasons, and under these circumstances, the individual is not said to have epilepsy.

SALIENT FEATURES

A seizure (convulsion) is defined as a paroxysmal involuntary disturbance of brain function that may manifest as an impairment or loss of consciousness, abnormal motor activity, behavioural abnormalities, sensory disturbances, or autonomic dysfunction. Some seizures are characterized by abnormal movements without loss or impairment of consciousness.

Diagnosis should be made by a description of the seizure(s) from the patient and witnesses about frequency, symptoms during and following attacks, duration, circumstances and trigger factors, injury, tongue biting and incontinence.

Diagnostically relevant factors are seizure types, age at onset (many epilepsies are age-specific), family history, past history of head injury, febrile convulsions, precipitating factors, e.g. photic stimulation, alcohol and other drug intake, EEG for evidence of generalized or focal abnormality.

CT/MRI for evidence of structural lesion.

Consider differential diagnosis of vasovagal syncope, nonepileptic attack disorder (pseudo seizures), migraine and breathholding spells, etc.
Treatment

For immediate care during seizure, see section on Status Epilepticus. Long-term treatment is required for recurrent seizures. First episode of seizures with no previous history of same or other types of seizures and where neurological and metabolic diseases are ruled out, may be kept under observation and are not treated unless parents/patients are not willing to take the risk. However, patients presenting with status epilepticus, partial seizures, Todd’s palsy, strong family history of epilepsy and with abnormal CT head and EEG have a higher risk of recurrence and can be put on long-term therapy after first seizure. For alcohol withdrawal and metabolic or drug related seizures, long-term treatment is considered only if there are recurrences suggestive of epilepsy. Treatment for seizures following head injury should be initiated after first seizure. However, duration of treatment depends on risk of late epilepsy. Any seizure presenting after 20 years of age should be investigated for secondary causes of seizures.

Pharmacological

Generalised tonic clonic seizures

Tab. Valproic acid 15-40 mg/kg/day in 2 divided doses increased by 200 mg at 3 days interval.

Or

Tab. Phenytoin 3-8 mg/kg/day in 2-3 divided doses or single night dose. Or

Tab. Carbamazepine 10-35 mg/kg/day (600-1800 mg 3 times a day). Or

Tab. Phenobarbitone 60-180 mg/day at night. In children: 5-8 mg/kg/day.

Partial seizures (simple and complex partial seizures)

Tab. Carbamazepine 10-35 mg/kg/day (600-1800 mg 3 times a day). Or

Tab. Valproic acid 15-40 mg/kg/day in 2 divided doses increased by 200 mg at 3 days interval.

Or

Tab. Phenobarbitone 60-180 mg/day at night. In children: 5-8 mg/kg/day

(For neonatal and febrile seizures see Chapter 19)

Patient should preferably be controlled on a single drug (monotherapy).

Start the drug with low dose. If seizures recur, the dose can be increased after checking the compliance/drug levels.

If seizures remain uncontrolled despite reaching maximum dose of first drug, add another drug as above and gradually reach the maximum dose of second.

If seizures are controlled by addition of second drug; always try withdrawal of first drug after few weeks of control of seizures.
Combination therapy (polytherapy or adjunctive or ‘add-on’ therapy) can be considered when two attempts at monotherapy with AEDs have not resulted in seizure freedom.

If seizures continue despite trial with two AEDs, patient should be referred to a specialist for evaluation.

The formulation or brand of AED should preferably not be changed (variations in bioavailability or different pharmacokinetic profiles may increase the potential for reduced effect or excessive side effects).

Modified release formulations offer ease of administration due to less frequent dosing and better compliance. These are costlier than regular formulations.

Once daily administration of AEDs should be used with caution during pregnancy.

**Routine laboratory tests during AED therapy**

- Complete blood count, liver enzymes and renal functions before starting AED.
- Serum calcium, alkaline phosphatase and other tests of bone metabolism every year for adults taking enzyme-inducing drug.
- Asymptomatic minor abnormalities in blood test results are not necessarily an indication for changes in medication.
- Therapeutic drug monitoring (TDM) is not routinely indicated for management of epilepsy. Indications are: When poor compliance is suspected; no response despite adequate dosage and compliance; drug toxicity in medicolegal cases; patient is on multiple AEDs; during pregnancy, status epilepticus, liver or kidney disease.

**Frequency of follow-up**

- People with epilepsy should maintain a seizure diary and have regular follow-up to ensure that the prescribed medication is taken as advised and to detect any adverse effects of AED. This will also avoid a situation in which they continue to take treatment that is ineffective or poorly tolerated.
- The first follow-up may be undertaken at anytime within 2-4 weeks of initiation of treatment. Subsequent follow-ups at every 3-6 months, depending on the control of seizures and side effects.
- The doctor should review the seizure diary to assess efficacy tolerability and ensure AED compliance. Lifestyle issues such as sleep, regular food intake, alcohol use, driving and pregnancy (if planned) should also be discussed.
- If seizures are not controlled with addition of second drug, the patient should be referred to a higher centre for further evaluation and second line drugs such as Lamotrigine, Topiramate, Tiagabine and Gabapentin.

*(For seizures due to granuloma see section on Neurocysticercosis)*

**Generalized absence, myoclonic and akinetic seizures**

Sodium valproate is the drug of first choice. In patients who do not achieve adequate seizure control on sodium valproate or do not tolerate, refer to a neurologist. The second choice depends on the seizure type and epilepsy syndrome.
**Age dependent epileptic encephalopathies (ADEE)**

It includes early infantile epileptic encephalopathy, infantile spasms and Lennox Gastaut syndrome (LGS) with onset within one month, 4-12 months and 1-6 years, respectively. These are difficult to control and generally have associated mental defects.

Infantile spasms (myoclonic jerks, hyper-arrhythmia on EEG and mental retardation)

1. Inj. ACTH 30-40 units/day. Or
   Tab. Prednisolone 2-4 mg/kg/day in 2-3 divided doses.
2. Syr. Sodium valproate 15-40 mg/kg/day in 2-3 divided doses.
   Inj. ACTH or Tab. Prednisolone is given for 2 weeks with tapering over next 2 weeks while sodium valproate is continued (after seizures are controlled) for 2-3 years.
3. Tab. Clonazepam 0.01-0.03 mg/kg in 2-3 divided doses.

**Lennox-Gastaut syndrome**

For control of seizures, multiple drugs may be required and treatment should be best carried out at a specialized centre. Valproic acid and clobazam should be used initially. Lamotrigine and topiramate to be added in case of continuing seizures. Avoid carbamazepine.

**Discontinuing antiepileptic drug (AED) therapy**

Withdrawal of AED medication can be discussed with patients suffering from idiopathic epilepsy after two years seizures free period. AEDs should be withdrawn over a period of 3-6 months or longer because abrupt withdrawal may cause status epilepticus. Withdraw one drug at a time in patients on multiple AEDs. If seizures recur during or after withdrawal, revert back to their AED dose before reduction.

**Surgery for epilepsy**

Refractory epilepsy in childhood can be defined as epilepsy which is uncontrolled despite adequate trials of three first line AEDs. However, before labelling as intractable seizures rule out errors in management as pseudo-intractability often results from an inadequate dose, irrational polytherapy or wrong choice of AED. Every effort should be made to keep a seizure diary and see if a specific AED is actually helping or in some cases worsening the seizures, e.g. carbamazepine/ oxcarbazine may worsen and sometimes even induce absence/myoclonic seizures.

Refer intractable epilepsy early to a tertiary centre for appropriate evaluation (including high-end MRI using standardized epilepsy protocols, video EEG, etc.) as
well as to get guidance on management options like newer AEDs, the ketogenic diet and surgery.

**Patient/parent education**

**Important information for caregivers** in case a person is found having a seizure or is unconscious after a seizure:

**DO’S:**

- Put the person on one side and allow the fit to be over. The fit is usually over in 1-2 minutes. Loosen the person’s clothes.
- Inform his/her relatives and/or the treating doctor in case any contact details are available in his/her pocket.
- Rush the person to the nearby hospital/medical facility in case the fits do not stop or there are several fits one after the other.

**DONT’S:**

- Put anything like a spoon, piece of wood or cloth in between the teeth or in the mouth or a key in his hands. Put a shoe or onion in front of his nose.
- Forcibly stop his arms and legs from jerking.
- Give him anything to drink or eat.
- Crowd around the person having seizure.

Most parents are initially frightened by the diagnosis of epilepsy and require support and accurate information. The physician should anticipate questions, including inquiries about duration of the seizure disorder, side effects of medication and convulsions, aetiology, social and academic repercussions, and parental guilt.

Provide information to parents and encourage them to maintain a seizure diary and treat the child as normally as possible. For most children with epilepsy, restriction of physical activity is unnecessary except that the child must be attended by a responsible adult while the child is bathing and swimming.

Most children with epilepsy are well controlled on medication, have normal intelligence, and can be expected to lead normal lives. However, these children require careful monitoring, as learning disabilities are more common in children with epilepsy than in the general population.

Cooperation and understanding among the parents, physician, teacher, and child enhance the outlook for the patients with epilepsy.

Counselling should also include first aid measures to be used, if the seizure recurs. Patients should be instructed to avoid high-risk activities like swimming, driving, roof tops, fire places, etc. for at least 6 months after the last seizure.

Explain that medications should be taken exactly as prescribed. Irregular intake of drugs or sudden stoppage can lead to status epilepticus and will also prolong the duration of the treatment.
To report immediately in case of status epilepticus, if seizure frequency increases, develops any intermittent illness especially fever and behavioural problem. Young women on AED must consult doctor before conceiving.


Explain special precautions to be taken with AEDs: In patients on valproic acid, frequent liver function test to be done at beginning and first six months of drug therapy.

For prevention of gum hypertrophy, patient should be advised to maintain good oral hygiene and frequent rinsing of mouth.

In patients on AEDs—explain possible risk of drug interactions especially oral contraceptives and antitubercular drugs.

References
5. Guidelines for management of Status Epilepticus in India. Indian Epilepsy Association 2008.

STATUS EPILEPTICUS (SE)

Status epilepticus (SE) is an emergency condition associated with high morbidity and mortality, if not treated early and effectively. However, about 12-30% of adult patients first present with status epilepticus as their first presentation. It often occurs in patients with pre-existing epilepsy. SE can occur due to underlying metabolic disturbances, central nervous system (CNS) infections, head trauma and hypoxia.

SALIENT FEATURES

Continuous seizures lasting for at least 30 minutes or two or more discrete seizures between which there is incomplete recovery of consciousness. Compensatory mechanisms start failing after 30 minutes resulting in hypotension, decreased cerebral blood flow, normo- or hypoglycaemia, hypoxia and hyperpyrexia.

Transient or early (0-30 minutes) physiological changes are hypertension, increased cerebral blood flow, hyperglycaemia, hyperkalaemia and lactic acidosis.
Treatment

Out-of-hospital setting

Children and young adults: Rectal diazepam 0.5 mg/kg or buccal midazolam 0.2-0.3 mg/kg.

**Adults** Rectal diazepam 10 mg or buccal midazolam 10 mg

IV administration by local doctor or nurse (on doctor’s advice) Inj. Lorazepam 2 mg IV or Inj. Diazepam 5-10 mg IV.

**General measures:** Secure airway, breathing and circulation, safety and check random sugar.

Nonpharmacological

In hospital, immediately ensure adequate oxygenation by nasal cannula or mask, position patient’s head for optimal airway patency; patient should be transported in lateral position and clear the mouth from secretions/frothing.

Rule out the treatable metabolic causes which can precipitate epilepsy. Establish IV access, draw venous blood samples for glucose level, serum chemistries, haematological studies, toxicology screens and determination of antiepileptic drug levels and EEG monitoring (if available).

Assess oxygenation with pulse oximetry or periodic arterial blood gas determinations. If hypoglycaemia is established or if blood glucose determination is not available, administer glucose, in adults, 25% Dextrose IV 50-100 ml immediately (to be preceded by 50 mg IM Thiamine, if patient is a known alcoholic). In children, the dose of glucose is 2 ml/kg of 25% glucose.

**Pharmacological (adults)**

1. Inj. Lorazepam 0.1 mg/kg (max 4 mg) at the rate of 2 mg/min IV over one minute (can be repeated after 10-20 min).

   Or

   Inj. Diazepam 0.2 mg/kg (max 10 mg) at 5 mg/min IV over one minute (can be repeated, if seizures do not stop after 5 minutes).

Second stage established GCSE (20-60 minutes)

Inj. Phenytoin 15-20 mg/kg slow infusion in saline (not more than 50 mg/min). (**Caution:** Phenytoin is incompatible with glucose containing solutions; purge IV line with normal saline before administering phenytoin infusion; IM not recommended as absorption is erratic). If seizures are not controlled after 10 minutes after a loading dose of phenytoin, give additional dose of Phenytoin 5-10 mg/kg IV at the rate of 50 mg/min.

Or

Inj. Fosphenytoin 15-18 mg/kg phenytoin equivalent (PE) at 150 mg PE/min (**Caution:** Cardiac monitoring and check BP as it can produce hypotension/arrhythmia).
2. If seizures are continuing after 10 minutes of loading dose of phenytoin/fosphenytoin, give additional Phenytoin 5-10 mg/kg or 5-10 mg/kg phenytoin equivalent.

3. If seizures are continuing, Inj. Sodium valproate 25-35 mg/kg IV at the rate of 6 mg/kg/hour
   Or
   Inj. Phenobarbitone 20 mg/kg IV at 60 mg/minutes (should be considered where ventilator facility is available as it can cause hypotension and respiratory depression).
   **Once seizures are controlled**, commence longer term AED with one of
   Tab. Sodium valproate 800-1500 mg/day orally Or Tab. Phenytoin 300 mg/day orally Or Tab. Carbamazepine 400-1200 mg/day.

   **If status persists after 60 minutes (refractory SE):** Identify the precipitating or underlying cause of SE and institute treatment accordingly and shift patient to a tertiary care hospital with ICU or emergency care unit having ventilation facility).

   1. Prepare for mechanical ventilation, place EEG monitor, place arterial catheter and central catheter.
   2. Give anaesthetic dose of Inj. Midazolam 0.2 mg/kg (max 10 mg) IV bolus over 2 minutes followed by 0.1-0.4 mg/kg/h continuous infusion.
      Or
      Inj. Propofol 2.5 mg/kg IV bolus followed by 5-10 mg/kg/h. Or
      Inj. Thiopental 10-20 mg/kg IV over one hour followed by 0.5 -1 mg/kg/h infusion.
   3. Coma phase: Continue pharmacologic coma for 12 hour after last seizures with EEG goal of burst suppression.
   4. Weaning phase: Reduce infusion of the anaesthetic agent every 3 hours with EEG monitoring, if there are no clinical or electrographic seizures, then wean off. If seizures recur, re-institute coma therapy with the same anaesthetic agent to which the seizures responded. Try to wean as outlined above, if there are no clinical or electrographic seizures for last 12 hours.
   5. General measures: Identification and treatment of medical complications including hyperthermia. Consider treating acidosis if pH 7.2 or if symptomatic in the form of cardiac conduction disturbances or haemodynamically unstable.

**Status epilepticus in children** (See Fig. 1.10)

**Non-convulsive status epilepticus (NCSE)**

NCSE is less critical compared to convulsive status but requires ICU with facility for continuous EEG monitoring. General measures and investigation apply as described for GCSE. As the NCSE is more common in the elderly, non-anaesthetizing anticonvulsants may be tried.
Establish ABCs: Establish IV access, draw blood for laboratory investigations IV glucose, calcium, or pyridoxine (in neonates and infants)

IV Lorazepam 0.1 mg/kg

OR

IV diazepam 0.2 mg/kg followed by IV phenytoin/fosphenytoin

(If no IV access, use PR diazepam 0.5 mg/kg or buccal/nasal/IM midazolam 0.2 mg/kg; intraosseous access could be considered as a next step, if IV still not available.)

Repeat lorazepam/diazepam once more SOS (5-10 mins)

IV fosphenytoin 20 PE (phenytoin equivalent)/kg phenytoin 20 mg/kg (30 mins)

(Consider transfer to PICU facilities as child at risk of refractory status)

IV valproate (1:1 diluted NS 20-40 mg/kg over 1-5 minutes; given as continuous infusion at a rate of 5 mg/kg/h, if required.

OR

IV phenobarbital 15-20 mg/kg

(Re-assess airway again; consider tracheal intubation, if the airway is compromised or the patient develops respiratory depression) (45-60 min)

Transfer to a PICU set-up is mandatory as the child has refractory SE and will need intensive monitoring in a tertiary PICU set-up.

Midazolam infusion (loading dose of 0.2 mg/kg, followed by 0.1 mg/kg/h titrate every 15 mins upwards by 0.05 mg/kg/h till control; maximum dose 2 mg/kg/h)

OR

Propofol infusion/pentothal infusion

(Propofol should not be routinely recommended in view of significant morbidity and mortality in children)

General anaesthesia, if above steps fail

(Tertiary hospital set-up essential)

In refractory status epilepticus, needing coma producing therapies (Pentothal, etc.), EEG monitoring preferably continuous should be used, if available. It should also be used, if coma persists despite control of convulsive status epilepticus (to exclude non-convulsive status epilepticus)

Fig. 1.10. Management of status epilepticus in children.

**Maintenance AED treatment following control of status epilepticus**

Along with emergency treatment of GCSE and NCSE, maintenance AED therapy should be given to prevent recurrence of seizures.
In patients known to have epilepsy, their usual AED should be maintained and dose adjustments may be carried depending on serum AED levels.

In patients presenting for the first time as status, start AEDs to control status and then can be continued as oral maintenance therapy.

NCSE may not require long-term AEDs. When required, choose the AED depending upon the clinical situation.

Patient education

Convulsive SE is a serious complication most often seen in patients with pre-existing epilepsy and is most often precipitated by missing or discontinuing medication or associated medical illness.

If patient continues to convulse for more than 5 min or does not regain consciousness after a seizure, the patient should be hospitalized.

Patient should be transported in lateral position and mouth should be cleared from secretions/frothing.

Reference


ASTHMA

A chronic inflammatory disease characterized by increased responsiveness of the airways to a number of stimuli resulting in their narrowing which is reversible spontaneously or with treatment.

SALIENT FEATURES

Classic triad of recurrent cough, wheeze, breathlessness; however, all the three may not be present.

Clinical symptoms may be increased due to upper respiratory viral infections, exercise, exposure to smoke, dust, cold air, cold food or various allergens. Diagnosis is clinical and demonstration of reversible airway obstruction on pulmonary function tests (Fig. 1.11).

Asthma can present as an acute exacerbation which can be mild, moderate to severe or life-threatening. Treatment depends on the severity of asthma.

Mild acute asthma is characterized by: Cough with or without wheeze, some difficulty in respiration but no problems of speech or feeding. Oxygen saturation of more than 95% and PEFR of more than 80% predicted.
Moderate to severe asthma is characterized by: Tachypnoea, tachycardia, mild chest indrawing, difficulty in feeding and speech. Oxygen saturation may be as low as 90% and PEFR is 30-60% in severe asthma.

Consider the diagnosis of asthma in patients with some or all of the following:

<table>
<thead>
<tr>
<th>Symptoms and Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episodic/variable</td>
</tr>
<tr>
<td>• Wheeze</td>
</tr>
<tr>
<td>• Shortness of breath</td>
</tr>
<tr>
<td>• Chest tightness</td>
</tr>
<tr>
<td>• Cough</td>
</tr>
<tr>
<td>• Signs could be none (common) or wheeze—diffuse, bilateral, expiratory (+ inspiratory) and tachypnoea</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Helpful additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Personal or family history of asthma or atopy (eczema, allergic rhinitis)</td>
</tr>
<tr>
<td>• History of worsening after use of aspirin/NSAID ingestion, use of beta-blockers (including glaucoma drops)</td>
</tr>
<tr>
<td>• Recognised triggers – pollens, dust, animals, exercise, viral infections, chemicals, irritants</td>
</tr>
<tr>
<td>• Pattern and severity of symptoms and exacerbations</td>
</tr>
</tbody>
</table>

Spirometry is suggestive of airway obstruction which is reversible completely or partially after bronchodilators.

<table>
<thead>
<tr>
<th>Indications for referral for specialist opinion/ further investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diagnosis unclear or in doubt</td>
</tr>
<tr>
<td>• Unexpected clinical findings, e.g. crackles, clubbing, cyanosis, heart failure</td>
</tr>
<tr>
<td>• Spirometry or PFTs don’t fit in the clinical picture</td>
</tr>
<tr>
<td>• Suspected occupational asthma</td>
</tr>
<tr>
<td>• Persistent shortness of breath (non-episodic, or without associated wheeze)</td>
</tr>
<tr>
<td>• Unilateral or fixed wheeze</td>
</tr>
<tr>
<td>• Stridor</td>
</tr>
<tr>
<td>• Persistent chest pain or atypical features</td>
</tr>
<tr>
<td>• Weight loss</td>
</tr>
<tr>
<td>• Persistent cough and/or sputum production</td>
</tr>
<tr>
<td>• Non-resolving pneumonia</td>
</tr>
<tr>
<td>• Severe eosinophilia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Differential diagnoses in adults:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• COPD</td>
</tr>
<tr>
<td>• Cardiac disease</td>
</tr>
<tr>
<td>• Tumour - laryngeal, tracheal, lung</td>
</tr>
<tr>
<td>• Bronchiectasis</td>
</tr>
<tr>
<td>• Foreign body</td>
</tr>
<tr>
<td>• Interstitial lung disease</td>
</tr>
<tr>
<td>• Pulmonary emboli</td>
</tr>
<tr>
<td>• Aspiration</td>
</tr>
<tr>
<td>• Vocal cord dysfunction</td>
</tr>
<tr>
<td>• Hypertension</td>
</tr>
<tr>
<td>• Aspergillosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Differential diagnosis in children</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Episodic viral wheeze</td>
</tr>
<tr>
<td>• Congenital heart disease</td>
</tr>
<tr>
<td>• Aspiration - GERD, pharyngeal incoordination, tracheo-oesophageal fistula</td>
</tr>
<tr>
<td>• Cystic fibrosis</td>
</tr>
<tr>
<td>• Immunodeficiency</td>
</tr>
<tr>
<td>• Immotile cilia syndrome</td>
</tr>
</tbody>
</table>

• Consider chest X-ray in any patient presenting atypically or with additional symptoms

**Fig. 1.11.** Diagnosis of asthma.
Life-threatening asthma is characterized by: Poor respiratory effort, cyanosis, exhaustion, agitated or depressed, confusion, oxygen saturation may be lower than 90% and PEFR is less than 30%.

Treatment

Nonpharmacological

Wherever possible, identify and avoid the trigger factor(s), stop smoking and do regular breathing exercises, e.g. ‘Pranayama’.

Pharmacological

Acute exacerbation of asthma (Fig. 1.12)

Good response is defined as patient feeling well with minimal or no dyspnoea, marked improvement in heart rate, respiratory rate and little or no rhonchi on auscultation with oxygen saturation above 95% at room air. If response is sustained for next 3-4 hours patients, patients showing good response may be sent home on inhaled or oral bronchodilators for 7-10 days.

If the response is partial or the patient is on maintenance treatment with high dose inhaled steroids or attended emergency room in last 72 hours add Tab. Prednisolone 1 mg/kg/day for 3-5 days. Call the patient again for reassessment after 1 week or early, if symptoms are not getting controlled or worsening.

Patients not showing any response or poor response should be treated as moderate to severe acute asthma.

Life-threatening asthma

Treatment of life-threatening episode should be immediate and no time should be spent on detailed clinical history.

1. Oxygen inhalation 4 L/min to maintain SpO\textsubscript{2} >90%.
2. Inj. Terbutaline 10 mcg/kg subcutaneously or IV (maximum 40 mcg/day).
3. Inhaled Salbutamol/Terbutaline preferably by nebulizer (as discussed above).
4. Ipratropium Bromide 250 mcg by nebulizer with Salbutamol.
5. Inj. Hydrocortisone 10 mg/kg IV.
6. Inj. Aminophylline 5 mg/kg bolus slowly followed by 0.8-1.2 mg/kg/hour slow infusion (If patient has received theophylline preparation in last 72 hours; reduce bolus dose to 2.5 mg/kg).
7. Inj. Magnesium sulphate 40 mg/kg in 50 ml 5% dextrose as slow infusion over 30 minutes can be considered.

If no response do arterial blood gas analysis, X-ray chest and serum electrolytes. Intubate the patient if no or poor respiratory effort, increased carbon dioxide with respiratory acidosis. Transfer to intensive care unit as early as possible.

If above therapy fails. Transfer should be arranged so that oxygen and inhalation therapy can be continued on the way.
Initial assessment and grade severity of attack

**History, physical examination**

### MILD ATTACK

**Initial Treatment**
- Salbutamol inhalation 2.5 mg/dose (5 mg/ml solution), by nebulizer every 20 minutes × 3
- Salbutamol inhalation by MDI-spacer 4 puffs (100 mcg/puff) at 2-3 min interval. This course is repeated every 20 minutes × 3
- Inj Adrenaline 0.01 ml/kg (max of 0.3 ml) of 1:1000 solution subcutaneous every 20 min × 3

**Good response:**
- Home treatment
  - Continue inhaled or oral salbutamol 6 hourly

**Incomplete or poor response:**
- Add steroids
- Observe for 4 h
- Continue Salbutamol 4-6 hourly inhalation
- Discharge, if improvement seen

**Home treatment:**
- Continue inhaled or oral Salbutamol 6 hourly
- Short course steroids for 3-5 days; can be stopped without tapering.

### MODERATE TO SEVERE ATTACK

**Initial Treatment**
- Salbutamol inhalation 2.5 mg/dose (5 mg/ml solution), by nebulizer every 20 minutes × 3
- Salbutamol inhalation by MDI-spacer 4 puffs (100 mcg/puff) at 2-3 min interval. This course is repeated every 20 minutes × 3
- Inj Adrenaline 0.01 ml/kg (max of 0.3 ml) of 1:1000 solution subcutaneous every 20 min × 3
- Oxygen
- Start steroids; Prednisolone 1 mg/kg or Hydrocortisone 10 mg/kg IV stat

**Poor response:**
- Repeat initial treatment as before, and
- Add Ipratropium bromide inhalation (may mix or alternate with salbutamol)
- Oxygen
- Oral Prednisolone (1-2 mg/kg)

**Poor response at any stage:**
- Follow the principle of "Last in–First out"
  - Omit aminophylline infusion in 12-14 h, if used
  - Omit ipratropium inhalation in next 12-24 h
  - Reduce the salbutamol inhalation to 4-6 hourly
  - Plan discharge

Fig. 1.12. Management algorithm for treating acute asthma in a hospital.
Notes:
Antibiotics are required only if there is a consolidation, high grade fever or polymorphonuclear leucocytosis.
Mere presence of crackles is not an evidence of pneumonia and does not warrant antibiotics.
Mucolytics and cough syrups are not helpful.
Sedation should be avoided in acute asthma.
Non-sedating antihistaminics may be used, if associated allergic rhinitis is there.

Long-term management of asthma

Long-term asthma management depends on severity over a period of time. Assess severity of asthma on the basis of the frequency of symptoms including disturbance of sleep, effect on day-to-day activity of patient and need for medication, hospital visit and hospitalization and pulmonary function tests (PFTs) by spirometer (Table 1.14).

Table 1.14. Assessment of severity of asthma

<table>
<thead>
<tr>
<th>Step</th>
<th>Symptoms</th>
<th>Night time symptoms</th>
<th>PEFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Continuous</td>
<td>Frequent</td>
<td>≤ 60% predicted</td>
</tr>
<tr>
<td>3</td>
<td>Limited physical activity</td>
<td>Variability &gt; 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Daily use beta-2 agonist daily attack affects activity</td>
<td>&gt;1 times a week</td>
<td>&gt;60%-&lt;80% predicted</td>
</tr>
<tr>
<td>2</td>
<td>&gt;1 times a week but &lt;1 time a day</td>
<td>&gt;2 times a month</td>
<td>≥ 80% predicted variability 20-30%</td>
</tr>
<tr>
<td>1</td>
<td>&lt;1 time a week</td>
<td>&lt;2 times a month</td>
<td>≥ 80% predicted variability &lt; 20%</td>
</tr>
<tr>
<td>Intermittent</td>
<td>Asymptomatic and normal PEFN between attack</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Treatment of Chronic Asthma

Principles of asthma treatment

1. Use rescue medication (SABA) for symptoms of dyspnoea, wheezing and chest tightness at any stage.
2. Begin anti-inflammatory medication (inhaled ICS preferred) when symptoms occur two or more times a week.
3. Do not use LABA bronchodilators continuously as solo treatment.
4. Adding LABA to ICS is preferred approach when step-up therapy is needed.
5. Medium or high dose ICS may be necessary to control persistent symptoms, but risk more systemic absorption.
6. Sustained-released theophylline is a bronchodilator with weak anti-inflammatory properties and frequent side effects.
7. The use of a spacer device is recommended when MDI canisters are used to reduce oropharyngeal deposition and reduce systemic absorption. In children below 4 years of age: Metered dose inhaler (MDI) with spacer with facemask; For children above 4 years of age: MDI with spacer; For patients above 12 years of age: MDI may be used directly or dry powder inhaler is as effective. Elderly patient: MDI with spacer; however, some may prefer dry powder inhaler.

8. Reassess inhaler technique as part of clinical assessment and review treatment plan with current clinical control criteria. If the patient is unable to use a device satisfactorily an alternative should be found.

9. Systemic corticosteroids have many side effects. They may be necessary for severe asthma; oral use is preferred over intramuscular or intravenous delivery.

Figure 1.13 gives summary of stepwise management in adults; and in children aged 5-12 years. Treatment in children less than 5 years is discussed in the Chapter 19 under Wheezy Child section.
Level of control of symptoms to be assessed by using Table 1.15 and modify treatment based on the level of control.

**Table 1.15.** Levels of asthma control and the clinical characteristics of controlled, partly controlled, and uncontrolled asthma

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Controlled (all of the following)</th>
<th>Partly controlled (any measure presented)</th>
<th>Uncontrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day time symptoms</td>
<td>None (twice or less/week)</td>
<td>More than twice/week</td>
<td>Three or more features of partly controlled asthma*†</td>
</tr>
<tr>
<td>Limitation of activities</td>
<td>None</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>Nocturnal symptoms/awaking</td>
<td>None</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>Need for reliever/rescue inhaler</td>
<td>None (twice or less/week)</td>
<td>More than twice/week</td>
<td></td>
</tr>
<tr>
<td>Lung function (PEF or FEV₁) ‡</td>
<td>Normal</td>
<td>&lt;80% predicted or personal best (if known)</td>
<td></td>
</tr>
</tbody>
</table>

**B. Assessment of future risk (risk or exacerbations, instability, rapid decline in lung function, side effects)**

Features that are associated with increased risk of adverse events in the future include: Poor clinical control, frequent exacerbations in past year*, ever admission to critical care for asthma, low FEV₁, exposure to cigarette smoke, high dose medications.

*Any exacerbation should prompt review of maintenance treatment to ensure that it is adequate. †By definition, an exacerbation in any week makes that an uncontrolled asthma week. ‡Without administration of bronchodilator, lung function is not a reliable test for children 5 years and younger.

**Follow-up and modification in treatment**

Call the patient every 8-12 weeks. On each visit, examine the patient; look for adverse effects of the drugs and record height and weight in children. Measure PEF/PFTs and record the assessed status of disease.

Monitoring is necessary as asthma is a variable disease. Treatment has to be adjusted periodically in response to loss of control as indicated by worsening symptoms or development of an exacerbation.

Step down the medications, if control is sustained for at least 3 months and follow a gradual stepwise reduction in treatment. When deciding which drug to step down first and at what rate, the severity of asthma, the side-effects of treatment, the beneficial effect achieved, and the patients’ preference should all be taken into account. Patients should be maintained at the lowest possible dose of inhaled steroid. Reduction in inhaled steroid dose should be slow as patients deteriorate at different rates.
Applying the following rules can be helpful:

When an ICS alone in medium to high dose is used a 50% reduction in dose should be attempted at three month intervals.
Where low dose ICS alone achieves control, switch to once-daily dosing.
Where ICS and LABA combination achieves control, begin by reducing ICS dose by 50% while continuing LABA. Continue until a low dose of ICS is reached then stop the LABA.
Or switch the combination treatment to once-daily dosing.
Controller treatment may be stopped, if the patient’s asthma remains controlled on the lowest dose of controller with no recurrence of symptoms in one year.

If there is no improvement or deterioration, look for possible cause such as poor compliance, wrong technique of inhalation, continued use of empty canister, inappropriate doses, infection (otitis media, sinusitis, pneumonitis), continued exposure to allergens, under assessment of illness in previous visit, allergic rhinitis and sinusitis. If no cause is found, a step up may be considered, i.e. increase in dose and frequency of medication and avoidance of risk factors.

Rescue patients therapy of acute exacerbation
Parents/patients should be trained to identify acute exacerbations.

1. Identify acute exacerbation by increase in cough, wheeze and breathlessness.
2. Measure PEFR (if feasible), if decreased by 15% from the baseline, administer Salbutamol by MDI with spacer with or without facemask, one puff at a time, repeated every 2-4 minutes up to a maximum of 10-20 puffs with monitoring of symptoms.

If symptoms are relieved and PEFR is increased at the end of inhalation, continue on Salbutamol/Terbutaline every 4-6 hours and a visit to treating physician should be planned.

If there is no improvement or partial improvement or there are symptoms of life-threatening attack (severe distress, difficulty in speech, feeding, cyanosis, exhaustion) at any time, the patient should be immediately transferred to a hospital and during transportation continue inhaled Salbutamol/Terbutaline and give a dose of prednisolone (1-2 mg/kg).

Patient/parent education

Explain the nature and pathogenesis of asthma in simple language and inform the patient that severity may change over a period of time because it is a variable disease.

Emphasize that there is a wide-spectrum of severity of asthma and that most patients can lead active and normal life.

Ask to maintain a record of daily symptoms such as cough, coryza, wheeze and breathlessness. A record of sleep disturbances, absence from school due to illness and medication is required to keep the patient symptom free.
Patients/parents should be trained to identify acute exacerbations and initiate rescue plan as above.

Environmental control to avoid precipitating factors is very important. Patient/parents should avoid dusting (wet mopping is preferred), when children are around.

Avoid using carpets, stuffed toys, open bookshelves, smoking and chemical sprays in the house. Mosquito nets should be preferred over repellents.

Food with chemicals like preservatives/colouring agents should be avoided. Inhalation technique: It is best to use MDI with spacers, however, if low dose steroids are being given then dry powder inhaler can also be used. MDI must be shaken well before inhalation. It is then attached to spacer (commercial/indigenous made from plastic bottle) and patient is asked to inhale 3-4 times slowly and deeply just when the drug is released by activation of MDI.

To avoid continued use of an empty canister, parents/patients can keep a record of number of doses used every day or use a canister with counter.

The spacer should be cleaned monthly with detergent and dried in air. The mouthpiece should be wiped clean of detergent before use.

References

CHAPTER 2  
EMERGENCIES

CARDIOPULMONARY RESUSCITATION (CPR)

CPR consists of a series of manoeuvres by which oxygenated blood supply to brain and vital organs is maintained during cardiopulmonary arrest (CPA), i.e. cessation of respiration and circulation.

In children, CPA is not sudden but end result of long period of hypoxaemia secondary to inadequate ventilation, oxygenation or circulation. Therefore, prompt management of these is essential to prevent CPA, the outcome of which is poor.

Diagnosis of cardiopulmonary arrest

Cardiac arrest

1. Absence of pulse in major arteries (carotid or femoral in older children and femoral or brachial in infants as carotid is difficult to palpate due to short neck).
2. Absence of heart sounds on auscultation.
3. Asystole /ventricular fibrillation on ECG.

Respiratory arrest

Absence of respiration on looking (absent chest movements), listening (absent air flow on bringing ears in front of mouth) and feeling (absent air flow on keeping hands in front of mouth or nose).

Levels of CPR. There are two levels of CPR:

1. BLS (basic life support). The elements of CPR provided without additional equipment. Skill and speed are most essential.
2. ACLS (advanced cardiac life support). Use of equipment and drugs for assisting ventilation or circulation.

BASIC LIFE SUPPORT (BLS)

Provide CPR as a team. One rescuer activates the emergency response system while a second begins chest compressions, a third is either providing ventilations or retrieving the bag mask for rescue breathing, and fourth is retrieving and setting up a defibrillator (Figs 2.1-2.4). Table 2.1 summarizes key BLS components for adults, children, and infants excluding the newly born, in whom the aetiology of an arrest is nearly always asphyxial.

Call for help. Position the victim supine on firm flat surface with head level with the heart. To assess the need for CPR, the lay rescuer should assume that cardiac arrest is present, if the victim is unresponsive and not breathing or only gasping. There has been a change in the
recommended sequence for the lone rescuer to initiate chest compressions before giving rescue breaths (C-A-B rather than A-B-C).

Check for response gently tap the victim and ask loudly, “Are you okay?” Call the victim’s name, if you know it. If the victim is responsive, he or she will answer, move, or moan. Quickly check to see, if there are any injuries or needs medical assistance. If the victim is unresponsive and not breathing (or only gasping), begin CPR.

**Fig. 2.1.** Simplified adult BLS.
1. No movement or response or no normal breathing

2. Phone 102 or emergency number
Get Automated External Defibrillator (AED) or send second rescuer (if available) to do this

3. No response, check pulse:
Do you DEFINITELY feel pulse within 10 seconds?

3A. Definite Pulse
- Give 1 breath every 5 to 6 seconds
- Recheck pulse every 2 minutes

4. No Pulse
Give cycles of 30 COMPRESSIONS* and 2 BREATHS until AED/defibrillator arrives, ALS providers take over, or victim starts to move
*Push hard and fast (at least 100/min) and release completely Minimize interruptions in compressions

5. AED/defibrillator ARRIVES

6. Check rhythm
Shockable rhythm?

7. Shockable
Give 1 shock Resume CPR immediately for 2 minutes

8. Not shockable
Resume CPR immediately for 2 minutes check rhythm every 2 minutes; continue until ALS provider take over or victim starts to move

* Compression depth at least 2 inches (5 cm)

Note: Boxes bordered with dotted lines indicated actions or steps compression depth at least 2 inches (5 cm) performed by the health care provider but not the lay rescuer.

Fig. 2.2. Adult BLS healthcare provider algorithm.
Paediatric BLS Healthcare Providers

1

Unresponsive
No breathing or only gasping
Send someone to activate emergency response system, get AED/defibrillator

2

Activate emergency response system Get AED/defibrillator or send second rescuer (if available) to do this

3

Check pulse: DEFINITE pulse within 10 seconds?

3A

Definite Pulse

• Give 1 breath every 3 seconds
• Add compressions if pulse remains <60/min with poor perfusion despite adequate oxygenation and ventilation
• Recheck pulse every 2 minutes

4

One Rescuer: Begin cycles of 30 COMPRESSIONS and 2 BREATHS
Two Rescuers: Begin cycles of 15 COMPRESSIONS and 2 BREATHS

Push hard and fast at the rate of at least 100/min. Compression depth at least 3 Anterior Posterior diameter of chest, about 1.5 inches (4 cm) in infants and 2 inches (5 cm) in children. Allow complete chest recoil after each compression minimize interruptions & avoid excessive ventilation.

5

After about 2 minutes, activate emergency response system and get AED/defibrillator if not already done Use AED as soon as available

6

Check rhythm

Shockable rhythm?

7

Shockable

Give 1 shock Resume CPR immediately for 2 minutes

8

Not Shockable

Resume CPR immediately for 2 minutes Check rhythm every 2 minutes; continue until ALS providers take over or victim starts to move

Note: The boxes bordered with dashed lines are performed by healthcare providers and not by lay rescuers

Fig. 2.3. Paediatric BLS algorithm.
Note: For term babies use 100% oxygen when baby is cyanotic or when positive pressure ventilation is required. One may begin with less than 100% oxygen or room air. If so, supplementary oxygen should be available to use if there is no appreciable improvement within 90 seconds after birth. If supplemental oxygen is not available positive pressure ventilation should be continued with room air.

Medications: Naloxone not to be given by endotracheal route.

* Endotracheal intubation may be considered at several steps.

Fig. 2.4. Newborn resuscitation algorithm.
Table 2.1. Summary of key BLS components for adults, children, and infants, excluding the newly born, in whom the aetiology of an arrest is nearly always asphyxial.

<table>
<thead>
<tr>
<th>Component</th>
<th>Adults</th>
<th>Children</th>
<th>Infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>No breathing or no normal breathing (i.e. only gasping)</td>
<td>No breathing or only gasping</td>
<td>No pulse palpated within 10 seconds for all ages (Health Care Provider (HCP) only)</td>
</tr>
<tr>
<td>CPR sequence</td>
<td>C-A-B</td>
<td>C-A-B</td>
<td>C-A-B</td>
</tr>
<tr>
<td>Compression rate</td>
<td>At least 100/min</td>
<td>At least 1/3 AP diameter</td>
<td>At least 1/3 AP diameter</td>
</tr>
<tr>
<td>Compression depth</td>
<td>At least 2 inches (5 cm)</td>
<td>At least 1/3 AP diameter</td>
<td>At least 1/3 AP diameter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>About 2 inches (5 cm)</td>
<td>About 1½ inches (4 cm)</td>
</tr>
<tr>
<td>Chest wall recoil</td>
<td>Allow complete recoil between compressions</td>
<td>Minimize interruptions in chest compressions</td>
<td>Attempt to limit interruption to &lt;10 seconds</td>
</tr>
<tr>
<td>Compression interruptions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airway</td>
<td>Head tilt-chin lift (HCP suspected trauma: jaw thrust)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression-to-ventilation ratio</td>
<td>30:2</td>
<td>30:2</td>
<td>30:2</td>
</tr>
<tr>
<td>(until advanced airway placed)</td>
<td>1 or 2 rescuers</td>
<td>Single rescuer</td>
<td>Single rescuer</td>
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<tr>
<td></td>
<td></td>
<td>15:2</td>
<td>15:2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 HCP rescuers</td>
<td>2 HCP rescuers</td>
</tr>
<tr>
<td>Ventilations: when rescuer untrained or trained and not proficient</td>
<td>Compressions only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilations with advanced airway (HCP)</td>
<td>1 breath every 6-8 seconds (8-10 breaths/min)</td>
<td>Asynchronous with chest compressions</td>
<td>Asynchronous with chest compressions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>About 1 second per breath</td>
<td>About 1 second per breath</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visible chest rise</td>
<td>Visible chest rise</td>
</tr>
<tr>
<td>Defibrillation</td>
<td>Attach and use AED as soon as available. Minimize interruptions in chest compressions before and after shock; resume CPR beginning with compressions immediately after each shock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Circulation

Initiate chest compressions before ventilation. If a bystander is not trained in CPR, the bystander should provide Hands-only compressions only CPR for adult victim who suddenly collapses, with an emphasis on “Push Hard and Fast” on the centre of the chest and continue hands-only CPR until an AED arrives and is ready to use. The lone rescuer should continue this cycle of 30 compressions and 2 breaths for approximately 2 minutes before leaving the victim to activate the emergency response system and obtain an automated external defibrillator (AED), if one is nearby.
Rescuer should stand or kneel at the side of the patient so that his hips are on a level with the victim’s chest.

In a newborn, (Fig. 2.4) 2 thumbs are positioned side by side on sternum just below the nipple line, with fingers encircling chest and supporting the back and compress sternum by 1.2 cm (120/min). For details, see section on Newborn Care, Chapter 19.

In an infant, compress the sternum with 2 fingers placed just below the intermammary line. 2 fingers (index, middle) to compress sternum by at least 4 cm at the rate of at least 100/min and do not lift the finger, when compression is released. Two thumb-encircling hands technique can also be used.

In children, (1 year- up to the start of puberty) use heel of hand on lower half sternum with long axis of heel same as long axis of sternum and compress at least 2 inches (5 cm) at the rate of at least 100/min.

In adults, the heel of one hand is placed on the lower sternum and the other hand placed on top of the first. The elbows should be locked in position with the arms straight and the shoulders over the hands. Sternum should depress by at least 2 inches (5 cm) and the rate of compression at least 100/min.

Allow for complete chest recoil after each compression and minimize interruptions in chest compressions. (Caution: Do not exert pressure on the ribs, costal cartilages or xiphoid)

Combination of ventilation and cardiac massage

If both cardiac and respiratory arrest—Compression: ventilation = 30:2 in adults, children and infants with one rescuer and 15:2 with 2 rescuers.

Compression only CPR if unable or unwilling to provide rescue breaths, although the best method of CPR is compression coordinated with ventilations.

(b) Airway

After delivery of 30 compressions, open the airway and deliver 2 rescue breaths in case of lone rescuer

i. Clear airway by cleaning blood, secretions, foreign particles (suction, if available).

ii. Prevent posterior displacement of tongue due to muscle relaxation during CPA, by head tilt and chin lift or jaw thrust (may use an airway if available).

Head tilt: Put a hand at forehead and tilt head back to sniffing or neutral position in an infant and little more in older children and adults.

(Caution: In a patient with suspected cervical spine injury, head tilt should be avoided)

Chin lift: Put finger of other hand under bony part of lower jaw at chin and lift chin upward.

Jaw thrust: Place 2-3 fingers under each side of lower jaw at its angle and lift jaw upward with the elbow resting on the surface on which victim is lying.
(c) Breathing

While maintaining an open airway, look, listen, and feel for breathing within 10 seconds. Rescue breaths be given in approximately 1 second every 6 to 8 seconds (about 8-10 breaths per minute). Avoid excessive ventilation, with enough volume to produce visible chest rise. It applies to all forms of ventilation during CPR, including mouth to mouth/nose/mask/airway breath (may use bag and mask, if available). Inhale and then make a seal around the mouth and nose together in an infant and seal mouth only in older children and adults (nose pinched with the hand used for head tilt) to exhale smoothly. Avoid delivering breaths that are too large or too forceful. Once advanced airway is in place, continue chest compressions at the rate of at least 100/min.

ADVANCED CARDIAC LIFE SUPPORT (ACLS)

If ACLS facility is available, shift the patient to ACLS as soon as possible. If this is not available, then continue cardiac massage till spontaneous HR is more than 60-80/min and continue artificial breathing till adequate respiratory efforts are present (good chest movement, no cyanosis or shock). The management of cardiac arrest is highlighted in the ACLS algorithm (Figs 2.5 & 2.6).

Do not interrupt compressions and delay shock for accessing vascular access, drug delivery, advanced airway placement.

**Inj. Naloxone**

Indication: Narcotic overdose or poisoning and newborn resuscitation (if mother has been given morphine or pethidine during labour. For details see section on Opioid Poisoning).

Dose and route: 0.1 mg/kg IV.

**Inj. Sodium bicarbonate (NaHCO	extsubscript{3})**

Not required routinely as it can cause alkalosis later and worsen respiratory acidosis by releasing CO	extsubscript{2} in inadequate ventilation.

Indication: Hyperkalaemia, significant metabolic acidosis (pH <7.2) or prolonged CPR.

In adults and in children: Inj. Sodium bicarbonate 1 mEq/kg stat and 0.5 mEq/kg every 10 minutes in protracted resuscitation.

**Inj. Calcium**

Indication: Not used routinely nowadays unless there is hyperkalaemia, hypocalcaemia or calcium channel blocker toxicity.

Dose and route: In children, 0.5 ml/kg of calcium gluconate IV. In adults, 10 ml to be given as a slow infusion under ECG monitoring.
**Shout for help/activate emergency response Phone 102**

**Start CPR**
“Push hard and fast” (rate at least 100/min) Compression depth at least 5 cm with complete chest recoil between compressions and minimize interruptions
Attach monitor/defibrillator

**Check rhythm**
If VF/VT
Give Shock

**Return of spontaneous rhythm**

**Post-cardiac arrest care**

**CPR 2 minutes, IV/IO access**
Epinephrine every 3-5 minutes/amiodarone for refractory VF/VT

Continue CPR 2 minutes, check quality of CPR Consider advance airway. (Supraglottic advance airway or endotracheal intubation)
Quantitative waveform capnography. 8-10 breaths per minute with continuous chest compressions

Continue CPR 2 minutes, check CPR quality
Treat reversible causes

**Fig. 2.5. ACLS in adults.**

**Inj. Glucose**
Indication: Hypoglycaemia.
Dose and route: 0.5-1 g/kg IV and maintain blood sugar around 140 to 180 mg/dL.
PULSELESS ARREST
BLS algorithm: Call for help, give CPR
Give oxygen when available
Attach monitor/defibrillator when available

1

Pulseless Arrest

Give 1 shock

- Manual biphasic: Device specific (usually 120 to 200 J)
- AED: Device specific
- Monophasic: 360 J

Resume CPR immediately

2

Shockable rhythm?

Give 2 minutes of CPR*

Check rhythm

- No

- Stockable

Give 1 shock

- Manual biphasic: Device specific (same as first shock or higher dose)
- AED: Device specific
- Monophasic: 360 J

Resume CPR immediately after the shock

When IV/IO available, give vasopressor during CPR (before or after the shock)

Epinephrine 1 mg IV/IO

Repeat every 3 to 5 min

- May give 1 dose of vaspressin 40 U IV/IO to replace first or second dose of epinephrine

3

Shockable

4

Not shockable

5

Check rhythm

- No

Resume CPR immediately for 2 minutes

- When IV/IO available, give vasopressor

- Epinephrine 1 mg IV/IO

- Repeat every 3 to 5 min

- Consider Advanced airway, capnography.

6

Check rhythm

- No

If no pulse, go to Box 10

If electrical activity, check pulse.

7

Shockable

8

Continue CPR while defibrillator is charging

Give 1 shock

- Manual biphasic: Device specific (same as first shock or higher dose)
- AED: Device specific
- Monophasic: 360 J

Resume CPR immediately after the shock

Consider antiarrhythmics: give during CPR (before or after the shock)

- Amiodarone (300 mg IV/IO once, then consider additional 150 mg IV/IO once or lidocaine 1 to 1.5 mg/kg first dose, then 5 to 7.5 mg/kg Q15min IV/IO, maximum 3 doses or 3 mg/kg)
- Consider magnesium, loading dose 1 to 2 g IV/IO for torsades de points

After 2 minutes of CPR* go to Box 5 above

9

Asystole/PEA

10

Shockable

11

Check rhythm

- Stockable rhythm?

- No

Give 2 minutes of CPR*

Epinephrine 1 mg IV/IO

Repeat every 3 to 5 min

- Consider Advanced airway, capnography.

12

Check rhythm

- No

If no pulse, go to Box 10

If electrical activity, check pulse.

13

Go to Box 4

During CPR

- Push hard and fast (at least 100/min)
- Ensure full chest recoil
- Minimize interruptions in chest compressions
- One cycle of CPR: 30 compressions then 2 breaths every 2 min
- Avoid hyperventilation
- Secure airway and confirm placement
- After an advanced airway is placed, resuscitation need not be delayed
- "Glycol" of CPR: Give continuous chest compression without pauses for breaths. Give 8 to 10 breaths/minute. Check rhythm every 2 minutes

Reversible causes are hypovolaemia, hypoxia, acidosis, hypo/hyperkalaemia, tension pneumothorax, tamponade, toxins, thrombosis; VF – ventricular fibrillation; VT – ventricular tachycardia; PEA – pulseless electrical activity.

Fig. 2.6. Adult cardiac arrest algorithm.
Get ABG, serum electrolytes and blood sugar (dextrose stick/glucometer)

Atropine is not recommended for routine use in the management of PEA/asystole.

**Post-resuscitation care** by expert multidisciplinary management with neurologic and physiologic assessment monitoring in critical care unit:

- Optimize cardiopulmonary function and systemic perfusion, especially perfusion in the brain.
- Titrate oxygen administration to maintain arterial saturation \( \geq 94\% \). Try to identify the precipitating causes of the arrest.
- Do serial ABGs. Provide adequate mechanical ventilation to minimize lung injury. Institute measures to prevent recurrence.
- Look for and treat seizures.
- Do serial 12-lead ECG and cardiac biomarkers for the detection of acute coronary syndromes.
- Maintain temperature to optimize neurological recovery, fluid and electrolyte balance.
- Avoid hyperthermia. Do not actively rewarm haemodynamically stable patients who spontaneously develop a mild degree of hypothermia (\( > 33^\circ C \) [91.5\(^\circ F\)])) after resuscitation from cardiac arrest.
- Treat shock with fluids, dopamine, dobutamine and adrenaline infusion as required.
- Anticipate and treat and prevent multiple organ dysfunction. Avoid excessive ventilation and hyperoxia.

**Monitoring**

Pulse should be palpable and chest expansion should be seen during effective CPR. Blood pressure, SpO\(_2\), \( Et \) CO\(_2\) (in intubated patient and if facility available), ABG should be monitored during and soon after CPR.

**Maternal cardiac arrest**

To relieve aortocaval compression during chest compressions and optimize the quality of CPR, it is reasonable to perform manual left uterine displacement in the supine position first. Left uterine displacement can be performed from either the patient's left side with the 2-handed technique or the patient's right side with the 1-handed technique, depending on the positioning of the resuscitation team. If this technique is unsuccessful, and an appropriate wedge is readily available, then providers may consider placing the patient in a left-lateral tilt of 27° to 30°, using a firm wedge to support the pelvis and thorax.

**Termination of CPR**

The resuscitation team must make a conscientious and competent effort to give patients a trial of CPR and ACLS. The final decision to stop efforts can never be as simple as an
isolated time interval. After 10 minutes of continuous and adequate efforts, if there are no signs of life (no heart rate and no respiratory effort), discontinue resuscitative efforts.

**Patient education**

Explain to parents that many causes of CPA are preventable, e.g. injuries (by providing safe environment), poisoning (by keeping drugs out of reach of children), foreign bodies (safe toys and avoid beads, balloons, etc. and avoid eatables like peanuts in infants). Young children should be closely supervised.

General public should be trained in BLS.

Health care workers should be able to recognize and refer emergencies in time, and also know about BLS.

**References**


**ANAPHYLAXIS**

It is a generalized hypersensitivity reaction characterized by hypotension, peripheral circulatory collapse and respiratory difficulty in the form of stridor and dyspnoea. Anaphylaxis can occur due to food, inhaled/ingested allergens or drugs (Table 2.2). Symptoms may occur instantaneously or within a few minutes after an intravenous injection of the offending agent. At times the reaction may develop after 1/2-1 hour of the exposure. Anaphylaxis to oral drugs may take 1-2 hours, but in many patients it can be instantaneous.

**SALIENT FEATURES**

Serious upper airway (laryngeal oedema, lower airway oedema (asthma) or both may develop, causing stridor and wheezing. Rhinitis is often an early sign of respiratory involvement. Patient can deteriorate over a brief period of time (½ to 3 hours).

Cardiovascular collapse (hypotension) is the most common periarrest manifestation.

Gastrointestinal signs and symptoms include abdominal pain, vomiting and diarrhoea.

Differential diagnosis to be considered since failure to identify other conditions can be fatal are angioedema, severe, near-fetal asthma, vasovagal reactions and ACE inhibitors.
Table 2.2. Commonly used agents implicated in anaphylactic and anaphylactoid reactions

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Antibiotics</td>
<td>7.</td>
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<tr>
<td></td>
<td>• Penicillin and analogs</td>
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</tr>
<tr>
<td></td>
<td>• Tetracycline</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sulfonamides</td>
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<tr>
<td></td>
<td>• Streptomycin</td>
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<tr>
<td>2.</td>
<td>Local anaesthetics</td>
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<tr>
<td></td>
<td>• Inj. Lidocaine</td>
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<tr>
<td>3.</td>
<td>General anaesthetics and muscle relaxants</td>
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<tr>
<td></td>
<td>• Inj. Thiopental</td>
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<tr>
<td></td>
<td>• Inj. Tubocurarine</td>
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<tr>
<td>4.</td>
<td>Non-steroidal anti-inflammatory agents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Red blood cells, white blood cells, platelet transfusions</td>
<td></td>
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<tr>
<td></td>
<td>• Gamma globulin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Snake and spider antivenoms</td>
<td></td>
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<tr>
<td></td>
<td>• Rabies</td>
<td></td>
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<tr>
<td></td>
<td>• Diphtheria</td>
<td></td>
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<tr>
<td></td>
<td>• Tetanus</td>
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<tr>
<td>5.</td>
<td>Blood products and vaccines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Iodinated radiocontrast agents</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Diagnostic agents</td>
<td></td>
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<tr>
<td></td>
<td>• Inj. Insulin</td>
<td></td>
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<tr>
<td></td>
<td>• Pituitary extracts</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Venoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bees, wasps, spiders, jellyfish</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Hormones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inj. Insulin · Pituitary extracts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inj. Hydrocortisone</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Extracts of allergens used for desensitization</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Food</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Eggs</td>
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<tr>
<td></td>
<td>• Nuts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Milk and milk products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Shellfish</td>
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<tr>
<td></td>
<td>• Legumes (peanuts, soybeans, kidney beans, chick peas)</td>
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<tr>
<td></td>
<td>• Citrus fruits</td>
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<td>11.</td>
<td>Other drugs</td>
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<tr>
<td></td>
<td>• Protamine</td>
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<tr>
<td></td>
<td>• ACE inhibitors</td>
<td></td>
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<tr>
<td></td>
<td>• Parenteral iron</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inj. Dextran</td>
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</tr>
</tbody>
</table>

Treatment

A severe anaphylactoid reaction is a life-threatening emergency. Effective treatment depends on prompt diagnosis and rapid supplementation of appropriate therapy.

1. For severe anaphylaxis with shock as in all medical emergencies, initial management should be directed at the CAB of resuscitation, namely maintenance of adequate airway—suction, breathing, and circulation. If working alone, call for assistance. (For details see chapter on Cardiopulmonary Resuscitation).

2. Inj. Adrenaline 1:1000, 0.01 ml/kg (maximum 0.2 ml in children and 0.5 ml in adults) by IM injection. If necessary, dose can be repeated every 5-15 minutes. If the anaphylaxis is to injection of an allergen extract or to a hymenoptera sting into an extremity, half the dose of adrenaline can be infiltrated locally, subcutaneously after dilution with 2 ml saline.

A tourniquet above the site slows systemic distribution of allergen. It should be loosened every 3 minutes.

Administer IV adrenaline, if anaphylaxis appears to be severe with life-threatening manifestations (1:10,000) 0.1 mg IV slowly over 5 minutes. An IV infusion at rates of 1 to 4 mcg/min may prevent the need to repeat adrenaline injections frequency. (Caution: Close monitoring is critical)

3. Establish one or preferably two, wide bore intravenous lines. Commence rapid fluid resuscitation with normal saline.
4. If there is severe laryngeal obstruction, bronchospasm, circulatory shock or coma, intubate and commence intermittent positive pressure ventilation.

5. If the only manifestation of anaphylaxis is urticaria or angioedema, initial IM dose of adrenaline should be given in addition to Ranitidine. If no progression occurs, patient can be kept under observation for at least 12 hours and then discharged.

Additional measures

1. Administer Salbutamol or Terbutaline by aerosol or nebulizer, if bronchospasm is a major feature. Inhaled Ipratropium may be especially useful for treatment of bronchospasm in patients receiving beta blockers.

2. Inj. Diphenhydramine 1 mg/kg slow intravenously.

3. Inj. Ranitidine 1 mg/kg slow intravenously.

4. Inj. Hydrocortisone 2-6 mg/kg or Dexamethasone 0.1-0.4 mg/kg IV early in the course of therapy. Beneficial effects are delayed by at least 4 to 6 hours.

Supportive treatment

Removal of the causative factor such as venom. Observe vital signs frequently and if possible, monitor electrocardiogram and pulse oximetry.

All patients who have suffered a severe anaphylactoid reaction must be admitted to the hospital. Patients who remain clinically unstable after initial resuscitation should be admitted to an intensive care unit. If patient is not admitted to hospital, and if they respond to the initial treatment, provide information to them about possible late reaction.

Patient education

To check and look for the cause (food, drugs, etc.) and to avoid it in future. Desensitization is effective against some of the venoms.

References


BURNS

Burns are a major preventable cause of morbidity and mortality. These can be caused by dry heat or space heating, moist heat-scalds and fat burns, ionizing radiation, electric burns, friction, chemicals and cold-frost bite.
SALIENT FEATURES

Burns, pain, anxiety, fluid loss and dehydration, local tissue oedema and infection.

Early complications include shock, toxaemia, sloughing of mucous membranes-gastrointestinal tract and respiratory tract inhalation injuries, acute renal failure, and haematemesis (Curling ulcer).

Late complications include, protein losing enteropathy, secondary haemorrhage, hypertrophic scar/keloid and contracture.

Treatment

Burns are characterized by degree and amount of body surface area (BSA). The severity of the burn determines the type of treatment as well as place of treatment. Minor burns, as well as second-degree burns that is limited to an area of between 2 to 3 inches in diameter, or covering less than 15% of adult’s (10% in children) body surface area (BSA), may be treated at home or in a doctor’s office as follows:

1. Cool the burn. This is done by holding the burn under cold running water for around 5 minutes or until the pain dips, or immersing the burned area in cold water or cooling it with cold compresses. Never put ice on the burn.

2. Cover the burned area with a sterile gauze bandage or clear moist towels: Don’t use fluffy cotton, as it may irritate the skin. Wrap the gauze loosely to avoid putting pressure on the wound. Bandaging the burned skin keeps air away from the injury.

3. Don’t break or prick blisters.

For major burns, call for emergency medical assistance. These are defined as first- or second-degree burns covering more than 25% of adult’s (> 20% in children) BSA, or a third-degree burn on >10% BSA. Until an emergency unit arrives, follow these steps:

1. Check for signs that the person is alive such as a heartbeat, breathing, coughing or movement. If such signs do not exist, begin cardiopulmonary resuscitation or CPR (see section on Cardiopulmonary Resuscitation in Chapter 2).

2. Don’t remove burnt clothing. However, do ensure that the victim is no longer in contact with burning materials or exposed to smoke or heat.

3. Don’t immerse victims with critical large burns in cold water. Doing so may cause shock.

4. Cover the area of the burn with a moist, cool, sterilized bandage or clean, moist cloth or moist towels.

Immediate resuscitation and care in hospital

Clear airway, suspect inhalation injury, if history of being trapped in close space, facial burns, stinging of eyebrows/nasal hairs, respiratory distress, hoarseness of voice or stridor, altered consciousness and soot in sputum.
Check for breathing and circulation and provide support.
Rule out other associated injuries.

**Assess the severity of burns**

Assessment includes calculation of surface area of burns: Rule of nine chart in adults/ Rule of five chart in children, depth of burns, location of burns, patient’s age and presence of associated injury or disease. Criteria for admission or transfer to a burns centre:

- Burns of more than 20% body surface area in an adult.
- Burns of more than 10% body surface area in a child under 10 or adult over 50 years.
- Burns of more than 5% body surface area in an infant.
- Burns of head, face, neck or perineum.
- Respiratory burns or inhalation injury.
- Circumferential burns.

Transfer should be done in a fully equipped ambulance with secured airway and circulatory support.

**General Management**

1. **Fluid resuscitation**

Intravenous fluids to be infused through a wide bore cannula (lactated Ringer’s solution) at the rate of 4 ml/kg/\% burns area. If not available then normal saline can be used. Half of the volume calculated is infused in the first 8 hours after the injury and the rest is infused in the next 16 hours (for details see respective section on fluid and electrolyte imbalance in adults and children).

Adequacy of the fluid therapy is best assessed by measuring hourly urine output, which should be maintained at 30-50 ml per hour in adults and 0.5-1 ml/kg body weight in children. Infusion rate should be increased or decreased accordingly. Amount of fluid: In first 24 hours give 4 ml/kg/\% of burn, in next 24 hours give 2 ml/kg/\% of burn. Other features to be assessed are pulse rate, respiratory rate, blood pressure and level of consciousness.

2. **Pain relief**

Cold compresses using fresh running water; avoid ice cold water. Inj. Morphine sulphate (15 mg/ml) 10-15 mg stat and can be repeated after 4-6 hours.

Or Inj. Pethidine 25-100 mg SC or IM route (In children 0.5-2 mg/kg IM)

Or Inj. Pentazocine 30 mg (for severe pain 45-60 mg) IM or IV (In children over 1 year 1 mg/kg IM or SC; by IV up to 500 mcg/kg) every 3-4 hours when necessary.
3. Care of the burns

1. Clean the burns with running water except for the chemical burns.
2. Remove cloths, dirt, and eschar.
3. Dressing: Aims to minimize pain, absorb exudates and debris, shield the burns from secondary infection and provide protection during transport.
4. Application of cream—Silver sulphadiazine 1% or Silver nitrate or Framycetin 1%.
5. Fasciotomy in cases of circumferential burns in extremities or chest wall.

4. *Inj. Ampicillin 500 mg 6 hourly IV*

In children, 50-100 mg/kg in 4 divided doses for 7-10 days. Or

Inj. Ciprofloxacin (infusion 100 mg/50 ml), 500 mg 2 times a day for 7 days. Secondary infections are treated by appropriate antibiotics according to culture sensitivity results.

5. In case of airway burns keep endotracheal tube ready by bedside
6. Place nasogastric tube in major burns
7. Place urinary catheter in all major burns and record hourly urine output. Titrate fluid to maintain urine output as above.

Patient is advised to attend physiotherapy: Use compression garments to prevent hypertrophic scars. Plastic surgeon’s advice may be required to correct contractures.

Scalds

Scalds may result from drinking extremely hot fluids or some irritant chemicals. In such cases, the inner side of the mouth and throat becomes red and swollen. Give cold water to drink or ice, followed by milk or egg emulsion to drink and refer the patient to a hospital.

Patient education

Provide psychological support to the patient and relatives about the extent of burns, possible outcome and complications.

Educate parents about prevention of accidents and burns in future by taking necessary preventive steps at home.

Transport of patient to healthcare centre should be done at the earliest.

The wound should be covered with a clean cloth and teach home management of burns.

Inform the relatives about the medicolegal aspects of the injury and importance of evidence and dying declaration by the patient in case of homicidal burns or suspected dowry deaths.

References

**SHOCK**

Shock is a state of acute circulatory failure that leads to tissue hypoxaemia.

**SALIENT FEATURES**

Shock is a progressive disorder which, if untreated, can lead to severe haemo-dynamic and metabolic deterioration finally causing multiorgan failure. Stages of shock can be arbitrarily classified as:

**Early compensated shock:** Vital organ function is maintained by intrinsic compensatory mechanisms. Blood pressure is usually normal, there is increasing tachycardia and hypotension. The skin is cold and clammy, increased capillary refill time (>3 sec). If there is delay in treatment, it may lead to decompensated shock.

**Decompensated shock:** There is fall in blood pressure and cardiac output. Features of peripheral poor perfusion are compounded with manifestations of vital organ impairment. Patient may have alteration of mentation (impaired cerebral perfusion), oliguria (renal hypoperfusion) and myocardial ischaemia (coronary flow impairment). Patient has acrocyanosis, cold and damp extremities and a pale look. If untreated, it can progress to irreversible state of shock.

**Irreversible shock:** It is a term applied to the clinical situation in which even haemodynamic correction does not halt the progressive organ failure.

Classification and causes of shock

1. **Haemorrhagic shock**

Table 2.3. Causes of haemorrhagic shock

<table>
<thead>
<tr>
<th>Traumatic</th>
<th>Non-traumatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Blunt or penetrating injury</td>
<td>• GI bleeds (e.g. peptic ulcer, gastric mucosal erosions, oesophageal varices, typhoid bleeds, bleeds in sepsis, DIC)</td>
</tr>
<tr>
<td>• Fractures specially of long bones and pelvic fractures</td>
<td>• Aortic dissection</td>
</tr>
<tr>
<td></td>
<td>• Rupture of aneurysm of a large vessel, e.g. aorta</td>
</tr>
<tr>
<td></td>
<td>• Erosion of a large vessel, e.g. in pancreatitis or due to tumour infiltration</td>
</tr>
<tr>
<td></td>
<td>• Diffuse inflammation of mucosal surfaces, e.g. ulcerative colitis</td>
</tr>
</tbody>
</table>
2. **Hypovolaemic shock**

Fluid loss from vomiting and/or diarrhoea, e.g. in cholera, other GI infections. Fluid loss in diabetes mellitus, adrenal insufficiency, excessive sweating, exfoliative dermatitis, diabetes insipidus, reaccumulation of ascites after tapping. Sequestration of fluid, e.g. in intestinal obstruction, pancreatitis.

Burns.

Crush injuries.

3. **Cardiogenic**

Acute myocardial infarction.

Cardiomyopathy.

Cardiac arrhythmias.

Mechanical causes, e.g. valvular disease, outflow tract obstruction, ruptured ventricular septum.

4. **Distributive or vasogenic (relative hypovolaemia)**

Septic shock; toxic shock syndrome.

Anaphylactic.

Neurogenic.

**Treatment (stepwise management)**

1. Immediately start oxygen therapy 4-6 L/min.

2. Initial volume expansion measures. Venous access should be restored as early as possible (within 3-5 min). Peripheral veins should be tried first, if failed, then central veins like jugular/femoral can be used. Establish 2 wide bore IV lines and infuse crystalloids.

3. If venous access cannot be achieved in a short period, intraosseous infusion can be given into the bone marrow by putting a bone marrow needle.

4. Nature of fluids: Normal saline/Ringer’s lactate (crystalloids) can be used initially in all types of hypovolaemic/haemorrhagic shocks. Colloids are used in conditions with capillary leaks, burns, dengue fever, nephrotic shock. Whole blood can be used as replacement in cases of trauma and haemorrhagic shock; packed cells are used in burn patients.

5. Volume of fluids: Boluses of 20 cc/kg should be pushed in 5-7 min to restore blood volume quickly through 3 way cannula. Features of recovery, i.e. warm skin and improved capillary filling time appear, very quickly after fluid replacement. If these do not appear, give a 2nd bolus.

6. In case no improvement is seen and facilities for monitoring CVP are not available and there are no features of over-hydration, give another bolus and start inotrope (Table 2.3). If facilities for CVP are available, modify fluid therapy and inotropes according to CVP as given in Fig. 2.7.
SHOCK
(Undetermined aetiology)

- Assess Airway-Breathing-Circulation
- Supplement-Oxygen
- Secure IV access
- Give isotonic crystalloid [(20 ml/kg over 3-5 min) NS, RL]

REASSESS

No improvement
Repeat isotonic crystalloid
(20 ml/kg over 3-5 min)
REASSESS: (ventilation, acid base balance, electrolytes)

No improvement
Assess cardiac status (CXR, ECG)
Place central venous catheter

Improved BP
- Peripheral perfusion
- Urine passed

CVP < 10 mmHg
Repeat isotonic crystalloid
Or colloids (5-10 ml/kg)
- Reassess
- Continue fluid under CVP monitoring
- Consider alternate aetiology

CVP > 10 mmHg
- Inotrope

CVP > 15 mmHg
- Vasodilator
- Establish aetiology
- Careful fluid replacement
- Consider Diuretics

Fig. 2.7. Schematic outline of initial resuscitation of shock.

**Monitoring**

Fluid therapy in patients with hypovolaemic shock to improve the peripheral perfusion and monitor pulse rate, respiratory rate, capillary filling time, blood pressure, sensorium and urine output. Final end points for volume resuscitation include warm skin,
re-establishment of urine output to 0.5-1.0 ml/kg/h, adequate capillary refill (<3 sec) and heart rate and blood pressure returning to normal range for that age.

**Use of Inotropes**

Inotropes are used to increase myocardial contractility. These are given as continuous intravenous infusions preferably with an infusion pump. Initial therapy is undertaken with either dopamine or dobutamine. If no response, more potent agents like adrenaline and noradrenaline can be used. Dose of dopamine/dobutamine generally required is 5-10 mcg/kg/min, can be augmented to 20 mcg/kg/min (Table 2.4).

**Table 2.4. Cardiovascular support drugs**

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Dose</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopamine</td>
<td>5-20 mcg/kg/min</td>
<td>Effects are dose related and complex</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>5-15 mcg/kg/min</td>
<td>Selective inotrope, little chronotropic, mild vasodilator</td>
</tr>
<tr>
<td>Adrenaline</td>
<td>0.05-1.0 mcg/kg/min</td>
<td>Powerful vasoconstrictor, minimum increase in heart rate, used if other agents have failed</td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>0.05-1.0 mcg/kg/min</td>
<td>Strong vasoconstrictor, mainly useful for prolonged hypotension, not responding to other agents</td>
</tr>
</tbody>
</table>

*Note:* Titrate infusion to desired haemodynamic effect.

**Preparation of catecholamine infusions in infants and children can be done by following formula:**

For Dopamine and Dobutamine, $6 \times$ body weight in kg is the dose added to sufficient diluent to create a total volume of 100 ml. 1 ml/h of this fluid will deliver 1 mcg/ kg/min. For adrenaline, $0.6 \times$ body weight in kg is used in similar diluent to deliver 0.1mcg/kg/min. Response to inotropes is measured in the same way as after fluid push. If patient shows better peripheral perfusion, i.e. improved capillary filling time and warm extremities and blood pressure reaches within normal range, inotropes can be maintained for few hours, till underlying condition shows features of reversal. If patient does not show signs of improvement, should be referred to a tertiary level centre where facilities for ventilation are available.

**Metabolic corrections**

Metabolic acidosis as a consequence of tissue ischaemia is the most important secondary complication. Correction is indicated only when marked acidosis (pH <7.2) is present. Sodium bicarbonate 1-2 mEq/kg can be used initially but subsequent doses should be based on base deficit (mEq = body weight in kg × base deficit × 0.3).
Ventilatory support may be required in critically sick patients showing signs of ventilatory fatigue/failure.

Cardiogenic shock

Cardiogenic shock is best viewed as pump failure and common causes are acute myocardial infarction in adults and dysrhythmias in children. Immediate treatment is same as mentioned above, however, invasive monitoring and advanced life support systems are required, hence patient should be referred to a tertiary level centre after initial resuscitation (See section on arrhythmia, myocardial infarction for specific treatment).

Septic shock

Septic shock is a consequence of bacteraemia most commonly by Gram-negative organisms but Gram-positive and viral infections can also cause it. It follows trimodal pattern of haemodynamic presentation—warm shock, cold shock and multisystem organ failure.

Initial treatment is as above except requirement of volume replacement may be more and aggressive antibiotic therapy should be started early. Disseminated intravascular coagulation (DIC) is a common complication and may require fresh frozen plasma and platelet transfusion (see section on sepsicaemia for specific treatment).

For anaphylactic shock, see section on Anaphylaxis.

References


FLUID AND ELECTROLYTE IMBALANCE AND REPLACEMENT (IN ADULTS)

For life-threatening electrolyte imbalance in children, see Chapter 19.

Disturbances in fluid and electrolyte balance occur in a wide spectrum of diseases, are not confined to any particular field of medicine, and are common following burns, trauma and major surgery.

The conventional and easy method of evaluating disturbances in fluid and electrolyte balance is the frequent measurement of the concentration of serum electrolytes. It is crucial to remember that intracellular and extracellular electrolytes are normally constant, and that major shifts in and out of ‘compartments’ can occur in disease with minimal changes in serum electrolyte. Compositional changes also involve disturbances in acid-base balance.
Volume changes: volume deficit

I. Obvious causes

Vomiting, diarrhoea, intestinal fistulae, nasogastric suction, fluid loss following burns, sequestration of fluid in soft tissue injuries and infections, diuretics, renal disease/ adrenal insufficiency.

II. Less obvious causes

Unsuspected inadequate fluid intake, fluid loss through excessive sweating as in high fever, hot humid temperature, haemodialysis, haemofiltration from surgical incisions and in diseases like tetanus.

Management

The first principle is to restore circulating volume through infusion of intravenous fluids. Once this is satisfactorily achieved, disturbances in electrolytes and acid-base balance, if present, need to be rectified. Various fluids used for volume replacement are given below.

A. Replacement fluids

1. Replacement fluids are used to replace abnormal loss of blood, plasma or other extracellular fluids as first line treatment for hypovolaemia in:
   a. Treatment of patients with established hypovolaemia, e.g. haemorrhagic shock.
   b. Maintenance of normovolaemia in patients with ongoing fluid losses, e.g. surgical blood loss.

2. Intravenous replacement fluids are the first line of treatment for hypovolaemia. Initial treatment with these fluids may be life-saving and provides some time to control bleeding and obtain blood for transfusion, if it becomes necessary.

3. Crystalloid maintenance fluids, which contain dextrose, are not suitable for use as replacement fluids. Only crystalloid solutions with a similar concentration of sodium to plasma (normal saline or balanced salt) solutions (Ringer’s lactate or Hartmann’s solutions) are effective as replacement fluids. These should be available in all hospitals where intravenous replacement fluids are used. Fluid and electrolyte requirements in adults and children are shown in Table 2.5.

4. Crystalloids should be infused in a volume at least three times the volume lost in order to correct hypovolaemia.

5. All colloid solutions (albumins, dextran, gelatins and hydroxyethyl starch solutions) are replacement fluids. However, they have not been shown to be superior to crystalloids in resuscitation.

6. Colloid solutions should be infused in a volume equal to the blood volume deficit.
7. Plasma should never be used as a replacement fluid.

8. Plain water should never be infused intravenously. It will cause haemolysis and will probably be fatal.

9. In addition to the intravenous route, the intraosseous, oral, rectal or subcutaneous routes can be used for the administration of fluids, blood and certain drugs. However, with the exception of intraosseous route, other routes are generally unsuitable in severely hypovolaemic patients.

10. Rectal fluids are administered through a plastic or rubber enema tube which is inserted into the rectum and connected to a bag or bottle of fluid. The fluid rate can be controlled by using a drip giving-set, if necessary. The fluids used need not be sterile. A safe and effective solution for a rectal rehydration is 1 liter of clean drinking water with teaspoon of table salt.

11. Subcutaneous fluids: Occasionally, when other routes of administration of fluids are unavailable, a subcutaneous infusion can be used. A cannula or needle is inserted into the subcutaneous tissue (the abdominal wall is a preferred site) and sterile fluids are administered in a conventional manner. Do not give dextrose-containing solutions subcutaneously as they can cause sloughing of tissues.

12. Oral and nasogastric fluids: Oral rehydration can often be used in mildly hypovolaemic patients, if the oral route is not contraindicated. Do not use, if:
   – The patient is unconscious.
   – The patient has gastrointestinal lesions or reduced gut motility e.g. obstruction.
   – General anaesthesia and surgery is planned imminently.

WHO/UNICEF formula for low osmolarity oral rehydration fluid:
Dissolve in one litre of drinkable water

- Sodium chloride: 2.6 g/L
- Trisodium citrate, dihydrate: 2.9 g/L
- Potassium chloride: 1.5 g/L
- Glucose anhydrous: 13.5 g/L

Resulting concentrations
- Na⁺ 75 mmol/L, Cl⁻ 65 mmol/L, K⁺ 20 mmol/L, Glucose anhydrous 75 mmol/L, Citrate 10 mmol/L, Total osmolarity 245 mmol/L.

B. Maintenance fluids

Maintenance fluids are fluids used to replace the normal physiological loss that occurs in a patient through skin, lung, faeces and urine. Since a considerable proportion of the loss is water, maintenance fluids are mainly composed of water in the form of a dextrose solution. Some electrolytes may also be included in these solutions.

All maintenance solutions are crystalloid solutions. Some examples of crystalloids that are suitable as maintenance fluids are: 50% dextrose and 4% dextrose in sodium chloride 0.18%.
Table 2.5. Fluid and electrolyte requirements for adult and children under normal circumstances

<table>
<thead>
<tr>
<th>Weight</th>
<th>Fluid ml/kg/24 h</th>
<th>Sodium mmol/kg/24 h</th>
<th>Potassium mmol/kg/24 h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First 10 kg</td>
<td>100 (4*)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Second 10 kg</td>
<td>50 (2*)</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Subsequent kg</td>
<td>20 (1*)</td>
<td>0.75</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All weights (kg)</td>
<td>35(1.5*)</td>
<td>1</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*These figures represent the fluid requirements in ml/kg/hour.

**Safety**

Before giving any intravenous infusion:
1. Check that the seal of the infusion fluid bottle or bag is not broken.
2. Check the expiry date.
3. Check that the solution is clear and free from visible particles.

**VOLUME EXCESS**

Volume excess is often iatrogenic, when the fluid intake has consistently exceeded the output. Excessive intravenous infusions of saline, and blood transfusions are important causes of hypervolaemia. Renal insufficiency, congestive heart failure, liver disease and other causes of sodium retention, or excessive sodium administration can all produce increase in extracellular fluid content and hypervolaemia.

**SALIENT FEATURES**

Oedema, ascites, pleural effusion, neck veins full, pulmonary congestion, hyperdynamic circulation with tachycardia, a warm skin, and a bounding pulse. Increase in the systolic pressure and pulse pressure.

CVP >12 mmHg, pulmonary capillary wedge pressure (PCWP) >20 mmHg in the presence of pulmonary oedema.

**Treatment**

In cases of moderate volume excess, salt restriction, restriction of fluid intake and the use of frusemide as a diuretic. Fulminant pulmonary oedema secondary to overhydration from overtransfusion of blood or fluids is more appropriately dealt with by phlebotomy in stages so that PCWP is reduced below 15 mmHg. Rarely, ultrafiltration (dialysis) may be required.

**References**

2. Life Threatening Electrolyte Abnormalities. Circulation 2005; 112: IV-121-I
STRIDOR

Common causes of stridor in children are: (i) Congenital laryngomalacia, (ii) croup (acute laryngitis, laryngotracheobronchitis, epiglottitis); In adults are: (i) Croup, (ii) allergies and (iii) tumours. Sudden onset of stridor may be caused by aspiration of a foreign body. Other causes include peritonsillar, retropharyngeal abscesses, angioedema and hypocalcaemic tetany.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noisy respiration primarily during inspiration produced by turbulent airflow through narrowed air passages.</td>
</tr>
<tr>
<td>Respiratory distress, restlessness and cyanosis are features of severe airway obstruction.</td>
</tr>
</tbody>
</table>

Treatment

Treatment of common causes of stridor is discussed below in four sections:

A. Acute laryngitis/laryngotracheobronchitis
B. Spasmodic croup
C. Epiglottitis
D. Diphtheria

A. Acute laryngitis, laryngotracheobronchitis (croup)

It is an acute infection of the larynx and is usually caused by viruses. In children, may lead to respiratory obstruction.

Nonpharmacological

- Maintain airway by positioning the patient in lateral position with neck slightly extended.
- Gentle suction of secretions, if required.
- Oxygen by ventimask/hood at the rate of 4-6 L/min.
- With the supportive and specific therapy, need for endotracheal intubation/tracheostomy may arise rarely. In case, the patient is deteriorating steadily despite therapy, elective intubation/tracheostomy should be done to prevent respiratory failure.

Pharmacological

Mild cases with minimal stridor (hoarse voice, barking or hacking cough, stridor heard on exertion/crying) do not require any treatment and may need home care with voice rest, feeding and fluids only with clear instructions on when to report immediately.

- Moderate (stridor at rest) and severe cases (to be hospitalized immediately) need specific therapy in the form of:
92 STANDARD TREATMENT GUIDELINES

1. Inj. Dexamethasone 0.6 mg/kg IM stat or oral Prednisolone 1-2 mg/kg
2. Inhaled Adrenaline 0.01 - 0.05 mg/kg/dose to be diluted in 3 ml saline every 1-2 hours. A few doses can be administered until side effects, viz. tachycardia, tremors, etc. appear.
   Or
   Inhaled Budesonide 500-1000 mcg/dose 12 hourly till response is seen.
3. Intravenous fluids maintenance dose (see respective section on fluids and electrolytes in adults and children).
4. Oxygen therapy
5. Intubation or tracheostomy in children with incipient obstruction (such as severe indrawing of the lower chest wall and restlessness).
   Antibiotics are not recommended.

B. Spasmodic croup

It occurs most commonly in children 1-3 years of age. It is possibly allergic and recurrent and occurs more often in the evening or night time. It has sudden onset, preceded by mild coryza and hoarseness. Symptoms usually diminish within few hours.

Taking out the child with spasmodic croup in fresh air may decrease the airway obstruction.

C. Epiglottitis

It is usually caused by *H. influenzae* and is a potentially life-threatening condition. Lateral X-ray of soft tissue neck may show swollen epiglottis (thumb sign). It is a medical emergency; airway and specific therapy must be introduced aggressively.

Treatment

1. Nonpharmacological treatment as above in acute laryngitis.
2. Inj. Cefotaxime 100 mg/kg/day divided into 3 doses. Or
   Inj. Ceftriaxone 100 mg/kg/day (maximum dose 4 g/day) in 2 divided doses. If cephalosporins not available Tab. Chloramphenicol 500 mg 6 hourly.
   In Children 100 mg/kg/day divided into 6 hourly doses.

D. Diphtheria

It is usually seen in non-immunized children.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presents as stridor but laryngeal examination may show a membrane-like structure (pseudomembrane), removal of which leads to bleeding.</td>
</tr>
<tr>
<td>Large cervical lymph nodes (bull neck appearance) and hoarseness.</td>
</tr>
<tr>
<td>Common complications are palatal palsy, III nerve palsy, polyneuritis and myocarditis.</td>
</tr>
</tbody>
</table>
Treatment

1. Supportive treatment as above in acute laryngitis.
2. Immediately refer the child to infectious diseases hospital under supervision and oxygen therapy. In case the child cannot be transferred, isolation should be done and following measures should be taken immediately:
3. Inj. Diphtheria antitoxin 20,000 - 40,000 IU, IV or IM for pharyngeal and laryngeal involvements with disease present for < 48 hours; 40,000 to 60,000 IU for nasopharyngeal infections; 80,000 to 100,000 IU for diffuse involvement that has been present for > 3 days.
4. Inj. Crystalline penicillin 1 Lac - 1.5 Lac units/kg/day divided into 4 doses for 14 days. Or
   Inj. Procaine penicillin 25,000 - 50,000 units/kg/day in 2 divided doses for 14 days. Or
   Syr. Erythromycin 40-50 mg/kg/day divided into 4 doses for 14 days.
5. IV saline infusion over 60 min.
6. Rifampicin, clindamycin can be used in patients allergic to penicillin.

Monitoring and follow-up

1. Watch the child for altered sensorium, degree of stridor, pulse rate, respiratory rate and for other features of respiratory distress like intercostal recession, etc.
2. Laryngeal examination should not be done until facilities for intubation are available because it might lead to sudden respiratory arrest.
3. If child develops stridor at rest, hospitalize immediately.
4. Increasing respiratory distress with alteration of sensorium or cyanosis may be an indication for intubation.

Patient education

Avoid overuse and misuse of voice.
If stridor worsens or is noticed at rest, the patient should immediately report to the nearest health facility.
Children with diphtheria should be completely immunized after recovery of the current episode and contact to be immunized immediately (See section on immunization in Chapter 19).

References


SEPTICAEMIA

Sepsis is a commonly encountered problem and a major cause of mortality in 80% of children. Septicaemia is a clinical condition associated with invasion of bloodstream by microorganisms giving rise to features of systemic inflammatory response syndrome (SIRS), i.e. presence of any two of the following: fever/hypothermia, tachypnoea, tachycardia, leucocytosis/leucopenia. It may be associated with infection at specific
sites (e.g. lungs, urinary tract, gastrointestinal tract) or there may be no clear originating focus. Septicaemia occurs more commonly in patients with defective body defenses. In previously healthy persons, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Escherichia coli* are the most frequent organisms, while in patients with defective immune systems, Gram-negative bacteria including *Pseudomonas aeruginosa* may be responsible. Other febrile illnesses due to enteric fever and malaria may be difficult to differentiate from these pathogens clinically. Septicaemia, when persists, can result in multiorgan dysfunction syndrome requiring immediate intervention to maintain haemostasis.

### SALIENT FEATURES

**Definitions of sepsis**

**A. Systemic inflammatory response syndrome (SIRS):** The presence of at least two of the following four criteria, one of which must be abnormal temperature or leucocyte count:

1. Core [oral or rectal] temperature of $>38.5^\circ$C or $<36^\circ$C
2. Tachycardia, in the absence of external stimulus, chronic drugs, or painful stimuli; or otherwise unexplained persistent elevation over a 0.5 h time period or for children $<1$ year old: bradycardia, in absence of external vagal stimulus, $\beta$-blocker drugs, or congenital heart disease; or persistent depression over a 0.5-h time period.
3. Tachypnoea for an acute process not related to underlying neuromuscular disease.
4. Leucocyte count elevated or depressed for age [not secondary to chemotherapy-induced leucopenia] or $>10\%$ immature neutrophils.

**B. Infection:** A suspected or proven infection caused by any pathogen or a clinical syndrome associated with a high probability of infection. Evidence of infection includes positive findings on clinical examination, imaging, or laboratory tests (e.g. leucocytes in a normally sterile body fluid, perforated viscus, chest radiograph consistent with pneumonia, petechial or purpuric rash, or purpura fulminans) or a positive culture, tissue stain, or polymerase chain reaction test.

**C. Sepsis:** SIRS in the presence of or as a result of suspected or proven infection.

**D. Severe sepsis:** Sepsis plus one of the following: Cardiovascular organ dysfunction OR acute respiratory distress syndrome or two or more other organ dysfunctions.

**E. Septic shock:** In a child with sepsis presence of: Hypotension [systolic BP $<70$ mmHg in infant; $<70 + 2 \times$ age after 1 year of age] or need for vasoactive drug to maintain BP above fifth centile range [dopamine $\geq5$ mcg/kg/min or dobutamine, epinephrine, or norepinephrine at any dose] or Signs of hypoperfusion—any three of the following: Decreased pulse volume [weak or absent dorsalis pedis pulse], capillary refilling time $>3$ s, tachycardia, core [rectal/oral] to peripheral [Skin-toe] temperature gap $>3^\circ$C, and urine output $<1$ ml/kg/h [but $20$ ml/h in $>20$ kg child] or sepsis and cardiovascular organ dysfunction.

**F. Multiple organ dysfunction:** The detection of altered organ functions in the acutely ill patient constitutes multiple organ dysfunction syndrome (MODS; two or more organs involvement).
Treatment

Nonpharmacological
1. Care of airway and breathing as given in section on CPR.
2. After initial assessment, a central venous catheter (CVC) should be inserted in most patients with severe sepsis or septic shock.
3. If hypoperfusion exists, early restoration of perfusion to prevent or limit multiple organ dysfunction, as well as reduce mortality.
4. Removal or drainage of a focal source of infection. Indwelling intravenous catheter, Foley's catheter, etc. should be replaced, if considered as a source.
5. General care of skin, orodental hygiene and nutrition supplementation should be taken care of, in prolonged severe sepsis.

Pharmacological
1. Oxygen therapy—2-4 liters/min with catheter/mask (to keep $\text{SaO}_2 > 95\%$).
2. Intravenous fluids—to be guided by haemodynamic status. If in shock, aggressive fluid therapy and drugs as mentioned in section on shock to maintain urinary output at more than 1 ml/kg/hour.
3. Antimicrobial agents—antimicrobial therapy should be initiated as soon as samples for culture are withdrawn from blood and other relevant sites. Choice of antibiotics depends on suspected organism.

Immunocompetent host
1. Inj. Cefotaxime 150-200 mg/kg/day in 3 divided doses. Or
   Inj. Ceftriaxone 100 mg/kg/day (maximum dose 4 g/day) in 2 divided doses.
2. Inj. Gentamicin 7.5 mg/kg/day in 2-3 divided doses. Or
   Inj. Amikacin 15 mg/kg/day in 2-3 divided doses.
3. Add Penicillin/Vancomycin, if *Streptococcus/Staphylococcus* organisms are suspected
   Inj. Penicillin G aqueous 200,000-300,000 units/kg IV 4 hourly. Or
   Inj. Vancomycin 15 mg/kg/day in 2 divided doses.

Immunocompromised host
1. Inj. Ceftazidime IV 150 mg/kg/day in 3 divided doses.
2. Inj. Vancomycin 15 mg/kg/day in 2 divided doses.

Treatment algorithm for management of severe sepsis and shock in children (Fig. 2.8).
**STANDARD TREATMENT GUIDELINES**

**0 min:** Recognize depressed mental status and poor perfusion in a febrile child with or without focus of infection. 

O₂ by non-rebreathing mask, if effortless tachypnea and septic shock. 
Flow inflating bag if grunt, retractions, abdominal respiration. 
Bag valve mask (BVM) ventilation, if airway unstable. If bradypnoea, apnoea: Plan early intubation.

**STEP I**

**5 min:** Establish Intravenous/Intraosseous access

Start Normal Saline/Ringers 20 ml/kg over 15-20 minutes if BP normal; Rapidly by Pull push 20 ml/kg if BP low, First dose of Antibiotics, (after drawing appropriate cultures) 
Correct documented hypoglycaemia and hypocalcaemia.

Monitor for clinical therapeutic goals after each bolus till all goals achieved:
Respiratory rate, work of breathing, heart rate, capillary refill, BP, peripheral temperature, urine output, sensorium, liver span.

**Therapeutic goals attained. No pulmonary oedema/hepatomegaly**

**Goals not attained, No pulmonary oedema/hepatomegaly**

**Therapeutic goals not attained pulmonary oedema/hepatomegaly**

2nd bolus 20 ml/kg @ 15-20 minutes

3rd bolus 20 ml/kg @ 15-20 minutes, if needed, assess the response after each

**Goals not attained after 60 ml/kg No pulmonary oedema/hepatomegaly Fluid refractory shock**

* Dopamine @ 10 mcg/kg/min. Add Dobutamine 10 mcg/kg/min: Titrate, intubate, catheterize for urine output monitoring. Continue fluids in smaller aliquots, till goals attained

**Goals not attained pulmonary oedema/hepatomegaly**

Pulmonary oedema & hepatomegaly resolve Goals not attained

Tritate fluids 10-20 ml/kg @ 10-20 minutes until goals achieved

**Goals achieved**

Fluid refractory dopamine resistant shock

Continue monitoring

Shift to ICU

**STEP III**

40 minutes:

60 minutes:

* Dopamine may be started after 2nd bolus

Plan epinephrine infusion early, if bradycardia, BP remains low or falls with cold shock at any step. Relief of temponade, such as pneumothorax, or pericardial tamponade, increased intra-abdominal pressure due to fluid should be considered at any point.

Fig. 2.8. (Continued)
STEP IV: 60 min and beyond

Fluid Refractory Dopamine/Dobutamine Resistant Shock

Reassessment of clinical status, and wherever possible arterial blood pressure, CVP, echocardiography, ScVO₂ and hemoglobin and PCV

Cold shock

Warm shock

Hypotensive

Low pulse pressure

≤ 20 mmHg

Start Epinephrine <0.3 mcg/kg/min.

If pulse pressure low – Milrinone

If pulse pressure normal – titrate – Norepinephrine + dobutamine

Epinephrine-resistant low cardiac output

If BP-normalized add nitroso vasodilator or add milrinone after volume loading

Hydrocortisone 50mg/m²/dose

Catecholamine Resistant Shock

Vasopressin

Hypotensive Wide pulse pressure, Target-pulse pressure

≤ 40 mmHg

BP > 5th centile

Warm shock

Cold shock

BP < 5th centile

Hypotensive

Low pulse pressure

≤ 20 mmHg

Start Epinephrine <0.3 mcg/kg/min.

If pulse pressure low – Milrinone

If pulse pressure normal – titrate – Norepinephrine + dobutamine

Epinephrine-resistant low cardiac output

If BP-normalized add nitroso vasodilator or add milrinone after volume loading

Hydrocortisone 50mg/m²/dose

Catecholamine Resistant Shock

Vasopressin

PCV: packed cell volume, CVP: central venous pressure, ScVO₂: Mixed venous O₂ saturation Maximum dose of both Norepinephrine and Epinephrine is 1 mcg/kg/min

Fig. 2.8. Treatment algorithm for management of severe sepsis and shock in children.

Follow-up and monitoring

Continuous monitoring of pulse, respiratory rate, blood pressure, capillary filling time, urinary output and neurological status should be done for early detection of septic shock or multiorgan failure. Patient should be referred to tertiary level centre, if very sick or shows no signs of improvement after initial therapy.

Therapeutic endpoints of resuscitation of septic shock in children:
1. Normalization of the heart rate
2. Capillary refill of <2 sec
3. Well-felt dorsalis pedis pulses with no differential between peripheral and central pulses
4. Warm extremities
5. Normal range of systolic pressure and pulse pressure
6. Urine output > 1 ml/kg/hour
7. Return to baseline mental status tone and posture
8. Normal range respiratory rate

Other endpoints that have been widely used in adults and may logically apply to children include central venous pressure of 8–12 mmHg. Resuscitation of the circulation should target a central or mixed venous oxyhaemoglobin saturation (ScvO\textsubscript{2} or SvO\textsubscript{2}, respectively) of ≥70%. Other common goals include a central venous pressure (CVP) 8 to 12 mmHg, a mean arterial pressure (MAP) ≥65 mmHg, and a urine output ≥0.5 ml/kg per hour.

Patient/parent education

Immunocompromised patients should be informed about features of early sepsis. Fever in any child with congenital or acquired immunodeficiency state should be taken very seriously.

References


HEAD INJURY

Head injuries are frequent form of injuries in cities. A systematic approach is required to differentiate trivial injury from severe forms which may be life-threatening or may lead to neurological sequelae.

Treatment

The management of head injured patients should be guided by clinical assessments and protocols based on the Glasgow Coma Scale and Score (GCS) (see below in section on Coma).

Symptoms and signs of severe forms may appear immediately as in concussions or contusions or may appear after a few minutes to hours as in acute subdural haematoma. Patients admitted for a head injury may be discharged after resolution of all significant symptoms and signs provided they have suitable supervision arrangement at home and are able to access to hospital with written and verbal instructions to report back in case of deterioration.
Patients with history of unconsciousness at any time since injury, amnesia for the incident or subsequent events, severe and persistent headache, nausea, vomiting, bleeding from nose/ear, seizures or presence of black eye, suspected fracture of skull and haematoma of scalp indicate severe form of head injury and require hospitalization.

**Minor injury (GCS 13-15)**

A patient who is alert and has only one or more symptoms of headache, faintness, nausea, a single vomiting, difficulty with concentration or slight blurring of vision, may have scalp bruising or laceration should be kept under observation for a few hours and then sent home with proper instructions to the family members. Decision for X-ray skull and CT scan depends on degree of trauma to the rest of body and skull, in addition to the worsening of symptoms and signs.

**Moderate head injury (GCS 9-12)**

Patients with brief loss of consciousness at time of injury but currently alert or responds to voice, may be drowsy, have two or more episodes of vomiting, persistent headache, up to one single brief (<2 min) convulsion occurring immediately after the impact, may have a large scalp bruise, haematoma or laceration but normal examination otherwise. If, on the history from the parents and ambulance, the child is not neurologically deteriorating, he/she may be observed in the Emergency Department for a period of 4 hours with 30 minutely neurological observations (conscious state, PR, RR, BP, pupils and limb power).

The patient may be discharged, if there is improvement at 4 hours to normal conscious state and no further vomiting (patient should be able to tolerate oral fluids in the hospital) and with full written and verbal instructions to caregiver on when to report back immediately as given in the patient education section.

A persistent headache, large haematoma or possible penetrating wound may need further investigation, discuss with consultant. If the patient is still drowsy or vomiting at 4 hours or there is any deterioration during this time, consult with a neurosurgeon regarding admission and further investigation.

**Severe head injury (GCS 8 or less)**

Patients with persistent confusion, behavioural change, coma, focal neurological signs and features of raised intracranial pressure require immediate attention and should be admitted to the hospital. A CT scan should be done in all such cases and treated as follows:

1. Check and maintain airway and breathing (see section on Cardiopulmonary Resuscitation).
2. Check circulation by pulse volume, rate, blood pressure.
3. Establish IV access.
4. IV fluids according to volume loss: Crystalloids such as normal saline (0.9%) is a fluid of choice. Colloid can be given, if required to treat hypovolaemia due to major blood loss (see section on Shock).
5. Check for and stabilize extracranial injuries.

6. A head injury may be accompanied by a cervical injury. If spinal injuries are excluded, then transfer the patient in side position with head down, to a tertiary care centre where neurosurgical interventions are available.

7. If spinal injury is suspected then transfer the patient on a hard board, place two sand bags on either side of the head.

8. Assessment by Glasgow Coma Scale (as given in a section on Coma) may be used to prognosticate or follow a patient of head injury for improvement/deterioration of neurological status. Patients with Glasgow Coma Scale score 8 or less or with deterioration of level of consciousness should be transferred to a centre where facilities for neurosurgical interventions are available. Over 85% of patients with aggregate score of 3 or 4 die within 24 hours while score of 11 or more indicates death in only 5-10%.

9. A subdural haematoma, epidural haematoma or large intracerebral haematoma may require surgical intervention and must immediately be attended to by a neurosurgeon.

10. Hyperthermia, hypoxia and hypercarbia exacerbate intracranial pressure, so does an awkward head position like acute flexion. These conditions must be appropriately treated, if necessary by mechanical ventilation.

11. In case of raised intracranial pressure, give Inj. Mannitol (20%) 0.25-1 g IV every 3 to 4 hours.

   Patients with a head injury, who warrant admission, should have neurological observations carried out at least in the following frequency starting after initial assessment in the emergency department:
   - Half hourly for 2 hours
   - Hourly for 4 hours
   - Two hourly for 6 hours
   - Four hourly thereafter until agreed to be no longer necessary.

**Patient education**

Patients admitted with mild head injury benefit from brief, routine follow up consisting of advice, education and reassurance that they are likely to recover. Apply ice or a cool wash to the area injured to help reduce the swelling. If a patient has been sent home considering the initial diagnosis of minor head injury, the family members must be advised to report back in case of persistent/increasing headache, vomiting, and deterioration of level of consciousness or appearance of any focal motor weakness.

A guarded prognosis in severe head injury is given but some children and young adults show remarkable recoveries despite low score on Glasgow Coma Scale. Problems to watch for in the next day or two: **Headache**. Patient may have a headache. Give paracetamol every 4-6 hours, if needed to relieve pain or the pain does not go away, with a instruction to report back to doctor.
**Vomiting.** Patient may have vomited once but if vomiting continues, report back to the doctor.

**Drowsiness.** Immediately after the head injury patients may be sleepy. There is no need to keep the patients awake, if they want to sleep. If patients do go to sleep, wake them every half to one hour to check their condition, and their reaction to familiar things. One should do this until they are no longer drowsy and have been awake and alert for a few hours.

Some questions one could ask are: Do they know where they are? Do they know familiar people's names? Do they know which day it is? Or if they are very young: Do their reactions seem appropriate? i.e., reaching out for a dummy. Are they interactive and not too irritable?

If there is any difficulty waking your child, report to the nearest emergency department or call an ambulance. If patients, behaviour is very different to their normal behaviour.

Patients with a more severe head injury admitted for up to 72 hours should be assessed for intensive rehabilitation.

**References**


**COMA**

Coma is defined as a prolonged period of unconsciousness and lack of reaction to stimulus. Patients in coma cannot be aroused.

**SALIENT FEATURES**

Following causes affect the functions of reticular-activating system and its connections with cerebrum.

Structural damage to brain (haemorrhage, tumours, trauma, localized infections, meningitis, stroke).

Metabolic disturbances (ischaemia, anoxia, uraemia, diabetes), respiratory/hepatic/renal failure, dyselectrolytaemia, endocrinopathies, drugs like opiates, barbiturates, benzodiazepines, antidepressants and cyanide.

Abnormal electrical activity—periodic lateralized epileptiform discharge (PLED).
Treatment

Nonpharmacological

The immediate goal in acute coma is the prevention of further nervous system damage. Hypotension, hypoglycaemia, hypercalcaemia, hypoxia, hypercapnia, and hyperthermia should be corrected rapidly and assiduously.

An oropharyngeal airway is adequate to keep the pharynx open in drowsy patients who are breathing normally.

Tracheal intubation is indicated, if there is apnoea, upper airway obstruction, hypoventilation or emesis, or if the patient is liable to aspirate because of coma. Mechanical ventilation is required, if there is hypoventilation or if there is an intracranial mass and a need to induce hypocapnia in order to lower intracranial pressure.

Establish intravenous access and draw blood sample for biochemical and other investigations.

Pharmacological

1. Inj. Glucose (25 or 50%) 50 g IV.
2. Inj. Thiamine 100 mg IV.
3. If opiate overdose is suspected, give Inj. Naloxone 0.8 mg IV. If response is inadequate, double the dose every 15 minutes (for details see section on Opioid Intoxication).
4. If benzodiazepine overdose is suspected, give Inj. Flumazenil 200 mcg IV slowly. If no response repeat 100-200 mcg after 1 minute. If required, give maximum dose of 1 mg or give as IV infusion of 100-400 mcg/h, if drowsiness recurs.
5. If focal neurological deficit or signs of herniation/decerebration/decortication occurs, CT scan, EEG and neurologic consultation are required.
6. If no clear aetiology and no herniation—CSF examination should be done.
7. If signs of raised intracranial tension (papilloedema, convulsions, decerebrate posture indicating herniation) occurs:
   a. Avoid giving free fluid (glucose solution) intravenously.
   b. Inj. Frusemide 40 mg IV to maintain adequate urine output of 30-50 ml/h.
   c. Inj. Mannitol 1.0 g/kg IV over 10 minutes.
   d. Hyperventilate to bring down PCO₂ to 25 mmHg.
   e. Inj. Dexamethasone 20 mg IV stat and 6 mg 4 hourly.

Children and young adults may have ominous early clinical findings such as abnormal brainstem reflexes and yet recover. Metabolic comas have a far better prognosis than traumatic comas. Glasgow Coma Scale empirically has predictive value in case of brain trauma (Table 2.6 & 2.7). Children who have sustained a head injury should be referred to hospital, if any of the following risk factors applies: Clinical suspicion of non-accidental injury; significant medical comorbidity (e.g. learning
difficulties, autism, metabolic disorders); difficulty making a full assessment; not accompanied by a responsible adult or social circumstances considered unsuitable.

For anoxic and metabolic coma, clinical signs such as pupil size reactivity and motor responses after 1 day, 3 days and 1 week have been shown to have predictive value. Absence of cortical waves of the somatosensory evoked potentials has also proved a strong indicator of poor outcome in coma from any cause.

**Grading of coma**

**Table 2.6. Glasgow Coma Scale in adults**

<table>
<thead>
<tr>
<th>Eye opening (E)</th>
<th>Coma score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>4</td>
</tr>
<tr>
<td>To loud voice</td>
<td>3</td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td>Nil</td>
<td>1</td>
</tr>
</tbody>
</table>

**Best motor response (M)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obeys command</td>
<td>6</td>
</tr>
<tr>
<td>Localizes pain</td>
<td>5</td>
</tr>
<tr>
<td>Withdraws (flexion)</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal flexion posturing</td>
<td>3</td>
</tr>
<tr>
<td>Extension posturing</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**Verbal response (V)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oriented</td>
<td>5</td>
</tr>
<tr>
<td>Confused, disoriented</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total Coma Score** 3/15—15/15

*Note: Coma score=E+M+V. Patients scoring 3 or 4 have an 85% chance of dying or remaining vegetative, while scores above 11 indicate only a 5 to 10% likelihood of death or vegetative state and 85% chance of moderate disability or good recovery. Intermediate scores correlate with proportional chances of recovery.*

**Table 2.7. Glasgow Coma Scale in children under 5 years of age**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye opening</td>
<td>Spontaneous</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>To voice</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>
### Standard Treatment Guidelines

<table>
<thead>
<tr>
<th>Feature</th>
<th>Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal response</td>
<td>Orientated/interacts/follows objects/smiles/alert/coos/babbles words to usual ability</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Confused/consolable</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Inappropriate words/moaning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Incomprehensible sounds/irritable/inconsolable</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>Best motor response</td>
<td>Obey commands/normal movement</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Localise pain/withdraw to touch</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdraw to pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Flexion to pain</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Extension to pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**TOTAL COMA ‘SCORE’** 3/15–15/15

Great care should be taken when interpreting the Glasgow Coma Scale in the under fives and this should be done by those with experience in the management of the young child.

**References**


**Poisoning**

**General considerations**

Increasing incidence of poisoning is attributable to rapid development of newer compounds in trade, industry and medicine and easy access to them. A stepwise care approach to a patient of poisoning is helpful in successful management.

**Stepwise care approach**

- **Diagnosis**—suspect and identify poison, if possible.

- Treatment includes basic principles, antidotes, symptomatic and supportive. Anticipate complications, preserve evidence and prevent sequelae as well as recurrence.
Diagnosis

1. Suspicion of poisoning should be aroused by sudden onset of symptoms, uniform and increasing severity of symptoms in a group, e.g. food poisoning or industrial poisoning. Unexplained nausea, vomiting, diarrhoea, drowsiness or coma, euphoria, increased psychomotor activity, convulsions, delirium and unusual breath smell are symptoms which in the absence of disease need careful evaluation for suspected poisoning. Signs and symptoms helpful in diagnosis of poisoning are shown in Table 2.8.

2. Identification of the substance should not take precedence over the first step, since the process is slow and unreliable and further lack of proper history might add to confusion. Action of poisons is modified by physical factors like quantity, form, chemical combination, dilution, route of administration and host factors like age, idiosyncrasy, sleep, food and use (abuse) of multiple substances.

Table 2.8. Signs and symptoms helpful in diagnosis of poisoning

<table>
<thead>
<tr>
<th>Signs</th>
<th>Poisons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. CNS signs</strong></td>
<td></td>
</tr>
<tr>
<td>Delirium/hallucinations</td>
<td>Antihistamines, dhatura, atropine and related drugs, psychomimetics, bromides, salicylates, pesticides.</td>
</tr>
<tr>
<td>Depression/coma</td>
<td>Barbiturates and other sedatives, hypnotics, tranquilizer, morphine group, organic solvents, carbon monoxide, cyanides.</td>
</tr>
<tr>
<td>Convulsions</td>
<td>Organophosphates, organochlorines, phenol,amphetamine, atropine, kerosene, aminophylline, benzoyl benzoate, salicylates, strychnine.</td>
</tr>
<tr>
<td>Weakness or paralysis</td>
<td>Lead, arsenic, botulism, organic mercurials, triorthocresyl phosphate, pesticides.</td>
</tr>
<tr>
<td>Fasciculations</td>
<td>Organophosphates.</td>
</tr>
<tr>
<td>Dilated pupil</td>
<td>Atropine group, cocaine, nicotine.</td>
</tr>
<tr>
<td>Small pupil</td>
<td>Opium group, phenothiazines, organophosphates.</td>
</tr>
<tr>
<td><strong>2. Respiratory signs</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory difficulty</td>
<td>Organophosphate-insecticides, salicylates, botulism, carbon monoxide, cyanides, atropine.</td>
</tr>
<tr>
<td>Cyanosis without respiratory distress</td>
<td>Methaemoglobinemia.</td>
</tr>
<tr>
<td><strong>3. Temperature abnormality</strong></td>
<td></td>
</tr>
<tr>
<td>High fever</td>
<td>Salicylates, anticholinergic, atropine, organophosphates, nitrophenols, kerosene, paracetamol.</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Opiates, barbiturates.</td>
</tr>
<tr>
<td><strong>4. CVS signs</strong></td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>Beta-blockers, sedatives, hypnotics or narcotic.</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Amphetamine or sympathomimetic overdose, sedative or narcotic withdrawal.</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>Digitalis, beta-blockers, calcium channel antagonists or hypothermia.</td>
</tr>
<tr>
<td><strong>5. Odours</strong></td>
<td>Kerosene, bitter almond-cyanides, garlic-parathion, organophosphates, phosphorus, alcohol, paradehyde, phenols and cresols, sulfides.</td>
</tr>
</tbody>
</table>
Treatment

Poisoned patients may deteriorate rapidly. Care for all adult patients who are critically ill or under evaluation for possible toxin exposure or ingestion, particularly when the history is uncertain, should begin in a monitored treatment area where the development of central nervous system depression, haemodynamic instability, or seizures can be rapidly recognized and addressed.

A. Basic principles and first aid measures

Attention to CAB of resuscitation is utmost priority at all times.
Removal of poison from the person or person from the poison.
Removal of contaminated clothing. In case of skin contamination with toxic materials, a shower or drenching the skin in a water tub and use of soap and water will mechanically remove the substance.
For eye contamination, washing the eye with running clean water, holding the lids apart is a useful measure. Rubbing of eyes is to be discouraged. Use of sterile liquid paraffin will prevent irritation.
When a toxic substance has been inhaled, removal of the person away to open surroundings, loosening of clothes and if necessary, artificial respiration are important first aid measures.

In case of venomization by snake or other insect bites (see section on Snake Bite), washing the area with clean water will mechanically remove the venom. Suction (oral) of the bite area should be discouraged. If the patient is unconscious, put the patient in a position lying on one side (preferably left side) with head tilted slightly backwards so that choking due to falling back of the tongue is prevented.

B. Removal of ingested poison

Gastrointestinal decontamination, once a mainstay in the management of ingested toxins, has a less significant role in poisoning treatment today. With rare exceptions, gastric lavage, whole bowel irrigation, and administration of syrup of ipecac are no longer recommended.

Administer single-dose activated charcoal to adsorb ingested toxins in case of ingestion of life-threatening poisons for which no adequate antidotal therapy is available and when the charcoal can be administered within 1 hour of poisoning. Multiple-dose activated charcoal given in patients who have ingested a life-threatening amount of specific toxins (e.g., carbamazepine, dapsone, phenobarbital, quinine, or theophylline, tricyclic antidepressants, phenothiazines, alcohol, salicylates and many plant toxins). Charcoal should not be administered for ingestions of caustic substances, metals, or hydrocarbons. Charcoal should only be administered to patients with an intact or protected airway. In patients who are at risk for aspiration, endotracheal intubation and head-of-bed elevation should be performed before charcoal administration. Because the decision to perform gastrointestinal decontamination is complex, multifactorial, and associated with risk, seek expert advice.
1. Induce emesis

(Caution: Contraindicated in cases of corrosive poisoning, unconscious patients and in those who have swallowed petroleum products.)

Mechanical tickling of the throat with fingers, spatula or tongue depressor will induce vomiting.

Or

Two to four teaspoonful (10-20 ml) of syrup ipecac followed by half a glass of water.

(Caution: Contraindicated in children with age less than 6 months)

Or

Inj. Apomorphine hydrochloride 6 mg subcutaneously causes vomiting in 3-4 minutes but should be used with caution since it is also a depressant.

Elimination through other measures. Elimination of poisonous substances can be enhanced by use of diuretics like frusemide, ethacrynic acid, acetazolamide, and osmotic substances like urea and mannitol. Forced alkaline diuresis treatment is done in patients of barbiturate intoxication. Other effective measures to eliminate ionizable substances are peritoneal dialysis, haemodialysis and exchange transfusions.

C. Antidotes

The absorption of the ingested poison can be reduced by activated charcoal, cholestyramine, Fuller’s earth, bentonite, etc. Commonly available specific antidotes are shown in Table 2.9.

D. Asymptomatic therapy

Give symptomatic therapy for pain, vomiting, diarrhoea, abdominal distension, convulsions, hyperexcitability and delusions (for details see respective sections).

E. Supportive treatment

Fluid and electrolyte disturbances are managed with proper laboratory investigations and assessment of intake and output. Careful monitoring of vital signs like temperature, pulse, respiration and blood pressure is mandatory. Metabolic needs are increased by about 10% with rise in temperature by 0.8°C. Hypothermia delays detoxification and excretion of poison due to reduced metabolism and circulatory disturbances.

A comatose patient needs careful supervision for clear airway, proper oxygenation, prevention of aspiration of gastric contents by proper positioning, frequent change of position, care of bladder, bowels, skin, eyes and buccal mucosa. Antibiotics for infections are given according to the needs.
108 STANDARD TREATMENT GUIDELINES

Table 2.9. Commonly available specific antidotes

<table>
<thead>
<tr>
<th>Poison</th>
<th>Antidote and dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>Pure oxygen</td>
</tr>
<tr>
<td>Cyanide</td>
<td>Sodium nitrite 3% soln, 0.2 ml/kg, IV over 2 min followed by sodium thiosulphate (25% soln, 1 ml/kg, IV over 10-20 minutes)</td>
</tr>
<tr>
<td>Nitrate and nitrates</td>
<td>If methaemoglobinaemia, treat with methylene blue</td>
</tr>
<tr>
<td>Organophosphates</td>
<td>Inj. Atropine - 0.05 mg/kg, IV every 10 min until signs of atropinism Inj. PAM 25-50 mg/kg, IV in older children, and 250 mg IV in infants over 5-10 minutes, 8 hourly up to 36 hours; adults 1g IV repeated every 3-4 hours as needed, preferably as a constant infusion of 250-400 mg/kg</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Inj. Physostigmine 0.56 mg slow IV over 5 min (atropine gp); repeated every 10 min till a maximum of 2 mg.</td>
</tr>
<tr>
<td>Narcotics (opium)</td>
<td>Inj. Naloxone - 0.1 mg/kg, IV or intratracheal, from birth up to 5 years or 20 kg of weight, at time a minimum of 2 mg should be used</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>Ethyl alcohol</td>
</tr>
<tr>
<td>Phenothiazine</td>
<td>Inj. Diphenhydramine 1-2 mg/kg</td>
</tr>
<tr>
<td>Iron</td>
<td>Inj. Desferrioxamine 15 mg/kg/h IV in 100-200 ml 5% glucose soln (maximum 80 mg/kg in 24 hours; 100 mg of desferrioxamine binds 8.5 mg of Iron).</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>N-acetyl cysteine: Oral - initially 140 mg/kg, then 4 hourly up to 72 hours. IV 150 mg/kg by infusion over 125 min followed by 50 mg/kg 4 hourly for 72 hours.</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Inj. Flumazenil in adults Initial dose: 0.2 mg IV one time over 30 seconds; 0.5 mg may be given every minute (most patients respond to 1 to 3 mg; Max total dose 3 mg). Patients responding partially at 3 mg may receive additional doses up to 5 mg. Resedation doses: 0.5 mg every 20 minutes to a total of 1 mg/dose and 3 mg/hour. Children 1 to 17 years: Initial dose: 0.01 mg/kg IV over 15 seconds. Repeat doses: 0.01 mg/kg given over 15 seconds; may repeat 0.01 mg/kg after 45 seconds, then every minute to a maximum total cumulative dose of 0.05 mg/kg.</td>
</tr>
</tbody>
</table>

F. Other aspects

1. Complications of various types arise commonly in poisonings.
   Anticipating such complications and proper management help in successful outcome (Table 2.10).

2. Preserving evidence for medicolegal purposes and toxicological studies is the responsibility of the attending physician. Urine, stool, gastric contents (vomited or aspirated), blood and food samples and viscera should be preserved.

3. Prevention of sequelae like strictures following corrosive poisoning is done by using corticosteroids. Corticosteroids are useful in petroleum product poisoning to treat shock, lung syndrome and to prevent pulmonary fibrosis.
4. Preventing recurrence of poisoning is by proper labelling, keeping such substances away from children; keeping medicines, cosmetics and household products separately, and psychiatric consultation to patients who have taken drugs with suicidal intention.

Table 2.10. Complications in poisoning and their management

<table>
<thead>
<tr>
<th>Complications</th>
<th>Poisons</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary oedema</td>
<td>CNS depressants</td>
<td>Semirecumbent position,</td>
</tr>
<tr>
<td></td>
<td>Organophosphorus compounds</td>
<td>Diuretics</td>
</tr>
<tr>
<td></td>
<td>Poisonous bites</td>
<td>Mannitol,</td>
</tr>
<tr>
<td>Cardiac failure</td>
<td>Electrolyte disturbances</td>
<td>Cardiac glycosides</td>
</tr>
<tr>
<td></td>
<td>Toxic myocarditis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scorpion bites</td>
<td></td>
</tr>
<tr>
<td>Cerebral oedema</td>
<td>Methyl alcohol</td>
<td>Diuretics</td>
</tr>
<tr>
<td></td>
<td>Convulsions</td>
<td>Mannitol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dexamethasone</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>Nephrotoxic drugs</td>
<td>Management of shock</td>
</tr>
<tr>
<td></td>
<td>Venoms</td>
<td>Alkaline urine</td>
</tr>
<tr>
<td></td>
<td>Hypovolaemic shock</td>
<td>Fluid and electrolyte balance</td>
</tr>
<tr>
<td></td>
<td>Haemolytic reactions</td>
<td>maintenance, dialysis</td>
</tr>
<tr>
<td>Acute hepatic failure</td>
<td>Poisonous substances</td>
<td>Management of liver failure</td>
</tr>
<tr>
<td></td>
<td>Snake bites</td>
<td></td>
</tr>
</tbody>
</table>

**ORGANOPHOSPHORUS POISONING (OP)**

Common agents for organophosphorus poisoning are malathion, parathion (fatal dose 0.1 mg/kg). Onset of symptoms is within 12 hours of exposure; usually following a household spraying.

**SALIENT FEATURES**

Dizziness, headache, blurred vision, miosis, excessive lacrimation and salivation, nausea, vomiting, diarrhoea, epigastric pain, sense of constriction around chest, dyspnœa, sweating, muscle twitching and fasciculations, convulsions, flaccidity and muscle weakness, loss of reflexes and coma. Fasciculations are less common in children than adults. Bradycardia may occur in some children.

A high index of suspicion is needed as the history of exposure may be denied. It may be confirmed by measuring red cell cholinesterase level, which is reduced to 20% of the normal values in clinically apparent poisoning (normal range 5-12 U/ml).
Treatment

Mild poisoning (normal consciousness, mild secretions and few fasciculations, serum acetylcholinesterase enzyme (AChE) is 20-50% of normal (> 700-1700 U/L) suggests eventless recovery. Severe poisoning (copious secretions, generalized fasciculations, and altered consciousness, AChE is < 10% of normal (<350 U/L) indicates the likelihood of complications and the need for ventilation. Life-threatening poisoning, generally associated with suicide attempts is characterized by a \( \text{pO}_2 < 75 \text{ mmHg} \) and abnormal chest X-ray. These patients need immediate ventilatory support.

1. Establish airway, suctioning, and oxygen. This is most urgent as death can occur from respiratory failure. Establish an IV line, monitor BP, and do not rush fluids. If unable to protect airway—intubate and ventilate; Assisted ventilation may be required in up to 25% of patients. **Do not use succinylcholine**, as it may result in prolonged paralysis of hours to days. Immediate aggressive use of atropine may eliminate the need for intubation.

2. Decontamination of the skin, mucous membrane and gut (if skin is contaminated, clean and wash using copious amount of soap water and change the clothing; gastric lavage and catharsis, if poison has been ingested). (**Caution:** Health care providers must avoid contaminating themselves while handling patients. Use personal protective equipment at all times—mask, impermeable gown, rubber gloves. If spills occur—wipe over with dilute hypochlorite solution (household bleach) to inactivate the organophosphorus ester.)

3. Inj. Atropine IV 0.05 mg/kg every 10 minutes until signs of atropinism appear; maintain it for 24 hours. The signs of atropinism are: Drying of all secretions (most reliable), delirium, restlessness, fever, tachycardia, dryness of tongue and dilated pupils. As much as 10 times of usual dose of atropine may be required. (**Caution:** There is no fixed dose of atropine in OP poisoning. (The aim is to keep patient atropinised till poison effect weans off).

4. In moderate to severe cases, immediately give Inj. Pralidoxime (PAM) 25-50 mg/kg IV; in older children and in infants 250 mg IV over 5-10 minutes; and then 8 hourly up to 36 hours. (**Caution:** Do not use in carbamate poisoning such as neostigmine, physostigmine, rivastigmine)

5. Administer paracetamol and non-opioid analgesia for relief of muscle pain.

6. Continuous monitoring is required for 72 hours or longer as organophosphate may be intermittently released from fat stores with ECG, arterial BP monitoring, \( \text{SpO}_2 \), CVC access, CXR.

Observe for deterioration post-reduction of drug therapies, auscultate lung bases for crackles. If crackles heard or there is a return of miosis, bradycardia or sweating, re-establish atropinization.

**Note:** Morphine, succinylcholine, theophylline, phenothiazines, reserpine are contrain-dicated.
ALUMINIUM PHOSPHIDE AND PHOSPHINE POISONING

Aluminium phosphide is used to control rodents and pests in grain storage facilities. It produces phosphine gas, which is a mitochondrial poison. Toxicity can occur either after the inhalation of phosphine gas or after the ingestion of aluminium phosphide pellets. Phosphine is a colourless, flammable gas with an odour of garlic or rotten fish. The specified fatal dose is 0.15-0.5 g.

SALIENT FEATURES

Poisoning by inhalation produces irritation of the mucous membrane, dizziness, easy fatigability, nausea, vomiting, headache and diarrhoea in mild exposure. Excessive thirst, abdominal pain and epigastric tenderness in moderate to severe poisoning. Moderate degree of exposure causes ataxia, numbness, paraesthesia, muscle weakness, paralysis, diplopia and jaundice. In case of severe inhalational poisoning, the patient presents with acute respiratory distress syndrome (ARDS), congestive cardiac failure, convulsion and coma.

Cardiovascular abnormalities seen are profound hypotension, dry pericarditis, myocarditis, acute congestive heart failure and arrhythmias. Several ECG changes ranging from ST segment elevation/depression, PR and QRS interval prolongation, complete heart block to ectopics and fibrillation. Highly variable arrhythmias in a young patient with shock and no previous history of cardiac disease points towards aluminium phosphide poisoning.

Diagnosis by presence of typical clinical features, garlicky odour from the mouth and confirmation by laboratory diagnosis by silver nitrate test on patient’s breath or blood or gastric acid.

Treatment

There is no specific antidote and treatment is mainly supportive. The most important factor for success is resuscitation of shock and institution of supportive measures as soon as possible. The following conditions should be anticipated and supportive measures should be tailored according to the individual’s condition:

1. Oxygen inhalation and if required, by intubation and assisted ventilation.
2. Intravenous fluids to maintain adequate hydration 2-3 litres of normal saline to be administered within the first 8-12 h guided by central venous pressure (CVP) and pulmonary capillary wedge pressure (PCWP). The aim is to keep the CVP at around 12-14 cm of water.

For treatment of shock, low dose Inj. Dopamine 4-6 mcg/kg/min to maintain systolic BP >90 mm Hg and Inj. Hydrocortisone 200-400 mg IV every 4-6 h. For details of management of shock, see section on Shock in Chapter 2.

Diuretics like frusemide can be given, if systolic blood pressure is >90 mm Hg to enhance excretion.
3. An early gastric lavage with potassium permanganate (1:10,000) or saline or sodium bicarbonate within the first 30-45 minutes followed by slurry of activated charcoal (approx 100 g) through a nasogastric tube.

4. If bicarbonate level less than 15 mEq/L, give Inj. Soda bicarbonate in a dose of 50-100 mEq IV every 8 hour till the bicarbonate level rises to 18-20 mEq/L. Patients may require up to 300-500 ml of sodium bicarbonate. Dialysis may be required for severe acidosis and acute renal failure.

5. For treatment of cardiac arrhythmias, intensive cardiac monitoring is necessary in ICU (For details see Chapter 2). Conventional drugs such as digoxin, xylocaine are ineffective. Atropine is not useful in bradyarrhythmias. Magnesium sulphate is effective in both tachy- and bradyarrhythmias due to its membrane stabilizing effect.

**Prognostic markers:** Development of refractory shock, ARDS, aspiration pneumonitis, anaemia, metabolic acidosis, electrolyte imbalance, coma, severe hypoxia, gastrointestinal bleeding, and pericarditis are associated with poor prognosis.

The outcome correlates best with the number of vomiting the patient gets after ingestion and the severity of hypotension the patient develops. It does not correlate with the ingested dose. The average time interval between intake of poison and death is 3 hours with a range of 1-48 hours.

**PHENOL**

Phenol or carbolic acid is a corrosive aromatic hydrocarbon, which is widely used as a household disinfectant. Phenol is well absorbed by all routes of exposure. Exposure by any route can cause systemic effects. Poisoning usually occurs due to ingestion mainly. The minimum lethal oral dose is 1 g or 20 ml of a household phenol solution. Systemic toxicity can result from skin or eye exposures. Children are more vulnerable to toxicants absorbed through the skin because of their relatively larger surface area: body weight ratio.

**SALIENT FEATURES**

Phenol is corrosive and causes severe chemical burns on contact. Systemic effects can occur from all routes of exposure and may include convulsions, sudden collapse, coma, nausea, vomiting, diarrhoea, methemoglobinemia, haemolytic anaemia, profuse sweating, hypotension, arrhythmia, pulmonary oedema, seizures, acidosis and shock.

Systemic manifestations develop after 5 to 30 minutes post-ingestion or post-dermal application, and may produce nausea, vomiting, lethargy or coma, hypotension, tachycardia or bradycardia, dysrhythmias.

The diagnosis is primarily clinical based on CNS depression and other symptoms as above. The urine may show red blood cells, proteins and casts. Add a few drops of 10% ferric chloride in urine. A violet or blue colour indicates the presence of phenolic compounds.

Repeated phenol exposure in the workplace may cause renal and hepatic damage.
Treatment

There is no antidote for phenol. Treatment consists of support of respiratory and cardiovascular functions.

1. Patients who are comatose, hypotensive, or are having seizures or cardiac arrhythmias should be treated according to advanced life support (ALS) protocols. Maintain airway, breathing and circulation and establish vascular access. Inhalation of 100% oxygen. Intubation and assisted ventilation might be necessary. Extreme throat swelling may require endotracheal intubation or cricothyroidotomy.

2. Rapid decontamination of the skin with extensive irrigation. Flush exposed or irritated eyes with copious amounts of water or saline for at least 15 minutes. Health personnel should wear protective clothing and gloves while treating patients whose skin/cloths are contaminated with phenol. Remove contaminated clothing rapidly.

(Caution: Avoid hypothermia when decontaminating children or the elderly. Use blankets or warmers when appropriate).

3. If phenol is ingested, victims who are conscious and able to swallow should be given 4 to 8 ounces of milk, egg whites, or gelatin solution, if this has not been given previously; if the patient is symptomatic, delay decontamination until other emergency measures have been instituted. **Do not induce emesis.**

4. If the victim is alert, asymptomatic, and has a gag reflex, administer a slurry of activated charcoal at 1 g/kg (usual adult dose 60-90 g, child dose 25-50 g). A soda can and straw may be of assistance when offering charcoal to a child.

5. Consider gastric lavage with a small nasogastric tube with a sodium or magnesium sulphate solution for the lavage, if a large dose has been ingested; the patient’s condition is evaluated within 30 minutes; the patient has oral lesions or persistent oesophageal discomfort.

(Caution: Blind gastric-tube placement may further injure the chemically damaged oesophagus or stomach; lavage is discouraged in children unless performed under endoscopic guidance).

Isolate toxic vomitus or gastric washings (collect vomitus in plastic bags, attach the lavage tube to isolated wall suction or another closed container).

6. Treat shock (fluids and dopamine), arrhythmias (lidocaine) and convulsions (diazepam). For details see respective sections.

7. In children who develop stridor, Epinephrine aerosol 0.25-0.75 ml of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

8. Treat patients who have bronchospasm with aerosolized bronchodilators.

9. Metabolic acidosis should be managed by 1 to 2 mEq/kg of sodium bicarbonate.

10. Methemoglobinemia should be treated, if greater than 30%, or in cases of respiratory distress, with Inj. Methylene blue 1 to 2 mg/kg of 1% solution, slowly IV. Further doses may be required.

Pulmonary oedema or CNS effects may be delayed; patients who have suspected serious exposure should be observed and re-examined periodically for 18 to 24 hours.
To detect an oesophageal stricture, follow up the patient. Patients who have mild exposure and remain asymptomatic for 2 to 4 hours may be discharged with instructions to seek medical care promptly, if symptoms develop. Patients who have skin or eye burns should be re-examined in 24 hours.

**HYDROCARBONS (KEROSENE, PETROL)**

This is the most common accidental poisoning in children, usually in infants and toddlers. Significant toxicity does arise from the inhalation of vapours or pulmonary aspiration of the liquid while being ingested. Large amounts (100 ml or more) must be swallowed to allow GI absorption to produce pulmonary lesion.

### SALIENT FEATURES

Two major systems affected by hydrocarbon ingestion are the respiratory and central nervous systems.

Respiratory symptoms are usually due to chemical pneumonitis or bronchopneumonia (cough, breathlessness, tachypnoea and fever) and may appear as early as within 15 minutes and as late as 24 hours after kerosene ingestion. Hyperexpansion of chest is seen occasionally. In severe cases, haemoptysis ensues. Cyanosis is accentuated and death may follow, usually within 24 hours. CNS involvement can cause lethargy, dizziness, headache, visual disturbances and may progress to seizures, hyperpyrexia, coma, respiratory paralysis and death. Symptoms usually subside between the second and fifth day.

**Ingestion:** Often no symptoms occur but there may be nausea, vomiting and occasionally diarrhoea.

**Ocular:** Irritating to the eyes causing an immediate stinging and burning sensation with lacrimation.

**Dermal:** Irritant. Drying and cracking, transient pain with erythema, blistering and superficial burns.

Radiographic findings consist of perihilar mottling, consolidation, areas of collapse or frank pulmonary oedema. Pleural effusion may develop. Rarely cysts or pneumatoceles may form. The X-ray abnormality usually clears within 7-10 days but may rarely last for months.

### Treatment

Remove patient from exposure. In case of inhalation, give oxygen; maintain a clear airway and adequate ventilation and apply other measures as indicated by the patient’s clinical condition.

In case of dermal exposure, remove all soiled clothing and wash the contaminated area thoroughly with soap and water for 15 minutes.

In case of ocular exposure, remove contact lenses and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
Record vital signs and observe for 6-8 hours. If the patient is asymptomatic, it is unlikely that significant problems will occur, and may not need any treatment. If significant symptoms appear, the patient should have a chest X-ray to identify pulmonary disease not appreciated by auscultation in up to 60% cases. Liver and renal function tests, urine and electrolytes should be evaluated.

1. Prevention of aspiration is the main goal. **Do not induce emesis.**
   Gastric lavage should not be undertaken. Consider gastric aspiration within 1 hour of ingestion, if very large amounts have been taken or there is concern about another toxin, provided the airway can be protected.

2. Instillation of oils to slow gastric emptying and decrease intestinal absorption has not proved to have practical application.

3. Specific treatment is aimed at aggressive correction of hypoxia with humidified oxygen and CPAP (continuous positive airway pressure).

4. Prophylactic antibiotics to prevent secondary bacterial infection may be used.

5. Proper supportive care especially to maintain fluid balance and to prevent hypoxia.
   Value of corticosteroids to prevent chemical pneumonia is doubtful.

Pneumatocele, pneumothorax, cardiomegaly or arrhythmia may occur occasionally. Recovery is usually complete. However, pulmonary fibrosis and bronchiectasis have been known on long-term follow-up.

**CARBON MONOXIDE**

The most important and common source of carbon monoxide (CO) exposure is smoke inhalation. Heating systems in rooms that are not properly ventilated (e.g. gas, wood, kerosene heaters and stoves and brick ovens) and petrol engine exhaust fumes can cause such exposure. Diesel fumes produce very little carbon monoxide.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
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<tbody>
<tr>
<td><strong>Low-level poisoning</strong></td>
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</table>

**Early features:** Low-level exposure may produce no abnormal physical signs. Symptoms are likely to be mild and may include nausea, subjective weakness, headache and poor concentration/memory.

**Late features:** Some patients develop symptoms later, perhaps after several weeks of apparent recovery from the incident. This late stage is more common in those aged over 40. Neurological or neuropsychiatric features including disorientation, apathy, irritability, inability to concentrate, personality change, parkinsonism, parietal lobe lesions and memory loss. Encephalopathy develops 2-6 weeks after the initial acute intoxication. Urinary incontinence and/or faecal incontinence and disturbance of gait are common.
**Chronic poisoning** is often unsuspected and unrecognized and features may appear nonspecific, e.g. headache, nausea and flu-like symptoms, vertigo, alteration in consciousness and subjective feeling of weakness. They are most common in winter as that is when fires are used and ventilation is restricted. Suspected, if more than one person in a household has such symptoms that do not appear to be due to a viral infection. There may be black, sooty marks near a fire.

**High-level poisoning**

The above symptoms may be more severe. In addition: personality change, poor performance on the mini-mental state examination, tachycardia and tachypnoea, dizziness and ataxia, angina, hypotension, arrhythmias, agitation, seizures, impairment of consciousness and respiratory failure; cerebral oedema and metabolic acidosis may develop.

Oxygen saturation levels are usually normal. ECG changes, metabolic acidosis, raised TLC and amylase and raised SGOT and SGPT in severe cases. A raised carboxyhaemoglobin level is definitive diagnostic investigation. However, it can be misleading as the levels start falling as soon as the patient is removed from the site of exposure. Symmetrical and diffuse low density lesions in globus pallidus, cortical lesions on CT scan are characteristic.

**Treatment**

**Prehospital**

Remove the patient promptly from the source of exposure and immediately institute oxygen therapy with a non-rebreather mask.

**Hospital**

1. Perform intubation for the comatose patient or, if necessary, for airway protection, and provide 100% oxygen therapy and may be required for 24 hours.

2. Early blood samples may provide much more accurate correlation between carboxyhemoglobin (HbCO) and clinical status; however, do not delay oxygen administration to acquire them.

3. Institute cardiac monitoring. Measure pulse oximetry gap, the difference between the saturation as measured by pulse oximetry and one measured directly, is equal to the HbCO level. Measure the HbCO concentration as an emergency. HbCO of 30% indicates severe exposure but much lower concentrations do not exclude significant poisoning and the relationship between HbCO and severity of poisoning and clinical outcome is poor.

4. In uncomplicated intoxications, venous HbCO levels and oxygen therapy are likely to be sufficient.
5. Evaluate patients with significant cardiovascular disease and initial HbCO levels above 15% for myocardial ischaemia and infarction and treat accordingly (for details see Chapter 4).

6. Consider immediate transfer of patients with levels above 40% or cardiovascular or neurologic impairment to a hyperbaric facility, if feasible. Persistent impairment after 4 hours of normobaric oxygen therapy necessitates transfer to a hyperbaric centre.

7. Calculate a gross estimate of the necessary duration of therapy using the initial level and half-life of 30-90 minutes at 100% oxygen.

8. Pregnant patients with lower HbCO (above 15%) should be considered for hyperbaric treatment. Continue treatment even after carbon monoxide is no longer found in the blood.

9. Inj. Mannitol 1g/kg intravenously over 20 minutes, if cerebral oedema is suspected.

Acidosis generally improves with oxygen therapy. Do not aggressively treat acidosis with a pH above 7.15. Monitor the heart rhythm for 4-6 hours and blood gases. In patients who fail to improve clinically, consider other toxic inhalants or thermal inhalation injury.

Asymptomatic patients with HbCO levels below 10% may be discharged. Admit patients with histories of lung or vascular diseases, young children and pregnant women without symptoms for observation in a monitored setting (CCU/ICU) and evaluate acid-base status. Refer patients with cerebral oedema to a neurosurgical ICU setting. Cardiac arrest, coma, metabolic acidosis, and high HbCO levels are associated with poor outcome. Neuropsychiatric testing may have prognostic efficacy in determining delayed sequelae.

**Patient Education**

- If treatment is timely, most people are able to recover from carbon monoxide poisoning.
- Discuss the possibility of delayed neurologic complications, although they are much more common in severe intoxication.

During the weeks following treatment, report any changes in vision, coordination, or behaviour to doctor.

Minimizing physical activity for 2-4 weeks. Advise patient to stop smoking.

**ETHYLENE GLYCOL AND METHANOL**

Methanol is commonly found in home chemicals, industrial chemicals, varnishes, paints, dies and used as denaturant in ethanol. Poisoning can be accidental or may be consumed by chronic alcoholics deprived of their alcoholic beverage of choice, suicidal ingestion of methanol containing products and unintended consumption of such products by children. Methanol is cheap and may be used to fortify illicit spirits. Toxic dose is 15-30 ml of 40% methanol. Symptoms of toxicity appear within 12-24 hours.
SALIENT FEATURES

Methanol typically induces nausea, vomiting, abdominal pain and mild CNS depression initially. After 12-24 hours depending upon consumption there is metabolic acidosis, visual disturbance (difficulty in vision, pupillary dilation, retinal oedema and optic disc hyperaemia) due to formation of formic acid. At later stages, seizures, coma and respiratory failure may develop.

Treatment

Start treatment without delay on suspicion of methanol or ethylene glycol intoxication. The treatment of both alcohols is the same, and differentiating which of the two toxic alcohols is responsible is not necessary before implementing treatment.

1. Maintain airway, breathing, and circulation (See section on CPR in Chapter 2).
2. Gastric lavage, if patient reports within four hours of consumption.
3. Sodium bicarbonate intravenously liberally, if pH <7.35 or bicarbonate <15 mEq/l.
4. If methanol level >20 mg/dl, osmolar gap >10 mosm/L H$_2$O ethylene glycol Inj. Fomepizole loading dose 15 mg/kg IV as soon as possible, subsequent dose 10 mg/kg every 12 h for 48 h. After 48 h 15 mg/kg 12 hourly (higher maintenance dose due to autoinduction) until serum level of Methanol is < 20 mg/dl and resolution of metabolic acidosis and symptoms.

Or

Ethanol is given as oral loading dose as 56 ml of 100% ethanol or 140 ml of 40% ethanol for a 60 kg patient. Maintenance dose is 10 ml/h for 100% ethanol or 50 ml/h of 20% ethanol and given as IV infusion of 100-130 mg/kg/h. Close monitoring of serum ethanol concentrations is essential in order to achieve a value within the recommended range.

(Caution: Adverse effects include hypoglycaemia, due to inebriation CNS depression, pancreatitis, and local phlebitis. Check serum glucose levels frequently, at least every 2 hours and maintain sugar levels between 100-150 mg/dl).

5. Haemodialysis in severe ethylene glycol and methanol poisoning, if serum methanol levels >50 mg/dl, metabolic acidosis, significant electrolyte disturbance unresponsive to conventional treatment, CNS, visual or fundoscopy abnormalities, renal failure and in case of consumption of >30 ml of methanol. During dialysis, Fomepizole needs to be dosed every four rather than every 12 hours.

6. Inj. Folinic acid should be administered at a dose of 1 mg/kg, with a maximal dose of 50 mg. It should be repeated every 4 hours. If Folinic acid is not immediately available, folic acid can be substituted at the same dose.

7. If ethylene glycol overdose is suspected and in patients with methanol poisoning
who are also ethanol abusers, give Inj. Thiamine 100 mg IV every 6 hours and 50 mg of Pyridoxine every 6 hours.

**DHATURA POISONING**

Dhatura stramoniun (thorn apple) grows in India at high altitudes. The seeds and fruits are the most poisonous parts of the plant with hyoscine, hyoscyamine and traces of atropine, as the active principles. The dried leaves and dried seeds are used in India, as a substitute for stramonium and belladonna. The drug is commonly used in India for criminal purposes.

**SALIENT FEATURES**

Peripheral effects are predominant and result from anticholinergic (parasympatholytic) action. Central effects involve initial stimulation of the CNS, with excitement and restlessness followed by subsequent depression, delirium and coma.

Within half an hour of taking the poison, gastric irritation starts. The patient complains of a bitter taste, dry mouth and throat, burning pain in the stomach and difficulty in swallowing and talking. This is followed by giddiness, ataxia, incoordination of muscles, a peculiar flushed appearance of the face, dry hot skin, rise in temperature, diplopia, dilated pupils with loss of accommodation, reddening of the conjunctiva and drowsiness. Sometimes, an erythematous rash appears all over the body.

Usually a full, bounding pulse which later becomes weak and irregular. Muttering delirium, tries to run away from the bed, picks at bed clothes, tries to pull imaginary threads from the tips of his fingers and develops dreadful hallucinations of sight and hearing. The condition may pass on to stupor, convulsions, coma and sometimes death from respiratory failure. Death may occur within 4-24 hours.

**Treatment**

1. The stomach is washed out with 1:10,000 potassium permanganate solution or 5% tannic acid solution.
2. In severe poisoning, only Inj. Physostigmine 1-2 mg IM or IV repeated after half an hour, if necessary. Watch for side effects: bradycardia, heart block, excessive secretions.
3. Inj. Pilocarpine nitrate 6-15 mg injected subcutaneously.
4. Inj. Diazepam may be given for convulsions (see section on Status Epilepticus).
5. For delirium, chloral hydrate, Inj. Paraldehyde or any short-acting barbiturate is usually given.
   (Caution: Morphine is contraindicated).
OPIOID INTOXICATION

Opioid overdose can be a medical emergency and is usually accidental. It can result from incorrect estimation of dose or erratic pattern of use in which person has lost previous tolerance to drug. Often caused by combined use with other CNS depressants, e.g. alcohol or sedative hypnotics.

**SALIENT FEATURES**

Pinpoint pupils, respiratory depression and CNS depression, decreased gastrointestinal motility, analgesia, nausea and vomiting, slurred speech, hypotension, bradycardia and seizures.

**Treatment** [immediate admission in intensive care unit (ICU)]

1. Establish adequate airway and respiration. Oxygen inhalation and IV fluids. If facilities are available, give artificial ventilation.

2. Activated charcoal 1g/kg suspended in water, if ingestion of large doses of oral opioids is suspected.
   
   Or
   
   Gastric lavage to remove any remaining drug.

3. Inj. Naloxone 0.4-2 mg IV or IM (0.01 mg/kg for neonates) and response should occur in 1-2 min, if needed dose can be repeated every 2-3 min up to 10 mg. If no response to 10 mg, it is unlikely due to opioids except in case of buprenorphine or suspect another diagnosis. Titrate dose relative to the patient’s symptoms to ameliorate the respiratory depression but not provoke a severe withdrawal state. If successful, continue at 0.4 mg every hour IV until the opioid has been cleared (at least for 24 hours for heroin and 72 hours for methadone overdose). Babies born to opioid-abusing mothers may experience intoxication, overdose or withdrawal.

4. Always consider possible polysubstance overdose. A patient successfully treated with naloxone may wake up briefly only to succumb to a subsequent overdose from another slower acting drugs, e.g. sedative-hypnotic taken simultaneously. Give Inj. Flumazenil 0.2 mg/min (max 3 mg in an hour) (Caution: It might precipitate seizures and increase intracranial pressure).

5. Supportive measures for respiration, hypotension with pressor agents and cardiac arrhythmia.

6. Body warmth to be maintained with hot water bottles.

7. If convulsions are present, Inj. Diazepam 10 mg IV and repeated as required (for details see section on Status Epilepticus).

8. The patient should not be made to walk forcibly in opium poisoning, as it is frequently done, but attempts should be made to keep him awake, by flicking a wet towel on the face.
References

TRAUMA

Cardiac arrest associated with trauma

Survival rates of 0 to 3.7% are reported for victims of traumatic cardiac arrest. Resuscitation of this patient group is, therefore, considered by many to be futile and an inappropriate use of resources. Consider if there are reversible causes of cardiac arrest and treat which include hypoxia, hypovolaemia, diminished cardiac output secondary to pneumothorax or pericardial tamponade, and hypothermia.

BLS modifications

When multisystem trauma is present or trauma involves the head and neck, the cervical spine must be stabilized. A jaw thrust should be used instead of a head tilt–chin lift to establish a patent airway. If breathing is inadequate and the patient’s face is bloody, ventilation should be provided with a barrier device, a pocket mask, or a bag-mask device while maintaining cervical spine stabilization.

Stop any visible haemorrhage using direct compression and appropriate dressings. If the patient is completely unresponsive despite rescue breathing, provide standard CPR and defibrillation as indicated.

ACLS modifications

After initiation of BLS care, if bag-mask ventilation is inadequate, an advanced airway should be inserted while maintaining cervical spine stabilization. If insertion of an advanced airway is not possible and ventilation remains inadequate, experienced providers should consider a cricothyrotomy.
If unilateral decrease in breath sounds during positive-pressure ventilation, consider the possibility of pneumothorax, hemothorax, or rupture of the diaphragm.

When the airway, oxygenation, and ventilation are adequate, evaluate and support circulation.

Control ongoing bleeding where possible and replace lost volume, if the losses appear to have significantly compromised circulating blood volume. Cardiac arrest resuscitation will likely be ineffective in the presence of uncorrected severe hypovolaemia.

Treatment of pulseless electrical activity (PEA) requires identification and treatment of reversible causes, such as severe hypovolaemia, hypothermia, cardiac tamponade, or tension pneumothorax. Development of bradyasystolic rhythms often indicates the presence of severe hypovolaemia, severe hypoxaemia, or cardiopulmonary failure. Ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT) are treated with CPR and defibrillation.

In cardiac tamponade in traumatic cardiac arrest, consider emergency department thoracotomy.

Commotio cordis

Commotio cordis is VF triggered by a blow to the anterior chest during a cardiac repolarization. Blunt cardiac injury may result in cardiac contusion with injured myocardium and risk of ECG changes and arrhythmias. Even a small blow to the anterior chest during a cardiac repolarization, such as that imparted by the strike of a baseball or hockey puck, may trigger VF, so-called commotio cordis. Events causing commotio cordis are most commonly seen in young persons up to 18 years of age who are engaged in sports but may occur during daily activities.

Prompt recognition that a precordial blow may cause VF is critical. Rapid defibrillation is often life-saving for these frequently young victims of cardiac arrest. Provide immediate BLS care using an automated external defibrillator (AED) and ACLS for VF.

THORACIC TRAUMA

Thoracic trauma is responsible for one-fourth of civilian trauma deaths. Two-thirds of these deaths occur after reaching the hospital. Deaths can be prevented by prompt transportation, diagnosis and correct management.

Most thoracic traumas do not require thoracotomy but rather simple life-saving manoeuvres of airway control, rapid infusion of fluids and tube thoracostomy are needed. The trauma can be penetrating or blunt.

Blunt trauma causes injury to the chest by the following mechanisms:
1. Direct blow, e.g. rib fracture.
2. Deceleration injury, e.g. pulmonary contusion.
3. Compression injury, e.g. cardiac and diaphragm injury.
SALIENT FEATURES

Chest pain and shortness of breath. Careful physical examination of the patient is important especially in the management of patient with equivocal radiological investigation.

Management

(a) **Resuscitation.** Assess for the patency of airway, breathing and circulation. Ensure the patency of the airway and adequacy of ventilation. Insert two 16G intravenous cannulae and start resuscitation with crystalloid. If haemothorax or a pneumothorax are suspected in a patient with acute respiratory distress, chest tube should be inserted through the 4th/5th intercostal space in the anterior axillary line on the affected side without waiting for chest radiography.

(b) **Quick assessment of injuries.**

**Treatment of specific injury**

1. **Chest wall**

(a) Rib fracture can vary from simple fracture to fracture with haemo-pneumothorax, to severe multiple fractures with flail chest and internal injuries. In case of simple fractures, pain with inspiration and localized tenderness and occasional localized crepitus on examination are present. Diagnosis is confirmed with a chest X-ray anteroposterior view. Exclude other intrathoracic injuries. Patients are treated with adequate analgesic drugs and muscle relaxants. In cases of multiple fractures, intercostal nerve blocks or epidural analgesia is required to ensure adequate pain relief and ventilation. Elderly patients need admission for pain relief, ventilation assistance and observation.

(b) Flail chest occurs due to unilateral fracture of 4 or more ribs, both anteriorly and posteriorly; and bilateral anterior or costochondral fracture of more than 4 ribs causes a paradoxical respiratory motion. It leads to hypoventilation, atelectasis, hypercapnia and inadequate ventilation (RR > 40/min, pO$_2$ < 60 mmHg with 60% FiO$_2$). It requires immediate endotracheal intubation and ventilatory support.

2. **Pleural space**

(a) Haemothorax should be suspected with penetrating or severe blunt thoracic injury. It is classified according to the amount of blood collected inside the pleural cavity and more importantly rate of bleeding after evacuation. In 85% of the patients with haemothorax, only tube thoracostomy is required. After tube thoracostomy, if the rate of continuing haemorrhage is more than 100-200 ml/hour or the haemorrhagic output exceeds 1000 ml in 24 hours, thoracotomy should be performed.
(b) Pneumothorax is a true surgical emergency requiring immediate diagnosis and chest tube insertion. Subcutaneous emphysema, absent breath sound, mediastinal shift and acute respiratory distress warrant immediate chest tube insertion without waiting for a chest X-ray examination. Sucking chest wounds, which allow air to pass in and out of the pleural cavity, should promptly be treated by closure of the wound (initially sealing with large pads and later with suturing) and concomitant tube thoracostomy. Simple pneumothorax (without tension) should also be managed by chest tube insertion but only after documentation by chest X-ray.

3. Lung injury

(a) Pulmonary parenchymal injury can be effectively managed nonoperatively, but about 15% of penetrating lung injury requires thoracotomy for control of haemorrhage. Approximately 80-90% of pulmonary injuries requiring operation can be managed by simple suturing or stapling of the involved segments. Only 10-20% cases require anatomical lung resection.

(b) Pulmonary contusion in most patients with flail chest can also appear without any evidence of rib fracture (particularly in children). Treatment is often delayed because clinical and X-ray findings may not appear until 12-24 hours after injury. Clinical findings are loose, copious, blood tinged secretions, chest pain, restlessness, and laboured respiration. X-ray changes consist of patchy parenchymal opacification or diffuse peribronchial densities.

Management involves careful pulmonary support and clearing of secretions, with ventilatory support, if arterial blood gases cannot be maintained in a physiologic range. Positive end-expiratory pressure (PEEP) is a useful adjunct in the management of those requiring ventilation. Fluid overload should be avoided.

4. Trachea and bronchus

Tracheobronchial injuries should be suspected, when there is a massive air leak or when the lung does not readily expand after chest tube placement. In most patients having pneumothorax, subcutaneous emphysema, pneumo-mediastinum, and haemoptysis, diagnosis may require tracheobronchoscopy. When diagnosis is confirmed, thoracotomy and primary repair is advised.

5. Heart and pericardium

Cardiac tamponade can occur both from blunt and penetrating cardiac trauma. Tamponade in blunt trauma is often due to myocardial rupture or coronary artery laceration. Patient presents with chest pain, distended neck veins, shock and cyanosis. Treatment includes immediate thoracotomy, pericardial decompression and repair of injuries.
6. Oesophagus

Anatomically, the oesophagus is well protected, and perforation from external wounds is relatively infrequent. The most common symptom of oesophageal perforation is pain; fever develops within hours in most patients. Regurgitation of food, hoarseness, dysphagia or respiratory distress may be present. Physical findings include shock, local tenderness, subcutaneous emphysema, or Hamman’s sign. X-ray findings on plain chest films include evidence of foreign body or missile and mediastinal widening or air. Contrast studies (urograffin, not barium) confirm the diagnosis. Treatment consists of early recognition (24-48 h), closure of oesophageal perforation and pleural drainage. Old perforation may require advanced surgical management and should be referred to a specialized centre.

Reference


BLUNT ABDOMINAL TRAUMA

The presentation varies from innocuous injury with no symptoms or signs of a severe injury presenting with peritonitis or shock or even causing death before reaching the hospital. The management depends upon the condition at presentation:

1. Immediately transfer the patient to the hospital along with intensive monitoring, where facilities for operation are available after providing first-aid treatment for bleeding and shock. Evaluate for head injury and intrathoracic injuries.

2. Immediate exploratory laparotomy should be done, if the patient is in shock, has rigid distended abdomen, evidence of peritonitis or evisceration of the bowel.

(a) Diagnostic peritoneal lavage (DPL). In patients with trauma who are hypotensive with possible intra-abdominal bleeding when focused abdominal sonography for trauma (FAST) capability is not available, Hypotensive patients should not be evaluated with CT scanning. In the absence of CT scanning, DPL is also useful in patients with unreliable physical examination due to altered sensorium (injury to brain, ingestion of alcohol or drugs), loss of sensation (injury to spinal cord) or injuries to adjacent structures (pelvis, ribs, dorsolumbar spine):

- Insert nasogastric tube and urinary catheter.
- Use an infraumbilical incision (supraumbilical, if patient has pelvic fracture).
- Lavage is considered positive, if you get 10-20 ml non-clotting blood or bile, succus entericus, stool or food material.

In a hypotensive patient with grossly negative ‘tap’ (i.e. no fresh blood aspirated), the value of time-consuming lavage with 1000 ml of saline and its evaluation by microscopy (often not available) is questionable.
Contrast-enhanced computed tomography (CECT) of abdomen should be performed in patients who are haemodynamically stable and in whom physical examination is unreliable because of the above mentioned factors. If CECT detects diaphragmatic injuries, intraperitoneal or retroperitoneal free air, contrast extravasation from bowel, disruption of pancreas, urinary bladder injury or grade IV or V injuries of liver, spleen and kidney with hot spot (active haemorrhage), exploratory laparotomy should be performed.

Patients with lesser grades of liver or splenic injuries can be managed conservatively, provided intensive monitoring facilities and facility for immediate exploration, should the need arise, are there.

It must be reiterated that during conservative management, these patients need intensive monitoring and frequent reviews by an experienced surgeon. If these are not available or there is doubt about the nature of injuries, exploration is safer. When CT scan is not available, chest X-ray in erect posture, plain X-ray films of abdomen and contrast studies of the bowel or urinary tract as and when indicated will detect all the injuries except injuries to liver, spleen and pancreas. Ultrasound examination can help to detect solid organ injuries, collections in the peripheral cavity, etc. Imprint abrasions or patterns of injury are the marks of ecchymosis due to restraint devices like seat belts. When present, they often are signs of serious infra-abdominal injuries especially to hollow viscous or to lumbar spine.

References

PENETRATING STAB INJURIES

The management depends upon the site of injury.

I. Anterior abdominal wall (between two axillary lines)

A. Immediate exploratory laparotomy, if patient is in shock at the time of presentation with rigid distended abdomen, peritonitis or evisceration.

B. Wound exploration in operation theatre with good illumination in haemodynamically stable and cooperative patients. If anterior fascia (in obese patients) or peritoneum (in thin patients) is not breached, wound can be closed after irrigation and patient can be discharged and followed up in the OPD.

C. If wound exploration reveals breach of anterior fascia or peritoneum but the abdomen does not have evidence of peritonitis, the patient can be admitted and serially examined for 24 hours. This method can delay definitive operation in about
5-10% of patients. The other option is to perform diagnostic peritoneal lavage (DPL). DPL in stab injuries has slightly higher false positive results (as compared to blunt abdominal trauma) because of bleeding from the site of stab wound. It can also miss some hollow viscous injuries especially of colon, if patient presents early and hence DPL is performed very early.

D. In the sub-group of patients in whom there is high suspicion of intra-abdominal injury, but the patient is haemodynamically stable on presentation, perform diagnostic laparoscopy. It can confirm or rule out intra-abdominal injury without needing a laparotomy. However, it must be performed by a surgeon experienced in laparoscopy.

II. Stab wound of the flank (between anterior and posterior axillary lines from sixth intercostal space to iliac crest) and back (posterior to posterior axillary line between tip of scapula and iliac crest).

In haemodynamically stable and cooperative patients

Wound exploration in operation theatre with good illumination. If anterior fascia (in obese patients) or peritoneum (in thin patients) is not breached, wound can be closed after irrigation and patient can be discharged. In patient where the end of the wound track cannot be reached (because of thick musculature in that area), patient should be admitted and serially examined for 24-48 h. If any sign(s) of intra-abdominal injury are obvious, laparotomy should be performed. This method can delay definitive operation in about 5-10% of patients. The other option in these patients is to perform triple contrast CECT (intravenous, oral and rectal), and proceed according to the findings. This has an overall accuracy of 96-97%.

III. Gunshot wounds of the abdomen

Most of the patients of gunshot wounds of the abdomen need immediate exploratory laparotomy since visceral or vascular injuries that need surgical repair are seen in more than 95% of these patients. However, if patient presents late and is haemodynamically stable and have no signs of peritonitis, the patient can be serially examined or subjected to triple contrast CECT before deciding for conservative treatment.

References

CHEMICAL BURNS OR INJURIES OF THE EYE

Chemical injuries due to entry of alkaline or acidic materials may result in potentially serious ocular damage including permanent visual loss and cosmetically unsightly
eye. Alkalies cause extensive damage due to their ability to readily penetrate inside the eye. Most acid burns cause mild ocular damage because they tend to coagulate and precipitate proteins which act as a barrier for further penetration of acids. Depending upon the concentration and degree of penetration, there may be injury to the conjunctiva, cornea, limbal stem cells, episclera, sclera, uvea, lens and eyelid, etc.

**SALIENT FEATURES**

Clinical manifestations vary according to the extent of ocular surface injury:
- Congestion and chemosis of conjunctiva, corneal epithelial damage, total loss of corneal epithelium, corneal haziness or totally opaque cornea, limbal ischaemia, anterior uveitis, cataract and rise in intraocular pressure (IOP), lid injury, symblepharon.

Complications include non-healing epithelial and stromal ulceration, corneal perforation, corneal melting, sequelae vascularized opaque cornea, cataract, glaucoma, symblepharon, dry eye, eyelid deformities, phthisis bulbi.

**Treatment (at the site of injury)**

Irrigate the eye (conjunctival sac) with any innocuous liquid water and continue for at least 10 min. The face may be plunged into a water container and then open the eyes under water.

**Treatment in the hospital**

1. Irrigation in the hospital—retract the eyelids and irrigate the conjunctival sac with normal saline or Ringer’s lactate or water using intravenous tubing connected to the irrigating solution for 30 minutes or until litmus paper touched to the inferior fornix indicates neutrality.
   **(Caution: Do not try to neutralize the alkali with acids or vice versa)**
2. Remove retained solid particles of lime, or any other material from superior and inferior fornix after anaesthetizing the conjunctiva. It may require double eversion of eyelid and use of forceps. If double eversion is not possible, a moistened cotton-tipped applicator should be swept in the fornix.

   Sodium ethylene diamine tetra-acetic acid (EDTA) 0.01 to 0.05 molar solution may be used as an irritant to dissolve calcium hydroxide.

**Pharmacological (acute phase 1st week)**

1. Homatropine eyedrops 2% 3 times a day.
2. Gentamicin eyedrops 0.4% 4 times a day. Or
   Ciprofloxacin eyedrops 0.3% 4 times a day.
3. Tab. Ibuprofen 400 mg, if required.
   Patch the eye and refer to an ophthalmologist.

**Surgical therapy**

Debridement, tenoplasty, limbal stem cell transplantation, keratoplasty, keratopresthesis, etc.

**Reference**


**FOREIGN BODY IN THE EYE**

This could be a small insect or a piece of grit or a loose eyelash.

<table>
<thead>
<tr>
<th><strong>SALIENT FEATURES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute pain, redness and watering in the affected eye.</td>
</tr>
</tbody>
</table>

**Treatment (at the site of injury)**

**Nonpharmacological**

Not to rub the affected eye. If possible, make the patient blink the eyelids, with the eye under clean water. If this is not effective, make the patient sit in good light, wash your hands with soap and water and try to remove the foreign body gently by flushing the eye with clean water or saline. For foreign body under the upper eyelid, turn the eyelid up and identify the foreign body and then remove it gently with moistened and twisted cotton wool or a clean piece of cloth. In case the foreign body is in the lower lid, gently draw the lower lid down and identify the particle and remove it with a moistened wisp of cotton. After removal, ciprofloxacin eye ointment/eyedrop should be applied and the eye should be bandaged. In case the foreign body cannot be removed or corneal perforation occur immediately refer to a higher centre.

**BLACK EYE**

Black eye is a collection of blood and fluid in the space around the eye, under the skin leading to swelling and dark discoloration of the skin. It results due to injury/blow to face or head or as a result of surgical procedure on face and head injury.
SALIENT FEATURES

The eye itself is usually not injured, subconjunctival haemorrhage may be present.
Injury to nose or basilar skull fracture causes bilateral black eyes.
Signs of associate serious eye injury are double vision, loss of vision, loss of consciousness, inability to move the eye, blood on surface of eye itself, lacerations or cuts on the eyelids, or injury with penetrating object.
Following tests to be performed: Visual acuity, pupil and outer examination, ocular movements, fluorescence staining, X-ray orbits, orbital bones and CT scan orbit for suspected fracture or foreign body.

Treatment

Most black eyes are minor injuries that heal spontaneously in 1-2 weeks with icepacks for 24-48 hours, rest and protection of injured area with instructions to contact the doctor immediately, if the patient experiences any change in or worsening of symptoms.

Swelling either after a bee sting near the eye or from a suspected infection of the eye should be evaluated by a doctor.

Seek immediate medical care in case of symptoms of serious eye injury as above and who are on warfarin or suffer from haemophilia. An ophthalmologist should examine especially if injuries to the eye itself or fracture of the orbital bones to ensure no significant eye injury. For other associated injuries, refer patient to neurosurgeon, ENT surgeon or plastic surgeon.

Nonpharmacological

As soon as possible apply cold pack or ice wrapped in cloth (Do NOT apply direct ice) to constrict blood vessels and localize bleeding. Do not press on eye while applying cold pack.

Sleep with head elevated on 2 pillows to decrease swelling of eyes. Wear dark glasses to reduce eye strain during healing.

Pharmacological

If pain relief is required, avoid aspirin as it may increase bleeding.

Patient education

Avoid black eye with basic injury prevention
Wear protection gear and seat belts while driving.

References

FRACTURES

A fracture is a break in the structural continuity of a bone. It is termed as an open (compound) fracture, if there is a concomitant wound through which the fracture site communicates to the environment. If the fracture does not communicate to the environment, it is called as close fracture.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain, swelling, tenderness, loss of function, deformity, shortening, crepitus, abnormal mobility and loss of transmitted movement, singularly or in combination.</td>
</tr>
</tbody>
</table>

Treatment

Only observe but do not elicit these signs by purposefully manipulating the limb at the site of accident or injury.

Emergency care of fractures at the site of accident (first aid)

All trauma patients with a cervical spinal column injury or with a mechanism of injury having the potential to cause cervical spinal injury should be immobilized at the scene and expeditiously transported to nearest hospital using one of several available methods – a combination of a rigid cervical collar and supportive blocks on a backboard with straps.

If injury to the spine is suspected, carefully move the person from the site of accident in one piece like a log of wood without any twisting or flexion.

Give temporary immobilization (called splintage) after grossly correcting the deformation without moving or manipulating much with either wooden stick/ an umbrella/a folded magazine or newspaper, a fractured lower limb temporarily can be supported and tied with opposite lower limb for splintage and transfer of patient; a fractured upper limb can be splinted by supporting it on the chest wall and wrapping any cloth piece around it. Take a note of the colour of the finger or toes before applying splintage.

If the patient has an open fracture with excessive bleeding, avoid trying any circumferential ligature to any part of the limb to stop the bleeding (unless the bleeding is life-threatening) as the ligature can be more injurious to the distal circulation of the limb.
Care of patient in the emergency department

The general aim of early fracture management is to control haemorrhage, provide pain relief, prevent ischaemia-reperfusion injury, and remove potential sources of contamination (foreign body and nonviable tissues).

(a) Patient with fracture in an extremity. Splint the limb with either Crammer wire (a malleable metallic support) or a slab or goose splint (thin layers of wood adhered to cloth) or a Thomas splint (for femoral fractures) or Bohler Braun splint (for fractures around the knee or leg bones fractures); include the proximal and the distal joint of the fractured segment of the limb in splintage (Table 2.11).

Table 2.11. Splinting in injured/fractured part of the limb

<table>
<thead>
<tr>
<th>Injured/fractured part of limb</th>
<th>Extent of splintage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fingers (phalanges)</td>
<td>Support with adjacent finger (called Buddy strapping).</td>
</tr>
<tr>
<td>Hand (metacarpals)</td>
<td>Terminal pulp of fingers to proximal third of forearm.</td>
</tr>
<tr>
<td>Wrist (carpals or lower end of radius or ulna)</td>
<td>Distal palmar crease to upper one-third forearm.</td>
</tr>
<tr>
<td>Elbow and forearm (lower end humerus or upper end of radius or ulna)</td>
<td>Distal palmer crease to upper one-third of arm.</td>
</tr>
<tr>
<td>Arm (humerus)</td>
<td>Middle one-third of forearm to base of neck (include shoulder).</td>
</tr>
<tr>
<td>Foot and ankle (tarsals or metatarsals)</td>
<td>Base of toes to upper one-third of leg.</td>
</tr>
<tr>
<td>Leg (tibia or fibula)</td>
<td>Base of toes to upper one-third of thigh (include knee and ankle). Can apply Bohler-Braun splint also.</td>
</tr>
<tr>
<td>Knee (lower end of femur or upper end of tibia)</td>
<td>Just above the malleoli to upper one-third of thigh.</td>
</tr>
<tr>
<td>Thigh (femur)</td>
<td>Base of toes to nipple line on trunk. The better option is application of Thomas splint.</td>
</tr>
<tr>
<td>Pelvic</td>
<td>See section on pelvic fractures.</td>
</tr>
</tbody>
</table>

(b) Any open wound is dressed before application of splintage. For wounds of open fractures, irrigation of the wound with copious amount of saline (0.9% NaCl) helps to remove dirt and foreign particles/bodies. The definitive treatment should be provided by an orthopaedic surgeon after radiological examination.

c) Multiple injuries. Remove clothing and examine the patient rapidly from head to toe.

Ensure patency of the airway.
Perform throat suction, if secretions are present in the throat.
The neck may be “gently” turned to one side to prevent aspiration and ensure patent airway and breathing.
Check for pneumothorax or a flail segment and take appropriate measures (see section on Thoracic Trauma for details).

Record vital parameters. Assess the level of consciousness according to Glasgow Coma Scale. Establish intravenous line and catheterize the patient (see section on Coma for details).

Splint the limbs and note down distal neurovascular status. The patient, if required to be shifted, is handled with great care as patient might be having spinal injury.

**Pharmacological**

1. Inj. Diclofenac sodium 75 mg IM stat for pain relief.  **(Caution: Do not give any sedative or centrally acting analgesic)** (like morphine or its derivatives); to keep a watch on their level of consciousness and early detection of any complication arising secondary to any fracture in the limb).

2. Inj. Tetanus toxoid 0.5 ml IM stat, if open injuries or wounds.

3. IV fluids for management of haemorrhagic shock (see section on Shock). Give an initial rapid fluid bolus of 1-2 liters of Ringer’s lactate in the adult patient and 20 ml/kg in the paediatric patient. Send blood for grouping and cross-matching.

4. Catheterize the patient for measuring urine output as the latter is one of the most reliable clinical parameters to assess the adequacy of visceral perfusion and it also helps in the assessment of IV fluid to be transfused.

5. In case of open fractures, give intravenous antibiotics after sensitivity testing. Various combinations can be used but each should provide coverage for Gram-positive as well as Gram-negative organisms. The antibiotics should be continued for at least a period of 7-14 days.

   Inj. Cloxacillin 500 mg 6 hourly (50-100 mg/kg in children)
   Inj. Gentamicin 80 mg 12 hourly (5-7.5 mg/kg in children)
   Or
   Inj. Cefotaxime 1 g 12 hourly (100-200 mg/kg in children)
   Inj. Amikacin 500 mg 12 hourly (15 mg/kg in children)
   Or
   Inj. Ceftriaxone 1 g 12 hourly (50-100 mg/kg in children) Inj.
   Amikacin 500 mg 12 hourly (15 mg/kg in children)

   The patient or parents should report to the hospital in case of:
   - Severe pain in the limb,
   - Difficulty in moving fingers/leg or has sense of numbness, fingers/toes are swollen,
   - Any change in the colour of toes or finger nails, i.e. pale, dusky or blue,
   - Rashes on skin under plaster in perineal or buttock; in case of vomiting or abdominal distension developing in a patient with a spica cast,
   - Pain in a localized area with discolouration of the distal organ, or reappearance of swelling (could be because of plaster sore) or
   - If the plaster cracks, breaks or becomes soft.
The goal in managing fractures is to ensure that the involved limb segment, when healed, has returned to its maximal possible function. Exercises are initiated according to the recommendations of the treating physician and based on tissue healing. Therapy should begin with gentle range of motion and progress to strengthening exercises as tolerated. Intensity and duration of exercises should be advanced as indicated.

Patient education

Following points should be explained to the patient after application of a plaster:

- The plaster immediately after application feels warm/hot during setting. Don’t cover the plastered limb with clothing or bed sheet to allow the plaster to dry and to permit direct observation of the limb.
- Keep the limb elevated and keep on moving toes/fingers frequently.
- In children to cover the edges of the plaster with waterproof material like polythene or plastic adhesive tape to avoid soiling of a hip spica or GT cast with urine or faeces.
- Not to bear weight on plaster unless permitted by the doctor, otherwise it gets spoiled/cracked.
- Avoid resting the plaster over any edge or hard surface to avoid dents and plaster sore.

Explain a home exercise programme to the individual to complement supervised rehabilitation.

References


PELVIC FRACTURES

Classification

Pelvic fractures are generally divided into two types based on amount of energy involved:

i. Low energy fractures resulting in isolated fractures of individual bones of pelvis without disruption of pelvic ring.

ii. High energy fractures generally producing pelvic ring disruption.
Fig. 2.9. Pelvic fractures: Therapeutic measures for the control of haemorrhage.
Evaluation

Evaluate the patient with attention to ABC of trauma care (i.e. airway, breathing and circulation). Conduct a primary survey and note baseline vital signs and neurological status.

Assess pelvic stability, very carefully, by pushing anterior superior iliac spines towards each other and then apart (preferably perform this manoeuvre once only). Perform perineal and digital rectal examination.

Secondary detailed survey is carried out once the patient’s condition is stable and X-rays and other relevant investigations are done.

Treatment

As a primary aid, pelvis can be quickly and temporarily stabilized by wrapping a sheet tightly around it. Isolated stable pelvic bone fractures are treated by bed rest (for symptomatic duration) and analgesics, followed by gradual mobilization and weight bearing.

Treatment of unstable pelvic ring disruptions (Fig. 2.9) includes: Volume replacement (see section on Shock).

Control haemorrhage—Apply pressure dressing for conspicuous external bleeding. Open pelvic fracture wounds can be packed to control bleeding. Apply external fixator as a resuscitative measure in patients with demonstrable haemodynamic instability after an initial fluid bolus.

As an alternative to fixator, pelvic clamp can be applied, but it is not a popular modality as complication rate with this clamp is higher than fixator (Caution: Pelvic clamp is contraindicated for iliac wing fracture close to the sacroiliac joint).

Urological management—Catheterize the urinary bladder to document urinary output as a crucial determinant of adequate volume resuscitation. Blood at urethral meatus/ inability to void urine/perineal haematoma/high riding prostate indicate urethral injury. Microscopic haematuria indicates bladder contusion.

Further management is required in consultation with general surgeon.

(a) Gastrointestinal injuries: Concomitant small bowel/large bowel/rectal/anal tears or perforation can occur. Peritoneal lavage and abdominal CT are required to exclude GI trauma with close pelvis fractures (For details see section on Trauma).

Reference


SNAKE BITE

There are more than 2000 species of snakes in the world and about 216 species are found in India out of which 52 are poisonous. It is estimated that annually about
2 lakhs people are bitten, of whom around 16,000 die. The poisonous snakes found in India belong to the families Elapidae and Viperidae. The most common Indian elapids are Naja naja (Indian Cobra) and Bungraus coerules (Indian Krait), Viper russelle (Russells’ Viper) and Echis carinatus (saw scaled viper).

**SALIENT FEATURES**

Although manifestations of the envenomization are complex, signs of neurotoxic effects predominate in patients bitten by elapids, while signs of vascular damage and alterations of blood coagulation are prominent features of a viperid bite.

**Elapid envenomization (neurotoxic)**

In the case of a cobra bite, pain and numbness at the site of the bite and lassitude and drowsiness followed by a sense of clouding consciousness, growing dimness of vision, difficulty in breathing, weakening of pulse, tachycardia, drooping of eyelids and difficulty in speech. In the initial stages, there is dribbling of saliva, paralysis of the tongue and laryngeal muscles, and the patient passes into coma. At this stage, respiration ceases and convulsions appear, but the heart continues to beat for some time after respiratory paralysis. Symptoms of krait envenomization are almost similar, but pain and swelling may be absent at the site of the bite with the result that even a suspicion of snake bite may not be aroused. Later on, however, the patient may complain of severe cramp-like pains in the abdomen.

**Viperine envenomization (haemovasculotoxic)**

After a viperid bite, there is a burning pain at the site, oedema accompanied by a painful lymphangitis and regional lymphadenitis, bluish purple tinge in the affected area 12 hours or more following the bite, with petechial haemorrhages and haematoma. This haemorrhagic tendency may result in epistaxis, melena, haematemesis and haematuria. In severe cases, vomiting and incontinence of faeces and urine may be seen followed by a fall in blood pressure resulting in an acute excitatory collapse, ending in death.

**Diagnosis**

A bite from a venomous snake may show one or more punctures, a small abrasion and perhaps a linear laceration. Unless there is a semicircular row of teeth marks, the bite may not be assumed to be that of a nonvenomous snake. The pattern of fang marks is, however, of no help in ascertaining the amount of venom injected, severity of systemic poisoning and nature of poisoning—Elapidae or Viperidae venom. A local swelling appearing within a few minutes after the bite is an important sign of viper envenomization. The local sucking may also occur in the Indian cobra bite, although it usually does not appear until after 1–2 hours.

The important early diagnostic criteria of systemic viper poisoning are blood-stained sputum and nonclotting of blood. The early signs of an elapid envenomization are ptosis and glossopharyngeal palsy.
Treatment

The aim is rapid and safe transport to a place where optimal medical care is available. (Caution: Do NOT make local incisions or pricks/punctures (“tattooing”) at the site of the bite or in the bitten limb, attempts to suck the venom out of the wound, use of (black) snake stones, tying tight bands (tourniquets) around the limb, electric shock, topical instillation or application of chemicals, herbs or ice packs).

I. First aid measures

1. Ensure airway, breathing and intravenous access.
2. Reassurance.
3. Keep the patient warm, and at rest. Activity may enhance the spread of venom.
4. Immobilize the whole of the patient’s body by laying him/her down in a comfortable and safe position and, especially, immobilize the bitten limb with a splint or sling. Any movement or muscular contraction increases absorption of venom into the bloodstream and lymphatics.
5. Avoid any interference with the bite wound (incisions, rubbing, vigorous cleaning, massage, application of herbs or chemicals) as this may introduce infection, increase absorption of the venom and increase local bleeding. Wipe the bitten site and cover loosely with a piece of clean cloth. Leave the blisters undisturbed. Allow them to break spontaneously.
6. For pain, a mild, non-sedating analgesic can be administered (paracetamol).
7. A tourniquet (constricting band in the form of a strap or belt, etc.) can be applied lightly proximal to the bitten site to prevent lymphatic spread. It should be capable of admitting a finger beneath it. It is used till the patient is shifted to the hospital and approximately tied 10 cm above the bite. Once applied, the tourniquet should be loosened or removed only after antivenom administration has begun. A recent suggested modification to the tourniquet is a broad, firm constrictive bandage (elastic bandage) wrapped over the bitten area, including the entire limb with the limb placed in a splint. Tight (arterial) tourniquets are not recommended.

II. Identification of snake

Try to identify snake for features of poisonous nature, if snake is available for examination, however, do not waste time in identification or attempt to kill it as this may be dangerous.

III. Investigations

Simple bedside examination: Measure limb circumference 10 cm proximally to the bite and repeat every 2-4 hourly, single breath count – 1001,1002….., breath holding time and chest expansion measurement and look for dropping of upper eyelids. Keep on monitoring the patient and repeat all above, every 1-2 hourly.

Bedside tests: BT, CT & 20 minute Whole Blood Clotting Test (20WBCT)
20 minute whole blood clotting test (20 WBCT):

Place a 2 ml of freshly sampled venous blood in a small glass vessel and leave undisturbed for 20 minutes at ambient temperature. Gently tilt the test tube to see if the blood is still liquid, the patient has hypofibrinogenaemia (“incoagulable blood”) as a result of venom-induced consumption coagulopathy.

(Caution: If the vessel used for the test is not made of ordinary glass, or if it has been used before and cleaned with detergent, its wall may not stimulate clotting of the blood sample in the usual way and test will be invalid).

If there is any doubt, repeat the test in duplicate, including a “control” (blood from a healthy person). If negative the test should be carried out every 30 minutes from admission for three hours and then hourly after that to ascertain if antivenom is indicated.

IV. Hospital measures

Check arterial pulse and level of consciousness immediately. However, the Glasgow Coma Scale cannot be used to assess the level of consciousness of patients paralyzed by neurotoxic venoms.

Early clues that a patient has severe envenoming:

Snake identified as a very dangerous one.
Rapid early extension of local swelling from the site of the bite.
Early tender enlargement of local lymph nodes, indicating spread of venom in the lymphatic system.
Early systemic symptoms: collapse (hypotension, shock), nausea, vomiting, diarrhoea, severe headache, “heaviness” of the eyelids, inappropriate (pathological) drowsiness or early ptosis/ophthalmoplegia.
Early spontaneous systemic bleeding.
Passage of dark brown/black urine.

Observe every case of alleged snake bite for at least 24 hours before discharging.

1. Check for and monitor the following:
   a. Pulse rate, respiratory rate, blood pressure and WBC count every hour.
   b. Blood urea, creatinine, WBC count.
   c. Urine output, urine for RBCs (in case of Viper bite).
   d. Vomiting, diarrhoea, abnormal bleeds.
   e. Extent of local swelling and necrosis. ECG, arterial blood gas analysis, BT, CT, PTT (to be repeated 6 hourly, if abnormal).

2. Antivenom therapy. Do not administer antivenom as a routine measure in every case of snake bite. It is associated with serious risks of anaphylaxis. It should be given only when features of systemic envenomation are present and in case of local swelling involving more than half of the bitten limb (in the absence of a tourniquet) within 48 hours of the bite, swelling after bites on the digits (toes and especially fingers), rapid extension of swelling (beyond the wrist or ankle within a few hours of bite on the hands or feet), development of an enlarged tender lymph node draining the bitten limb.
However, in pregnant woman bitten by a poisonous snake, give antivenom therapy, if there is a slowing of the fetal movements even if the woman herself is asymptomatic.

It is most effective in the first few hours after the bite, may reverse systemic envenoming even when this has persisted for several days or, in the case of haemostatic abnormalities, for two or more weeks. The lyophilized powder is dissolved in distilled water or normal saline to make a clear solution before use.

**Note:** Polyvalent antivenom is the one available and used in India. **(Caution:** Do not use, if reconstituted solution is opaque to any extent).

**Dosage regimen**

Dose of antivenom varies from case to case. A rough guideline is as follows:

a. For bites with local swelling but no systemic features: 20-50 ml.

b. If the swelling has progressed beyond the bitten site and there are mild systemic features or bleeding diathesis: 50 to 100 ml.

c. If there are marked local and systemic features with haemolysis, clotting abnormalities, etc.: 100-150 ml.

d. Children also be given exactly the same dose of antivenom as adults.

Inj. Hydrocortisone 200 mg and pheniramine maleate 22.75 mg should be given prior to the administration of antivenom in high-risk cases (hypersensitivity to animal serum such as equine antivenom, tetanus-immune globulin or rabies-immune globulin in past, severe atopic conditions and should be given antivenom only if they have signs of systemic envenoming).

**Procedure of antivenom therapy**

Reconstituted freeze-dried antivenom or neat liquid antivenom is given by slow intravenous injection (not more than 2 ml/minute).

Or

Reconstituted freeze-dried or neat liquid antivenom is diluted in approximately 5-10 ml of isotonic fluid per kg body weight (i.e. 250-500 ml of isotonic saline or 5% dextrose in the case of an adult patient) and is infused at a constant rate over a period of about one hour. All patients should be watched carefully for two hours after the completion of antivenom administration.

Persistence or recurrence of blood incoagulability after 6 hours or of bleeding after 1-2 hours or deteriorating neurotoxic or cardiovascular signs after 1-2 hours repeat the initial dose. Repeat every 6 hours until coagulation is restored. If large doses have been administered and the coagulation abnormality persists, give fresh frozen plasma (FFP) or factors.

**Caution:** Antivenom must NEVER be given by the IM route, if it could be given intravenously. Antivenom should never be injected into the gluteal region (upper outer quadrant of the buttock) as absorption is exceptionally slow and unreliable and there is always the danger of sciatic nerve damage, when the injection is given by an inexperienced operator. Do not inject the antivenom locally at the bite site since it is not effective.)
At the earliest sign of a reaction: Antivenom administration must be temporarily suspended; keep Epinephrine (adrenaline) (0.1% solution, 1 in 1,000, 1 mg/ml) ready. Skin/conjunctival hypersensitivity testing does not reliably predict early or late antivenom reactions and is not recommended.

In patients envenomed by vipers, after an initial response to antivenom (cessation of bleeding, restoration of blood coagulability) signs of systemic envenoming may recur within 24-48 hours.

**Conservative treatment, when antivenom is NOT available or run out or where the bite is known to have been inflicted by a species against whose venom there is no available specific antivenom.**

**Neurotoxic envenoming** with respiratory paralysis: Assisted ventilation with room air or oxygen has been followed by complete recovery, even after being maintained for periods of more than one month. Manual ventilation (anaesthetic bag) by relays of doctors, medical students, relatives and nurses has been effective where no mechanical ventilator was available. Administer anticholinesterases, Inj. Neostigmine 0.56 mg half hourly, if there are signs of neuroparalysis. Give Inj. Atropine 0.6 mg IV before every injection of neostigmine to block its muscarinic side effects. Oxygen, assisted ventilation, etc. if there is respiratory failure.

**Haemostatic abnormalities:** Strict bed rest to avoid even minor trauma; transfusion of clotting factors and platelets; ideally, fresh frozen plasma (FFP) and cryoprecipitate with platelet concentrates or, if these are not available, fresh whole blood. Avoid intramuscular injections.

**Shock, myocardial damage:** Correct hypovolaemia with colloid/crystalloids, controlled by observation of the central venous pressure. Ancillary pressor drugs (dopamine or epinephrine-adrenaline) may also be needed (for details see section on Shock). Treat patients with hypotension associated with bradycardia with atropine.

**Acute kidney injury:** Conservative treatment or dialysis.

**Dark brown urine (myoglobinuria or haemoglobinuria):** Correct hypovolaemia with intravenous fluid, correct acidosis with a slow intravenous infusion of 50-100 mmol of sodium bicarbonate and, by analogy with crush syndrome, consider a single infusion of 20% mannitol 200 ml intravenously over 20 minutes. Must not be repeated as there is a danger of inducing dangerous fluid and electrolyte imbalance.

**Severe local envenoming:** Local necrosis, intracompartmental syndromes and even thrombosis of major vessels is more likely in patients who cannot be treated with antivenom. Surgical intervention may be needed but the risks of surgery in a patient with consumption coagulopathy, thrombocytopenia and enhanced fibrinolysis must be balanced against the life-threatening complications of local envenoming. Give prophylactic broad-spectrum antimicrobial treatment

**Other measures**

1. Clean the bitten site with povidone-iodine solution, but do not apply any dressings.
2. Leave blisters alone. They will break spontaneously and heal. If there is local necrosis, excise and apply saline dressings. Surgical decompression may be necessary in some cases.
3. Tetanus toxoid injection must always be given.
4. Prophylactic antibiotic.
5. Aspirin or other mild analgesic for pain.
6. Diazepam 5-10 mg for sedation in some cases.
7. Rehydration and nutrition.

Observation of the response to adequate dose of antivenom

The patient feels better. Nausea, headache and generalised aches and pains may disappear very quickly. This may be partly attributable to a placebo effect. Spontaneous systemic bleeding (e.g. from the gums) usually stops within 15-30 minutes.

Blood coagulability [as measured by 20 minute whole blood clotting test (20WBCT)] usually restored in 3-9 hours. Bleeding from new and partly healed wounds usually stops much sooner than this.

In shocked patients: Blood pressure may increase within the first 30-60 minutes and arrhythmias such as sinus bradycardia may resolve.

Neurotoxic envenoming of the post-synaptic type (cobra bites) may begin to improve as early as 30 minutes after antivenom, but usually takes several hours. Envenoming with presynaptic toxins (kraits and sea snakes) will not respond in this way.

Active haemolysis and rhabdomyolysis may cease within a few hours and the urine returns to its normal colour.

Management of venom ophthalmia

1. Urgent decontamination by copious irrigation
2. Instil topical 0.5% adrenaline in the eye
3. Topical administration of local anaesthetics—tetracaine)
4. Exclude corneal abrasions by fluorescein staining with a slit-lamp examination and application of prophylactic topical antibiotics
5. Prevent posterior synechiae, ciliary spasm and discomfort with topical cycloplegics
6. Antihistamines in case of allergic keratoconjunctivitis.

Topical or intravenous antivenom and topical corticosteroids are contraindicated.

References


ANIMAL BITES

Bites of squirrels, hamsters, guinea-pigs, gerbils, chipmunks, rats, mice, other rodents, rabbits and hares almost never require anti-rabies treatment.

DOG BITES (RABIES)

Rabies can be transmitted by dog bites or licks of rabid animals on abraded skin and intact mucosa. Other animals which can transmit rabies are cat, monkey, horse, sheep, goat, mongoose, jackal, fox, hyena and bat. Exposure to rodents, rabbits and hares seldom, if requires specific anti-rabies treatment.

SALIENT FEATURES

Prodromal symptoms—such as headache, malaise, sore throat and fever last about 3-4 days. Pain and tingling at the bitten site.

Stage of excitation—patient is intolerant to noise, bright light or a cold draught. Aerophobia may be present. Hydrophobia is a characteristic symptom of rabies. Examination shows increased reflexes, dilatation of pupils, increased sweating, lacrimation and salivation. Mental changes include fear of death, anger, irritability and depression. Convulsions may occur resulting in death.

The last stage is that of paralysis and coma. The total duration of illness lasts for 2-3 days.

A. Treatment (post-exposure prophylaxis)

The WHO recommended classification (Table 2.12) of animal bite for post-exposure treatment should be followed. Every instance of human exposure to a suspected rabid or wild animal must be treated as a category III. The post-exposure treatment is a three-pronged approach. All three carry equal importance and should be done simultaneously:

1. Management of wound: Immediate washing of the wound is a priority. Wound toilet must be done even if several hours or days have elapsed. The wound is immediately flushed and washed with plenty of soap and water (avoid direct touching of wounds with bare hands). Punctured wounds should be irrigated with the help of catheters followed by, 70% alcohol or povidone iodine application.

   The application of irritants (like chillies, oil, turmeric, lime, salt, etc.) is unnecessary and damaging.

   Do not suture bite wounds immediately. If suturing is required, hold it for 24-48 hours, applying minimum number of stitches under the cover of antirabies immunoglobulin locally.
2. **Passive immunization** with **rabies immunoglobulin** (RIG): Local infiltration of RIG in category III rabies—RIG should be infiltrated in the depth and around the wound even if the lesion has begun to heal followed by administration of antirabies vaccine.  
*(Caution: RIG should never be administered in the same syringe or at the same anatomical site as vaccine).*

3. **Active immunization** with **antirabies vaccine**: Human Diploid Cell vaccine (HDCV)/Purified Chick Embryo Cell Vaccine (PCEC)/Purified Vero Cell Rabies Vaccine (PVRV).

   Antitetanus treatment can be given after local wound treatment.

**Table 2.12. WHO guide to post-exposure treatment against rabies**

<table>
<thead>
<tr>
<th>Category</th>
<th>Type of contact with a suspect or confirmed rabid domestic or wild animal, or animal unavailable for observation</th>
<th>Type of exposure</th>
<th>Recommended treatment</th>
</tr>
</thead>
</table>
| I        | Touching or feeding of animals  
Licks of intact skin | None            | None, if reliable case history is available |
| II       | Nibbling of uncovered skin  
Minor scratches or abrasions without bleeding | Minor           | Wound management: Administer vaccine immediately. Stop treatment, if animal (dog or cat only) remains healthy throughout an observation period of 10 days or if animal is killed humanely and found to be negative for rabies by appropriate laboratory techniques |
| III      | Licks on broken skin  
Single or multiple transdermal bites or scratches  
Contamination of mucous membrane with saliva (i.e. licks)  
Bite with bleeding | Severe          | Wound management: Administer rabies immunoglobulin and vaccine immediately |

(a) Exposure to rodents, rabbits and hares seldom, if ever, requires specific antirabies treatment.

(b) If an apparently healthy dog or cat in or from a low-risk area is placed under observation, the situation may warrant delaying initiation of treatment.

(c) This observation period applies only to dogs and cats. Except in the case of threatened or endangered species, other domestic and wild animals suspected as rabid should be killed humanely and their tissues examined using appropriate laboratory techniques.

**Doses of rabies immunoglobulin (IG)**

Human rabies immunoglobulin (HRIG) 20 IU/kg (max 1500 IU), available in concentration of 150 IU/ml, it does not require any prior sensitivity testing. SHOULD
NEVER BE INJECTED INTRAVENOUSLY. The antirabies sera should always be brought to room temperature (20-25°C) before use.

Or

Equine antirabies serum (ERIG) 40 IU/kg (max 3000 IU), available in concentration of 300 IU/ml, given after prior skin sensitivity testing, single dose on day 0. Half the dose is infiltrated around the bitten wound and the rest is given IM.

(Caution: A negative skin test must never reassure the physician that no anaphylactic reaction will occur. Avoid alcohol, glucocorticoids and chloroquine during vaccination; avoid multiple needle injections into the wound.

Must not exceed the total recommended dose of IG as it may reduce the efficacy of the vaccine).

If the calculated dose of IG is insufficient to cover infiltration in all wounds, sterile saline can be used to dilute 2 or 3 fold to permit thorough infiltration. RIG is not indicated beyond the seventh day after administration of the first dose of vaccine.

**Antirabies vaccine (ARV)**

**Intramuscular schedule.** The course for post-exposure prophylaxis consists of five injections (days 0, 3, 7, 14 and 28) irrespective of severity of exposure. The 6th injection (day 90) is optional for immunologically deficient and extremes of age and on steroid therapy. The dose of vaccine per injection is 2.5 IU/dose/ml for HDCV and PCEC vaccines and 0.5 ml for PVRV irrespective of age and weight of vaccine. Preferable site is deltoid; anterolateral thigh in children (Caution: Must NOT be given into gluteus muscle).

**Intradermal (ID) schedule.** The same vaccine is used approved by DCGI for ID administration as per following schedule:

(i) The 2 site ID TRC schedule (2-2-2-0-1-1) to be administered: One ID injection of 0.1 ml per ID site over each right and left deltoid on days 0, 3, 7 and 0.1 ml at a single site on days 28 and 90 or as per updated TRC schedule (2-2-2-0-2) on days 0, 3, 7 and 28.

**Note:** Correct ID injection should result in a raised papule with an orange peel appearance. If a papule is not observed, the needle should be withdrawn and vaccine re-administered correctly nearby.

(ii) The 8-site ID method (8-0-4-0-1-1) for use with HDC/PCECV in emergency, when no RIG is available.

The intradermal route is preferred as it reduces cost but must not be used in case of immunocompromised patients, individuals receiving long-term corticosteroids or other immunosuppressive therapy or chloroquine.

Antirabies vaccine should be kept and transported at a temperature range of +2°C to 8°C. The reconstituted vaccine should be used immediately or within 6-8 hours of reconstitution.
B. Post-exposure treatment of persons previously vaccinated

Managing re-exposure following post-exposure treatment with nervous tissue vaccine (NTV)

Persons who have received full post-exposure treatment with NTV should be considered as a fresh case and may be given treatment as per merits of the case. If within 6 months, a patient of category I has been exposed to a category II or category III wound, a full course of that type of exposure is indicated. However, if the patient has been treated earlier for a category II or category III exposure and the next exposure is also of same class, only two boosters of ARV 0.5 ml/1 ml intramuscularly or 0.1 ml at 1 site intradermally on day 0 and 3.

Managing re-exposure following post-exposure treatment with tissue culture vaccine (TCV)

If re-exposed, persons who have previously received full post-exposure treatment with a potent cell-culture vaccine should be given only two booster doses, intramuscularly (0.5 ml/1 ml)/intradermally (0.1 ml at 1 site) on days 0 and 3, but no rabies immunoglobulin. Proper wound toilet should be done.

C. Pre-exposure prophylaxis

Indications: Laboratory staff working with rabies virus, veterinarians, animal handlers and wildlife officers. Three full IM or ID doses of tissue culture vaccine given on days 0, 7, and 28.

Laboratory staff and others at high continuing risk of exposure should have their neutralizing antibody titer checked every 6 months. If it is less than 0.5 IU/ml, a booster dose of vaccine should be given. Such individuals on getting exposed to rabies virus after successful pre-exposure immunization require only two booster injections of vaccine given on days 0 and 3 without any antirabies serum/RIGs.

Patient education

Dog bite (category II and III) is an emergency and as a general rule rabies post-exposure treatment should not be delayed or deferred.

Immediate washing/flushing with plenty of water and disinfecting with alcohol/iodine.

References


INSECT AND ARACHNID BITES AND STINGS CAUSING SKIN DISEASES

Mosquitoes and other biting flies

Most insect bites and stings cause small reactions that are confined to the area of the bite (localised reactions). They can usually be treated at home.

Besides being vectors of several most important parasitic diseases, including malaria, leishmaniasis, onchocerciasis and filariasis, mosquitoes and other biting flies can induce florid local lesions in susceptible persons.

Treatment (for papular urticaria)

1. Tab. Cetirizine 10 mg once daily to relieve pruritus.
2. Topical antimicrobial preparation to prevent secondary bacterial infection (see section on pyogenic skin infections).

Bees, wasps, hornets and ants

Bees, wasps, hornets and ants are species of Hymenoptera. Remove the sting and the venomous sac, if it has been left in the skin immediately by scraping it out, either with fingernails or using something with a hard edge, such as a bank card.

(Caution: Do not puncture the venomous sac or pinch the sting out with your fingers or a pair of tweezers).

Wasps and hornets do not usually leave the sting behind, so could sting again so leave the room calmly.

Treatment

Most insect bites and stings cause itching and swelling that usually clears up within several hours.

For minor bites and stings:
1. Wash the affected area with soap and water.
2. Place a cold compress (a flannel or cloth cooled with cold water) over the affected area to reduce swelling.
3. Do not burst the blister or scratch the area because it can become infected.

If the bite or sting is painful or swollen:
1. Topical administration of ice pack or calamine lotion for symptomatic relief.
2. Systemic antihistamines and analgesics can be given to relieve pruritus or pain.
3. Systemic corticosteroids may be appropriate, if there are severe side effects.
Any person who collapses, or who complains of wheezing, feeling of anxiety or faintness, generalized itching, or tightness in the chest within approximately 1 hour of being stung by an insect should be treated as having anaphylactic shock (see section on Anaphylactic Shock).

Inj. Adrenaline 1 mg (as hydrogen tartrate) 0.5-1.0 ml IM injection of Adrenaline (1:1000 solution) repeated every 15-20 min, if required.

All patients should be observed at least for 24 hours for recurrent anaphylaxis. (For details see section on Anaphylaxis).

Scorpions

Treatment

1. Simple analgesics, such as paracetamol and aspirin, can be given to relieve pain. However, because of the potential for severe reactions, every effort should be made to get the patient to a hospital as soon as possible.
2. Vasodilators, administered in a hospital setting within 24 hours of the attack, may attenuate the cardiovascular response and possibly reduce mortality.
3. In endemic area, species-specific antiscorpions sera may be available locally and this can be of value, if administered within few hours.

Poisonous spiders

Poisonous spiders are endemic in the tropics and the southern hemisphere where they typically inhabit woodpiles, outhouses and dark corners of garages and houses.

Treatment

1. Specific antivenoms.
2. Analgesics.
3. Muscle relaxants should be given to relieve pain and muscular spasms.
4. Oral corticosteroids, if administered within 24 hours of the attack, may reduce the risk of local necrosis and the incidence of disfiguring scars.

Reference

Chapter 3  Cardiovascular Diseases

Infective Endocarditis

Bacterial endocarditis is a life-threatening infectious disease. Infection of the endothelial surface of the heart with its attendant complications. Acute bacterial endocarditis (ABE) is usually caused by \textit{S. aureus}, \textit{Group A haemolytic Streptococci}, \textit{Pneumococci} or \textit{Gonococci}. Subacute bacterial endocarditis (SABE) is usually caused by \textit{S. viridans} or other \textit{streptococci}, rarely by other organisms. Prosthetic valvular endocarditis (PVE) develops in 2-3% of patients within 1 year, more in aortic valve than mitral and least with porcine valves. Early onset infections (<2 months) are caused by resistant \textit{S. epidermidis}, \textit{coliforms}, candida, etc. while late infections are caused by low virulence organisms. ABE may affect normal valves, especially in intravenous drug addicts while SABE complicates deformed/damaged valves or congenital heart disease (CHD).

Salient Features

Clinical manifestations of bacterial endocarditis are highly variable and frequently non-specific. The diagnosis of bacterial endocarditis is based on clinical, laboratory and echocardiographic criteria. Classification and definitions of infective endocarditis are given in Table 3.1.

Fever, toxaemia, clubbing, splenomegaly, anaemia, microscopic haematuria, a new onset or changing murmur, evidence of immune phenomena and metastatic infection.

Complications such as congestive heart failure (CHF), mycotic aneurysm, embolic cardiovascular accident (CVA) or other phenomena may be the presenting features.

Definitive diagnosis requires positive blood cultures aided by positive echocardiogram (transoesophageal positive in >90%).

Treatment (infective endocarditis should be treated as a medical emergency)

Treatment should be started on clinical suspicion. Subsequent changes in the antibiotic regimen should be based on the results of cultures and sensitivity testing. The choice of antibiotic therapy for bacterial endocarditis is determined by the identity and antibiotic susceptibility of the infecting organism, the type of cardiac valve.
Table 3.1. Classification and definitions of infective endocarditis (IE)

**IE according to localization of infection and presence or absence of intracardiac material**

- Left sided native valve IE
- Left sided prosthetic valve IE (PVE)
  - Early PVE: <1 year after valve surgery; late PVE: >1 year after valve surgery
  - Right-sided IE Device-related i.e., (permanent pacemaker or cardioverter-defibrillator)

**IE according to the mode of acquisition:**

- **Health care-associated IE:**
  - Nosocomial IE: Developing in a patient hospitalized >48 hours prior to the onset of signs/symptoms consistent with IE
  - Non-nosocomial IE: Signs and/or symptoms of IE starting <48 hours after admission in a patient with health care contact defined as:
    1. Home-based nursing or intravenous therapy, haemodialysis, or intravenous chemotherapy <30 days before the onset of IE; or
    2. Hospitalized in an acute care facility < 90 days before the onset of IE
    3. Resident in a nursing home or long-term care facility

- **Community-acquired IE:** Signs and/or symptoms of IE starting <48 hours after admission in a patient not fulfilling the criteria for health care associated infection

- **Intravenous drug abuse associated IE:** IE in an active injection drug user without alternative source of infection.

**Active IE**

- IE with persistent fever and positive blood cultures or
- Active inflammatory morphology found at surgery or
- Patient still under antibiotic therapy or
- Histopathological evidence of active IE

**Recurrence**

- Relapse: Repeat episodes of IE caused by same microorganism < 6 months after the initial episode
- Reinfection: Infection with different microorganism or repeat episodes of IE caused by the same microorganism > 6 months after the initial episode

**Presumptive initial treatment** for SABE should cover *S. viridans*, microaerophilic and anaerobic streptococci.

Inj. Crystalline Penicillin-G 12-18 MU/24 h after test dose in 6 divided doses + Inj. Gentamicin 3 mg/kg/day IV (or IM) 8 hourly for 2 weeks.

**Enterococci.**

Inj. Crystalline Penicillin-G 18-30 MU/day after test dose (in 6 divided doses) + Gentamicin 1 mg/kg 8 hourly IV for 4-6 weeks.

Or

Inj. Ampicillin 12 g/day, given 4 hourly may be substituted for crystalline penicillin-G

**In acute bacterial endocarditis**, cover for *staphylococci*: Inj.

Nafillin 2 g IV 4 hourly for 4-6 weeks.

**In penicillin sensitive individuals**

Inj. Cefazolin IV 8 hourly for 4-6 weeks.
Or
Inj. Vancomycin 15 mg/kg IV 12 hourly for 4-6 weeks.

*Methicillin resistant Staphylococcus aureus (MRSA) in native valve*

Inj. Vancomycin as above for 6-8 weeks + Inj. Gentamicin 1 mg/kg IV 8 hourly for 2 weeks + Cap. Rifampicin 300 mg orally 8 hourly for 6-8 weeks.

(For treatment of congestive heart failure see section on Congestive Heart Failure).

**Follow-up**

Patients with bacterial endocarditis should be monitored carefully. Clinical response occurs in 3-7 days. Change the antibiotics as per culture/sensitivity report, if required. Blood cultures should be obtained to ensure eradication of the organism. Gentamicin blood levels should be monitored with dosage adjustments as indicated and renal function should be assessed frequently when an aminoglycoside is administered. If a prolonged course of gentamicin is planned, a hearing assessment should be performed. Fever usually resolves within several days of initiation of effective antibiotic treatment, although fever may persist longer with *S. aureus* infection. Persistent fever after the first week of treatment suggests a septic embolic complication or inadequate antibiotic therapy. The recurrence of fever after an initial defervescence suggests a septic or nonseptic embolic event, a drug hypersensitivity reaction or the emergence of a resistant strain.

**Cardiac surgery** is required if:

1. No response to medical treatment (especially in prosthetic valve endocarditis).
2. Worsening heart failure and the lesion is correctable.
3. Acute onset cardiac complication due to infection, e.g. septal perforation/valvular damage/stroke perivalvular extension of infection.
4. Large (> 1 cm diameter) hypermobile vegetation with increased risk of embolism.

**Antibiotic prophylaxis in high-risk patients**

Antibiotic prophylaxis should only be considered in patients at higher risk of IE:

*Prosthetic valve or a prosthetic material used for cardiac valve repair, patients with previous IE*

**High-risk patients**

Patients with congenital heart disease

Dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa; prophylaxis is not recommended for local anaesthetic injections in non-infected tissue, removal of sutures, dental X-ray, placement or adjustment of removal prosthetics or orthodontic appliances or braces. Prophylaxis is also not recommended following the shedding of deciduous or trauma to the lips and oral mucosa.

Assess individual risk and develop an appropriate management plan with following:
Cap. Amoxycillin 3 g orally 1 hour preoperatively or Cap. Clindamycin 600 mg 1 hour preoperatively (for details see section on Antibiotic Prophylaxis in Chapter 18). Higher risk patients with prosthetic valves, genitourinary procedures Inj. Amoxycillin 2 g IV + Inj. Gentamicin 120 mg IV before procedure followed by Cap. Amoxycillin 1 g orally 6 hours postoperatively.

Substitute Vancomycin 1 g IV infusion over 100 min in case patient is allergic to penicillin.

Patient education

Good oral hygiene, including daily flossing, is an important preventive measure. If you have a history of structural heart disease or believe that you are at risk for the development of endocarditis. Discuss this potential risk with dentist or other health care providers that may be performing invasive procedures (dental extraction, upper respiratory tract) to take prophylactic treatment.

References


ACUTE PERICARDITIS

Inflammation of pericardium, which may be acute or chronic and may result in pericardial effusion. It may be caused by viruses, bacteria, mycobacteria, connective tissue disorders, uraemia, myocardial infarction (MI), malignancies, radiation and trauma.

SALIENT FEATURES

Chest pain, dyspnoea, presence of friction rub, tamponade and serial ECG changes.

Treatment

Nonpharmacological

Bed rest.

Pharmacological

1. Tab. Aspirin 650 mg orally every 3 to 4 hours. Or Tab. Ibuprofen 400 mg orally every 6-8 hours for 1 week.
2. In the absence of relief within 48 hours (non-infective cases only) Tab. Prednisolone 20-60 mg per day for 3-4 days.
3. Antibiotics should be used only in case of documented purulent pericarditis empirically
to cover *pneumococci*, *meningococci*, *staphylococci*, *H. influenzae*
(Ampicillin + Gentamicin may be used).
4. Anticoagulants are not to be used except in case of prosthetic valves when
Heparin may be used.
5. Treatment of primary disease causing pericarditis.

Complications of the pericarditis are pericardial effusion, constrictive pericarditis
and recurrent pericarditis.

**Pericardial effusion**

Pericardial effusion occurs when pericarditis leads to accumulation of fluid in
pericardial cavity. Echocardiography is diagnostic.

*Treatment*

- As above for pericarditis.
- Diagnostic tap for effusion.
- Pericardiocentesis in case of a large effusions or tamponade.
- Pericardiostomy with drainage for large effusions with rapid refilling.

**Constrictive pericarditis**

It is the restriction induced by a thickened fibrous pericardium as sequelae of
pericarditis. Tuberculosis is the commonest cause. Treatment is surgical excision.
Pericardiectomy for recurrent pericarditis or constrictive pericarditis.

*Treatment*

1. Antitubercular therapy (for details see section on Tuberculosis in Chapter 1).
2. Tab. Prednisolone 1 mg/kg for 2 weeks and then taper off in next 4 weeks.

**Recurrent pericarditis**

It may require intravenous methyl prednisolone pulses, colchicine 1 mg daily or
pericardiectomy.

**Monitoring**

Monitor symptomatic relief so as to stop NSAIDs or taper steroids.

- Watch for complications (clinical course, echocardiography, chest
  roentgenograms) and refer to a higher centre for appropriate management.
- Ensure treatment of the underlying cause.

**Patient education**

Reassurance that viral pericarditis is self-limiting and monitoring for
complications is sufficient.
Patients with tubercular or purulent aetiology must be educated to ensure adequate therapy and compliance. Myxoedema must be adequately treated and emphasize the need for follow-up and compliance. Uraemia, malignancy, etc. require referral for specialized care and management. Rheumatic fever patients must receive prophylaxis and follow-up at a higher centre for management of valvular involvement. Drug induced pericarditis must be prevented by educating the patient against future use. Emphasize the need for post-myocardial infarction prophylaxis, follow-up with echocardiography and other measures including lifestyle modification, drugs, revascularization, etc.

Reference

CARDIOMYOPATHY

Any structural or functional abnormality of the ventricular myocardium, excluding congenital/valvular structural defects, vascular (systemic/pulmonary), pericardial, nodal or conductive system diseases.

Dilated congestive cardiomyopathy

Commonest type of cardiomyopathy usually caused by ischaemia and characterized by ventricular dilatation and systolic dysfunction. The other important causes include alcohol, endocrinopathies (diabetes, thyrotoxicosis), myocarditis or idiopathic.

**SALIENT FEATURES**

Features of biventricular failure resulting in oedema and dyspnoea. Diagnosis is clinical supported by ECG, chest X-ray and echocardiography. Carries a poor prognosis with 5-year survival of <70%.

**Treatment**

Symptomatic, management as in congestive heart failure (see respective section). Treat any underlying treatable cause.

Reference
HYPERTENSION

Usually asymptomatic and discovered on routine measurement of blood pressure. Secondary hypertension (HT) presents as a part of a symptom complex as in acromegaly, Cushing’s disease, renovascular or renal parenchymal disease, connective tissue disorders (SLE, scleroderma, etc.), or coarctation of aorta.

SALIENT FEATURES

Nonspecific symptoms are fatigue, headache, epistaxis.

Uncontrolled hypertension can lead to target organ damage (TOD) such as coronary artery disease (CAD), left ventricular hypertrophy (LVH), cerebrovascular accidents (CVA), transient ischaemic attacks (TIA), retinopathy, peripheral vascular diseases including dissecting aneurysm, renal disease.

Associated risk factors are — age >55 years in males and >65 years in females, smoking, diabetes mellitus, microalbuminuria or GFR <60 ml/min, hyperlipidaemia, family history, obesity, sedentary lifestyle and ethnic group.

Routine laboratory tests recommended before initiating therapy include an electrocardiogram; urinalysis; blood glucose and haematocrit; serum potassium, creatinine (or the corresponding estimated GFR) and calcium; and a lipid profile (after a 9-12-hour fast) that includes high-density lipoprotein, cholesterol, low-density lipoprotein cholesterol, and triglycerides. Optional tests include measurement of urinary albumin excretion or albumin/creatinine ratio. More extensive testing for identifiable causes is not indicated generally unless BP control is not achieved.

Precautions to be taken while measuring BP

The auscultatory method of BP measurement with a properly calibrated and validated instrument should be used. BP should be measured using an appropriate size cuff in both upper limbs and at least one lower limb in both supine and erect posture. Patient should have been resting for at least 5 minutes and should not have consumed coffee, smoked during the last 30 minutes before measuring the blood pressure. At least 2 measurements should be made. Systolic BP is the point at which the first of 2 or more sounds are heard (phase 1) and diastolic BP is the point before the disappearance of sounds (phase 5).

Treatment

Nonpharmacological

Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).

Adopt DASH eating plan-diet rich in fruits, vegetables, with low fat dairy products with a reduced content of saturated and total fat.
Lifestyle modification — exercise consisting of vigorous aerobic exercise like brisk walking, swimming or jogging at least 20 to 30 minutes on most days of the week with the heart rate reaching 65-70% of maximal heart rate.

Weight control using a combination of dietary and exercise measures to maintain normal body weight (body mass index 18.5-24.9 kg/m²).

Moderation of alcohol consumption — limit alcohol to no more than 2 drinks (1 oz or 30 ml ethanol; e.g. 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men and to no more than 1 drink per day in women and lighter weight persons.

Cessation of smoking.

Yoga.

Control of other risk factors.

**Pharmacological**

Table 3.2. Classification and management of blood pressure for adults aged 18 years or older

<table>
<thead>
<tr>
<th>BP Classification</th>
<th>Systolic BP mmHg*</th>
<th>Diastolic BP mmHg*</th>
<th>Lifestyle modification</th>
<th>Management*</th>
<th>Initial drug therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120 and &lt;80</td>
<td>Encourage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139 Or 80-89</td>
<td>Yes</td>
<td>No antihypertensive</td>
<td>Drug(s) for the compelling indication**</td>
<td></td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159 Or 90-99</td>
<td>Yes</td>
<td>Thiazide type diuretic for most; may consider ACEI, ARB, beta blocker, CCB or combination</td>
<td>Drug(s) for the compelling indication Other antihypertensive drugs as needed</td>
<td></td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥ 160 Or ≥ 100</td>
<td>Yes</td>
<td>2-drug combination for most (usually thiazide type diuretic and ACEI or ARB or beta blocker or CCB)♣</td>
<td>Drug(s) for the compelling indication Other antihypertensive drugs as needed</td>
<td></td>
</tr>
</tbody>
</table>

ACEI: Angiotensin converting enzyme inhibitor; ARB: Angiotensin receptor blocker; CCB: Calcium channel blocker

* Treatment determined by highest BP category

** Compelling indications — heart failure, post-myocardial infarction, high coronary disease risk, diabetes, chronic kidney disease, recurrent stroke prevention (for details see respective section).

♣ Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.

**Antihypertensive drug choices: Additional considerations**

(a) Diuretics—elderly, obese, congestive heart failure (CHF).

(b) Beta-blockers—young, coronary artery disease (CAD), vascular headache, associated atrial fibrillation (AF).
Calcium channel blockers (CCB)—old age, CAD, atrial fibrillation (AF), paroxysmal supraventricular tachycardia (PSVT).

Angiotensin converting enzyme inhibitors (ACEI)—young, left ventricular failure (LVF), diabetes.

Angiotensin II receptor antagonists (ARB)—same as ACEI.

Alpha-blockers—prostatism, diabetes, dyslipidaemia.

Combined alpha and beta blockers—pregnancy.

Old drugs—alpha-methyl dopa (pregnancy), clonidine-refractory cases.

Thiazide diuretics should be used with caution in patients with gout or history of hyponatraemia.

Beta blockers should be avoided in patients with bronchial asthma, reactive airways disease, or second- or third-degree heart block.

ACEI should not be used in patients with a history of angioedema.

Aldosterone antagonists and potassium sparing diuretics can cause hyperkalaemia and should generally be avoided in patients who have serum potassium values of more than 5.0 mEq/L while not taking medications.

**Drug combination used for**

Additive effect—use drugs acting by different mechanisms.

Minimization of the side effects:

– Block opposing effects on homeostatic mechanism.
– Block predictive side effects.
– Permits use of lower dose (less side effects).

**Fully additive drug combinations**

Diuretic + beta-blocker.

Diuretic + ACEI.

CCB + beta-blocker.

CCB + ACEI.

**Questionable drug combinations**

(a) Nonadditive

– beta-blocker + ACEI

– ARB + ACEI.

(b) Side effects additive

– beta blocker + Verapamil/Diltiazem (older CCB).

– alpha blocker + CCB.

**Drug combinations for patients with associated conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Drug Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT with angina</td>
<td>Beta blocker + CCB</td>
</tr>
<tr>
<td>HT with heart failure</td>
<td>Diuretic + ACEI</td>
</tr>
<tr>
<td>HT with diabetes mellitus</td>
<td>ACEI + CCB</td>
</tr>
<tr>
<td>HT with COAD</td>
<td>Diuretic + CCB</td>
</tr>
</tbody>
</table>
**Isolated systolic hypertension (systolic BP ≥ 160 mmHg)**

Drugs of choice in order of preference are:
- Diuretics.
- Beta blocker.
- Diuretic + beta blocker.
- Diuretic + CCB.
- ACEI + CCB.

**Hypertension in pregnancy**

Alpha-methyldopa, beta blockers and vasodilators are preferred medications for safety of the foetus. **ACEI and Angiotensin II receptor blockers are contraindicated** (for details see section on Eclampsia in Chapter 15).

**Hypertension in children and adolescents**

In children and adolescents, hypertension is defined as BP that is, on repeated measurement, at the 95th percentile or greater adjusted for age, height, and gender. The fifth Korotkoff sound is used to define diastolic BP. Be alert for possibility of identifiable causes of hypertension in younger children (i.e. kidney disease, coarctation of aorta). Lifestyle interventions are strongly recommended, with pharmacological therapy instituted for a higher levels of BP or if there is insufficient response to lifestyle modification. Choices of antihypertensive drugs are similar in children and adults, but effective doses for children are often smaller and should be adjusted carefully.

**Commonly used antihypertensive drugs**

Tab. Hydrochlorothiazide 12.5-25 mg once daily or 2 times a day
- Or
Tab. Frusemide 20-40 mg twice a day
- Or
Tab. Frusemide 20 mg + Spironolactone 50 mg 1-2 times a day
- Or
Tab. Benzthiazide 25 mg + Triamterene 50 mg per day
- Or
Tab. Indapamide 2-5 mg daily
- Or
Tab. Atenolol 25-100 mg daily or Metoprolol 25-150 mg 2 times a day. (Caution: Contraindicated in asthma, peripheral arterial disease, moderate to severe congestive heart failure, uncontrolled hypothyroidism, myocardial conduction defects).
- Or
Tab. Amlodipine 2.5-20 mg daily or Cap. Nifedipine 20-80 mg as sustained release daily. (Caution: May cause peripheral oedema in some individuals)
- Or
Tab. Enalapril 2.5 mg and may be increased to 40 mg daily or Lisinopril 2.5 to 20 mg daily or Ramipril 1.25 mg to 10 mg daily (Caution: May cause dry cough in some individuals).
Or
Tab. Losartan 25-50 mg once or twice daily. Or
Tab. Prazosin 1-20 mg/day first dose to be given at bedtime. Or
Tab. Terazosin 1-10 mg daily in 2 divided doses. First dose to be given at bedtime.
Or
Tab. Clonidine 0.05-0.6 mg 2 times a day. Or
Tab. Methylldopa 250-1000 mg 2 times a day.

**Accelerated hypertension**

Patients presenting with BP 200/140 mmHg or more without papilloedema: Inj. Enalapril 1.25-5 mg IV 6 hourly
Or
Inj. Nitroprusside 0.25-1.0 mcg/kg/min IV infusion (dose to be titrated with BP, maximum dose for 10 mcg only)
Or
Inj. Nitroglycerine 5-100 mcg/min infusion Or
Inj. Hydralazine 10-20 mg IV or IM, if no response at 20 mg change the drug Or
Inj. Labetalol 20-80 mg IV every 5-10 min up to a total of 300 mg, infusion 0.5-2 mg/min, oral 100-600 mg 2 times a day.
Or
Inj. Phentolamine 5-15 mg IV (specially useful in pheochromocytoma)

**Malignant hypertension**

Patients presenting with BP 200/140 mmHg and evidence of vascular damage like papilloedema, deranged renal function, should be referred to a tertiary care centre.

**Resistant hypertension**

Resistant hypertension is the failure to reach goal BP in patients who are adhering to full doses of an appropriate 3-drug regimen that includes a diuretic. Refer these patients to hypertension specialist.

**Follow-up**

1. Regular BP monitoring to ensure optimal or normal BP in young or middle aged or diabetic subjects (130/80 mmHg) and at least high normal BP in elderly patients (140/90 mmHg).
2. Monitor all risk factors for coronary artery disease.
3. Ensure compliance with lifestyle modifications.
4. Assess for complications and target organ damage.
5. In accelerated or malignant HT, avoid sudden fall in diastolic BP to below 100 mmHg.

Patient education

Explain consequences of uncontrolled HT and the need for the long-term control with medication.

Advise regarding control of other risk factors like diabetes, hyperlipidaemia, etc.

Diuretics should be taken in the morning and if two doses a day are required second dose should be given before 4 PM.

Manage target organ damage — referral to a higher centre for CAD (PTCA/CABG), nephropathy (prepare for dialysis or transplant), carotid Doppler to determine presence of atheroma and possibility of endarterectomy.

References


ANGINA PECTORIS

Acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischaemia and covers the spectrum of clinical conditions ranging from unstable angina (UA) to non-ST segment elevation myocardial infarction (NSTEMI) to ST-segment elevation myocardial infarction (STEMI).

Myocardial ischaemia’s caused by critical obstruction in coronary arteries due to atherosclerosis, calcific aortic stenosis or rarely due to spasm/embolism.

SALIENT FEATURES

Typical anginal pain is characterized by precordial or retrosternal discomfort or pressure or tight, squeezing, choking pain usually precipitated by exertion and relieved by rest and sublingual nitroglycerine. Pain may radiate to left shoulder, arm, neck or jaws.

Atypical symptoms of acute coronary syndrome may be more common in the elderly, women, and diabetic patients, but any patient may present with atypical signs and symptoms.

If anginal pain occurs at any time without any precipitating factor or increases in intensity or frequency, it is called unstable angina.
Signs and symptoms cannot be used to confirm or exclude the diagnosis of acute coronary syndrome and may be confirmed, if reversible ischaemic ECG changes are seen during pain, and cardiac biomarkers. However, a normal 12 lead ECG does not exclude a diagnosis of coronary heart disease. Exercise testing may be used to support the diagnosis in other cases. Other investigations include echocardiography, cardiac biomarkers (trop-I, trop-T), radionuclide studies or coronary angiography and investigation for risk factors such as blood sugar, HbA1C, lipid profile, ApoB, CRP, lipoprotein A, homocysteine, CPK, etc.

### Treatment

**Nonpharmacological**

Avoid heavy exertion and take rest during acute stage, lifestyle modification, smoking cessation, weight control.

**Pharmacological**

1. For immediate relief, Tab. Isosorbide dinitrate 5-15 mg sublingual during the attack, dose repeated as required and tolerated. The onset of action is within 3 minutes.
   
   Or
   
   Tab. Nitroglycerin 0.3-0.6 mg sublingual during the attack, dose repeated as required.

2. If attacks are more than twice a week, regular drug therapy is required.
   
   Tab. Isosorbide mononitrate 20 mg 2 times a day orally, may be increased to 120 mg per day, if required.

3. If no contraindications exist, Tab. Metoprolol 50 mg 2 times a day Or
   
   Tab. Atenolol 50 mg/day orally

4. If beta-blockers are contraindicated or angina persists, Tab. Diltiazem 60-120 mg/ day orally

5. Tab. Aspirin 100-150 mg per day orally Or
   
   If patient cannot tolerate Aspirin, Tab. Clopidogrel 75 mg/day.

6. If still ischaemia is not controlled, Tab. Nicorandil 20 mg 2 times a day can be started.

All patients with stable angina due to atherosclerotic disease should receive long-term aspirin and statin therapy.

When adequate control of anginal symptoms is not achieved with beta-blockade, a calcium channel blocker should be added. Refer patients whose symptoms are not controlled on maximum therapeutic doses of two drugs to a cardiologist. Following coronary angiography and assessment of left ventricular function, patients may be considered for coronary revascularization by PCI (percutaneous intervention) or CABG (coronary artery bypass grafting). Revascularization for prognostic and symptomatic
benefit in patients is recommended with the following anatomy: significant LMS disease (>50% stenosis), or proximal three vessel disease, or two vessel disease involving the proximal left anterior descending.

UNSTABLE ANGINA

Initial management (Patient should be hospitalized.)
1. Tab. Aspirin 300 mg stat. If aspirin is given before arrival at hospital, note saying that it has been given, should be sent with the patient.
2. Tab. Clopidogrel 300 mg stat followed by 75 mg/day, if available and no contraindications to it.
3. Inj. Nitroglycerine 5 mcg/min IV infusion, increase dose by 2.5 to 5 mcg every few minutes until pain is controlled (monitor BP).
4. Continue other drugs as above.
5. Inj. Heparin—unfractionated—1000 U/h or low molecular weight heparin (Enoxaparine) 1 mg/kg (0.6 ml for 60 kg) 12 hourly.
6. Angioplasty/CABG may be done, if no relief with medication or disease is progressive.

Follow-up
Assess the risk factors like diabetes, obesity, hyperlipidaemia, hypertension, smoking and correct these factors.
Correct anaemia, if present.
Worsening angina/unstable angina requires further investigation and should be referred to a higher centre.

MYOCARDIAL INFARCTION (MI)
The term myocardial infarction is used when there is evidence of myocardial necrosis in a clinical setting consistent with myocardial ischaemia.

SALIENT FEATURES

Any one of the following criteria meets the diagnosis:
Detection of rise and/or fall of cardiac biomarkers (preferably troponin) with at least one value above the 99th percentile of the upper reference limit-together with evidence of myocardial ischaemia with at least one of the following.

Symptoms of ischaemia:
Chest pain similar to anginal pain is the commonest symptom, usually begins at rest, no response to nitrates, lasts >20 minutes and patient may have associated dyspnoea, hypotension, sweating, altered sensorium and cyanosis. Diagnosed by typical ECG changes.
ECG changes indicative of new ischaemia (new ST-T changes (STEMI) or new left bundle branch block (LBBB).

Development of pathological Q waves in the ECG.

Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

**Sudden unexpected cardiac death:**

Sudden death is 1st manifestation in significant number of patients. Some patients may be asymptomatic and detected on routine ECG.

**Prehospital care**

Administer 162 to 325 mg of aspirin (chewed) to chest pain patients suspected of having STEMI unless contraindicated or already taken by patient.

Perform and evaluate ECG

Goal of transport time is to keep total ischaemic time within 120 minutes.

**Treatment (preferably in CCU)**

**Nonpharmacological**

Diagnosis should be made as soon as possible (within 20 minutes of arrival in hospital). Admit in CCU (if available), supplementary oxygen in patients with respiratory distress and oxygen saturation ≤94%, bed rest, ensure IV access, continuous cardiac monitoring and pulse oximetry, avoid visitors and outside influences, e.g. radio, newspapers; therapeutic lifestyle changes, diet, restrict sodium intake.

**Pharmacological**

1. Inj. Morphine 2-4 mg IV, repeated 4-6 hourly, if needed.
2. Tab. Aspirin 150-325 mg PO administered as soon as possible on admission, if not taken earlier.
3. Tab. Clopidogrel 300 mg stat and 75 mg/day for maintenance, if available.
4. Tab. Nitroglycerine 0.3-0.6 mg sublingual.
5. Confirm MI by cardiac enzymes estimation and ECG.
6. Thrombolysis should be done within 6-12 hours with the following (There is slightly increased risk of intracranial haemorrhage—if age >65, weight <70 kg, hypertension, and with TPA).
   - Inj. Streptokinase 1,50,000 units IV as loading dose over 60 min
   - Or
   - Inj. Urokinase 1 to 2 Million International Units (max 3 Million International Units) administered IV once over 15-30 minutes. The rate of infusion is limited by side effects (fever, chills, rigors), and may need to be decreased in some patients. Or
STANDARD TREATMENT GUIDELINES

Inj. rt-PA 100 mg continuous IV infusion over 2 hours.
7. Primary PTCA may be done as an alternative to thrombolysis.
8. Close monitoring as mortality is maximum in the first 24 hours.
10. Limit physical activities at least for 12 hours.
11. Do not use prophylactic antiarrhythmics but should be readily available.
12. Inj. Enoxaparin 1 mg/kg subcutaneously 12 hourly for 3-5 days or Inj. Dalteparin 120 IU/kg subcutaneously 12 hourly or Inj. Heparin 1000 units/h IV infusion for 72 h (more useful with TPA).
14. If no contraindication, Inj. Metoprolol 2 mg IV every 2 minutes for 3 injections; if well tolerated follow with 50 mg PO started 15 minutes after last IV dose and given every 12 hourly for 48 hours. Then it may be changed to 100 mg once a day.
15. If no hypotension or contraindications and uncomplicated MI given Tab. Enalapril 5 mg 2 times a day PO.

After first 24 hours:
17. Continue aspirin, beta-blockers, nitroglycerine, heparin, ACEI, analgesia (if required).
18. Observe and treat any complication—high-dose aspirin, if pericarditis; diuretics, if congestive heart failure; defibrillation, if haemodynamic compromise in atrial fibrillation; atropine, if heart block/bradycardia; intra-aortic balloon, if severe hypotension.

Indications for urgent angiography/angioplasty
Ischaemic episodes (spontaneous/provoked) and preserved left ventricular systolic function.

Indications of temporary pacing
Sinus bradyarrhythmia unresponsive to drugs, mobitz type II AV block, third degree AV block, bilateral bundle branch block (BBB), newly acquired BBB, and bifascicular or trifascicular block.

Indications for urgent surgery
   Failed PTCA with persistent chest pain or haemodynamic instability.
   Persistent or refractory ischaemia who is not a candidate for catheter intervention.
   Cardiogenic shock and coronary anatomy not amenable to PTCA.
   Mechanical abnormality leading to pulmonary oedema/hypotension, e.g. papillary muscle rupture or acute ventricular septal defect.
   Life-threatening ventricular arrhythmias in the presence of ≥ 50% left main stenosis and/or triple-vessel disease.
Discharge from hospital

Stable patients with a low risk of complications may be candidates for early discharge such as STEMI patients managed with fibrinolysis, with an uncomplicated course after 72 hours of hospitalization. However, the duration of hospitalization in patients treated with reperfusion therapy may be determined by other needs, such as patient education or titration of medications to optimum doses. Non-invasive testing for ischaemia should be performed before discharge to assess the presence and extent of inducible ischaemia in patients with STEMI who have not had coronary angiography and do not have high-risk clinical features for which coronary angiography would be warranted. Exercise testing early after STEMI may also be performed: to assess functional capacity and ability to perform work at home/work; evaluate efficacy of current medical regimen and titrate accordingly; risk stratification for future.

Long-term management (secondary prevention)

Complete smoking cessation at every visit ask about smoking and assist patient in quitting.

Initiate or maintain lifestyle modification—weight-control, increased physical activity, alcohol moderation, sodium reduction, and emphasis on increased consumption of fresh fruits, vegetables, and low-fat dairy products.

BP control goal is < 140/90 mmHg or 130/80 mmHg, if patient has diabetes or chronic kidney disease.

Maintain LDL-C < 100 mg/L (for very high-risk patients, an LDL-C <70 mg/dl); if TG are ≥ 200 mg/dl, non-HDL-C should be < 130 mg/dl whereas non–HDL-C should be <100 mg/dl for very high risk with life style modification, diet, and hypolipidaemic agents.

Physical activity 30 minutes 7 days/week (minimum 5 days per week).

Weight management goal is to maintain body mass index 18.5 to 24.9 kg/m²; waist circumference: men < 40 inches, women < 35 inches.

Aspirin, beta-blockers and ACEI (selected patients)—indefinite period. Those who do not tolerate aspirin give Tab. Clopidogrel 75 mg/day. For patients undergoing coronary artery bypass grafting, aspirin, (110-325 mg) should be started within 6 hours after surgery to reduce saphenous vein graft closure.

Warfarin for compelling indication for anticoagulant therapy, such as atrial fibrillation, prosthetic heart valve, left ventricular thrombus, or concomitant venous thromboembolic disease. Use of warfarin in conjunction with aspirin and/or clopidogrel is associated with increased risk of bleeding and monitor closely.

Patient education

Counsel patient to comply with medication, to stop smoking, reduce weight, regular exercise (20 minutes brisk walk at least 3 times a week), restrict fat intake to control serum lipids.

Family members of patients experiencing STEMI to immediately activate the Emergency Response Team when symptoms appear and should be advised to take
CPR training and familiarize themselves with the use of an automated external defibrillator (AED).

References

CONGESTIVE HEART FAILURE (CHF)

Clinical syndrome of inadequate cardiac output resulting in fluid retention in the lungs, abdominal organs and peripheral tissue. Common causes include coronary artery disease, hypertensive heart disease, cardiomyopathy, valvular heart disease, and pulmonary vascular disease.

SALIENT FEATURES

Dyspnoea and peripheral oedema. Cyanosis may or may not be present.
Raised JVP, S3 summation gallop and bilateral basal crepitations.
Profuse pink frothy sputum in severe cases.
Tender hepatomegaly and ascites.

Treatment

Since it is a syndrome, appropriate examination and investigations like chest X-ray, ECG, ABG and echocardiography should be done to identify the cause.
Identify precipitating factor – arrhythmias, fluid overload, thyroid disease, infection, anaemia, pregnancy, pulmonary embolism, dietary or medical noncompliance (for details see respective sections).

Nonpharmacological

Restrict physical activity and take bed rest in propped up position with a back rest. Oxygen inhalation—high flow oxygen 10 liters/min through facemask or 60% venturi mask.
Dietary sodium restriction (2-3 g/day; no added salt in cooking and no table salt). Fluid restriction depending on output and other conditions.
Dialysis or ultrafiltration or mechanical fluid removal (ascitic tap, paracentesis, etc.).
Discontinue drugs with negative inotropic action (high dose beta blockers, calcium-antagonists, etc.).

**Pharmacological**

Treatment consists of a judicious mix of vasodilators, diuretics and inotropic support.

1. In severe/acute cases, Inj. Frusemide 40-80 mg IV stat and repeated after 2-3 hours. Individualize the maximum dose up to 200 mg/day. Maintenance dose is 40 mg IV 12 hourly till clinical improvement is seen.
   High dose of Frusemide infusion, i.e. 10 mg/h undiluted and 1 mg/h as continuous infusion can be used in refractory patient.
2. Tab. Spironolactone 25-200 mg daily may be used in combination with above. Or
   Tab. Chlorothiazide 250-500 mg/day. Or
   Tab. Indapamide 2.5-5 mg/day. Or
   Tab. Benzthiazide 25 mg + Tab. Triamterene 50 mg/day.
3. Tab. Enalapril 2.5-20 mg/day may be given as a single or two divided doses. Or
   Tab. Lisinopril 2.5-20 mg/day as a single daily dose.
4. Tab. Isosorbide mononitrate 60 mg/day preferably as slow release preparation given at night.
5. Digoxin is indicated in fast ventricular rate (e.g. in atrial fibrillation).
   Inj. Digoxin 1 mg IV, followed by 0.5 mg at 8 and 0.25 mg at 16 hours Or 0.5 mg followed by 0.25 mg PO at 8, 16 and 24 hours (rapid digitalization) followed by 0.125-0.375 mg/day as maintenance dose.
   Or
   Tab. Digoxin 0.5 mg first day, followed by 0.25 mg/day (slow digitalization).
6. Tab. Carvedilol 3.125 - 25 mg per day in single/or two divided doses (useful if persistent tachycardia, idiopathic dilated cardiomyopathy) — dose to be doubled, if required, only after 2 weeks.
6. Inj. Heparin 5000 U 12 hourly SC, if the patient is bed ridden.

**Monitoring**

Strict intake-output charting and daily weight as well as abdominal girth.
Symptomatic relief and resolution of signs and symptoms of failure.
Serum electrolytes and uric acid.

In case of refractory failure and for management of underlying cause, refer the patient to a higher centre for cardiac repolarization therapy.

**Prevention of heart failure**

Identifying and preventing illnesses which lead to HF including hypertension, and coronary heart disease should be paramount among the approaches to prevent HF.
Patient education

Explain need to control salt intake and bed rest or regular compliance with medication.

Patient should be advised to contact the physician, if symptoms of digitalis toxicity, e.g. anorexia, nausea and vomiting or worsening of heart failure.

Diuretics should be taken in the morning and if two doses a day are required, second dose should be given before 4 PM.

Lifestyle changes – alcohol moderation, cessation of smoking, management of dyslipidaemia, diabetes, hypertension, ischaemic heart disease; weight reduction in obese patients and physical activity.

(See also Cardiac Failure in Chapter-19).

References


PULMONARY EMBOLISM/INFARCTION

SALIENT FEATURES

Pulmonary embolism may pass off unnoticed in case of a small embolism or present with a full blown acute cor pulmonale.

Patients usually present with dyspnoea, tachypnoea, chest pain, haemoptysis and cough; crepitations, rhonchi and occasionally pleural rub or signs of collapse accompanied by acute cor pulmonale, loud P2, RV S3, right ventricular heave, raised JVP, hepatomegaly, pedal oedema, cyanosis, and dyspnoea.

ECG changes S1-Q3-T3 pattern, incomplete RBBB or right ventricular ischaemia.

Predisposing factors for pulmonary embolism are surgery, immobilization, trauma, oral contraceptives, pregnancy, postpartum, cancer, chemotherapy, stroke, indwelling venous catheter.

Investigations

Chest roentgenogram – oligaemia in lung fields and typical wedge-shaped infarction, arterial blood gas analysis.

Lung scanning and pulmonary angiography, D-Dimer ELISA and latex agglutination, LDH, echocardiography, contrast plethysmography and venous ultrasound for deep vein thrombosis.

Blood cultures in case of septic emboli.
Treatment

Primary therapy

A. Pharmacological
1. Inj. Streptokinase 250,000 units IV as loading dose over 30 min followed by 100,000 units every hour for up to 12-72 hours.
   Or
   Inj. Urokinase 4400 U/kg IV over 10 min then 4400 U/kg/hour administered as continuous IV infusion.
   Or
   Inj. rt-PA 100 mg continuous IV infusion over 2 hours.
2. Inj. Dobutamine IV infusion at the rate of 5 to 10 mcg/kg/min.
3. Oxygen 100% inhalation (except in cases of COPD/cor pulmonale).
4. Pain relief with NSAIDs or narcotics.

B. Catheter-based suction embolectomy, local mechanical dispersion, local pharmacological thrombolysis.

C. Surgical embolectomy.

D. Secondary prevention
1. Inj. Heparin 5000-10,000 IU over 5 minutes followed by an IV infusion at the rate of 15-25 units/kg/hour. Check prothrombin time (PT) after 6 hours and titrate INR to 1.5 to 2.3 times control. Complete blood count (CBC) for heparin associated thrombocytopenia (HAT).
   (Caution: Protamine sulphate is an antidote to overdosage with heparin with 1 mg neutralizing 100 IU of heparin given within 75 minutes (maximum 50 mg).
2. Tab. Warfarin is initiated on the first day of documenting PT within therapeutic range in a dose of 10 mg daily for 2 days. The subsequent maintenance dose depends on PT with an overlap of 5 days with heparin (stop heparin, when INR>2). A target INR of 2.0 to 3.0 is achieved and therapy is continued for at least a year. (Caution: Vitamin K 1-10 mg acts as an antidote to warfarin overdose).
3. Tab. Aspirin 75 mg/day following a full course of warfarin.
4. Inferior vena caval (IVC) obstruction with green field or bird’s nest filter to prevent recurrent embolization from deep vein thrombosis (DVT).

Monitoring and follow-up
1. Complete course of anticoagulant therapy with INR at regular intervals. First INR after 16 hours of warfarin.
2. Inferior vena caval filters for recurrent emboli.
3. Evaluate for hypercoagulable states such as protein C and S deficiencies, factor V leiden, antithrombin III deficiency, plasminogen deficiency, and elevated factor VIII.
Patient education

Prophylaxis against deep vein thrombosis and pulmonary embolism in high-risk settings with graduated compression stockings, pneumatic compression, IVC interruption and heparin therapy.

Reference


ARRHYTHMIA

SALIENT FEATURES

Palpitations, anxiety, lightheadedness, angina, syncope or near syncope, hypotension and may lead to cardiac compromise.

When severe, these may suggest underlying cardiac disease, ischaemic heart disease (IHD), cardiomyopathy, myocarditis, conduction disorders, etc. or non-cardiac (thyroid disorders, electrolyte imbalances or drugs).

Arrhythmias are frequently intermittent (paroxysmal) and may be classified based on:

– Ventricular vs supraventricular.
– Narrow QRS vs wide QRS.
– Regular vs irregular.
– Clinically benign vs those associated with haemodynamic compromise (lower the ejection fraction [EF], poorer the prognosis).

Diagnostic tests include ECG during attack of arrhythmia or 24-hour Holter monitoring (if no abnormality seen in ECG on presentation)

Treatment

Identify and treat precipitating factors.

SUPRAVENTRICULAR TACHYCARDIA

SALIENT FEATURES

Sustained regular narrow QRS tachycardia with normal appearing QRS (<120 msec) or may be broad QRS, if there is aberrancy.

Onset is sudden with heart rate being 160-200/min, presents with palpitation. Hypotension may occur in some patients. Polyurea may follow the episode.
Nonpharmacological treatment
Reassure the patient especially if no haemodynamic disturbance present at a time when the patient has symptoms.
Vagal stimulation by drinking cold water, Valsalva manoeuvre, carotid massage, etc.

Pharmacological treatment
Acute attack is treated as follows (if no response to vagal stimulation): Inj. Adenosine 3 mg as a rapid IV push into the large peripheral vein, 3 mg over 2 seconds with cardiac monitoring, if necessary followed by 6 mg after 1-2 minutes, and then by 12 mg after a further 1-2 minutes followed by a saline flush.
(Caution: Contraindicated in 2nd and 3rd degree heart block)
Or
Inj. Verapamil 5-10 mg bolus over 2-3 min repeated at 15-30 min, if necessary. Or
Inj. Diltiazem 0.25 mg/kg slow IV repeated after 15 min. It can be continued as an infusion 10 mg/h up to 24 h.
Or
Inj. Metoprolol 1-2 mg/min IV at 5 min interval up to a total of 5-10 mg. Low energy (25-50 joules) DC shock may be used in resistant cases.

Maintenance treatment
Tab. Atenolol 25-100 mg/day as single or divided doses. Or
Tab. Metoprolol 50-200 mg/day as a single dose or divided doses. Or
Tab. Verapamil 40 mg thrice a day. Or
Tab. Amiodarone 150-200 mg/day (in resistant cases).

Patient should be referred to a higher centre for maintenance treatment/definitive treatment.

VENTRICULAR TACHYCARDIA

SALIENT FEATURES
Run of three or more consecutive ventricular beats at a rate >120 beats/min. If the rate of consecutive ventricular beats is >100/min, it is called accelerated idioventricular rhythm which is a benign condition, usually occurring following the thrombolytic therapy.
Diagnosis is made by ECG, suggested by independent P wave, fusion or capture beats, uniformity of QRS wave in the V leads (concordance) and a frontal plain QRS axis > -30.
A. Haemodynamically stable

Inj. Lidocaine 1 mg/kg IV bolus (3 ml) followed by repeated 0.5-1 mg/kg boluses at 5 min intervals up to a total of 3 mg/kg to attain desirable response followed by IV infusion 2-4 mg/min. Endotracheal or IM administration in extreme cases (300 mg).

If no effect of Lidocaine and DC conversion is not available:

Inj. Procainamide 15 mg/kg loading dose followed by 2-5 mg/min maintenance infusion.

NOTE: Lidocaine (class 1B) is the drug of choice for ventricular tachycardia during acute ischaemia and myocardial infarction.

B. Haemodynamically unstable VT or no response to lidocaine

Synchronized DC shock starting with 50-200 Joules.

C. In ventricular fibrillation

Unsynchronized 200 Joules followed by 360 Joules, if required.

D. Maintenance treatment

Tab. Flecainide (class 1C) 100 mg 8-12 hourly. Or
Tab. Procainamide (class 1A) 250-750 mg 4 to 6 hourly.

In refractory cases, Tab. Amiodarone (class III) 200-400 mg/day, starting at a higher dose of 200 mg 8 hourly for first week.

SUSTAINED ATRIAL FIBRILLATION

It is characterized by sustained rapid irregular atrial rhythm. Mostly associated with underlying heart disease, e.g. rheumatic heart disease, coronary heart disease, hypertension. Other non-cardiac causes include thyrotoxicosis and alcohol ingestion.

SALIENT FEATURES

Usually presents with severe palpitation, chest discomfort, weakness, breathlessness and sometimes signs/symptoms of arterial embolic phenomenon like stroke.

Treatment

Nonpharmacological

Reassurance, oxygen inhalation, propped up position, if patient is dyspnoeic.
Pharmacological
1. Rapid digitalization done as in section on CHF followed by maintenance dose.
2. Beta blockers (class II) like metoprolol 25-100 mg twice daily are also effective in controlling ventricular rate.
3. Tab. Warfarin 5 mg daily with titration as per INR (maintain about 1.5 to 2) in patients with documented clots or thromboembolic episodes. In cases of elective DC cardioversion (100 to 400 Joules), 3 weeks of anticoagulation required.
   Treatment of underlying condition like thyrotoxicosis.

BRADYARRHYTHMIAS AND BLOCKS

Treatment

Pharmacological
May be useful initially while pacing is organized.
   Inj. Atropine 0.5-2 mg IV repeated 4-6 hourly, if needed. And/Or
   Inj. Dopamine 5-20 mcg/kg/min infusion,
   And/Or
   Inj. Isoproterenol 2-10 mcg/min infusion.
   Monitor patient for improvement in pulse rate and blood pressure. Definitive treatment is cardiac pacing.

Monitoring
Shift patient on to appropriate oral drugs once the arrhythmia has been controlled.
Monitor for drug toxicities and recurrences so as to titrate the dose.
Evaluate and refer for electrophysiological studies.
Monitor INR for patients on anticoagulant therapy.
Evaluate and refer for electrophysiological studies.

Patient education
Emphasize need for compliance and regular follow-up.
Prepare for further intervention depending upon the cause. Valvular heart disease may be managed by repair or replacement; reentrant tachycardia can be managed with radiofrequency ablation; coronary heart block requires temporary often followed by permanent pacing; coronary artery disease requires revascularisation. Emphasize need for compliance and regular follow-up, including monitoring of anticoagulation.

Reference
CHAPTER 4 BLOOD DISEASES

BLEEDING DISORDERS

The management of bleeding disorders is based on a precise diagnosis. If bleeding is life-threatening, replacement of blood and fluids for haemodynamic stability takes priority.

SALIENT FEATURES

Suspect
(a) Vascular and platelet disorders—if prolonged bleeding from cuts, purpura and mucosal bleeding.
(b) Coagulation disorders—if delayed bleeding from injury, bleeding into joints, muscles and GIT.

Treatment

General measures

Stop anticoagulants, if any. No intramuscular injections; no aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs).
Apply local pressure to stop bleeding.

PLATELET DISORDERS (THROMBOCYTOPENIA)

Low platelet counts suggest either reduced production or increased destruction of platelets. In reduced platelet production, bone marrow examination shows reduced megakaryocytes and common causes are: megaloblastic anaemia, aplastic anaemia, marrow infiltration by malignancy. If bone marrow shows increased or normal megakaryocytes, it implies increased destruction as in idiopathic thrombocytopenic purpura (ITP), hypersplenism, disseminated intravascular coagulation (DIC). Infective disorders especially malaria and dengue are commonly associated with thrombocytopenia.
Blood Diseases

Treatment

Treat the primary cause.

Platelet transfusion is indicated mainly when platelets are not adequately produced and aim is to keep platelet count above 20,000/mm$^3$. If there is no fever and no clinical bleeding, even counts of 10,000/mm$^3$ are acceptable. Transfusing platelets in ITP is not useful as these are rapidly destroyed, but platelet concentrates may be transfused in life-threatening bleeding before specific therapy takes effect.

Platelets are stored at room temperature (22°C) on an agitator for up to 3-5 days. Once issued, they should be transfused rapidly.

Dose: One single donor platelet collected by apheresis raises platelet counts by 30,000 to 50,000 in an adult. One random donor platelet collected from a single unit of donated blood raises platelet counts by 5,000-10,000/mm$^3$ in an adult. The rise is less in DIC, ITP, febrile patients and during active bleeding. To check efficacy of transfusion, measure platelet count 45 minutes after transfusion.

Idiopathic thrombocytopenic purpura (ITP)

Test for HCV and HIV, iron deficiency for newly diagnosed patients. Bone marrow examination is not necessary irrespective of age of patients presenting with typical ITP.

Treatment

Tab. Prednisolone 2 mg/kg/day till response or 4-6 weeks and taper off slowly. Or

Inj. Immunoglobulin 400 mg/kg/day for 5 days is as effective as steroids, response may be faster, but is much more expensive in case of contraindications to corticosteroids.

Or

Inj. Anti-D 50-75 mcg/kg single dose IV in Rh-positive, non-splenectomised patients.

Failure with one therapy may still be followed by response to other therapy. If there is poor response to the above, case must be referred to specialist centre for consideration of splenectomy.

Platelet function defects

If clinical presentation suggests platelet defect but platelet counts are normal, suspect platelet dysfunction. Bleeding time is prolonged in most cases. Platelet function tests will confirm the defect but facilities are not routinely available. Commonly caused by aspirin/NSAID use, and hereditary disorders.
STANDARD TREATMENT GUIDELINES

Treatment

Stop NSAID use.
If active bleeding occurs, transfuse platelets.

COAGULATION DISORDERS

There is prolongation of coagulation parameters:

1. Prolonged prothrombin time: In liver failure, vitamin K deficiency, oral anticoagulants, disseminated intravascular coagulation (DIC).
2. Prolonged thrombin time, heparin use, DIC.

Treatment

Treat the underlying cause. If cause is not clear, give vitamin K and fresh frozen plasma (FFP) depending on investigation.

For overdose of oral anticoagulants or vitamin K deficiency.

Inj. Vitamin K intravenous (use IV preparation) 10 mg IV once daily for 3 days or till response.

For infusion of plasma components, refer to a specialist.

Fresh frozen plasma (FFP) contains active clotting factors present in blood. Dose is 15 ml/kg initially, followed by 10 ml/kg every 12 hourly. Cryoprecipitate contains factor VIII and fibrinogen and may be used in haemophilia

and in DIC as replacement therapy. Factor VIII concentrates are needed for haemophilia A (refer to a specialist).

References

CHAPTER 5 RESPIRATORY DISEASES

PNEUMONIA

Pneumonia is an inflammation in alveolar tissue, most often caused by a microbial agent. Inhalation is the commonest route of infection. The most frequent inhalational pneumonia is the community acquired pneumonia. The community acquired pneumonia is most commonly caused by Streptococcus pneumoniae (typical) and less frequently by Mycoplasma pneumoniae, H. influenzae, Chlamydia pneumoniae, Staphylococcus aureus or Legionella pneumophila (atypical). Haemophilus influenzae infection is seen mostly in patients with chronic bronchitis. Nosocomial pneumonia is likely to be caused by Gram-negative bacilli or Staphylococcus aureus. Aspiration pneumonia is usually seen in patients with neuromuscular disorders or in ICU care is polymicrobial including anaerobes. Age is an important predictor of infecting agent.

SALIENT FEATURES

Sudden onset of fever, productive cough, chest pain, shortness of breath and (in some cases) pleuritic chest pain; systemic symptoms like headache, bodyache and delirium are more severe with atypical pneumonia.

The atypical pneumonia syndrome is characterized by a more gradual onset, a dry cough, shortness of breath and a prominence of extrapulmonary symptoms (headache, myalgias, fatigue, sore throat, nausea, vomiting and diarrhoea) and abnormalities on chest X-ray despite minimal signs of pulmonary involvement (other than rales). The “primary atypical pneumonia” caused by Mycoplasma results in a violent, episodic cough with small mucoid sputum preceded by fever with or without chills and may be accompanied by profound weakness. Diagnosis is confirmed by X-ray chest, sputum examination (Gram stain and culture).

Treatment

Nonpharmacological

Adequate fluids, promoting expectoration (gravity drainage).
Pharmacological

Antibiotics are the mainstay of treatment—initial choice depends on setting in which infection was acquired, age, the clinical presentation, pattern of abnormality on chest X-ray, result of staining of sputum or other infected body fluids and current pattern of susceptibility of pathogens to antimicrobial agents. The choice of antibiotic may be modified based on response and sputum culture.

A. Community acquired pneumonia (CAP) in a young/middle aged, otherwise healthy subject: Outpatient

Cap. Clarithromycin 500 mg twice daily for 10 days
Or
Cap. Azithromycin 500 mg once and then 250 mg/day for 4 days
Or
Cap. Doxycycline 100 mg twice daily for 10 days
Or
Cap. Amoxycillin 500 mg 3 times a day for 10 days

B. Community acquired pneumonia (CAP) in patients with cardiopulmonary disease and/or risk factors for DRSP infection

i) Antibiotics for exacerbating bacterial infection/pneumonia

1. Cap. Levofoxacin 500 mg/day once daily for 10-14 days
   Or
   Cap Amoxycillin 500 mg 3 times a day for 10-14 days
   Or
   Cap. Amoxycillin 500 mg + Clavulanic acid 125 mg 3 times a day for 10-14 days

2. Tab. Erythromycin 500 mg 6 hourly for 10 to 14 days or Cap. Doxycyclin as above.
   Or
   If sensitivity to penicillin or when Mycoplasma or Legionella infection suspected
   Inj. Erythromycin 500 mg IV 6 hourly
   Or
   If Staph infection is suspected, Inj. Cefotaxime 1-2 g IV 8 hourly.

ii) Elderly individual (immunocompetent) with CAP or nosocomial pneumonia

Inj. Cefotaxime 1-2 g IV 8 hourly.
Or
Inj. Ceftazidime 1-2 g IV 8-12 hourly

iii) Elderly individual (immunosuppressed) with CAP or nosocomial pneumonia

1. Same as (ii).
2. Inj. Gentamicin 1-1.5 mg/kg IV 8 hourly. Or
   Inj. Amikacin 5 mg/kg IV 8-12 hourly.

**iv) Aspiration pneumonia**

1. Tab. Levofloxacin 500 mg/day once daily. Or
   Cap Amoxicillin 500-750 mg 8 hourly. Or
   Same as (ii), if aspiration occurs in the hospital.
2. Inj.or Tab. Metronidazole 400 mg 8 hourly for 7-14 days.

**C. Concommitant use of bronchodilators (salbutamol, terbutaline) is beneficial for associated bronchospasm.**

**D. Non-specific treatment, if high fever and body aches (see section on Fever in Chapter 1)**

**E. Non-invasive/invasive ventilator support depending upon the ABG analysis.**

**Follow-up**

Continue same antibiotic, if good clinical response for 7-10 days. Change of antibiotic required only if culture results show resistance to given antibiotic; if there is no clinical improvement, repeat chest X-ray after 4-5 days. Follow-up X-ray to be done after 4-6 weeks of completing treatment.

**Patient education**

Explain the importance of chest percussion and gravity drainage of sputum.

**References**


**CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)**

COPD is a common preventable and treatable disease and is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients.
It includes a spectrum of disease with two ends being ‘chronic bronchitis’ (cough/expectoration for at least 3 months in a year for 2 or more years) or ‘emphysema’ (distension of air spaces distal to terminal bronchiole with destruction of alveolar septa). The most important cause is inhalation of smoke, mostly from bidi/cigarette (80% of smokers get it), the other factors being air pollution, infections and genetic. Diagnosis is clinical, supported by chest X-ray and pulmonary function tests. A clinical diagnosis of COPD should be considered in any patient who has dyspnoea, chronic cough or sputum production, and/or history of exposure to risk factors for the disease. Spirometry post-bronchodilator FEV₁/FVC <0.70 confirms the presence of persistent airflow obstruction.

**Treatment**

A COPD management programme includes four components: Assess and monitor disease, reduce risk factors, manage stable COPD, manage and prevent exacerbations, actively identification of comorbidities.

The spirometric classification of severity of airflow limitation is divided into four grades based on post-bronchodilator FEV₁ using the fixed ratio FEV₁/FVC <0.70 as GOLD 1 (mild; FEV₁ ≥ 80% predicted), GOLD 2 (moderate; 50% ≤ FEV₁ <80% predicted), GOLD 3 (severe; 30% ≤ FEV₁<50% predicted) and GOLD 4 (very severe; FEV₁ <30% predicted).

Acute exacerbation is an acute event characterized by a worsening of the patients’ respiratory symptoms that is beyond normal day-to-day variation and leads to a change in medication. Commonly precipitated by viral upper respiratory infections.

**Nonpharmacological**

Cessation of smoking, avoiding inhalation of smoke from other sources (home or occupational), chest physiotherapy to help expectoration of sputum, postural drainage of sputum and adequate hydration.

**Pharmacological**

**A. Severe acute bronchospasm**

1. Oxygen inhalation (24-28%) with the venturi mask or through nasal prongs at flow rate of 1-2 liters/min.
2. Salbutamol solution 2.5 mg inhaled using nebulization 4-6 times a day and as and when required.
3. Inj. Aminophylline 250-500 mg (5 mg/kg) dissolved in 20 ml of 5% dextrose given slowly over 20 minutes (not given if patient already receiving theophylline) or has liver disease followed by infusion at the rate of 0.5 mg/kg/hr.
4. Oral/parenteral Amoxycillin 500 mg+ Clavulanic acid 125 mg 3 times a day for 7-10 days.
5. Tab Prednisolone 1-2 mg/kg/day for 5 days.
Refer the patient to hospital for further treatment/assisted ventilation if no response to above treatment, severe cyanosis and/or altered sensorium.

**B. Maintenance treatment**

1. Salbutamol-metered dose inhaler (MDI) inhalation 200 mcg 4 times a day and as and when required (use spacer, if coordination is a problem for the patient).
   
   Or
   
   Terbutaline metered dose inhaler 250 mcg 4 times a day and as and when required.
2. If no complete response to the above, give Ipratropium bromide inhalation 200 mcg 2 times a day.
3. Tab. Theophylline 100-200 mg 3 times a day given after meals.
4. If patient is expectorating yellowish sputum, oral Amoxicillin 500 mg+ Clavulanic acid 125 mg 3 times a day for 7-10 days.
5. Steroids have a very limited role in selected patients only, if at all required should be administered by the specialist only.

   Indication about home therapy of oxygen to be decided by the specialist and if indicated, should be taken for 15 hours a day.

   Use of mucolytics has no proven benefit. Regular use of antitussives is contraindicated in stable COPD. Respiratory stimulants are not recommended.

**Patient education**

Explain about importance of total cessation of smoking and its benefit not only during the acute stage but even about the long-term recovery of lung functions. Patient should also be given 1 week dose of antibiotic and instructed to use, if the symptoms start worsening with change in colour of sputum to yellow.

**References**


**BRONCHIECTASIS**

Bronchiectasis is caused by permanent abnormal dilatation of one or more bronchi/bronchiole due to destruction of ciliated epithelium, elastic and muscular tissue. The destructive process may be initiated by primary microbial infection (necrotizing pneumonia, tuberculosis, aspergillosis, etc.) or obstruction (foreign body, tumour, lymph node, etc.) resulting in stasis and secondary infection.
SALIENT FEATURES

Insidious onset with chronic productive cough, increasing volume of sputum due to recurrent infections, haemoptysis, clubbing of fingers, terminating in cor pulmonale and respiratory failure.

Treatment

*Nonpharmacological*

Stop smoking; physiotherapy in the form of chest percussion and gravity drainage to remove secretion; graded exercise. Routine deep breathing exercises and maintenance of good nutrition.

*Pharmacological*

Aim is to take care of complicating infections (as indicated by purulent sputum, may be associated with blood) and management of associated bronchospasm, if present.

1. Cap Amoxycillin 50 mg/kg in 3 divided doses. Or
   Cap Amoxycillin 500 mg+ Clavulanic acid 125 mg 3 times a day. Or
   Cap Tetracycline 25-50 mg/kg/day in 3 divided doses. Or
   Tab. Cotrimoxazole (SMZ 800 mg + TMP 160 mg) 2 times a day.
   The antibiotic choice is modified by Gram stain and sputum culture and is given for 7-10 days.

   If *Staph aureus* suspected or isolated, then consider Cap Ampicillin + Cloxacillin 1 g 6 hourly.

   Or

   Inj. Nafcillin or Oxacillin 2 g 4 hourly.

   If *Pseudomonas* isolated, use at least 2 effective antipseudomonal drugs Inj. Ceftriaxone 1-2 g IV 8 hourly + Inj Gentamicin 3-5 mg/kg/day.

2. Salbutamol inhaler 200 mcg four times a day and SOS.

3. Tab. Etophylline + Theophylline 100-200 mg 3 times a day.

Observe for the improvement in amount and colour of sputum and constitutional symptoms. If no clinical response and sputum culture report is available, change the antibiotic accordingly. If bronchospasm is not relieved by metered dose inhaler, nebulization should be done.

Hospitalization is required for severe bronchospasm, a very sick patient or significant haemoptysis.

Surgery is indicated in case of uncontrolled haemoptysis and if the disease is localized to one lobe/lobule. Emergency surgical resection may be necessary for life-threatening haemoptysis but embolization of appropriate bronchial artery is usually attempted first.
**Patient education**

Emphasize on stopping smoking, annual vaccination against *Pneumococcus* in high-risk cases, prompt treatment of upper respiratory tract infections, physiotherapy, early antibiotic treatment, if change in colour of sputum.

**Reference**


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**COR PULMONALE**

Right ventricular dilatation and/or hypertrophy associated with pulmonary hypertension (PHT) secondary to disease of thoracic wall, pleura or pulmonary parenchyma.

**SALIENT FEATURES**

Same as congestive heart failure.

Diagnosis is made by clinical findings, chest X-ray, pulmonary function tests (PFTs), ECG, echocardiography.

**Treatment**

1. Treat the underlying cause.
   - Salt reduced diet
   - Diaphragmatic breathing
   - Breathing exercises
   - Long-term oxygen therapy
   - Stop smoking
   - Prompt treatment of acute respiratory infections.
2. Same as congestive heart failure (for details see respective section).

**Surgical**

Phlebotomy when haematocrit > 50-60%.

**Patient education**

To stop smoking and avoid exposure to cold and allergens.

Emphasize on prompt treatment of acute respiratory infections.

**Reference**

PLEURAL EFFUSION

A pleural effusion is an abnormal amount of fluid around the lung. Pleural effusions can result from many medical conditions.

SALIENT FEATURES

Breathlessness, dry, non-productive cough, fever and pleuritic chest pain. Decreased or absent breath sounds, dullness on percussion stony dull, decreased vocal resonance.

Elevated white cell count and/or C reactive protein (CRP), blood culture. Diagnosis is confirmed by chest X-ray and diagnostic thoracocentesis (20 to 50 ml of pleural fluid). Types of pleural fluid are exudates and transudates.

Exudates have at least one and transudates have none of the following criteria:

i. Pleural fluid/total serum protein ratio > 0.5

ii. Pleural fluid/serum LDH ratio > 0.6

iii. Pleural fluid LDH > 2/3 the upper limit of normal serum LDH

O Transudate: Congestive cardiac failure, cirrhosis of liver, nephrotic syndrome, myxoedema, peritoneal dialysis, hypoproteinaemia, atelectasis


In tubercular pleural effusion: Pleural fluid is straw-coloured effusion with lymphocyte predominance, protein > 3 g/dl (exudative), ADA level > 50 U/l. Ultrasound chest may be done to detect small amounts of fluids, loculation and septation. Percutaneous pleural biopsy, if malignancy or tuberculosis is suspected and in case of undiagnosed exudative pleural effusion.

Treatment

Treatment is based on the underlying condition (tuberculosis/heart failure/nephritic syndrome/liver cirrhosis) (See respective section for details).

For large pleural effusion causing breathlessness, perform therapeutic thoracocentesis. Stop the procedure, if patient develops cough or chest pain. (Caution: Pain, pneumothorax, haemorrhage, and subcutaneous emphysema (do check X-ray after procedure).

For para pneumonic effusion

1. Give appropriate antibiotics where possible, antibiotic choice should be guided by bacterial culture results and sensitivity. Penicillins, penicillins combined with
β-lactamase inhibitors, metronidazole and cephalosporins penetrate the pleural space well. Avoid aminoglycosides; intrapleural antibiotics are not recommended. Switch to oral therapy once there is clinical and objective evidence of improvement in sepsis. Prolonged courses of antibiotics may be necessary and can often be administered as an outpatient after discharge.

In case of poor clinical progress during treatment with antibiotics alone promptly review, do repeat pleural fluid sampling and probably chest tube drainage.

2. Urgent drainage of para pneumonic effusions, if frankly purulent fluid, a pleural fluid pH of less than 7.2, loculated effusions, and bacteria on Gram stain or culture. Chest tube should be removed when pleural fluid drainage is less than 50 ml for 24 hours and draining fluid becomes clear yellow.

(Caution: Complications of chest tube drainage are pain, pneumothorax, haemorrhage, and subcutaneous emphysema).

3. In case patient does not demonstrate clinical or radiologic improvement with declining pleural fluid drainage, perform a pleural space ultrasound examination or chest CT scanning to look for pleural fluid loculations and ensure proper tube placement. Drainage failure is a consequence of misplacement of the chest tube, tube malfunction, and loculations.

All patients with empyema and pleural infection require outpatient follow-up with a repeat chest X-ray and inflammatory markers within 4 weeks following discharge and continued outpatient care may be required for several months depending on progress.

Early referral to a thoracic surgeon in patients with pleural effusions that are uncontrollable, failure of chest tube drainage and antibiotics. Refer to a higher centre in case of pleural effusion recurrence due to a malignancy despite drainage refer, for pleural sclerosis with instillation of a sclerosing agent occasionally into the pleural cavity through a tube thoracostomy or surgery.

**Patient education**

The long-term survival of patients with pleural infection is good, if prompt treatment is initiated.

Advise patients to return for prompt medical attention, if recurrent symptoms develop since late relapse of pleural infection is well recognized.

Advise patient to take adequate nutrition in patients with pleural infection.

**Reference**


PNEUMOTHORAX

Pneumothorax is presence of air in the pleural cavity. A primary pneumothorax occurs without an apparent cause and in the absence of significant lung disease, while a secondary pneumothorax occurs in the presence of existing lung pathology. Tension pneumothorax develops occasionally and is a medical emergency. Unless reversed by effective treatment, these sequelae can progress and cause death. Catamenial pneumothorax is a rare condition where women experience pneumothorax at the onset of menstrual period.

SALIENT FEATURES

The major symptoms of a spontaneous pneumothorax are: The sudden onset of chest pain and/or shortness of breath. The pain may be either dull or sharp or stabbing. It begins suddenly and is worsened by breathing deeply or coughing. On examination, hyper-resonant percussion note and absent or reduced breath sounds.

The most accurate diagnostic test is a chest X-ray, which will show air collected around the outside surface of the lung.

Treatment

Treatment is determined by the severity of symptoms and indicators of acute illness, the presence of underlying lung disease, and the estimated size of the pneumothorax on X-ray.

Patients with small spontaneous pneumothorax who have no significant underlying lung disease, resolve without treatment and require only monitoring. Patients with a small PSP without breathlessness may be discharged with early outpatient review along with clear written advice to return in the event of worsening breathlessness.

Tension pneumothorax and in larger pneumothorax, or when there are marked symptoms, urgent needle decompression followed by a chest tube connected to a one-way valve system is required. Needle decompression be required before transport to the hospital, and can be performed by an emergency medical technician or other trained professional. The needle or cannula is left in place until a chest tube can be inserted.

Occasionally, surgical intervention involving pleurodesis or pleurectomy is required when tube drainage is unsuccessful, or as a preventive measure, in case of repeated episodes.

Patient education

Advise patient to return to hospital, if increasing breathlessness develops. All patients should be followed up by respiratory physicians until full resolution. Air travel should be avoided until full resolution.
Diving should be permanently avoided unless the patient has undergone bilateral surgical pleurectomy and has normal lung function and chest CT scan postoperatively.

Reference

BIRD FLU AND SWINE FLU

Influenza-like illness caused by Influenza A (H1N1), a re-assorted influenza virus, was reported from Mexico in 2009 and rapidly spread to neighbouring United States and Canada. Subsequently, the disease spread to all the continents. Most of the cases reported subsequently were travel-related cases among those travelling to India from affected countries. Substantial numbers of cases now being reported from various states in India are indigenous cases.

SALIENT FEATURES

Fever, and upper respiratory symptoms such as cough, running nose and sore throat. Headache, bodyache, fatigue diarrhoea and vomiting have also been observed.

Routine investigations including haematological, biochemical, radiological and microbiological tests as necessary. Confirmation of pandemic Influenza A (H1N1) infection is through real time RT PCR or isolation of the virus in culture or four-fold rise in virus specific neutralizing antibodies at designated centres.

Treatment

The guiding principles of treatment are:

1. Early implementation of infection control precautions to minimize nosocomial/household spread of disease. Voluntary home quarantine for close contacts of suspected, probable and confirmed cases for at least 7 days after the last contact with the case.

2. Prompt treatment to prevent severe illness & death.

3. Screening of all individuals seeking consultations for flu like symptoms, examination by a doctor for early identification and follow up of persons at risk. Notify all suspected cases, clusters of ILI/SARI cases to the State Health Authorities and the Ministry of Health & Family Welfare, Govt. of India.

4. Follow guidelines on categorization of Influenza A H1N1 cases during screening for home isolation, testing treatment, and hospitalization.
Category-A

Patients with mild fever plus cough/sore throat with or without bodyache, headache, diarrhoea and vomiting do not require Oseltamivir and give symptomatic treatment. Monitor and reassessment by the doctor at 24 to 48 hours. No testing of the patient for H1N1 is required.

Confine patients to their home and to avoid mixing up with public and high-risk members in the family.

Category-B

i. In addition to all the signs and symptoms mentioned under Category-A, if the patient has high grade fever and severe sore throat, may require home isolation on Oseltamivir.

ii. In addition to all the signs and symptoms mentioned under Category-A, individuals having one or more of the following high-risk conditions shall be treated with Oseltamivir:

- Children with mild illness but with predisposing risk factors; pregnant women; persons aged 65 years or older; patients with lung diseases, heart disease, liver disease, kidney disease, blood disorders, diabetes, neurological disorders, cancer and HIV/AIDS; patients on long-term cortisone therapy.

No tests for H1N1 are required for Category-B (i) and (ii).

Confine all patients of Category-B (i) and (ii) at home and to avoid mixing with public and high-risk members in the family.

Category-C

In addition to the above signs and symptoms of Category-A and B, if the patient has one or more of the following:

- Breathlessness, chest pain, drowsiness, fall in blood pressure, sputum mixed with blood, bluish discolouration of nails.

- Children with influenza-like illness who had a severe disease as manifested by the red flag signs (Somnolence, high and persistent fever, inability to feed well, convulsions, shortness of breath, difficulty in breathing, etc).

- Worsening of underlying chronic conditions.

All patients in Category-C require testing, immediate hospitalization and treatment as follows:

Clinical specimens: Nasopharyngeal swab, throat swab, nasal swab, wash or aspirate, and tracheal aspirate (for intubated patients) to be collected by a trained physician/ microbiologist preferably before administration of the antiviral drug. Specimens should be stored at 4°C in viral transport media and transport samples to designated laboratories within 24 hours. If there is delay in transportation, store samples at –70°C. Also collect paired blood samples at an interval of 14 days for serological testing.
Nonpharmacological

1. Patient should be kept in dedicated isolation room and treated by dedicated doctors, nurses and paramedical workers. If dedicated isolation room is not available, then patients can be cohort in a well-ventilated isolation ward with beds kept one meter apart.
2. Reinforce standard infection control precautions, i.e. all those entering the room must use high efficiency masks, gowns, goggles, gloves, cap and shoe cover.
3. Restrict number of visitors and use personal protective equipment (PPE).
4. Dispose waste properly by placing it in sealed impermeable bags labelled as biohazard.

Pharmacological

1. Tab. Oseltamivir or Syp. (12 mg per ml) both for prophylaxis and treatment. Dose and duration to be modified as per clinical condition, if needed.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Dose</th>
<th>Age</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15 kg</td>
<td>30 mg twice a day for 5 days</td>
<td>&lt;3 months*</td>
<td>12 mg twice a day for 5 days</td>
</tr>
<tr>
<td>15-25 kg</td>
<td>45 mg twice a day for 5 days</td>
<td>3-5 months</td>
<td>20 mg twice a day for 5 days</td>
</tr>
<tr>
<td>24-&lt;40 kg</td>
<td>60 mg twice a day for 5 days</td>
<td>6-11 months</td>
<td>25 mg twice a day for 5 days</td>
</tr>
</tbody>
</table>
| >40 kg | 75 mg twice a day for 5 days | * Chemoprophylaxis not recommended unless situation judged critical due to limited date on use in this age group.

(Caution: Dose dependent (usually above 300 mg/day) transient gastrointestinal side effects (nausea, vomiting); bronchitis, insomnia and vertigo and sporadic transient neuropsychiatric events (self-injury or delirium).

2. Give supportive therapy for fever and upper respiratory symptoms (for details see respective sections).
   Note: Salicylate/aspirin is strictly contraindicated in any influenza patient due to its potential to cause Reye’s syndrome.
3. Monitor suspected cases for clinical/radiological evidence of lower respiratory tract infection and for hypoxia (respiratory rate, oxygen saturation, level of consciousness). Suspected cases not having pneumonia do not require antibiotic therapy. For treatment of pneumonia, see section on Pneumonia in Chapter 5.
4. Maintain airway, breathing and circulation (ABC) (see, section on CPR in Chapter 2).
5. In patients with signs of tachypnoea, dyspnoea, respiratory distress and oxygen saturation less than 90% supplement with oxygen therapy. Mechanical ventilation for patients with severe pneumonia and acute respiratory failure (SpO2 < 90% and PaO2 < 60 mmHg with oxygen therapy). Non-invasive ventilation when mechanical ventilation is not available. Use HEPA filters on expiratory ports of the ventilator circuit/high flow oxygen masks. Administer prophylactic antibiotics to patients on mechanical ventilation.
6. For treatment of shock, see section on Shock in Chapter 1.
7. Maintain hydration, electrolyte balance and nutrition (See respective section for details).

    Expect complications to be similar to seasonal influenza and treat accordingly.

    Immunomodulating drugs and high dose corticosteroids (potential for harm) are not beneficial in treatment of ARDS or sepsis associated multi-organ failure. Low dose corticosteroids (hydrocortisone 200-400 mg/day) may be useful in persisting septic shock (SBP < 90 mmHg).

    Adult and children to be discharged 7 and 14 days after symptoms have subsided, respectively. The family of patients discharged earlier should be educated on personal hygiene and infection control measures at home; children should not attend school during this period.

    Administer chemoprophylaxis to all close contacts of suspected, probable and confirmed cases including health care personnel. Close contacts include household/ social contact, family members, workplace or school contact, fellow travellers, etc. Provide prophylaxis till 10 days after last exposure (maximum period of 6 weeks).

**Patient education**

Mild illness does not need medical care or antiviral drugs, and recover in less than two weeks. Some people, however, are more likely to get flu complications that result in being hospitalized and occasionally result in death. The flu also can make chronic health problems worse such as asthma, chronic congestive heart failure.

The risk of infection and spread of influenza viruses between people, can be reduced by taking a combination of preventive actions including: covering nose and mouth with a tissue while coughing or sneezing and disposal of tissue in the trash after use; hand washing often with soap and water, especially after coughing or sneezing; avoid touching eyes, nose or mouth; avoiding close contact with sick people; staying home from work or school until your own illness is over.

**References**


CHAPTER 6  GASTROINTESTINAL DISEASES

RECURRENT ORAL APHTHOUS ULCERS

SALIENT FEATURES

Single or multiple 1-15 mm size painful ulcers surrounded by erythematous mucosa occurring repeatedly anywhere in the oral mucosa (lip, tongue, soft palate or oropharynx). Usually heal in 1-2 weeks time.

Treatment

Rule out secondary causes like malabsorption syndrome, inflammatory bowel disease, Behcet’s disease and recurrent trauma from tooth/denture and treat accordingly.

Nonpharmacological

Oral hygiene—repeated mouth wash with plain water specially after eating any thing (for details see section on Oral Hygiene in Chapter 20) and avoid constipation.

Pharmacological

1. Symptomatic treatment with application of any gel containing local anaesthetic before taking meals.
2. Only in severe cases with large multiple ulcers.
   Pellets Hydrocortisone 5 mg to be kept on the ulcer and sucked every 4 hours for 3-5 days.
   Or
   Tab. Prednisolone 0.5 mg/kg/day in a single dose for 3-5 days.

Patient education

Maintain good oral hygiene.
Avoid precipitating factors, if any.
Avoid spicy food.
Use soft brush and use straw for drinking.
ACUTE OROPHARYNGO-OESOPHAGEAL CANDIDIASIS

Commonly occurs as opportunistic infection in individuals with uncontrolled diabetes mellitus or immunosuppressed conditions (AIDS, malignancy, chronic steroid therapy, cytotoxic drugs). Usually caused by *Candida albicans*.

**SALIENT FEATURES**

Discrete or confluent curdy white adherent plaques on the oropharyngeal/oesophageal mucosa.

Oral lesions are usually painless but oesophageal involvement produces painful dysphagia.

Diagnosis is confirmed by demonstration of pseudohyphae on wet smears or culture.

**Treatment**

Susp. Nystatin local application in mouth and 100,000 units orally 4 hourly for 5-7 days.

Or

Soln. Clotrimazole 1% to be applied locally for 5-7 days.

Or

Tab. Ketoconazole 200 mg once a day for 7 days. Or

Tab. Fluconazole 100 mg/day for 10-14 days.

**DYSPEPSIA**

A syndrome of chronic or recurrent abdominal pain or discomfort in the upper abdomen. Discomfort is defined as a subjective negative feeling that is nonpainful, and can incorporate a variety of symptoms including early satiety or upper abdominal fullness. Dyspepsia may be organic due to acid-peptic disorders, upper GI malignancy or functional. Also classified as ‘ulcer-like dyspepsia’ (upper abdominal pain related to food intake), ‘dysmotility type’ (nausea, vomiting, belching, early satiety, bloating) or ‘non-specific dyspepsia’. Organic dyspepsia should be excluded by history and upper GI endoscopic examination.
Treatment

**Nonpharmacological**

Avoid excess tea, coffee, alcohol, smoking and anything in the diet that precipitates symptoms. Avoid high-fat meals; eating frequent and smaller meals throughout the day can sometimes be helpful. Avoid specific foods that precipitate symptoms.

**Pharmacological**

Dyspeptic patients over 55 years of age, or those with alarm features should undergo prompt oesophagastroduodenoscopy (EGD) such as unexplained weight loss (>10% body weight), anorexia, early satiety, vomiting, progressive dysphagia, odynophagia, bleeding, anaemia, jaundice, an abdominal mass, lymphadenopathy, a family history of upper gastrointestinal tract cancer, or a history of peptic ulcer, previous gastric surgery or malignancy. A few patients younger than 55 years of age with an upper gastrointestinal malignancy present without alarm symptoms.

A working diagnosis of functional dyspepsia is likely to be appropriate for most patients with dyspepsia who have no alarm features and in whom initial investigations are negative. Repeated or increasingly invasive investigation in pursuit of an organic cause for the symptoms may be both futile and counter-productive. Explain role of life-style and diet. Medication is not necessary for all patients with functional dyspepsia. When medication is given, short-term treatment, intermittent therapy, if necessary, is likely to be more appropriate than long-term continuous therapy.

Test and treat for *Helicobacter pylori* (*H. pylori*) in populations with a moderate to high prevalence of *H. pylori* infection using a validated noninvasive test and a trial of acid suppression, if eradication is successful but symptoms do not resolve. *H. pylori* treat infection with triple regimen (see section on Peptic Ulcer). Assess for clinical response after 4 weeks of the treatment.

Or

In low prevalence situations, Cap. Omeprazole 20 mg once daily 30 minutes before breakfast for 4-6 weeks. If initial acid suppression fails after 2–4 weeks, consider changing drug or dose.

If the patient fails to respond or relapses rapidly on stopping antisecretory therapy, then the test-and-treat for *H. pylori* before consideration of referral for EGD. **EGD is not mandatory in those who remain symptomatic as the yield is low; the decision to endoscope or not must be based on clinical judgement.**

Prokinetic agents (Domperidone or mosapride) are not recommended as first-line therapy for uninvestigated dyspepsia. There is no evidence on the efficacy of antacids in the management of functional dyspepsia.

**Follow-up**

Repeat short courses (4-6 weeks) of the drug or try alternative drug, if patient comes back with relapse after stopping the drug. Long-term treatment may be continued for
up to a year and rule out organic cause. Investigate fully before starting treatment, if patient is over 55 years of age, or those with alarm features.

**Patient education**

Reassure patient that functional dyspepsia is very common and is not itself serious, though the discomfort, pain, distension and fullness which are perfectly genuine, are often unpleasant and bothersome.

Avoid precipitating factors—avoid excess tea, coffee, alcohol and smoking and anything in the diet that precipitates symptoms. Avoid high-fat meals; avoid specific foods that precipitate symptoms.

Eating frequent and smaller meals throughout the day can sometimes be helpful.

**References**


**GASTRO-OESOPHAGEAL REFLUX DISEASE**

A common disorder caused by retrograde flow of gastric contents through an incompetent gastro-oesophageal junction. Dyspepsia is a chronic or recurrent pain or discomfort centred in the upper abdomen; patients with predominant or frequent (more than once a week) heartburn or acid regurgitation, should be considered to have gastro-oesophageal reflux disease (GERD) until proven otherwise.

**SALIENT FEATURES**

Retrosternal pain, heart burn and regurgitation mostly occurring after meals; rarely may present with chronic cough, laryngitis; recurrent pulmonary infections especially in children and bronchospasm.

Disease is classified as mild, if endoscopy reveals no or minimal oesophageal mucosal inflammation and moderate-to-severe, if there are ulcers with or without stricture formation in distal oesophagus.

Diagnosis is by history, upper GI endoscopy. 24-h pH monitoring required in difficult cases.

**Treatment**

*Nonpharmacological*

‘Lifestyle modification’ like weight reduction if obese, elimination of fatty foods, avoiding alcohol, and smoking, excessive consumption of tea/coffee, elevation of
head-end of the bed, taking early dinner (2-3 hours before sleep). Patients with postprandial symptoms are advised to take small frequent meals.

**Pharmacological**
A stepwise approach as indicated below.

**Mild gastro-oesophageal reflux**
For immediate symptomatic relief, Antacid gel (with or without alginate) 10-15 ml or 2-3 tablets (chewed) taken 4-6 times a day ½ to 1 hour after meals; may be given for a long time depending upon patients symptoms. If no relief, add (1) and/or (2) as below.

**Specific therapy**
1. Tab. Domperidone 10 mg 3 times a day 30 minutes before meals for 4-6 weeks or even for longer, if needed.
   Or
   Tab. Mosapride 5 mg 3 times a day 30 minutes before meals for 4-6 weeks or longer, if needed.
2. Cap. Omeprazole 20 mg once daily 30 minutes before meals for 4-6 weeks.

**Follow-up.** Omeprazole courses may be repeated or continued for several months, if patient relapses while on antacids or Domperidone/Mosapride.

**Moderate-to-severe gastro-oesophageal reflux disease**
(endoscopically proved erosive oesophagitis)
1. Cap. Omeprazole 20 mg twice daily 30 minutes before meals for 4 weeks, followed by further 4-8 weeks, if not fully healed.
   Or
   Cap. Lansoprazole 30 mg 2 times a day 30 minutes before meals for 3 months.
   Or
   Tab. Pentoprazole 40 mg 2 times a day 30 minutes before meals for 3 months.

**Follow-up.** Repeat endoscopy after 3 months to confirm healing of oesophagitis. If healed, continue maintenance treatment as in mild reflux disease or single daily dose of 10-20 mg Omeprazole (or any other PPIs). Refer to the specialist, if no or inadequate response.

**Patient education**
Explain about chronic nature of the illness, role of weight reduction and early small night-time meal.
Wearing tight clothes around the abdomen may also increase the reflux.

**References**

PEPTIC ULCER

Acid-pepsin-related ulceration of mucosa of stomach and duodenum.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharp or gnawing epigastric pain, may be worsened (gastric ulcer) or relieved by intake of food (in duodenal ulcer). Nocturnal pain commonly awakens the patient at midnight but early morning pain is very rare. Symptoms are recurrent and periodic.</td>
</tr>
<tr>
<td>Complications include upper GI bleed, perforation and gastric outlet obstruction. 95% of duodenal ulcers and 60% of gastric ulcers are related to <em>H. pylori</em> infection and remaining related to NSAID intake.</td>
</tr>
<tr>
<td>Diagnosis of peptic ulcer is confirmed by upper GI endoscopy. <em>H. pylori</em> infection may be diagnosed by serology, rapid urease test, histopathology of antral mucosa or C13 breath test.</td>
</tr>
</tbody>
</table>

**Treatment**

**Nonpharmacological**

Stop smoking and avoid/minimize intake of NSAIDs or switch over to a safer NSAID.

**Pharmacological**

**Symptomatic treatment**

Cap. Omeprazole 20 mg single dose 30 minutes before breakfast for 6 weeks. 
Or
Antacid gel 10-15 ml or 2-3 tablets (chewed) taken 4-6 times a day half to 1 hour after meals.

It is recommended that the presence of *H. pylori* is confirmed before starting eradication treatment.

**Preferred one week triple therapy for eradication of *H. pylori* regimen**

1. Tab. Omeprazole 20 mg 2 times a day.
2. Tab. Clarithromycin 500 mg 2 times a day.
3. Cap. Amoxycillin 1 g 3 times a day.
   All medicines to be taken 15-30 minutes before meals.

**Alternative regimen.** Replace Tab. Clarithromycin with Tab. Metronidazole 400 mg 3 times a day or Tab. Tinidazole 600 mg 2 times a day given after meals.

Concurrent use of proton pump inhibitors (PPI) and ranitidine is not recommended due to the potential decrease in the PPI effectiveness. In cases of ulcers refractory to Ranitidine, PPI is recommended.

Refractory and recurrent ulcers include ineffective eradication therapy, unidentified use of NSAID and poor compliance with medications regimen, incomplete healing of large ulcers, Zollinger-Ellison syndrome and malignant neoplasms.

In NSAID induced ulcers, discontinue NSAIDs or switch to NSAID with less gastric side effects, take NSAIDs after meals. If NSAID cannot be discontinued, give tab. Ranitidine 150 mg twice a day for 8 weeks.

**Follow-up**

Report to the physician urgently, if vomiting of blood or passage of black tarry stools. Refer to a specialist, if pain becomes continuous, frequent vomiting or symptoms of GI bleed.

**Patient education**

Patient should avoid frequent use of unsupervised pain killers. If these are required on long-term basis, a safer drug should be taken in consultation with a doctor. Smoking should be stopped.

There is no role of bland diet or drinking cold milk in the treatment of peptic ulcer.

**References**


**VOMITING**

Nausea is the unpleasant feeling that one is going to vomit. Vomiting is the forceful expulsion of the gastric contents due to involuntary contraction of abdominal musculature and simultaneous relaxation of gastric fundus and lower oesophageal sphincter. Regurgitation is spitting up of the gastric contents without associated nausea or forceful contraction of abdominal musculature.

**Causes of vomiting**

(a) Central (due to stimulation of vomiting centre)—neurological diseases, raised intracranial pressure, vestibular system disorders, drugs and toxins, any acute
severe pain, toxic or metabolic disorders like ketoacidosis, systemic infections, radiation exposure, pregnancy and psychogenic vomiting.

(b) Peripheral—obstructive lesion of GIT, acute gastritis or gastroenteritis, severe upper GI bleed, etc.

**SALIENT FEATURES**

Excessive vomiting causes loss of salt and water and exhaustion while chronic recurrent vomiting prevents eating and causes starvation. Severe nausea and retching may result in upper GI bleed by causing Mallory-Weiss Tear in oesophagus/cardia of stomach.

A detailed history and clinical examination usually gives a clue to the cause of acute vomiting. For chronic and recurrent vomiting, investigation should be done to exclude a local cause in the GIT, evidence of raised intracranial tension (ICT) or presence of any other neurological condition. Psychogenic vomiting is diagnosed by exclusion of organic causes only.

**Treatment**

**Nonpharmacological**

Acute gastroenteritis is usually self-limiting. Advise the patient to take sips of cold water/ORS.

Prevent motion sickness by avoiding heavy meal before travel.

Give rest to the injured part to prevent severe pain.

**Pharmacological**

Treat the underlying cause (medically or surgically).

Hospitalize the patient to give IV fluids, if dehydrated. Start oral fluids as soon as patient can tolerate. Appropriate analgesics, if patient has severe pain.

For symptomatic relief:

- In acute vomiting in the absence of obstruction to GIT or other organic cause, give Inj. Metoclopramide 10 mg IV and repeat after 6 hours, if needed.
- Or
- Inj. Prochlorperazine 5 mg IM, repeated after 4-6 hours, if needed.

In patients with recurrent vomiting due to gastroparesis (as in diabetes), non-ulcer dyspepsia, give:

- Tab. Mosapride 5 mg 3 times a day. Or
- Tab. Domperidone 10 mg 3 times a day. Or
- Tab. Metoclopramide 10 mg 3 times a day.
To prevent motion sickness, give:
Tab. Cyclizine 50 mg up to 3 times daily. In children: 6-12 years 25 mg up to 3 times daily to be taken half an hour before starting journey.

**Note:** In case of vomiting with cytotoxic chemotherapy for cancer patients.
Tab./Inj. Ondansetron 8 mg 12 hourly. In pregnancy, avoid all drugs, if possible. See section on Nausea and Vomiting in Chapter 15.

**Patient education**

Advise the patient to avoid stale food, cut vegetables/fruits kept in open; drink potable water only; not to take drugs like pain killers frequently without consultation with doctor.

Patient should be encouraged to take small sips of liquids at short intervals to prevent dehydration.

**Reference**


**CONSTIPATION**

Commonest cause of constipation is habitual, the important contributory factors being insufficient dietary fibre, physical inactivity, suppression of defaecatory urges occurring at inconvenient moments, prolonged travel, etc. Constipation may also occur following an attack of diarrhoea after taking a purgative; this needs no treatment. The important secondary causes may include neurological, hormonal, colonic, malignancy, depression. Secondary causes should be looked for in case of recent onset or constipation of severe symptoms.

**SALIENT FEATURES**

Constipation is defined as decrease in frequency and liquidity of stool compared to the normal pattern in a particular individual.

Important complaints suggesting constipation include straining at defaecation >25% of time, lumpy/hard stools, sensation of incomplete evacuation, or less than 3 bowel actions per week.

A rectal examination with a short length colonoscopy is a must for all patients with recent onset of constipation irrespective of bleeding per rectum.

**Treatment**

Acute constipation may be part of a more serious illness such as acute bowel obstruction. In that case, patient has abdominal pain, vomiting and distension and
cannot pass even wind (flatus). Immediately refer such cases to a higher centre. Treatment of habitual constipation is discussed as under.

**Nonpharmacological**

1. Reassurance—since many patients with normal stools and in pregnancy, imagine that they are constipated.
2. High fibre diet and increased intake of fluid with decrease in consumption of caffeinated drinks.
3. Retraining of bowels (avoiding suppression of urge to defaecate, making a regular habit).
4. Bulk forming agents like ‘isapghula husk’ or ‘psyllium seeds’ also help to relieve mild constipation.
5. Regular physical exercise such as walk for 1/2 to 1 hour daily and abdominal exercises.

**Pharmacological**

(Usually required for moderate to severe constipation).

1. Tab Bisacodyl 5-15 mg (1 to 3 tablets) orally once a day, or 10 mg (1 suppository) rectally once a day as needed.  
   Or  
   Lactulose Soln 15-20 ml orally at night.  
   Or  
   Liq paraffin 15-20 ml twice or thrice daily. Or  
   Susp. Magnesium sulphate 15-20 ml at night.  
   Or  
   Tab. Sodium picosulphate 10 mg at night. Or  
   Isotonic polyethylene glycol (PEG) electrolyte solution 125-250 ml.  
   Any of these may be given 2-4 times a week. Some patients may require treatment for several weeks or months, if there is no improvement.
2. Tab. Mosapride 5 mg 2 or 3 times a day. In some patients may be required for several weeks.
3. Phosphate enemas to be used on as and when required basis in patients having acute problem with severe constipation or sub-acute intestinal obstruction.

**Follow-up**

If patient continues to have severe constipation or symptoms worsen, refer the patient to a specialist for investigations to rule out secondary causes. Recent unexplained constipation (not acute) in an elderly person whose bowel habits were always regular should be investigated. Acute constipation especially when the patient is vomiting and has not passed even wind and appears ill, suspect GIT obstruction and refer immediately to a higher centre.
Patient education

1. Do not use purgative frequently to treat constipation as it may form a habit.
2. Do not use purgatives to treat constipation with fever and following heart attack. A suppository or simple enema is preferred.
3. In pregnancy, ispaghula is preferred.

References

(For constipation in children see Chapter-19).

IRRITABLE BOWEL SYNDROME (IBS)

A group of gastrointestinal symptoms associated with lower bowel that occurs in the absence of organic disease.

SALIENT FEATURES

A positive diagnosis of IBS is made using Rome II criteria: At least 3 months continuous or recurrent symptoms of abdominal pain associated with any 2 of the three features, viz. relief by defaecation and/or onset with change in stool frequency or consistency.

The supportive symptoms of IBS include passage of mucous, abnormal stool passage (straining, urgency of feeling of incomplete evacuation) and feeling of abdominal fullness. There should be no alarm symptoms like fever, weight loss, bleeding per rectum or anaemia.

Diagnosis generally by history and physical examination is normal. Sigmoidoscopy, colonoscopy, proctoscopy are done to rule out other causes.

Treatment

Nonpharmacological

Diet should contain high fibre and supplemented with bulk forming agents like ispaghula husk; avoid caffeine and alcohol; assess for lactose intolerance; avoid any other dietary constituent which worsens the symptoms. Hypnotherapy and modified form of psychotherapy may reduce symptoms.

Pharmacological

1. Tab. Mebavarine hydrochloride 270 mg 3 times a day given for long-term
   Or
   Tab. Dicyclomine 10 mg 3 times a day
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Or
Tab. Drotavirine 40-80 mg 3 times a day
Or
Tab. Propantheline hydrochloride 15 mg 3 times a day
2. In individuals complaining of symptoms suggestive of depression Tab.
Amitriptyline 25 mg at bedtime or 2 times a day
3. In case of severe diarrhoea, if symptoms are not controlled by above drugs, give
Tab./Cap. Loperamide hydrochloride 2-4 mg daily for several days/weeks
depending upon the clinical response.

This should be considered only as a temporary management. The final goal of treatment
is gradual withdrawal of medication with substitution of a high-fibre diet.

Follow-up
Symptoms of IBS are life long but vary in intensity. Pharmacological treatment
should be titrated according to the severity of symptoms.

Patient education

Explain the chronic nature of symptoms.

Patient should try to find out correlation of symptom with certain food item,
especially milk ingestion and should avoid these.
Stressful situation also worsen symptom. Relaxing exercises like yoga may help.

References

2. Clinical Approach to Irritable Bowel Syndrome. In: Approach to Patient with Chronic GI
Disorders, 1999; pp 323-29.

ACUTE DIARRHOEA/ GASTROENTERITIS

It is a self-limiting illness characterized by diarrhoea, abdominal cramps, nausea and
vomiting, usually caused by viruses or bacteria (E. coli, V. cholerae, Staph. aureus, Bacillus
cereus, etc). Most of these are noninvasive or toxic diarrhoea. Less commonly, patients
present mainly with diarrhoea with passage of mucous and/or blood in stools. This may be
associated with significant systemic symptoms like fever, malaise, etc. These patients are
more likely to have invasive diarrhoea caused by the bacteria (E. coli, Shigella, Salmonella,
Campylobacter, etc.) or parasite (Amoeba).

Treatment

In acute gastroenteritis, dehydration and electrolyte imbalance is the main problem which
needs attention and there is no need to go for aetiological diagnosis.
Investigations are indicated, if there is bloody diarrhoea, clinical evidence of toxicity or prolonged diarrhoea.

**Nonpharmacological**

Mainstay of treatment is adequate fluid replacement in any form. To prevent vomiting, patient should be asked to take only sips of fluid. Fluids used at home can be juices, soups and glucose/electrolyte drinks (oral rehydration solution). Milk and its products should be avoided initially because of secondary lactase deficiency. High fibre diet should be avoided. (For details of management of moderate to severe dehydration and electrolyte imbalance see section in Chapters 2 and 19).

**Pharmacological**

1. **Indicated only in very ill patients with systemic symptoms** associated with bloody diarrhoea, traveller’s diarrhoea or in cholera infection Tab. Ciprofloxacin 500 mg 2 times a day for 3-5 days.
2. **In amoebic dysentery**
   - Tab. Metronidazole 800 mg 3 times a day for 7 days. Or
   - Tab. Tinidazole 2 g orally as single dose with food.

**In acute Giardia infection**

- Tab. Tinidazole 2 g orally as single dose with food Or
- Tab. Metronidazole 400 mg 3 times a day for 3 days.

**Indications for hospitalization**

Patients with clinical signs of dehydration especially young children or elderly, suspected cholera, immunosuppressed patients and those with severe systemic symptoms.

**Patient education**

Patients should be instructed to continue taking adequate fluids even if it initially causes slight increase in frequency of stools due to increased gastro-colic reflex. They should report to the physician, if they are not able to retain any fluid taken orally and develop significant decrease in urine output.

**References**

A patient is diagnosed as having chronic diarrhoea, if patient continues to have diarrhoea for more than 2 weeks. The important causes of malabsorption in India include tropical sprue, tuberculosis and chronic pancreatitis. Patient should be investigated by a specialist to diagnose the cause of chronic diarrhoea. Tests for malabsorption include faecal fat excretion study, D-xylose absorption, small bowel contrast studies and mucosal biopsy, structural and functional evaluation of pancreas. Diagnosis of ulcerative colitis is confirmed by colonic endoscopy and mucosal biopsy.

**SALIENT FEATURES**

It may be classified as small bowel diarrhoea (bulky, greasy, frothy, foul smelling stools associated with lot of flatulence indicating malabsorption) or large bowel diarrhoea (loose/watery stools mixed with mucous and/or blood—commonly caused by irritable bowel syndrome).

**Treatment (to be treated by a specialist)**

Can be planned only after a proper diagnosis is made. Use of anticholinergics or nonspecific anti-diarrhoeal agents should be discouraged in the absence of proper diagnosis. Treatment of tropical sprue is discussed as under:

**Tropical sprue** diagnosis suggested by clinical history, small bowel barium study (mucosal oedema, flocculation and clumping of barium), jejunal mucosal biopsy (reveals varying degree of mucosal atrophy).

**Nonpharmacological**

Plenty of oral fluids. To reduce the symptoms of diarrhoea during the initial phase of treatment, advise the patient to avoid fatty food and dairy products and take otherwise a balanced diet. These nutrients should be introduced gradually once the patient has been on regular pharmacological treatment.

**Pharmacological**

Treat the underlying cause. If underlying cause is infection, give trial of antibiotics as follows:

1. Tab. Norfloxacin 400 mg 2 times a day. Or
   Tab. Ciprofloxacin 500 mg 2 times a day. Or
   Cap. Doxycycline 100 mg 2 times a day. Or
If the above mentioned drugs are contraindicated, Tab. Cotrimoxazole 960 mg 2 times a day.

2. Tab. Folic acid 5 mg 2 times a day for 3-6 months duration depending upon patient’s response. Other minor nutrient supplements are given, if there is evidence of specific deficiency.

3. For anaerobic infections, Tab. Tinidazole 2 g orally as single dose with food.

**Patient education**

Well-balanced diet including all major and minor nutrients should be taken.

Patient should be advised to follow proper hygienic measures regarding eating habits.

To come back for review, if there is no clinical improvement in 3-4 weeks of treatment.

**Reference**


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**ULCERATIVE COLITIS**

### SALIENT FEATURES

Patient may present in acute stage with bloody diarrhoea, may be associated with systemic symptoms of low to moderate fever, backache, arthralgias.

The diagnosis is confirmed by sigmoidoscopic examination and mucosal biopsies.

The disease almost always involves rectum and rest of the colon may be involved to variable length.

Acute disease is graded as mild (2-4 stool/day), moderate (4-6 stools/day) or severe (>6 stools/day). During remission, patient may be asymptomatic or may have extraintestinal symptoms.

**Treatment**

Aim of the treatment is induction of remission in acute stage and then maintenance of remission.

**Nonpharmacological**

There is no specific dietary restriction but patient may avoid any food, if the patient is uncomfortable.
Pharmacological

A. Mild to moderate acute ulcerative colitis (distal/left colonic involvement)

1. Tab. Sulphasalazine 1 g 3-4 times a day. Or
   Tab. Mesalazine 800 mg 3-4 times a day. Or
   Tab. Olsalazine 1-3 g/day in divided doses.

2. Prednisolone phosphate enema, 20 mg in 100 ml saline 1-2 time a day. Or
   Hydrocortisone enema 100-125 mg in 100 ml saline 1-2 times a day (to be prepared fresh).
   Or
   If disease limited to rectum, Hydrocortisone foam 125 mg 1-2 times a day.

B. Moderate to severe or extensive acute disease

1. Start (1) as above.

2. Tab. Prednisolone 20-60 mg/day in single or divided doses.

Follow-up. If the symptoms do not improve or worsen, hospitalize the patient.

C. Acute severe disease with systemic symptoms (requires hospitalization under the care of specialist)

1. Inj. Hydrocortisone 100 mg IV 4 times a day. Or
   Inj. Dexamethasone 4 mg IV 3-4 times a day.

2. Patient should be kept ‘nil by mouth’ and should be given adequate intravenous fluids and electrolytes.

3. Blood transfusion to be given as per requirement.

4. Patient switched over to oral steroids and amino-salicylates to be started as in A (1) after 5 days, when patient is allowed to take orally.
   If patient fails to respond to steroids, refer the patient to gastroenterologist for immunosuppressive therapy or surgery.
   Once the remission is induced, steroids are tapered slowly over 4-6 weeks period. For acute attack, there is no use of giving steroids for more than 12 weeks.

   Follow-up. Close clinical/biochemical/radiological monitoring is required for any complications like toxic megacolon/perforation.

D. Maintenance of remission

1. Any of the drugs used in A(1) should be given life long.

Patient education

Patient should be followed up at 6 monthly interval and maintenance treatment should be continued.
In any patient who has disease for more than 10 years, a regular sigmoidoscopy and rectal biopsy should be done at 6 monthly interval to look for any dysplasia and total colonoscopic examination should be done at 2-3 years interval. Patient should be explained about chronic nature of the disease and continuation of maintenance treatment for life long with regular follow-up and risk of colonic cancer after 10 years of onset of disease.

Reference

AMOEbic Liver Abscess (ALA)

Liver abscess is the commonest extraintestinal form of amoebiasis, caused by E. histolytica. In endemic areas, usually affects young individuals, more commonly chronic alcoholics. Females are only rarely affected.

**SALIENT FEATURES**

Acute fever, right upper quadrant abdominal pain which may be dull ache or pleuritic in nature. It is less common in elderly and is more likely to be chronic in presentation with low abdominal pain, intermittent fever and general symptoms. Jaundice is uncommon. Complications include rupture of abscess into pleural, pericardial or rarely peritoneal cavity. Elevated blood counts/ESR/serum alkaline phosphatase, one or more hypoechoic lesions in liver on ultrasonography and positive test for antibodies to E. histolytica in high titre help in the diagnosis. Examination of pus of the parasite is usually negative.

Treatment

**Nonpharmacological**

Hydrotherapy, if the fever is high.

**Pharmacological**

1. Tab. Metronidazole 800 mg 3 times a day for 7-10 days Or
   Tab. Tinidazole 2 g as a single dose for 7-10 days

In Children, 50 mg/kg (up to 2 g) orally once a day with food for 3-5 days. Close monitoring is recommended, when treatment duration exceeds 3 days.
If patient is very toxic, Inj. Metronidazole 500 mg given 8 hourly until patient improves. Switch over to oral therapy whenever possible.

**Indications for aspiration of amoebic liver abscess**

1. If doubt about possibility of pyogenic abscess.
2. No improvement with medical–one very close to the surface of liver.
3. Impending rupture of abscess–one very close to the surface of liver.
4. Left lobe abscess if large, to prevent rupture in to pericardium.

**Follow-up**

Monitor the patient for resolution of symptoms with medical treatment and aspirate, if any indication.

Abscess cavity may persist for several weeks even after cure of infection. Therefore, frequent ultrasonographic examinations are un-necessary unless patient develops symptoms; may be repeated after 4-6 weeks after the patient becomes asymptomatic.

After treatment with Metronidazole, Tab. Diloxanide furoate 500 mg 3 times a day for 1 week may be given, especially, if patient is in nonendemic area.

**Patient education**

Avoid taking alcohol specifically on treatment with metronidazole.

Stress the need for maintaining hygiene regarding food intake to prevent enteric infections.

**Reference**


**PYOGENIC LIVER ABSCESS**

Liver abscesses constitute 48% of all visceral abscesses. Pyogenic abscesses in liver are usually caused by spread of infection from peritoneum, abdominal viscera like appendicitis/diverticulitis/portal pyaemia or disease of biliary tract. It is mostly caused by coliform organisms.

**SALIENT FEATURES**

Fever is the commonest symptom, associated with abdominal pain, toxaemia, symptoms of the associated problem like appendicular pain/mass, etc. Mostly abscesses are small and multiple.

Diagnostic investigations include full blood counts, USG of abdomen, blood culture, examination of pus including culture. CT scan, MRI are seldom indicated.
Treatment

Nonpharmacological

Drainage—percutaneous catheter or open surgical—remains the mainstay of treatment.

If patient is toxic, should be kept nil by mouth and given IV fluids as per requirement.

Pharmacological

Initial empirical treatment should include broad-spectrum antibiotic(s):

1. Inj. Ceftriaxone 1-2 g IV 2 times a day
2. Inj. Gentamicin 3 mg/kg/day IV in 3 divided doses
3. If source of abscess is intra-abdominal sepsis, Inj. Metronidazole 500 mg IV 3 times a day should be added.

Follow-up

Monitor for clinical improvement and modify the therapy based on culture sensitivity report.

Abscess should always be drained.

Surgery considered, if no improvement with medical treatment and percutaneous drainage in 4-7 days.

Patient education

Avoid taking alcohol while on treatment with metronidazole.

Stress the need for maintaining hygiene regarding food intake to prevent enteric infection.

Reference


ACUTE PANCREATITIS

Acute inflammation of pancreas, usually caused by alcohol or gallstone migrating through the common bile duct. Less commonly caused by trauma, infections like mumps, ascariasis and drugs like diuretic, azathioprine, etc.

SALIENT FEATURES

Clinically presents as acute onset, constant upper abdominal pain ‘penetrating through to the back’, may be partially relieved by sitting with trunk flexed and knees drawn up. In severe cases, there is anorectal paralytic ileus, vomiting, abdominal distension, jaundice and fever.
Diagnosis is made by detection of increased serum amylase, three or more times the normal, in the absence of salivary gland disease, gut perforation or infarction.

Serum lipase elevation is more specific for pancreatitis. Ultrasonogram or CT scan further help to confirm the diagnosis. Complications include necrosis, haemorrhage, pseudocyst, abscess, pleural effusion, and other end organ failure.

Treatment

In 85-90% case, disease is self-limiting and subsides spontaneously in 3-7 days. There is no proven treatment of acute pancreatitis. Treatment is mainly supportive.

Nonpharmacological

Send blood for complete blood count, amylase, KFT, LFT, blood sugar, serum triglycerides and arterial blood gases. Repeat the test at 48 hours, early if indicated. Start oral intake after 48-72 hours depending upon appearance of bowel sound and relief in pain.

Fats should be avoided until acute phase settles.

Pharmacological

The goals of initial management is fluid replacement, electrolyte balance, calorie support and prevention of local and systemic complications.

Prompt transfer to an intensive care unit should take place for sustained organ failure. Transfer to an intensive care unit (or possibly a step-down care unit) should be considered, if there are signs that suggest that the pancreatitis is severe or is likely to be severe

If no signs of hypovolaemia:
1. Infusion Dextran saline - 1 L
2. Infusion Dextran - 1 L
3. Inj. Potassium chloride (KCl) 60-80 mmol (20 mmol added to 50 ml of IV fluid)
4. If signs of hypovolaemia: Add polymer from degradad gelatin 500-1000 ml.
5. Nasogastric tube aspiration—if evidence of paralytic ileus, abdominal distension and vomiting.
6. Inj. Diclofenac sodium 75 mg IM 2-3 times a day.
7. If pain is not relieved, Inj. Tramadol 50 mg IM, repeated 6-8 hourly, if needed.

Patient with severe necrotizing pancreatitis (as diagnosed by contrast enhanced CT) should be managed by a specialist.

8. Enteral nutrition. Parenteral nutrition is rarely indicated. The route of nutritional support must be tailored to the individual patient, and modified depending on the patient’s response and tolerance.

Use of prophylactic antibiotics to prevent pancreatic infection is not recommended.
Sterile necrosis is best managed medically during the first 2-3 weeks. In case of infected necrosis, CT-guided percutaneous aspiration with Gram’s stain and culture is recommended, when infected necrosis is suspected. Treatment of choice in infected necrosis is surgical debridement. Alternative minimally invasive approaches may be used in selected circumstances.

**Patient education**

Avoid alcohol, avoid fatty food and explain the patient about need of early gallbladder removal in patients with gallstone.

**References**


**CHRONIC PANCREATITIS**

Usually caused by chronic alcohol consumption or possibly malnutrition in tropics.

**SALIENT FEATURES**

Characterized by chronic diarrhoea due to malabsorption, upper abdominal pain and diabetes mellitus.

Diagnosis confirmed by pancreatic function tests, ERCP or MR pancreatography.

**Treatment**

**Nonpharmacological**

Alcohol should be stopped. Dietary modification includes use of ‘coconut oil’ as the source of fat, restriction of sugars/refined carbohydrates, if patient has impaired glucose tolerance.

**Pharmacological**

Aim is to supplement pancreatic lipase during meals (30,000 IU lipase required with each meal)

1. Cap. Pancreatin 170 mg, 2 capsules to be taken during the meal and 2 capsules after the meal.
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2. Cap. Omeprazole 20 mg twice a day to be taken 30 min before meals. Or
   Cap. Lansoprazole 30 mg twice a day. Or
   Tab. Pantoprazole 40 mg twice a day.
3. Tab. Diclofenac 50 mg to be taken as and when required for pain. Or
   Tab Tramadol 50 mg twice a day.
4. If diabetes not controlled with diet, for drug therapy (see section on Diabetes Mellitus).

Patient education

Patient should be regularly followed up for appearance of any specific nutrient deficiency, especially deficiency of fat-soluble vitamins and adequate supplements should be given, if required.

Patient should be explained about giving up alcohol and may require behavioural therapy.

Reference


GASTROINTESTINAL (GI) BLEEDING

Gastrointestinal (GI) bleed may present as occult or overt bleed. Upper GI bleed is defined as bleeding from any site from pharynx to duodenojejunal (DJ) flexure or more specifically up to ligament of Trietz and usually presents as haematemesis or melaena (black, tarry, sticky, foul smelling stools). Bleeding from GIT distal to DJ flexure is called lower GI bleed. Presence of identifiable fresh/altered blood in stool is called haematochezia. Minimum of 60 ml of blood is required in the stomach to produce melaena. Black stools may be seen in patients taking iron, charcoal or bismuth salts.

SALIENT FEATURES

Occult or overt bleed or fresh blood.
For diagnosis of GI bleed, need clinical history, examination and radiological/endoscopic examination.
Active bleed is indicated by presence of fresh blood in vomitus, nasogastric tube aspirate, melaena, passage of fresh blood in stool.

Treatment

Acute GI bleed is an emergency and needs active management. An assessment of activity and severity of bleed should be done immediately.
**Nonpharmacological**

Maintain vital signs (blood pressure, airways, respiration, temperature).

Insert a large bore IV cannula and send the blood samples for Hb, TLC, platelets, coagulation profile, renal and liver function tests, blood grouping and cross-matching.

Start IV fluids like normal saline/ Ringer’s lactate/ polymer from degraded Gelatin.

Severity of GI bleed is assessed as mild (patient has tachycardia but blood pressure is maintained), moderate (tachycardia with postural hypotension, tachypnoea, sweating, cold skin) and severe (hypotension and shock).

Replace blood as soon as available, if moderate to severe bleed or active bleed.

**Pharmacological**

1. **Inj. Ranitidine 300 mg IV if non-variceal upper GI bleed suspected** (patient with known peptic ulcer or reflux disease, taking NSAIDs).

2. If variceal bleed is suspected (chronic alcoholic, jaundice, splenomegaly, dilated abdominal veins, ascites, encephalopathy);
   - **Inj. Octreotide 50 mcg IV immediately followed by 25 mcg/hour infusion.** Or
   - **Inj. Terlipressin 1-2 mg IV given 4-6 hourly.** Or
   - **Inj. Vasopressin 20 IU in 200 ml of normal saline over 20 min.**
     Maintenance dose is given as 100 units in 50 ml of 5% dextrose given as 0.2-0.9 units/min (6-27 ml/h) in the next 24 hours; avoid in ischaemic heart disease (IHD). Nitroglycerine drip can also be used along with this, if systolic BP is >90 mmHg.

3. **In patients with major peptic ulcer bleeding (active bleeding or non-bleeding visible vessel) following endoscopic haemostatic therapy, Inj. Omeprazole or Pantoprazole 80 mg IV bolus followed by 8 mg/hour infusion for 72 hours.**

**Follow-up**

Monitor pulse, blood pressure, urine output and severity and activity of bleed. Presence of identifiable blood/clots per rectum in a patient with upper GI bleed indicates a severe ongoing bleed and need for very active management.

Transfer patient urgently (after starting the above treatment) to a higher centre for further investigations and treatment, if uncontrolled bleed, severe bleed, poor urine output and shock (see also Shock).

**References**


TETANUS

An acute neurological disorder resulting from contamination of a wound (may be a trivial one) by an obligate anaerobic organism \textit{Clostridium tetani}.

**SALIENT FEATURES**

Generalized tetanus, the most common form usually starts with trismus or lockjaw followed by rigidity, violent, painful, generalized muscle spasms and seizures provoked by slightest stimulation. Generalized muscle spasms may compromise respiration. Fever and tachycardia may be present. Mentation is not impaired.

Prognosis and management depend on grade. Poor prognostic features are age > 70 years, heart rate >140/min, BP >140 mmHg, temperature >38.5°C and severe tetanus.

In neonatal tetanus, poor prognostic features are pneumonia, recurrent apnoea, cyanosis and opisthotonus.

**Grade I or mild**—muscle rigidity with few or no spasms.

**Grade II or moderate**—trismus, dysphagia, rigidity, and short-lasting spasms.

**Grade III or severe**—frequent explosive spasms, autonomic dysfunction particularly sympathetic over-activity may be present.

**Grade IV or very severe**—features of grade III plus violent autonomic disturbances involving the CVS—severe hypo- or hypertension.

Other presentations include local, cephalic (cranial nerves) or neonatal tetanus (within 2 weeks of life).

Complications include respiratory failure, respiratory infections, barometric trauma due to prolonged ventilator support, persistent hypotension, labile hypertension, cardiac arrhythmia, sepsis and sudden death.
Treatment

Nonpharmacological

Admit in a quiet room/ICU with minimum stimulation, cardiopulmonary monitoring, protection of airways/respiratory support (intubation/tracheostomy) with or without ventilation, cleaning/exploration/debridement of wound. Maintain hydration and enteral/parenteral nutrition with high calorie and high protein diet.

Pharmacological

Give following to all patients:

1. Inj. Crystalline penicillin 2 mega units 6 hourly IV for 10 days.
   Or
   Inj. Metronidazole 500 mg 8 hourly or 1 g 12 hourly.
   (Other antibiotics may be required according to need of infected wound).
2. Inj. Human Tetanus Immunoglobulin (TIG) 3000-5000 units IV or IM.
   Or
   Inj. Equine antiserum, 10,000 units by slow IV injection after sensitivity test (If Human TIG is not available).
   Antiserum should be given before local manipulation of the wound.

   (Caution: Tetanus immunoglobulin does not produce natural immunity and a full course of immunization with tetanus toxoid should be administered once the patient has recovered).

Grade I tetanus. As above in nonpharmacological

1. Tab. Diazepam 5-20 mg 3 times a day in mild tetanus; slow IV infusion; not to exceed a dose of 80-100 mg in 24 hours.
2. If spasms not controlled.
   Inj. Phenobarbitone 200 mg IM every 8-12 hours. Or
   Inj. Chlorpromazine 50 mg IM in adults 4 times a day.
   The ideal sedative and muscle relaxant schedule for each patient should be individualized. An objective guide to decrease in rigidity is relaxation of abdominal muscles.

Grade II. (1) As above for Grade I

   (2) Tracheostomy.

   (3) Inj. Magensium sulphate 40 mg/kg IV loading dose followed by infusion of 1.5 mg/h to control muscle spasms.

Grade III and IV. (1) As above for Grade II

   (2) Ventilator support.

   (3) Inj. Pancuronium 2-4 mg IV.
   Or
   Inj. Gallamine 20-40 mg IV.

   (4) In case of hypotension
STANDARD TREATMENT GUIDELINES

Inj. Dopamine/Dobutamine 10-40 mcg/kg/min infusion titrated to maintain systolic BP of 100 mm Hg.

If bradyarrhythmias, Inj. Atropine 0.6-1.2 mg

IV. If hypertension, see Chapter 3 for details

References


HIV AND AIDS

HIV has emerged as a global pandemic and as on December 2008, more than 33.4 million people are living with HIV/AIDS worldwide. India has an estimated 2.4 million people living with HIV infection with adult (15-49 y) HIV prevalence at 0.31% in 2009. HIV infection leads to progressive immune deficiency that characterizes the disease and is responsible for the opportunistic infections that complicate the illness. The rate of disease progression is highly variable between individuals, ranging from 6 months to more than 20 years. The median time to develop AIDS after transmission is 10 years in the absence of antiretroviral therapy (ART). The availability of antiretroviral therapy (ART) has dramatically changed the outcome of the patients with HIV infection and has significantly reduced the disease mortality and morbidity.

SALIENT FEATURES

I) Case Definition of AIDS in Children (up to 12 years of age)

The positive tests for HIV infection by ERS (ELISA/RAPID/SIMPLE) in children above 18 months or confirmed maternal HIV infection for children less than 18 months. AND Presence of at least two major and two minor signs in the absence of known causes of immunosuppression.

Major signs:

(a) Loss of weight or failure to thrive which is not known to be due to medical causes other than HIV infection,
(b) Chronic diarrhoea (intermittent or continuous) > 1 month duration,
(c) Prolonged fever (intermittent or continuous) > 1 month duration.

Minor signs:

(a) Repeat common infections (e.g. pneumonitis, otitis, pharyngitis, etc.),
(b) Generalised lymphadenopathy,
(c) Oropharyngeal candidiasis,
(d) Persistent cough for more than 1 month,
(e) Disseminated maculopapular dermatosis
II) Case Definition of AIDS in adults (for persons above 12 years of age)

Two positive tests for HIV infection by ERS test (ELISA/RAPID/SIMPLE) AND

Any one of the following criteria:

(a) Significant weight loss (>10% of body weight) within last one month/ Cachexia (not known to be due to a condition other than HIV infection) AND chronic diarrhoea (intermittent or continuous) >1 month duration or prolonged fever (intermittent or continuous) >1 month duration

(b) Tuberculosis: Extensive pulmonary, disseminated, miliary, extrapulmonary tuberculosis

(c) Neurological impairment preventing independent daily activities, not known to be due to the conditions unrelated to HIV infection (e.g. trauma)

(d) Candidiasis of the oesophagus (diagnosable by oral candidiasis with odynophagia)

(e) Clinically diagnosed life-threatening or recurrent episodes of pneumonia, with or without aetiological confirmation

(f) Kaposi sarcoma

(g) Other conditions: Cryptococcal meningitis, neurotoxoplasmosis, CMV retinitis, Penicillium marneffei, recurrent herpes zoster or multi-dermatomal herpes infection and disseminated molluscum

HIV disease is characterized by three phases: acute primary illness, asymptomatic chronic illness and symptomatic chronic illness.

**Essential laboratory investigations:** HIV serology, CD4+, T lymphocyte counts (if available) or total lymphocyte count (TLC), complete blood count and chemistry profile, pregnancy test.

**Supplementary tests indicated by history and physical examination:** Chest X-ray, urine for routine and microscopic examination, hepatitis C virus (HCV) and hepatitis B virus (HBV) serology (depending on test availability and resources).

**Note:** It is most important to confirm the diagnosis of HIV infection by tests performed by a trained technician, preferably in a diagnostic laboratory (pre- and post-test counselling is a must). The test results should include the type of test performed to establish the diagnosis based on WHO guideline. In case there is any doubt, the test should be repeated in a standard/referral laboratory.

**PRE- AND POST-TEST HIV COUNSELLING**

Counselling is the confidential dialogue between a client and a care provider aimed at enabling the client to cope with stress and take personal decision related to HIV/AIDS. The counselling process includes an evaluation of personal risk of HIV transmission.
and facilitation of preventive measures. This includes information, education and psychosocial support and allows individuals to make decisions that facilitate coping and preventive behaviours. Counselling is an integral part of prevention, diagnosis, management and support of people living with HIV/AIDS. Counselling aims to enable the person to prevent the spread of infection by helping in change of behaviour and lifestyle and provide psychosocial support to individual and family.

**Components of pretest counselling:**

1. Assessment of risk and likelihood and meaning of positive, negative and indeterminate test result.
2. Assess and educate regarding the understanding of HIV transmission and natural history, window period and differentiation between HIV infection and full-blown AIDS.
3. Discuss confidentiality provisions and anonymous testing.
4. Assess psychological stability, social support and impact of a positive result.
5. Ensure follow up and discuss risk reduction plan and referral to other services, if needed.
6. Obtain informed consent for HIV antibody testing.

**Components of post-test counselling:**

1. The results of HIV testing should always be given in person and under all precautions of keeping confidentiality.
2. Disclose test results and provide interpretation (positive, negative, indeterminate) in the context of that person’s risk of infection.
3. If test is negative, readdress and reinforce risk reduction plan especially regarding safer sexual practices. Discuss the need for repeat testing for those with recent (<6 months) exposure or ongoing risk behaviour.
4. If test is positive, counsel about the meaning of a positive HIV test; differentiate with full-blown AIDS and ways to avoid transmitting HIV to others. Assess need for psychological support and provide referrals for medical, psychological or social service, if necessary. Emphasize the importance of early clinical intervention and schedule follow-up visit to assess psychological status and to address partner notification issues.

**Antiretroviral therapy–Assessment for initiation:**

Prior to starting antiretroviral therapy in any HIV infected patient, a thorough assessment of the patient should be performed. The goals of this assessment are:

1. Determine the clinical stage of HIV infection.
2. A detailed history and physical examination that focus on past significant illness (especially related to HIV), identify current, ongoing HIV associated illnesses or opportunistic infections (OI) that require treatment, identify other co-existing medical conditions.
3. Determine the eligibility and need for ART and OI prophylaxis.
4. Laboratory investigations – including a CD4 count that will help in staging the disease and determining the need to start ART.
5. Identify and manage other high-risk behaviours—injecting drug use, unprotected sex, etc.

---

**Fig. 7.1.** Assessment and management of HIV-infected person.

**WHO Clinical staging of HIV/AIDS for adults and adolescents**

**Clinical stage 1**
- Asymptomatic
- Persistent generalized lymphadenopathy

**Clinical stage 2**
- Unexplained moderate weight loss (<10% of presumed or measured body weight)
- Recurrent respiratory tract infections—sinusitis, tonsillitis, otitis media, pharyngitis
- Herpes zoster
Angular cheilitis
Recurrent oral ulceration
Papular, pruritic eruptions
Seborrhoeic dermatitis
Fungal nail infections

Clinical stage 3

Unexplained severe weight loss >10% of presumed or measured body weight
Unexplained chronic diarrhoea of more than 1 month
Unexplained persistent fever >37.5°C intermittent or constant for >1 month Persistent oral candidiasis
Oral hairy leukoplakia
Pulmonary tuberculosis
Severe bacterial infections—pneumonia, empyema, pyomyositis, bone or joint infections, meningitis, bacteremia
Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis
Unexplained anaemia < 8 g/dl, neutropenia < 500 /cumm, and/or chronic thrombocytopenia

Clinical stage 4

HIV wasting syndrome
Pneumocystis pneumonia
Recurrent severe bacterial pneumonia
Chronic herpes simplex infection—orolabial, genital or anorectal >1 month or visceral infection at any site
Oesophageal candidiasis
Extrapulmonary tuberculosis
Kaposi sarcoma
Cytomegalovirus infection—any site
CNS toxoplasmosis
HIV encephalopathy
Extrapulmonary cryptococcosis—including meningitis
Disseminated non-tuberculous mycobacterial infections
Progressive multifocal leucoencephalopathy
Chronic cryptosporidiosis,
isosporiasis Disseminated mycosis
Lymphoma – cerebral or B cell NHL
Invasive cervical carcinoma Atypical disseminated leishmaniasis Recurrent septicaemia
Symptomatic HIV associated nephropathy or cardiomyopathy
Antiretroviral therapy

The goals of ART are:
1. **Clinical goals** – prolongation of life and improvement in quality of life.
2. **Virological goals** – Prolonged suppression of viral replication to undetectable levels (HIV RNA <50-75 copies/ml).
3. **Immunological goals** – immune reconstitution that is both qualitative and quantitative.
4. **Therapeutic goals** – rational sequencing of drugs in a fashion that achieves clinical, virological and immunological goals while maintaining treatment options, limiting drug toxicity and facilitating adherence.
5. **Epidemiological goals** – reduction of transmission of HIV in individuals and in the community.

The currently available antiretroviral drugs are classified as:

**Nucleoside reverse transcriptase inhibitors (NRTIs):** Zidovudine (AZT, ZDV); Stavudine (d4T); Lamivudine (3TC); Didanosine (ddI); Zalcitabine (ddC); Abacavir (ABC); Emtricitabine (FTC); Tenofovir (TDF)

**Non-nucleoside reverse transcriptase inhibitors (NNRTI):** Nevirapine (NVP); Efavirenz (EFV); Delavirdine (DLLV)

**Protease inhibitors (PIs):** Saquinavir (SQV); Ritonavir (RTV); Nelfinavir (NFV); Amprenavir (APV); Indinavir (INV); Lopinavir/ritonavir (LPV); Fosamprenavir (FPV); Atazanavir (ATV); Tipranavir (TPV)

**Fusion inhibitors (FI):** Enfuviritide (T 20)

**CCR5 antagonist:** Maraviroc

**Integrase inhibitor:** Raltegravir

**Initiation of ART based on CD4 count and clinical staging (Table 7.1)**

Though CD4 count is used as a guide to initiate ART, ART must not be delayed in any patient, if he is clinically eligible according to WHO clinical staging. However a CD4 count must be ordered as soon as possible.

**Important points to consider:**
1. Offer ART to symptomatic patients if, CD4 count is 200-350 cells/cu mm.
2. Consider ART in asymptomatic patients with CD4 count 200-350 cells/cu mm and monitor closely for new symptoms.
3. The optimum time to start ART is when the patient is symptomatic and develops the first opportunistic infection (OI).
4. Ensuring good adherence is essential to the success of ART regimen. The patient must be assessed for readiness to start ART and must be counselled in detail about adherence – its benefits and the harms of non-adherence. Patients need at least 2 counselling sessions prior to ART initiation. Many patients may need more than this.
Table 7.1. Guidelines for the initiation of ART based on CD4 count and clinical staging

<table>
<thead>
<tr>
<th>Classification of HIV disease</th>
<th>WHO clinical stage</th>
<th>CD4 not available or pending result</th>
<th>CD4 available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>1</td>
<td>Do not treat</td>
<td>Treat, if CD4 &lt; 200</td>
</tr>
<tr>
<td>Mild symptoms</td>
<td>2</td>
<td>Do not treat</td>
<td>Treat, if CD4 &lt; 200</td>
</tr>
<tr>
<td>Advanced symptoms</td>
<td>3</td>
<td>Treat</td>
<td>Consider treatment if CD &lt;350 and initiate before CD &lt; 200</td>
</tr>
<tr>
<td>Severe / advanced symptoms</td>
<td>4</td>
<td>Treat</td>
<td>Treat irrespective of CD4 count</td>
</tr>
</tbody>
</table>

It is recommended that all patients should be started with a three drug combination from two different classes, namely NRTI and NNRTI (Table 7.2.). Different ART regimen approved for use by NACO are as shown in Table 7.3.

Table 7.2. Preferred ART regimen available through the NACO

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred first-line regimen</td>
<td>AZT + 3TC + NVP</td>
<td>AZT may cause anaemia, which requires Hb monitoring, but is preferred over d4T because of d4T toxicity (lipodystrophy, lactic acidosis, peripheral neuropathy) Patients who develop severe anaemia while on an AZT-based regimen should not be re-challenged with AZT. In such cases, the patient should receive either d4T or TDF in place of AZT. For women with CD4 &gt; 250 cells/mm³, monitor for hepatotoxicity closely, if started on the NVP-based regimen</td>
</tr>
<tr>
<td>Alternative first-line regimens</td>
<td>AZT + 3TC + EFV</td>
<td>EFV is substituted for NVP in cases of intolerance to the latter or if patients are receiving rifampicin-containing anti-TB treatment. EFV should not be used in patients with grade 4 or higher elevations of ALT</td>
</tr>
<tr>
<td></td>
<td>D4T + 3TC + (NVP or EFV)</td>
<td>If the patients have anaemia, a d4T-based regimen should be prescribed</td>
</tr>
</tbody>
</table>

### Table 7.3. The ART regimen approved for use by NACO

<table>
<thead>
<tr>
<th>National ART regimen</th>
<th>Regimen</th>
<th>Indications</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regimen I</td>
<td>Zidovudine + Lamivudine + Nevirapine</td>
<td>“Preferred regimen”</td>
<td>First line regimens available at all ART centers</td>
</tr>
<tr>
<td>Regimen I(a)</td>
<td>Stavudine* + Lamivudine + Nevirapine</td>
<td>For patients with Hb &lt; 9 g/dl</td>
<td>Alternate first line ART made available at 10 centers of excellence</td>
</tr>
<tr>
<td>Regimen II</td>
<td>Zidovudine + Lamivudine + Efavirenz</td>
<td>Preferred for patients on anti-tuberculosis treatment and Hb &gt; 9 g/dl</td>
<td></td>
</tr>
<tr>
<td>Regimen II (a)</td>
<td>Stavudine* + Lamivudine + Efavirenz</td>
<td>For patients on anti-tuberculosis treatment and Hb &lt; 9 g/dl</td>
<td></td>
</tr>
<tr>
<td>Regimen III</td>
<td>Tenofovir + Lamivudine + Nivirapine</td>
<td>For patients not tolerating ZDV or d4T on an NVP-based regimen</td>
<td></td>
</tr>
<tr>
<td>Regimen III (a)</td>
<td>Tenofovir + Lamivudine + Efavirenz</td>
<td>For patients not tolerating ZDV or d4T on an EFV-based regimen</td>
<td></td>
</tr>
<tr>
<td>Regimen IV</td>
<td>Zidovudine + Lamivudine + Atazanavir/Ritonavir</td>
<td>For patients not tolerating both NVP and EFV, and Hb &gt; 9 g/dl</td>
<td></td>
</tr>
<tr>
<td>Regimen IV (a)</td>
<td>Stavudine + Lamivudine + Atazanavir/Ritonavir</td>
<td>For patients not tolerating both NVP and EFV, and Hb &lt; 9 g/dl</td>
<td></td>
</tr>
<tr>
<td>Regimen V</td>
<td>Tenofovir + Lamivudine + Atazanavir/Ritonavir</td>
<td>Second line ART made available at 10 centres of excellence</td>
<td></td>
</tr>
</tbody>
</table>

**Dosages:**

- **Stavudine** – 30 mg twice daily
- **Zidovudine** – 300 mg twice daily
- **Lamivudine** – 150 mg twice daily
- **Nevirapine** – 200 mg once daily as lead in dose for 2 weeks followed by 200 mg twice daily
- **Efavirenz** – 600 mg once daily
Drug combinations and strategies NEVER to be used:
1. Monotherapy or dual therapy for the management of HIV infection
2. Combination of AZT and 3TC
3. d4T and ddI
4. Unboosted PIs
5. Structured treatment interruptions

Important considerations:
1. Nevirapine is the first choice NNRTI in ART regimens. Efavirenz is preferred over NVP when:
   a. There is significant NVP toxicity
   b. Patients have associated TB
2. Efavirenz is contraindicated in pregnant HIV-infected women.
3. Do not start ART in the presence of an active, ongoing OI. OIs should be treated or at least stabilized before ART is started.
4. Follow-up and monitoring is essential in patients initiated on ART.
5. Monitor for clinical effect, adverse effects and toxicities.
   The Table 7.4 highlights the major toxicities observed with the ARVs.

Definition of ART failure (first line regimen):
1. **Clinical failure**: New or recurrent WHO stage 4 condition after at least 6 months of ART
2. **Immunological failure**:
   a. Fall of CD4 count to pre-therapy or baseline
   b. 50% fall from the on treatment peak value
   c. Persistent CD4 levels below 100 cells/cu mm
3. **Virological failure**: Plasma viral load > 10,000 copies/ml

Table 7.4. Major drug toxicities

<table>
<thead>
<tr>
<th>Toxicity</th>
<th>Possible drug responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis</td>
<td>NVP, EFV, uncommon with NRTIs</td>
</tr>
<tr>
<td>Acute pancreatitis</td>
<td>ddI, Lamivudine</td>
</tr>
<tr>
<td>Lactic acidosis</td>
<td>All NRTIs</td>
</tr>
<tr>
<td>Hypersensitivity</td>
<td>NVP, Abacavir</td>
</tr>
<tr>
<td>Rash, Stevens Johnson syndrome</td>
<td>NVP, EFV (rarely)</td>
</tr>
<tr>
<td>Peripheral neuropathy</td>
<td>Stavudine, ddI</td>
</tr>
<tr>
<td>Haematological toxicity—anaemia</td>
<td>ZDV</td>
</tr>
<tr>
<td>Lipodystrophy</td>
<td>All NRTIs especially d4T</td>
</tr>
<tr>
<td>Neuropsychiatric symptoms</td>
<td>EFV</td>
</tr>
<tr>
<td>Dyslipidaemia, insulin resistance</td>
<td>All protease inhibitors</td>
</tr>
<tr>
<td>Renal toxicity</td>
<td>Indinavir</td>
</tr>
<tr>
<td>GI intolerance</td>
<td>Most ARVs</td>
</tr>
</tbody>
</table>
OCCUPATIONAL HIV EXPOSURE AND HIV POST-EXPOSURE PROPHYLAXIS (PEP)

PEP refers to the comprehensive management given to minimize the risk of infection following potential exposure to blood-borne pathogens (HIV, HBV, HCV). This includes counselling, risk assessment, relevant laboratory investigations based on informed consent of the source and exposed person, first aid and depending on the risk assessment, the provision of short term (4 weeks) of antiretroviral drugs, with follow-up and support. The following stepwise approach to occupational exposure is recommended:

Step 1: Management of exposure site—first aid

For skin—If the skin is broken after a needle-stick or sharp instrument:
Immediately wash the wound and surrounding skin with water and soap, and rinse. Do not scrub; do not use antiseptics or skin washes (bleach, chlorine, alcohol, betadine).

After a splash of blood or body fluids to unbroken skin:
Wash the area immediately; do not use antiseptics.

For the eye:
Irrigate exposed eye immediately with water or normal saline.

For mouth:
Spit fluid out immediately; rinse the mouth thoroughly, using water or saline and spit again. Repeat this process several times; do not use soap or disinfectant in the mouth.

Step 2: Define the category of exposure

Category definition

Mild exposure: Mucous membrane/non-intact skin with small volumes, e.g. a superficial wound (erosion of the epidermis) with a plain or low caliber needle, or contact with the eyes or mucous membranes, subcutaneous injections following small-bore needles.

Moderate exposure: Mucous membrane/non-intact skin with large volumes or percutaneous superficial exposure with solid needle, e.g. a cut or needle stick injury penetrating gloves.

Severe exposure: Percutaneous with large volume, e.g. an accident with a high caliber needle (>18 G) visibly contaminated with blood; a deep wound (haemorrhagic wound and/or very painful); transmission of a significant volume of blood; an accident with material that has previously been used intravenously or intra-arterially.
Step 3: Determination of risk in source

HIV negative – source is not HIV infected but consider HBV and HCV.

Low risk – HIV positive and clinically asymptomatic.

High risk – HIV positive and clinically symptomatic (see WHO clinical staging)

Unknown – status of the patient is unknown, and neither the patient nor his/her blood is available for testing (e.g. injury during medical waste management the source patient might be unknown). The risk assessment will be based only upon the exposure (HIV prevalence in the locality can be considered).

Table 7.5. Determine the risk for exposure to assess need for PEP

<table>
<thead>
<tr>
<th>Exposure</th>
<th>HIV + and asymptomatic</th>
<th>HIV + and clinically symptomatic</th>
<th>HIV status unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Consider 2-drug PEP</td>
<td>Start 2-drug PEP</td>
<td>Usually no PEP or consider 2-drug PEP</td>
</tr>
<tr>
<td>Moderate</td>
<td>Start 2-drug PEP</td>
<td>Start 3-drug PEP</td>
<td>Usually no PEP or consider 2-drug PEP</td>
</tr>
<tr>
<td>Severe</td>
<td>Start 3-drug PEP</td>
<td>Start 3-drug PEP</td>
<td>Usually no PEP or consider 2-drug PEP</td>
</tr>
</tbody>
</table>

Regimens of PEP:

<table>
<thead>
<tr>
<th>Medication</th>
<th>2-drug regimen</th>
<th>3-drug regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zidovudine (AZT)</td>
<td>300 mg twice a day</td>
<td>300 mg twice a day</td>
</tr>
<tr>
<td>Stavudine (d4T)</td>
<td>30 mg twice a day</td>
<td>30 mg twice a day</td>
</tr>
<tr>
<td>Lamivudine (3TC)</td>
<td>150 mg twice a day</td>
<td>150 mg twice a day</td>
</tr>
</tbody>
</table>

1st choice: Lopinavir/ritonavir (LPV/r)
400/100 mg twice a day or
800/200 mg once daily with meals
2nd choice: Nelfinavir (NLF)
1250 mg twice a day or
750 mg three times a day with empty stomach
3rd choice: Indinavir (IND)
800 mg every 8 hours and drink 8-10 glasses
(≥ 1.5 litres) of water daily

Note: If protease inhibitor is not available and the 3rd drug is indicated, one can consider using Efavirenz (EFV 600 mg once daily).
Table 7.6. Tuberculosis and HIV infection

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Presenting signs and symptoms</th>
<th>Diagnostics (laboratory, X-ray and others)</th>
<th>Management and treatment</th>
<th>Unique features, prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary tuberculosis</td>
<td>Cough for &gt;2 weeks, not responding to antibiotic treatment</td>
<td>Chest X-ray: Miliary pattern, hilar adenopathy, pleural effusion, focal infiltrates in upper and hilar regions</td>
<td>The management and treatment of TB is as per RNTCP guidelines following the DOTS regimen. Start ART after 2 weeks of initiation of ATT for all patients with CD4 &lt;350 cells/cu mm (as soon as patient is stabilized). For patients with CD4 &gt;350, defer ART</td>
<td>More common with HIV and worsens HIV disease. Atypical presentation if there is severe immunosuppression. Pulmonary TB at any CD4 level; disseminated TB usually at CD4 &lt;200 cells/cu mm</td>
</tr>
<tr>
<td>Purulent or blood-stained sputum</td>
<td>Night sweats</td>
<td>Interstitial infiltrates</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight loss</td>
<td>Cavitation with severe immunosuppression, X-ray might appear normal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evening fevers</td>
<td>Sputum in adults: 2 samples recommended: one on the spot, one early morning (day 2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Extrapulmonary TB and HIV: Start ART after 2 weeks of initiation of ATT in all patients irrespective of CD4 count (as soon as patient is stabilized, special attention to monitoring hepatotoxicity).

For details of prevention of parent to child HIV transmission (PPTCT), see Chapters 15 and 19.

OPPORTUNISTIC INFECTIONS

Definition of opportunistic infections (OIs)

An opportunistic infection is a disease caused by a microbial agent in the presence of a compromised host immune system. Acquired immunodeficiency syndrome (AIDS) is defined as the occurrence of life-threatening OIs, malignancies, neurological diseases and other specific illnesses in patients with HIV infection and CD4 counts <200 cells/cu mm. The appearance of many OIs correlates with the CD4 count. Tuberculosis (TB) generally develops at CD4 counts of 200–500 cells/cu mm, as does Candida albicans infection Pneumocystis jiroveci pneumonia (PCP, earlier known as Pneumocystis carinii) generally occurs at CD4 counts <200 cells/cu mm and cytomegalovirus (CMV) infection occurs when the CD4 count falls below 100 cells/cu mm.
In the West, the incidence of OIs has markedly declined because of the widespread availability of highly active antiretroviral therapy (HAART). However, OIs continue to contribute significantly to the morbidity and mortality in resource-limited countries, though the increasing availability of ART will help reduce this.

Table 7.7. Common opportunistic infections and their management

I. Pneumocystis carinii pneumonia (PCP)

*Pneumocystis carinii* pneumonia is a fungus that infects the lungs

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Typically fever, dry cough and progressive difficulty breathing. Also weight loss, night sweats and fatigue.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation time frame</td>
<td>Subacute onset of symptoms over a period of weeks</td>
</tr>
<tr>
<td>CD4 count</td>
<td>&lt;200</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>X-ray, induced sputum or bronchoscopy, serum LDH.</td>
</tr>
<tr>
<td>Severity of disease</td>
<td>Severe disease – breathless at rest or PaO&lt;sub&gt;2&lt;/sub&gt;&lt;50 mmHg breathing room air.</td>
</tr>
<tr>
<td></td>
<td>Moderate disease – breathless on minimal exertion, PaO&lt;sub&gt;2&lt;/sub&gt; 50-70 mmHg breathing room air at rest.</td>
</tr>
<tr>
<td></td>
<td>Mild disease – breathless on moderate exertion, PaO&lt;sub&gt;2&lt;/sub&gt; &gt; 70 mmHg breathing room air at rest.</td>
</tr>
<tr>
<td>Preventive therapy (prophylaxis)</td>
<td>Indicated when CD4+ cell counts equal or are below 200 and/or symptomatic HIV.</td>
</tr>
<tr>
<td></td>
<td>Preferred: TMP/SMX (two single-strength tablets daily or one double-strength tablet daily or three times a week). A gradual increase in TMP/SMX dose may help reduce the incidence of an adverse reaction to the drug.</td>
</tr>
<tr>
<td>Stopping preventive therapy</td>
<td>Able to stop, if CD4 cell count remain above 200 for more than 3 months measured on 2 separate occasions over at least 3 months on highly active antiretroviral therapy.</td>
</tr>
<tr>
<td>Treatment</td>
<td>Management of PCP depends on the degree and severity of disease</td>
</tr>
<tr>
<td></td>
<td>1. Severe disease – hospitalize, intravenous TMP/SMX (3-4 mg/kg/day for 21 days), supplemental oxygen. Patients with severe hypoxaemia (PaO&lt;sub&gt;2&lt;/sub&gt; &lt;70 mm Hg breathing room air at rest) should be given corticosteroids (prednisolone 1 mg/kg per day for 5 days with gradual tapering of dose until completion of acute treatment.</td>
</tr>
<tr>
<td></td>
<td>2. Moderate disease – an oral regimen can be used and management can proceed on an out-patient basis, although hospitalization should be considered. Recommended oral regimen: TMP/SMX 480 mg 2 tabs twice a day for 21 days.</td>
</tr>
<tr>
<td>Toxicities of treatment</td>
<td>TMP/SMX – hypersensitivity (typically fever and maculopapular rash), nausea and vomiting, bone marrow toxicity, hepatitis, Dapsone– hypersensitivity, haemolysis in people with G6PD deficiency</td>
</tr>
<tr>
<td></td>
<td>Clindamycin – hypersensitivity, diarrhoea</td>
</tr>
</tbody>
</table>
Atovaquone – hypersensitivity, GI, hepatitis
Pentamidine – renal impairment, pancreatic, cardiac dysrhythmias, hypotension

**Alternative therapies**

- Dapsone 100 mg once a day for 21 days – preferred second line option
- Clindamycin 450 mg 4 times a day + primaquine 15 mg once daily for 21 days
- Trimethoprim 300 mg once a day for 21 days
- Atovaquone 750 mg once a day for 21 days
- Pentamidine (intravenous) 3-4 mg/kg/day for 21 days

**Maintenance therapy**

Everyone who has had PCP should be on maintenance therapy. The choice is the same as those for primary preventive therapy.

**Stopping maintenance therapy**

There is some evidence that it may be possible to stop maintenance therapy, if CD4 cell counts stay above 200 on antiretroviral therapy. However, there is insufficient data to make a current recommendation.

---

**II. Oesophageal candidiasis**

Candidiasis is a fungal infection that frequently occurs in the mouth and vagina. It is considered to be an opportunistic infection when it occurs in the oesophagus.

**Symptoms**
Difficulty in swallowing, painful swallowing, or retrosternal discomfort. Weight loss is common.

**Presentation time frame**
Subacute over weeks

**CD4 count**
<100

**Diagnosis**
Usually made clinically in the presence of oral candidiasis and dysphagia. Endoscopy is only indicated in those who fail to respond to a clinical trial of appropriate treatment. The diagnosis of oesophageal candidiasis should be reconsidered, if oral candidiasis is not present. Associated fever and oral ulceration are not common.

**Preventive therapy (prophylaxis)**
Not recommended because current drugs effectively treat the disease, antifungal resistance may develop, and drug-drug interactions may occur.

**Treatment**
Fluconazole 100-200 mg once a day for 2 weeks is the treatment of choice.

**Alternative treatment**
Amphotericin 0.3-0.5 mg/kg/day;

**Maintenance therapy**
Fluconazole (50-100 mg once a day)

**Stopping maintenance therapy**
There is evidence that patient who achieves CD4 counts >100 on ART may cease maintenance therapy.
III. Cryptococcosis

*Cryptococcus* is a fungus that is inhaled but has a predilection for the meninges

**Symptoms**
- Meningitis – headaches, nausea, fever, malaise, altered mental status, irritability and seizures. Lung involvement may co-exist – cough, chest pain, breathlessness.

**Presentation**
- Subacute with progressive symptoms over weeks to months or acute with symptoms over days.

**CD4 count**
- <100

**Diagnosis**
- Usually by lumbar puncture to test for presence of *Cryptococcus* or cryptococcal antigen in cerebral spinal fluid, India Ink preparation.
- ICP is often raised, CSF protein and glucose are generally normal and there may be few white blood cells.

**Preventive therapy**
- Not currently recommended (prophylaxis)

**Treatment**
- Preferred: IV Amphotericin B (0.5-0.8 mg/kg daily) + Flucytosine (100 mg/day) 4 times a day) for 2 weeks then Fluconazole (400 mg daily) for 8 to 10 weeks.
- Alternative treatment: Liposomal Amphotericin

**Maintenance therapy**
- Fluconazole 200 mg once a day.
- Pregnant women should avoid azole drugs.

**Stopping maintenance therapy**
- Not currently recommended because of the few people studied.
- Cohort studies suggest that maintenance therapy can be ceased in patients with sustained CD4 response to ART (CD4 >200) for >3 months.

---

IV. Toxoplasmosis

Toxoplasmosis is a parasite that has a predilection for the brain

**Symptoms**
- Altered mental state (confusion, unusual behaviour), headache, fever, seizures, paralysis and coma.

**Presentation**
- Acute to subacute over days to weeks

**CD4 count**
- <100

**Diagnosis**
- Typical appearance on CT (computed tomography) or MRI (magnetic resonance imaging) scan. Diagnosis is frequently presumptive on the basis of appearance on scan. If no response to appropriate empirical anti-toxoplasmosis therapy after 2 weeks, then consider brain biopsy to rule out CNS lymphoma.

**Preventive therapy**
- Indicated when CD4+ cell counts are below 200 (for primary PCP prophylaxis).
- Preferred: TMP/SMX (1 double-strength every 12 hours three times a week; or a single-strength or 1 double-strength tablet once a day).

**Stopping preventive therapy**
- CD4+ cell counts above 200 for over 3-6 months.
**Treatment**

Pyrimethamine 100-200 mg loading dose and then 50-75 mg once a day given in combination with sulphadiazine 4-6 g/day 4 times a day or Clindamycin 2.4 g/day 4 times a day for 6 to 8 weeks duration depending upon response if sulphadiazine is used then Folinic acid 25 mg once a day should be given to prevent haematological toxicity.

Corticosteroids may be used in the presence of significant cerebral oedema.

**Alternative treatment**

Pyrimethamine in combination with one of the following:

- Azithromycin 1-1.5 mg/day
- Atovaquone 3 g/day
- Dapsone 100 mg/day
- Clarithromycin 2 g/day

**Maintenance therapy**

Preferred: Pyrimethamine (25-75 mg once a day) + sulphadiazine (500-1,000 mg four times a day for several days with leucovarin.)

**Stopping maintenance therapy**

Stopping maintenance therapy is not currently recommended

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**V. Cryptosporidiosis**

Cryptosporidiosis is a parasite that infects the GI tract and can cause symptoms

**Symptoms**

Chronic diarrhoea with frequent watery stools, abdominal cramps, nausea, fatigue, weight loss, loss of appetite, vomiting, dehydration, electrolyte imbalance (especially sodium and potassium) and fever.

**Presentation time frame**

Acute to chronic presentation over days to weeks or months in some cases

**CD4 count**

<100

**Diagnosis**

Stool examination for detection of acid-fast oocysts in the stool or biopsy of small intestine. A specific request for examination for Cryptosporidiosis is required (special lab techniques are needed)

**Preventative therapy (prophylaxis)**

There are no proven effective therapies.

There is no good evidence that boiling water or the use of water filters prevents disease

**Treatment**

There are no proven effective therapies.

Symptomatic treatment includes Loperamide, codeine and somatostatin analogues. Nitazoxanide up to 2 g/day can be used.

Immune recovery induced by ART alone results in excellent clinical responses.

**Maintenance therapy**

There are no proven therapies that prevent cryptosporidiosis.
## OI Prophylaxis:

<table>
<thead>
<tr>
<th>Opportunistic Infection</th>
<th>Primary Prophylaxis Indicated when CD4 is</th>
<th>Drug of Choice</th>
<th>Discontinue Primary Prophylaxis when CD4 is</th>
<th>Discontinue Secondary Prophylaxis when CD4 is</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCP</td>
<td>&lt;200</td>
<td>TMP-SMX 1 daily</td>
<td>&gt;200</td>
<td></td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>&lt; 100</td>
<td>TMP-SMX 1 DS daily</td>
<td>&gt;200</td>
<td></td>
</tr>
<tr>
<td>CMV Retinitis</td>
<td>Not indicated</td>
<td>Secondary: oral ganciclovir</td>
<td>Not applicable</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Cryptococcus Meningitis</td>
<td>Not indicated</td>
<td>Secondary: oral fluconazole</td>
<td>Not applicable</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Oral and Oesophageal Candidiasis</td>
<td>Not indicated</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not indicated</td>
</tr>
</tbody>
</table>

DS—double strength

### References

CHAPTER  8  PARASITIC INFECTIONS

INTESTINAL PROTOZOAL INFECTIONS

Amoebiasis and giardiasis are the commonest intestinal protozoal infections. Patients of amoebiasis and giardiasis commonly present as asymptomatic carriers.

Amoebiasis (intestinal)

Infection is caused by intestinal protozoa—Entamoeba histolytica. Infection usually spreads by infective cysts in stool which contaminate food and drinking water.

SALIENT FEATURES

Lower abdominal pain, mild diarrhoea develop gradually and may lead to full blown dysentery.

0-12 stools per day with blood and mucous and little faecal matter. Caecal involvement may mimic acute appendicitis.

Chronic form, i.e. amoebic colitis, can be confused with inflammatory bowel disease. Other form of chronicity may present as amoeboma.

Untreated or incompletely treated intestinal infection may result in amoebic liver abscess and involvement of other extraintestinal site.

Diagnosis made by demonstration of cysts and/or trophozoites of Entamoeba histolytica in the stool.

Treatment (asymptomatic cyst passers)

Tab. Diloxanide furoate 500 mg 8 hourly for 10 days.

Treatment (acute amoebic dysentery and chronic infections)

1. Tab. Metronidazole 400-800 mg 8 hourly orally with food for 10 days. In children, 15 mg/kg divided in three doses for 7 days.

Or

Tab. Tinidazole (300 mg, 500 mg and 1 g) 2 g orally as single dose with food. In children, 50 mg/kg as a single dose.
2. Tab. Diloxanide furoate 500 mg 8 hourly for 10 days. In children, 20 mg/kg/day in three divided doses for 10 days.

Fulminant amoebic colitis may occur and present with more severe diarrhoea, abdominal pain and fever leading to intestinal perforation. For treatment of amoebic liver abscess (see Chapter 6 on Gastrointestinal Diseases).

**Giardiasis**

Intestinal disease caused by protozoal parasite—*Giardia lamblia*. The disease spreads by direct faeco-oral transmission.

<table>
<thead>
<tr>
<th><strong>SALIENT FEATURES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute giardiasis</strong>—Although diarrhoea is common, upper intestinal manifestations like abdominal pain, bloating, belching, flatulence, nausea and vomiting may predominate. Duration is usually more than 1 week.</td>
</tr>
<tr>
<td><strong>Chronic giardiasis</strong>—History of one or more episodes of acute diarrhoea, increased flatulence, loose stools, abdominal distension, borborygmi, eructation of foul-tasting gas and passage of foul-smelling flatulence, and weight loss. Symptoms could be intermittent, recurring and gradually debilitating; Severe disease may result in malabsorption, weight loss, growth retardation and dehydration.</td>
</tr>
<tr>
<td>Diagnosis is made by the demonstration of cysts and/or trophozoites of <em>G. lamblia</em> in the stools.</td>
</tr>
</tbody>
</table>

**Treatment**

Tab. Tinidazole 2 g as a single dose with food.
In children, 50 mg/kg as a single dose with food.
Or
Tab. Metronidazole 400 mg every 8 hours for 7 days with food.
In children, 15 mg/kg divided in three doses for 7 days.

**Patient education**

These infections are spread by ingestion of food or water contaminated with cysts. Properly cooked food, use of clean drinking water, proper sanitation, good personal hygiene and hand washing with soap after defection and before meals may prevent infection.

Infection can be minimized by avoiding eating unpeeled fruits and vegetables. Side effects of medications are usually mild and transient and include nausea, vomiting, abdominal discomfort, metallic taste and a disulfiram like reaction, therefore, avoid use of alcohol during treatment.
WORM INFESTATION

The majority of worm infestations are asymptomatic.

Hookworm Infestation

Infection is caused by *A. duodenale* and *N. americanus*. The infective larvae penetrate through skin usually foot and travels through subcutaneous tissue to the intestines. The adult forms live in the jejunum and feed on blood thus, leading to chronic blood loss and anaemia.

**SALIENT FEATURES**

- Most of the affected individuals may be asymptomatic. Patients usually present with symptoms of anaemia (hypochromic microcytic).
- Pruritic maculopapular dermatitis (ground itch) at the site of skin penetration by infective larvae.
- Serpigenous tracts of subcutaneous migration in previously sensitized hosts.
- Mild transient pneumonitis because of larvae migration through lungs.
- Intestinal manifestations—epigastric pain often with post-prandial accentuation, inflammatory diarrhoea.
- Major consequences—progressive iron deficiency anaemia and hypoproteinaemia leading to weakness, shortness of breath and skin depigmentation.
- The condition is diagnosed by the demonstration of ova of *A. duodenale* and/or *N. americanus* in the stool and occult blood.

**Treatment**

Tab. Mebendazole 100 mg 12 hourly for 3 days in children above 2 years of age. (Caution: Contraindicated in children less than 2 years)

Or

References

STANDARD TREATMENT GUIDELINES

Tab. Pyrantel Pamoate (250 mg); Syr. (250 mg/5 ml) 10 mg/kg body weight once daily for 3 days.

(Caution: Not recommended in children below one year of age)

In children more than 1 year, Susp. Pyrantal pamoate 10 mg/kg as a single dose. Or
Tab. Albendazole 400 mg as a single dose.

In children between 1-2 years of age, Syr. Albendazole 200 mg as a single dose: In children more than 2 years, Syr. Albendazole 400 mg as a single dose.
For treatment of anaemia (see section on Anaemia).

Patient education

Hookworm infestation occurs through skin penetration by the infective larvae. The disease can be prevented by use of boots and gloves while working in the fields.
The deworming agents should not be used in pregnancy, lactation and along with alcohol.
Side effects of these drugs are generally mild which may include nausea, abdominal pain, headache, dizziness, malaise and skin rash.

ASCARIASIS (ROUN DWORM INFESTATION)

Ascariasis is caused by Ascaris lumbricoides, the largest intestinal nematode parasite of humans reaching up to 40 cm in length. The worm is usually located in the small intestine. Infection spreads by orofaecal route.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most infected individuals have low worm burden and are asymptomatic.</td>
</tr>
<tr>
<td>Features of pulmonary involvement because of larval migration include irritating nonproductive cough, bronchospasm or pneumonitis and burning substernal discomfort aggravated by coughing or deep inspiration, dyspnoea, fever, eosinophilic pneumonitis.</td>
</tr>
<tr>
<td>Heavy intestinal infection—pain abdomen, small bowel obstruction which may get complicated by perforation, intussusception or volvulus. Aberrant migration of a large worm may cause biliary colic, cholangitis, cholecystitis, pancreatitis and oral expulsion of the worm.</td>
</tr>
</tbody>
</table>

Treatment

Tab. Mebendazole 100 mg 12 hourly for 3 days.

(Caution: Contraindicated in children less than 2 years) Or
Tab. Pyrantel pamoate 11 mg/kg as a single dose. Or
Tab. Albendazole 400 mg as a single dose. In heavy infestation, however, a 2-3 day course is indicated.

(Caution: Contraindicated in pregnancy)

In children between 1-2 years: Albendazole Susp (200 mg/5 ml) 200 mg as a single dose; in children more than 2 years Syr./Tab. Albendazole 400 mg as a single dose.

Partial intestinal obstruction may be managed with nasogastric suction, IV fluid administration and instillation of piperazine through nasogastric tube. Complete obstruction and other surgical complications require surgical referral for intervention.

**Patient education**

Infection occurs mainly via faecally contaminated soil and via eggs borne on vegetables and food.

Proper sanitation and good personal hygiene – hand washing with soap after defaecation and before meals may prevent infection.

Infection can be minimized by avoiding unpeeled fruits and vegetables and use of clean drinking water.

**ENTEROBIASIS**

Infection is caused by *Enterobius vermicularis* (pinworm). Adult pinworm is around 1cm long and dwells in the lumen in the small and large intestine around caecum area. The eggs are transmitted by hand to mouth passage.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most pinworm infestations are asymptomatic.</td>
</tr>
<tr>
<td>Cardinal symptoms are perianal pruritis because of deposition of eggs in the perianal area, worse at night due to migration of female worms. Excessive itching can lead to perianal excoriation and bacterial superinfection. Sometimes also associated with enuresis in children.</td>
</tr>
<tr>
<td>Heavy infection causes abdominal pain and weight loss.</td>
</tr>
<tr>
<td>Rarely, in females, vulvovaginitis and pelvic or peritoneal granulomas occur. Eosinophilia.</td>
</tr>
<tr>
<td>Diagnosis is made by demonstration of the ova of <em>Enterobius vermicularis</em> in perianal swabs or a cellophane tape should be pressed against perianal skin. In the morning, when the child gets up, eggs stick to the tape and can be examined under the microscope.</td>
</tr>
</tbody>
</table>

**Treatment**

Tab. Mebendazole 100 mg as a single dose in adults and children more than 2 years of age.

(Caution: Contraindicated in pregnancy and in children below two years of age). Or
STANDARD TREATMENT GUIDELINES

Tab. Pyrantel pamoate 11 mg/kg body weight as a single dose. Or
Tab. Albendazole 400 mg as a single dose.

Children (1-2 years) Syr. Albendazole 200 mg as a single dose; More than 2 years 400 mg as a single dose.
Repeat treatment after two weeks.

Assessment of response of worm infestation to therapy
Clinical improvement.
Repeat stool, perianal swab examination for ova of Enterobius vermicularis.
Absolute eosinophil count, haemoglobin and peripheral blood smear examination at monthly intervals for 3-6 months.
Serum albumin level in hookworm infection.

Patient education
Treatment of all family members is required to eliminate asymptomatic reservoirs of potential reinfection.
Proper sanitation and good personal hygiene, nail hygiene and clipping, hand washing with soap after defaecation and before meals may prevent infection.
Infection can be minimized by avoidance of unpeeled fruits and vegetables and use of clean drinking water.
Regular washing and disinfection of linen.

References

KALA-AZAR

Also called visceral leishmaniasis, caused by Leishmania donovani, a protozoan transmitted mostly through bite of sandfly.
LEISHMANIASIS

Leishmaniasis is caused by parasitic protozoa of the genus *Leishmania*. Humans are infected via the bite of phlebotomine sandflies, which breed in forest areas, caves, or the burrows of small rodents. There are four main types of the disease:

In cutaneous forms, skin ulcers usually form on exposed areas, such as the face, arms and legs. These usually heal within a few months, leaving scars.

Diffuse cutaneous leishmaniasis produces disseminated and chronic skin lesions resembling those of lepromatous leprosy. It is difficult to treat.

In mucocutaneous forms, the lesions can partially or totally destroy the mucous membranes of the nose, mouth and throat cavities and surrounding tissues.

Visceral leishmaniasis, also known as kala-azar, is characterized by high fever, substantial weight loss, swelling of the spleen and liver, and anaemia. If left untreated, the disease can have a fatality rate as high as 100% within two years.

SALIENT FEATURES

Fever, abdominal discomfort due to a large spleen, weight loss, malaise and general debility.

Physical signs usually depend upon the duration of disease. Early cases may present with asymptomatic splenomegaly. Late cases are generally wasted, febrile and show hyperpigmentation of face, hands and feet.

Spleen is generally massively enlarged; liver is usually moderately enlarged and lymphadenopathy may be present.

Complications include extreme wasting and intercurrent infections. Untreated, 80-90% of patients die.

Diagnosis is suggested by clinical features, presence of pancytopenia, hypergammaglobulinaemia and hypoalbuminaemia and rapid dipstick test based on the recombinant K39 protein, confirmed by demonstration of LD bodies in the bone marrow/splenic aspirate. Serological tests (ELISA) are useful for field diagnosis.

Treatment

Blood transfusion.

Nonpharmacological

Cold sponging, rest and high protein diet.
Pharmacological

Nonspecific. (1) Tab. Paracetamol 500-1000 mg 6-8 hourly to reduce fever.
(2) Treatment of intercurrent infections.

Specific.

Inj. Sodium Stibogluconate 200 mg test dose followed by 20 mg/kg IM slow IV injection to reduce the risk of local thrombosis for 28 days. IM injection is painful thus IV route is preferred although cough is the common side effect specially when the volume is high.

Or

Inj. Amphotericin B 1 mg/kg/day on alternate day for 15 days. (Caution: Vomiting and diarrhoea seen commonly; cause hepatotoxicity, renal toxicity, cardiac toxicity, the treatment of the patients under strict supervision and on indoor basis should be undertaken.)

Drug of choice in patients not responding to Sodium Stibogluconate.

Or

Tab. Miltefosine in adults (>12 years and weight >25 kg) 100 mg/day in two divided doses after meals for a period of 28 days. In adults (<25 kg) 50 mg once daily after food for 28 days.

In children (2-11 years), 2.5 mg/kg daily after meals, i.e. 50 mg/day once a day for 28 days

(Caution: NOT to be used in children below 2 years and in pregnancy, or women in child bearing age not using any contraceptive or lactating mothers).

TREATMENT with Miltefosine is provided as Directly Observed Therapy (DOTS). Stop miltefosine, if any skin rashes or gastrointestinal symptoms develop and refer the patient to higher treatment centre. Consider monitoring of renal and hepatic functions wherever feasible as about 1% patients may develop nephrotoxicity or hepatotoxicity.

Other drugs that have been found useful are:

Inj. Pentamidine isoethionate 4 mg/kg/day for 15-30 days IV/IM or alternate day. (Caution: Adverse effects include nephrotoxicity, bone marrow suppression, hypoglycaemia, diabetes mellitus, pancreatitis and arrhythmia related sudden death)

Or

Inj. Aminosidine (Aminoglycoside) 12-15 mg/kg/day IM for 21 days per-orally particularly in HIV positive patients.

Clinically, patient feels better and becomes afebrile during the first week of treatment. Return of pancytopenia, abnormal liver function, serum albumin, splenomegaly and weight gain may take weeks or months.

Reassessment at 6 weeks and 6 months to detect any relapse.

Patient is said to be cured, if no clinical relapse occurs during the first 6 months of follow-up. There is no need to prove absence of parasite as a marker for cure.
Treatment of relapse
Inj. Sodium Stibogluconate 20 mg/kg/day for at least 8 weeks with frequent monitoring for parasite count.
Or
Inj. Amphotericin B in doses mentioned above. Or
Liposomal Amphotericin B 2-5 mg/kg/day IV on days 1-5, 14 and 21 for a total of 21 mg/kg.

Post-kala-azar dermal leishmaniasis (PKDL)
Tab. Miltefosine in adults (>12 years and weight >25 kg) 100 mg/day in two divided doses after meals for a period of 28 days. In adults (<25 kg), 50 mg once daily after food for 12 weeks.
In children (2-11 years), 2.5 mg/kg daily after meals, i.e. 50 mg/day once a day for 12 weeks.
(Caution: NOT to be used in children below 2 years and in pregnancy, or women in child bearing age not using any contraceptive or lactating mothers). Treatment with Miltefosine is provided as Directly Observed Therapy (DOTS) Or
Patient not responding to the first-line of drug or the drug is discontinued due to toxic effect, women during pregnancy, lactating mothers and their babies, children less than two years of age, PKDL patient with liver or kidney disease Inj. Amphotericin B 1 mg/kg/day very slowly IV infusion in 6 to 8 hours in 5% dextrose after mixing the drug in water for injection for up to 60-80 doses over 4 months. (Caution: Vomiting and diarrhoea seen commonly; cause hepatotoxicity, renal toxicity, cardiac toxicity, the treatment of the patients under strict supervision and on indoor basis should be undertaken.)
(Caution: Follow standard protocols for hydration premedication and renal function monitoring). Adverse effects include nephrotoxicity).

Special situations
Patients co-infected with HIV respond slowly, require longer treatment and are more liable to relapse.

Monitoring for drug side effects.
Sodium Stibogluconate: Patient may have myalgia, arthralgia, fatigue, elevated transaminases, chemical pancreatitis and ECG abnormalities in the form of increased QTc interval or concave ST segment may occur. LFT need to be monitored regularly.
Pentamidine can cause nephrotoxicity and diabetes.
Amphotericin B can cause nephrotoxicity, therefore, monitor for nephrotoxicity.
References


CHAPTER 9  CENTRAL NERVOUS SYSTEM DISEASES

MIGRAINE
Benign and recurring syndrome of headache, nausea, vomiting and other neurological symptoms in various admixtures.

SALIENT FEATURES

<table>
<thead>
<tr>
<th>A. At least 5 attacks fulfilling criteria B-D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Headache attacks lasting 4-72 h (untreated or unsuccessfully treated)</td>
</tr>
<tr>
<td>C. Headache has at least two of the following characteristics:</td>
</tr>
<tr>
<td>1. Unilateral location</td>
</tr>
<tr>
<td>2. Pulsating quality</td>
</tr>
<tr>
<td>3. Moderate or severe pain</td>
</tr>
<tr>
<td>4. Aggravation by or avoidance of routine physical activity.</td>
</tr>
<tr>
<td>D. During attack at least one and the following</td>
</tr>
<tr>
<td>1. Nausea and/or vomiting</td>
</tr>
<tr>
<td>2. Photophobia and phonophobia</td>
</tr>
<tr>
<td>E. Not attributed to another disorder.</td>
</tr>
</tbody>
</table>

- Migraine may also be preceded by focal neurological phenomenon called “aura” most commonly experienced as visual alteration (flickering lights, spots; loss of vision) but it may involve sensory symptoms (pins and needles numbers) or fully reversible dysphasic speech disturbance.
- May be mild (nondescript-tight band like discomfort often involving the entire head) or severe throbbing headache associated with vomiting, scalp tenderness with or without other neurological features.

Treatment

Nonpharmacological

Identify and avoid trigger factors such as alcohol, foods (chocolate, cheese), irregular sleep patterns and stress levels. Also assess menstrual cycle relationships in female patients.
Pharmacological

A staged approach to migraine pharmacotherapy

1. **In case of mild migraine**, i.e. occasional throbbing headaches, no major impairment of functioning.
   
   Tab. Aspirin 650 mg stat; if required can be repeated after 4 hours. Or
   
   Tab. Ibuprofen 400-800 mg stat; if required can be repeated after 6 hours; maximum 3 times/day.
   
   Or
   
   Tab. Paracetamol 1000 mg stat; if required can be repeated after 4 hours. Or
   
   Cap. Indomethacin 50 mg stat; if required can be administered 3 times a day. If associated nausea and vomiting, Tab. Metoclopramide 10 mg stat.

2. **In case of moderate to severe headache**, i.e. three severe attacks of headache a month with significant impairment of functioning and marked nausea or vomiting.
   
   Tab. Ergotamine 2 mg sublingual at onset and after half an hour (maximum 6/day, 10/week).
   
   Or
   
   Tab. Ergotamine (1 mg) + Caffeine (100 mg) 1/2 tab at onset, then 1 tab half hourly (maximum 6/day, 10/week).
   
   Or
   
   Tab. Ergotamine (2 mg) + Caffeine (100 mg) suppository; 1 suppository at onset (max 6/day, 10/week).
   
   (A subnauseating dose should be determined preferably during headache free period).
   
   Or
   
   Tab. Sumatriptan 25-100 mg orally at onset. Or
   
   Inj. Sumatriptan 6 mg SC at onset (may repeat once in 24 hours).
   
   (Caution: Contraindicated in ischaemic heart disease and hypertension).
   
   Or
   
   Inj. Diclofenac 75 mg IM at onset.
   
   Refer patient with severe migraine to hospital, if attack is not controlled by above and if the patient is dehydrated. Also consider prophylactic medications.

**Hospital management of acute migraine**

1. Inj. Metoclopramide 10 mg IV.

2. Inj. Sumatriptan 6 mg SC (may repeat once in 24 hours).

   (Caution: Contraindicated in ischaemic heart disease and hypertension).

   Or

   Inj. Prochlorperazine 12.5 mg in 25-50 ml saline slow push over 2 minutes can be given twice or thrice a day.

   Or
Inj. Chlorpromazine 7.5-20 mg in 25-50 ml saline slow push over 2 minutes can be given twice or thrice a day.

(Caution: Monitor carefully for orthostatic hypotension. Administer IV diphenhydramine, if acute dystonic reaction occurs).

3. In severe headache unresponsive to other drugs, Inj. Pethidine 50-100 mg IM as a single dose.

4. Status migranous (A debilitating migraine attack lasting for more than 72 hours) Inj. Dexamethasone 4 mg/ml 2 ml IV 8 hourly for 2 days.
   Or
   Inj. Sodium Valproate 500 mg IV 8 hourly for 2 days.

Prophylaxis

Consider prophylactic treatment, if number of attacks is two or more attacks per month or each attack is very severe necessitating loss of work time. Frequent headaches (more than two a week) or a pattern of increasing attacks with risk of developing medication overuse headache or failure of, contraindication to, troublesome side effects from acute medications.

Prophylaxis treatment

In addition to the above nonpharmacological and pharmacological treatment of the acute episode, consider following depending on co-morbidity:

- Tab. Atenolol 80-320 mg daily. Or
- Tab. Metoprolol 100-450 mg daily. Or
- Tab. Propranolol 80-320 mg daily. Or
- Tab. Amitriptyline 10-50 mg at bed time. Or
- Tab. Cyproheptadine 4-16 mg daily in children. Or
- Tab. Flunarizine 5-10 mg daily. Or
- Tab. Topiramate 50-200 mg daily for obese patients Or
- Tab. Sodium Valproate 50-100 mg/day for obese patients

The goals of preventive therapy are as follows: reduce attack frequency, severity, and/or duration, improve responsiveness to acute attacks, and reduce disability. Start the chosen drug at a low dose and increase it slowly until therapeutic effect or side effects develop. Give each treatment an adequate trial. A full therapeutic trial may take 2-6 months. If found to be effective, it should be continued for at least 6 months and then slowly tapered to assess its continued need. If headache recurs after discontinuation of prophylactic therapy, the medication regime should be reinstated for another 6 months trial.
Patient education

Avoid precipitating factors like lack of sleep, glare, anxiety, hunger, foods like processed cheese, banana, chocolates, wine, etc.
Avoid overdose or frequent use of ergot preparation as these can cause hypertension and precipitate vascular disease.
Drug for acute migraine should be taken as early as possible at the onset.
Regular, more than twice a week, or increasing consumption of analgesics over time are alarms that require attention.
Behavioural intervention relaxation techniques and stress management techniques.

References


NEUROCYSTICERCOSIS

This is the most common parasitic disease of CNS worldwide produced by invasion of the CNS by the cystic stage (cysticercus) of pork-tapeworm (Taenia solium). Human beings acquire the disease, when they ingest the food or water contaminated with the eggs of T. solium.

SALIENT FEATURES

The clinical features depend upon site and number of cysts in the CNS, and the inflammatory response of the CNS. It can remain silent or present most commonly with seizures, encephalitis, meningitis, hydrocephalus, or increased intracranial pressure.
Neurologic, cognitive or personality disorder may be the presenting features and decreased visual acuity may be seen in ocular cysticercosis.
In spinal neurocysticercosis, cord compression, nerve root pain, transverse myelitis, or meningitis.
Neuroimaging (CT/MRI) is the investigation of choice.

Treatment

The aim of therapy is to control symptoms, i.e. convulsions and hydrocephalus.

Pharmacological

Antiepileptic drugs (for control of seizure, see Epilepsy section in Chapter 1). If there is no calcification and the patient is free of seizures for 2 years, treatment can be gradually discontinued.
Cysticidal drugs accelerate the destruction of the parasites, resulting in faster resolution of the infection. Refer the patient to a hospital (to a physician or neurologist) for supervised treatment with following:

Tab. Albendazole 15 mg/kg/day (max 800 mg/day) in 2 divided doses per day for 8 days, taken with fatty meals. Before administering a two to three days priming with Tab. Prednisolone 1 mg/kg for 3 days.

(Caution: Absolute contraindications are ocular cyst, or spinal medullary cysts, heavy cyst burden, increased intracranial pressure).

Surgical treatment is indicated in case of ocular cysticercosis, ventricular cyst or hydrocephalus.

**Patient education**

Prolonged freezing or thorough cooking of pork to kill the parasite.

Personal hygiene and thorough washing and avoiding unpeeled fruits and vegetables in areas endemic for *T. solium* helps prevent ingestion of eggs.

All members of a family of an index case of cysticercosis should be examined for the presence of eggs or signs of disease.

**References**


**ACUTE BACTERIAL MENINGITIS**

The three main pathogens, *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Neisseria meningitidis*, account for 75-80% of cases after the neonatal period. There has been a worldwide increase in infection with strains of *S. pneumoniae* resistant to penicillin and other beta-lactam antibiotics (second- and third-generation cephalosporins).

**SALIENT FEATURES**

Fever with prominent headache, neck stiffness, photophobia, nausea, vomiting and altered mental status (lethargy to coma).

Infants, elderly, and immunocompromised patients may show only mild behavioural changes with low-grade fever and little clinical evidence of meningeal inflammation.

Approximately, 15% of all patients, and 40% of older patients, demonstrate focal cerebral findings, and 20-50% of patients develop seizures at some time during the course.
Diagnosis

Blood cultures, urgent lumbar puncture (LP). In case with focal findings or clinical evidence of raised intracranial pressure (ICP), contrast-enhanced cranial computed tomography (CECT) before LP.

CSF examination reveals elevated pressure (200-500 mm H₂O) and protein (100-500 mg/dl, normal 15-45 mg/dl), decreased glucose (<40% of serum glucose), and marked pleocytosis (100-10,000 white blood cells/μl, (normal <5) with 60% or greater polymorphonuclear leucocytes.

The CSF Gram’s stain result is positive in at least 60% of cases, and CSF culture results are positive in approximately 75%. The likelihood of finding Gram’s stain or culture-positive CSF may decrease, if antibiotics are administered before doing LP. Early in disease, 10-20% of patients have CSF cell counts less than 1,000 cells/μl. Otherwise, cell counts below 1,000 cells/μl in a patient with a compatible clinical syndrome indicate partially treated meningitis, concurrent immunosuppression, or a nonbacterial cause. Petechial or purpuric rash suggests N. meningitidis, or, less often, Staphylococcus aureus, Pneumococcus, or the Rickettsiae.

Treatment

Nonpharmacological

Hospitalize in a quiet place with no bright lights preferably in ICU.

Maintain vitals, endotracheal intubation in patient with poor respiratory effort.

Elevation of head to 30° and hyperventilation, if evidence of raised intracranial pressure.

Pharmacological

Empiric antimicrobial to be initiated based on the patients age and underlying disease status; once a bacterial pathogen is isolated, antimicrobial therapy can be modified for optimal treatment.

1. Inj. Ceftriaxone 4 g/day in 2 divided doses administered every 12 hours. It can also be administered as a single dose.
   
   Or
   
   Inj. Cefotaxime 8-12 g/day, in divided doses administered every 4 hours.

   If age is more than 50 years to cover Listeria monocytogenes and Pseudomonas or in immunocompromised patients.

   Inj. Ceftazidime 8 g/day in divided doses administered every 6 hours plus

   Inj. Ampicillin 10-12 g/day in divided doses every 4 hours.

   Or

   In case of resistant Gram-negative infection and are sensitive to Inj. Meropenem 1-2 g 8 hourly.

   Continue treatment for 10-14 days with antibiotics. Clinical response is observed within 24-48 hours. Repeat lumbar puncture after 48 hours especially if on dexamethasone.
2. In case of head trauma, CSF rhinorrhoea, intracranial shunt or history of neurosurgical intervention, when penicillin or cephalosporin resistant strains of *Streptococcus pneumoniae* are suspected, add
   Inj. Vancomycin 500 mg IV 6 hourly.

3. In *H. influenzae* type-B meningitis, pneumococcal meningitis in children and in children over 2 months of age with neurological sequelae
   Inj. Dexamethasone 0.15 mg/kg every 6 hour IV for 2 days. It should be started at the same time or shortly before, the first dose of antibiotic (not effective, if given after antibiotics).

4. In patient with papilloedema, altered sensorium, 6th nerve palsy, convulsions or decerbrate posturing
   Inj. Mannitol 20% 1 g/kg stat followed by 0.5 g/kg every 4-6 hours.

5. Chemoprophylaxis for close contacts of patients with meningococcal meningitis
   Cap Rifampicin 600 mg twice a day 5 days
   Or
   Cap Ciprofloxacinc 500 mg single dose
   Or
   Tab. Ofloxacin 400 mg single dose
   Or
   Inj. Ceftriaxone 250 mg IM single dose.

*Note:* Diagnosis and management of underlying cause, e.g. CSOM is important.

**Patient education**

Explain to the relative that in unconscious patient nothing should be administered orally until patient recovers his level of consciousness.

**References**


**TUBERCULOUS MENINGITIS**

<table>
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<th>SALIENT FEATURES</th>
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<td>TB meningitis should be staged depending on the clinical symptomatology.</td>
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**Clinical staging of patients with tuberculous meningitis**

Stage I (early): Nonspecific symptoms and signs, no clouding of consciousness, no neurologic deficits.
Stage II (intermediate): Lethargy or alteration in behaviour, meningeal irritation, minor neurologic deficits (cranial, nerve palsies).

Stage III (advanced): Abnormal movement, convulsions, stupor or coma, severe neurologic deficits (paresis).

Typically, the CSF is clear or slightly opalescent. There is a moderate degree of pleocytosis (usually less than 500 cells), with a predominant lymphocyte response. Biochemical examination reveals raised protein, usually below 200 mg%. But in late cases and particularly when a spinal block develops the protein content may be as high as 1 to 1.5 g%. Sugar is reduced to 40 mg% or below. Smear-positivity has been reported in less than 10% of samples.

A diagnosis of tuberculous meningitis is often made, if a clinical syndrome is accompanied by a consistent CSF profile, evidence of tuberculosis elsewhere in the body or response to specific antimycobacterial therapy in the absence of evidence for other diagnosis.

Treatment

Patient should be hospitalized.

1. Intermittent short course chemotherapy regimens of 6-9 months are recommended for all forms of extrapulmonary TB. In patients with poor or no response at 8 weeks of intensive phase may be given benefit of extension of IP for one more month. In case of TBM the continuation phase shall be extended by 3 months making the total duration of treatment to a total of 9 months. A further extension may be done for 3 more months in continuation phase (making the total duration of treatment to 12 months) on a case to case basis in case of delayed response and as per the discretion of the treating physician. (for details of therapy, see Tuberculosis in Chapter 1).

2. Corticosteroids are indicated in stage II or III disease or in case of the impending or established spinal block and are given for 3-6 weeks and tapered slowly over 2–4 weeks.
   Inj. Dexamethasone 8-16 mg/day in divided doses in adults.
   In children: 8 mg/day or 0.3-0.6 mg/kg/day.
   Or
   Tab. Prednisolone 60 mg/day or 1 mg/kg/day.

3. Urgent neurosurgical consultation and intervention (ventricular shunt) in case of hydrocephalus.

4. If signs and symptoms of increased intracranial pressure manage accordingly.

5. Seizures to be controlled with antiepileptic drugs (see section on Epilepsy in Chapter 1).

References


HERPES SIMPLEX ENCEPHALITIS

Herpes simplex encephalitis (HSE) is the most common cause of fatal sporadic acute encephalitis having a mortality of 70-80%, and leaves many survivors severely disabled, without any significant predilection for age, sex, race or season.

**SALIENT FEATURES**

The clinical hallmark of the HSE is acute/subacute onset of fever, headache, altered consciousness and focal neurologic symptoms/signs, especially personality/behavior changes suggestive of a temporal lobe/frontal involvement.

CSF shows mononuclear pleocytosis (50-200 cell/mm³), mildly raised protein and normal or mildly decreased sugar.

The diagnosis is confirmed by CSF-PCR suggestive of HSV expression in CSF and contrast-enhanced MRI. EEG usually shows abnormality (slow waves/PLEDS) localized to temporal/frontal lobes.

High index of suspicion is required and diagnosis should be considered in any patient with progressive deteriorating level of consciousness, fever, abnormal CSF and focal neurological signs in the absence of other causes.

**Treatment**

Hospitalize the patient preferably in a set-up with ICU facilities.

**Nonpharmacological**

In patients with signs of increased intracranial pressure, raise head end of patient by 30°, intracranial pressure monitoring, and hyperventilation in intensive care unit.

Maintain adequate hydration, however, in patients with syndrome of inappropriate ADH secretion (SIADH), restrict fluid intake.

(Caution: Prevent dehydration).

**Pharmacological**

For seizures (see section on Status Epilepticus).

1. Inj. Mannitol 20% 1 g/kg stat followed by 0.5 g/kg every 4-6 hours.
   Or
   Sol. Glycerol 30 ml 6 hourly orally.

2. Start empirical treatment with Acyclovir in all cases at a very early stage or suspected of HSE pending confirmation of the diagnosis.
   (Role of steroids is controversial).

   Inj. Acyclovir 10 mg/kg 8 hourly for 10 days. The drug should be diluted to a concentration not exceeding 7 mg/ml and infused slowly over 60 minutes (can cause local phlebitis, if extravasation occurs).

   If diagnosis of HSE is definite, give treatment for 21 days to prevent relapse.
However, in a stable patient without documented evidence of HSE including negative CSF-PCR and a normal MRI, acyclovir can be discontinued after 5 days of presumptive treatment.

**Patient education**

Unlike most viral infections this is treatable and the drug used is quite safe.

**Reference**


(For treatment of acute meningoencephalitis in children see Chapter – 19).

**JAPANESE ENCEPHALITIS**

Japanese encephalitis (JE) is an acute viral infection of the central nervous system caused by JE virus which is a flavivirus. The virus is transmitted by the bite of infected Culex mosquitoes. Culex tritaeniorhynchus is the principal vector of the disease in South East Asia. The mosquito becomes infected by feeding on pigs and wild birds infected with the JE virus. The infected mosquitoes then transmit the virus to human and animals during the feeding process. The transmission reaches its dead end in human. The disease is not directly transmitted from person-to-person. The incubation period is usually 6 to 16 days (usually 4-6 days).

**SALIENT FEATURES**

Mild infections may occur without apparent symptoms other than fever with headache. More severe infection is marked by rapid onset, headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions (especially in infants) and paralysis. Case fatality rates range from 10 to 35%. Neurological-movement disorder (Parkinson’s features, dystonia, dyskinesia), seizures, focal weakness or mental retardation, and psychiatric sequelae are common among survivors.

Diagnosis of JE infections can be made by serological tests, such as haemagglutination-inhibition test, by demonstrating a fourfold rise in antibody (IgG) titres in paired sera or IgM antibody in serum and CSF.

CT/MRI helps differentiating Japanese encephalitis from herpes simplex encephalitis and shows low density non-enhancing areas in thalamus, basal ganglia and brainstem.

**Treatment**

Treatment of JE is supportive and symptomatic with mannitol, steroids, antiepileptic drugs and IV fluids.
Patient education

As JE is a mosquito-borne disease, measures should be taken to eliminate mosquito breeding sites and prevent mosquito bites.

Vaccination is indicated mainly for person spending 30 days or more in a rural agricultural endemic area during the transmission season.

For initial immunization, usually two doses of JE vaccine are administered at an interval of 1-2 weeks and single booster dose at 1 year. Immunity may take one month to develop. Revaccination is recommended at 3 years interval.

Common reported side effects include local reactions at the injection site, and mild systemic symptoms such as headache, myalgia, gastrointestinal symptoms and fever.

Reference


STROKE

Cerebrovascular disease (CVD)/stroke refers to rapidly developing clinical syndrome of focal or global loss of brain functions lasting for more than 24 hours or leading to death with no apparent cause other than that of vascular origin. Transient ischaemic attacks (TIAs) refer to when focal or global cerebral dysfunction disappears within 24 hours. Most TIAs last for less than 30 minutes. Stroke is not a homogeneous condition. There are clear pathological subtypes—cerebral infarction, primary intracerebral haemorrhage and subarachnoid haemorrhage with over 100 potential underlying causes. Pre-hospital stroke identification and prompt transfer of patient to a center well equipped with stroke management is very important.

SALIENT FEATURES

Presentation varies depending on the site of involvement – carotid circulation stroke presents with hemiplegia and/or aphasia. Vertebrobasilar insult produces dysphagia, dysarthria, diplopia, dizziness/crossed signs or coma.

Diagnosis of stroke to be ascertained clinically supported by brain imaging (plain CT/MRI) within 48 hours and not later than 7 days but urgently, if: Level of consciousness is depressed; history of head trauma, severe headache at onset; history of fever, neck stiffness, papilloedema; indications for thrombolysis or anticoagulation or history of anticoagulation.

Cardiac status for associated coronary artery disease.

Treatment

The overall goal is to minimize acute brain injury and maximize patient recovery. The guidelines for stroke also include the management of patients with TIAs. The term stroke should be understood to encompass TIA.
The “D’s of Stroke Care” remain the major steps in diagnosis and treatment of stroke and for identification of the key points at which delays can occur.

Detection: Rapid recognition of stroke symptoms
Dispatch: Early activation and dispatch of emergency medical services (EMS) system by calling 102
Delivery: Rapid EMS identification, management, and transport
Door: Appropriate triage to stroke centre
Data: Rapid triage, evaluation, and management within the emergency department (ED)
Decision: Stroke expertise and therapy selection
Drug: Fibrinolytic therapy, intra-arterial strategies
Disposition: Rapid admission …

(Stroke is best treated in specialized stroke unit).

Immediately following acute stroke

Manage airway, breathing and circulation. Take precautions to avoid aspiration and ensure adequate oxygenation.
Nil orally. A swallowing assessment should be undertaken at home or hospital before starting eating or drinking.
Urgent neurosurgical assessment should be available for patients with large cerebellar infarcts with hydrocephalus, subarachnoid haemorrhage and for selected cases of cerebral haemorrhage.
Establish time of symptom onset (last normal)
For secondary prevention, identify and treat the underlying risk factors. Hypertension is the single most important modifiable risk factor for all types of strokes in both sexes and at all ages.
Acute elevation of BP is often transient and decline spontaneously. Hypotension/excessive BP reduction not recommended.
Glucose levels should be kept below 150 mg% as hyperglycaemia may be deleterious to the brain cells. Dextrose containing fluids in nonhypoglycemics not recommended.
Excessive intravenous fluids not recommended.
Treat even mild fever as elevation of temperature consistently worsens the neurological outcome from ischaemic insults.
Tab. Aspirin 650 mg within 48 hours of stroke after excluding intracerebral haemorrhage by brain imaging. Subcutaneous LMVH for preventing deep vein thrombosis in immobilized patients.

Elevated blood pressure not to be treated unless
If systolic BP >220 mmHg or diastolic BP >120 mmHg on two readings 5 minutes apart, or if systolic BP is 180-220 mmHg, diastolic BP is 105-120 mmHg; or mean arterial BP is >130 mmHg on two readings 20 minutes apart. (If rt-PA is to be given BP should be <185/110).
Patient has myocardial infarction/cardiac failure/dissection of aorta.
Patient otherwise eligible for acute reperfusion therapy except that blood pressure is >185/110 mmHg. Inj. Labetalol 10-20 mg IV over 1-2 minutes, may repeat once.

If systolic BP 180-230 mmHg or diastolic BP 105-120 mmHg: Inj. Labetalol 10 mg IV followed by continuous IV infusion 2-8 mg/min. If blood pressure not controlled or diastolic BP >140 mmHg, institute Nitroprusside 0.5-1.5 mcg/kg/min then increased in steps of 500 mcg/kg/min every 5 minutes within a range of 0.5-0.8 mcg/kg/min. Stop, if response is unsatisfactory with maximum dose in 10 minutes.

If systolic BP is <180 mmHg and diastolic BP is <105 mmHg, defer antihypertensive therapy. Overzealous treatment can convert ischaemic penumbra into an infarct.

Monitor blood pressure every 15 minutes for 2 hours from the start of rt-PA therapy; then every 30 minutes for 6 hours; and then every hour for 16 hours.

**Low blood pressure.** Volume replenishment is the first line of approach. Isotonic saline or colloids can be used and monitored with the central venous pressure or pulmonary artery wedge pressure. If hypotension persists after correction of volume deficit, continuous infusions of pressors (Dopamine 2-20 mcg/kg/min) should be considered, particularly for low systolic blood pressure, such as systolic BP<90 mmHg.

**Cerebral infarction**

No therapy has yet been confirmed to limit the neuronal damage associated with acute cerebral infarction.

Thrombolytic therapy with rt-PA in cerebral infarction demonstrates significant improvement in functional outcome in carefully selected patients treated in specialist units, if used within 4.5 hours of stroke onset. This should not yet be regarded as a routine therapy, particularly without specialist centres.

No benefit has been demonstrated for heparin, corticosteroids, nimodipine or other calcium channel antagonists, barbiturates, plasma volume expanders or haemodilution techniques in mortality in patients with acute ischaemic attack.

**Subarachnoid haemorrhage**

Acute severe headache with vomiting, neck stiffness and altered sensorium and CT scan shows blood in the cisterns and CSFs uniformly blood stained.

Tab. Nimodipine 60 mg 4 hourly.

**Treatment**

Immediately transfer the patient to a tertiary care centre with a neurosurgery set-up after securing patent airway and blood pressure.

**Stroke prevention**

Treat isolated systolic hypertension.

Intensive cholesterol lowering with statins reduces stroke risk and goal is an LDL-C level of < 100 mg/dl for very high-risk patients. Low HDL-C may be considered for treatment with niacin or gemfibrozil.
Tab. Aspirin 50-325 mg once daily after ischaemic stroke/TIA should be prescribed as early as possible or Tab. Clopidogrel 75 mg once daily or extended release Dipyridamole 200 mg added to Aspirin 50 mg twice daily. For patients who have an ischaemic cerebrovascular event while taking aspirin, there is no evidence that increasing the dose of aspirin provides additional benefit.

In patients with non-valvular atrial fibrillation and also after cardioembolic stroke from valvular heart disease and recent myocardial infarction.

Tab. Warfarin 5 to 7.5 mg/day to keep patients (International Normalized Ratio (INR) between 2-2.5). Urgent anticoagulation is not recommended in view of no added benefit in preventing recurrence and for increased risk of serious intracranial haemorrhage in cases of moderate to large infarction.

Carotid endarterectomy (by a specialist surgeon) for patients who had carotid or TIA/stroke but no major disability with 70-99% stenosis.

**Long-term management**

Management of hypertension – if hypertension persists for more than 2 weeks, treat hypertension and lifestyle modification (for details see section on Hypertension in Chapter 3).

**Atrial fibrillation (AF)**. Aspirin in AF patients who have a clear contraindication to vitamin-K antagonist therapy but are able to tolerate antiplatelet therapy. The combination of clopidogrel plus aspirin carries a bleeding risk similar to warfarin and so is not recommended for those with a haemorrhagic contraindication to warfarin or patients with AF who are at high risk of recurrent stroke but who require temporary interruption of oral anticoagulation, bridging therapy with a low-molecular-weight heparin. Avoid long-term anticoagulation as treatment for nonvalvular atrial fibrillation.

**Patient education**

Activation of emergency response team by patients or other members of the public speed treatment of stroke.

Modification of lifestyle factors including physical activity, not smoking, avoiding environmental tobacco smoke, moderate alcohol consumption, maintaining a normal body weight, and eating a low-fat diet high in fruits and vegetables.

Control of risk factors such as hypertension, diabetes mellitus, hyperlipidaemia and cessation of cigarette smoking.

Cardiac features of metabolic syndrome improve with weight loss, which has also been shown to improve insulin sensitivity; lower plasma glucose, plasma LDL-C, and plasma triglycerides; raise HDL-C; lower BP; reduce inflammation; improve fibrinolysis; and improve endothelial function in patients with metabolic syndrome.
References


ACUTE INFLAMMATORY DEMYELINATING NEUROPATHY/ GUILLAIN-BARRE SYNDROME (GBS)

GBS is an acute frequently severe fulminant polyradiculoneuropathy, usually presenting as ascending paralysis. GBS is presumed to have immune-mediated pathogenesis with lymphocytic infiltration of peripheral nerves and destruction of myelin for which no specific cause can be demonstrated, although it is commonly preceded by a viral or other infection—respiratory and gastrointestinal; it reaches a peak of disability within four weeks and follows a monophasic course with recovery. Several subtypes are recognized.

**SALIENT FEATURES**

Diagnostic criteria for GBS are progressive motor weakness of more than one limb and partial or total areflexia.

Involvement of ventilatory muscles is common and can be diagnosed by presence of respiratory distress/shallow respiration, weak voice, inability to cough effectively and decreased inability to count in single breath.

Features strongly supportive of diagnosis are progression of symptoms up to 4 weeks, relative symmetry, mild sensory signs or symptoms, facial nerve (50%) or other cranial nerve involvement, transient or absent bladder involvement, recovery 2-4 weeks after nadir, autonomous dysfunction and absence of fever at the onset; CSF features are protein elevated after first week and cell count <10 mononuclear/mm; electrophysiological evidence of demyelination (prolonged F-wave, distal latencies, decreased conduction velocities, conduction block).

**Treatment**

*Nonpharmacological*

Hospitalization is necessary for even mild cases for observation of progression of neurological deficit.

General care includes: care of back, bowel and bladder, pressure points.
Physiotherapy should be instituted early.
Ventilatory support in impending respiratory failure (required in ~30% cases).

**Pharmacological**

**Treatment should be started at the earliest and is not effective, if started after ~2 weeks of first motor symptoms.**

**Mild cases.** No specific therapy is needed (corticosteroids have no role).

**Severe cases.** As indicated by progressive weakness requiring assistance for walking (power grade 3 or less), involvement of respiratory/bulbar muscles, swallowing difficulty.

- Inj. Human immunoglobulins 400 mg/kg day for 5 days.
  (Caution: Contraindicated in patients with IgA deficiency). Or
- If facilities are available, Plasmapheresis for a total of 4-5 exchanges over 7-10 days.

All patients to be closely monitored for: (a) progression of motor weakness, (b) involvement of respiratory/bulbar muscles, (c) autonomic disturbance, e.g. hypo/hypertension, cardiac arrhythmia.

**Patient education**

- Explain the natural course of the disease. It can progress to involve all the four limbs, respiration and swallowing.
- Disability can be reduced with treatment and most patients achieve complete or nearly complete recovery.
- Prognosis is bad in old age, rapidly progressive weakness, axonal form of GBS and delay in onset of treatment.
- Role of physiotherapy to be stressed.
- Provide psychological support.

**References**


**DEMENTIA**

Dementia is a progressive and largely irrevocable clinical syndrome characterized by a wide-spread impairment of mental function. The essential features of dementia are an acquired and persistent compromise in multiple cognitive domains that are severe enough to interfere with every day functioning. Majority of dementias are degenerative and progressive. The deficiency of acetylcholine is the predominant neurochemical
defect in dementia. Vascular dementia is second most common cause of dementia after Alzheimer’s disease.

**SALIENT FEATURES**

As condition progresses, patient can experience some or all of the following: Memory loss, language impairment, disorientation, changes in personality, difficulties with activities of daily living, self-neglect, psychiatric symptoms (e.g. apathy, depression or psychosis) and out-of-character behaviour (e.g. aggression, sleep disturbance or disinhibited sexual behaviour, although the later is not typically the presenting feature of dementia).

A diagnosis of dementia should be made only after a comprehensive assessment including: history, cognitive and mental state examination; physical examination and other appropriate investigations; a review of medications in order to identify and minimise use of drugs that may adversely affect cognitive functioning.

A basic dementia screen should be performed at the time of presentation: Routine haematology, biochemistry, thyroid function test, serum vitamin B₁₂ and folate levels.

Syphilis serology, HIV, CSF examination and EEG should not be performed as a routine investigation.

MRI is preferred modality to assist with early diagnosis and detect subcortical vascular changes, although CT scanning could be used. Specialists advice should be taken, when interpreting scans in patients with learning disabilities.

**Treatment**

The treatable causes of dementia are to be ruled out before considering the diagnosis of degenerative dementia. The common treatable causes of dementias are alcoholic, endocrinoc–hypothyroidism, metabolic, infective and dementia related to head trauma (subdural haematoma).

Dementias are not curable, but the progression of dementia can be slowed down and quality of life can be improved by available treatment modalities. For optimal results, multiple modalities should be utilized including pharmacotherapy, behaviour management, psychotherapy, psychosocial treatment, support and education of families.

**Nonpharmacological**

- Behavioural modification, scheduled toileting and prompt voiding reduces urinary incontinence.
- Reactivation occupational rehabilitation
  - Memory training
  - Maximal creative activity
– Improving sensory motor function
– Psychosocial functioning
Graded assistance, practice, and positive reinforcement should be used to increase functional independence.

Low lighting levels, music, and simulated nature sounds may improve eating behaviour for persons with dementia, and intensive multimodality group training may improve activities of daily living, but these approaches lack conclusive supporting data.

**Pharmacological (to be given by a specialist)**

**For cognitive deficits.** For mild to moderate dementia (Mini-Mental State Examination (MMSE) score between 10 and 20).

- Tab. Rivastigmine 1.5-6 mg/day in 2 divided doses (maximum dose 12 mg/day). Or
- Tab. Donepezil – 5-10 mg/day as a single dose.

Start with lowest dose and titrate to maximum dose in 4-6 weeks time.

**For severe dementia, add 2nd line drug:**

- Tab. Memantine hydrochloride 5-10 mg as a single dose. Start with 5 mg and increase to 10 mg after 4 weeks.
- Review after every 6 months by MMSE score and global, functional and behavioural assessment. Carer’s views on the patients condition at follow-up also should be sought.

**For noncognitive neuropsychiatry disturbances.** Treat agitation or psychosis with dementia and depression accordingly (for details see section on Acute Psychotic Disorder and Depression in Chapter 16).

**Patient education**

Short-term programmes which are directed towards educating the family caregivers about dementia, should be offered to improve caregiver’s satisfaction.

Intensive long-term education and support services should be offered to caregivers of the patient with dementia to delay time to nursing home placement.

**References**


**PARKINSON’S DISEASE**

Parkinson’s disease (PD) refers to the idiopathic form of Parkinsonism. It affects 1-2 per 1000 population above the age of 65 years. Pathologically, there is degeneration and depletion of the pigmented dopaminergic neurons in substantia nigra compacta.
SALIENT FEATURES

The core features are rigidity, bradykinesia and rest tremors (pill rolling movements along with abnormal gait and posture, onset is asymmetric). Difficulty in performing fine co-ordinated movements like writing, using hand tools and kitchen utensils, grooming, doing and undoing buttons. Difficulty in rolling in bed and getting out of chairs or automobiles. Gait difficulty with slowing, stooped posture, decreased or loss of arm swing. Limb discomfort and stiffness may be an early symptom. Diagnosis of Parkinson’s disease remains clinical. As such no role of investigations.

Treatment

Nonpharmacological

Exercise: Occupational and physiotherapy improves activities of daily living along with mood and mobility.

Nutrition: A balanced diet with fibre supplement to be taken.

Pharmacological

‘Early disease’ refers to PD in people who have disease <5 years and have not developed motor complications. ‘Late disease’ refers to PD in people on levodopa who have developed motor complications. Figure 9.1 shows the algorithm for management of PD.

Treatment to be started once the Parkinsonian symptoms begin to impair the activities of daily living. Initiate treatment with levodopa in patients above 65 years of age; withhold Levodopa in younger patient. Treatment to be started with low dose and to be gradually increased until the benefit or side effects occur.

Early PD

There is no universal first-choice drug therapy. The choice of drug first prescribed should take into account clinical and life style characteristics and patient preference.

For tremors predominant PD

Tab. Trihexyphenidyl 6-20 mg in 3 divided doses.

Or

Tab. Benztropine 1-6 mg in 2-3 divided doses.

(Caution: Avoid anticholinergics in patients above 65 years of age).

Late PD

1. Trihexyphenidyl as above.

Any of the following can be given as monotherapy or in combination.
Patient presents with signs and symptoms consistent with parkinsonism

Idiopathic Parkinson’s disease confirmed

Yes

No functional impairment

Consider CT or MRI to rule out normal pressure hydrocephalus or a vascular cause; consider referral to a subspecialist.

No

Monitor for disease progression

Consider immediate-release carbidopa-levodopa or a dopamine agonist

Disease progression

Increase immediate-release carbidopa/levodopa dose or increase dopamine agonist to the maximum tolerated dose

Functional impairment present

Continued disease progression

Fractionate carbidopa/levodopa therapy and consider adding a dopamine agonist, MAO-B inhibitor, or COMT inhibitor.

Motor complications develop

Severe motor fluctuations

Refer to a neurologist

Fig. 9.1. Diagnosis and management of Parkinson’s disease.

2. Tab. Bromocriptine 2.5-10 mg/day in 2-3 divided doses. Or
   Tab Pramipixol 0.375-4 mg per day in 3 divided doses. Or
   Tab. Ropinirole 6-24 mg /day in 3 divided doses. Or
   Tab. Peribidil 25-100 mg/day as single dose or 2 divided doses.

3. Tab. Levodopa plus carbidopa (100-250 mg Levodopa) in divided doses as per requirement (modified release levodopa preparations should not be used so as to delay the onset of motor complication in people with early PD).

   The practice of withdrawing patients from their antiparkinsonian drugs (so-called drug holidays) to reduce motor complications should not be undertaken because of the risk of neuroleptic malignant syndrome (NMS).

   Selegiline, apomorphine and amantadine have limited role in treatment. Dopamine agonists, MAO-B inhibitors, co-enzyme Q10 and vitamin E should not be used as a neuroprotective therapy for people with PD except in context of clinical trial.

   At present, there is no agent that slows down the progression of PD.

   Most people with PD will develop, with time, motor complications and will eventually require levodopa therapy + Dopamine agonists/COMT inhibitors, triple combination—levodopa + carbidopa + entacapone and/or dopamine agonist.
Patient should be referred to neurologist, if drug-induced dyskinesias or motor fluctuations occur and Parkinson’s plus syndrome (progressive supranuclear palsy, multisystem atrophy, etc.).

About 20-30% of patients with PD may also have dementia and around 40% of patients with PD have associated mild to moderate depression which has a major impact on quality of life, therefore, should be treated appropriately. For details of management, see section on Dementia and Depression.

Patient education

Provide all relevant information to patients and families regarding the disease, its prognosis and therapeutic options. Discussions should focus on therapeutic expectations, lifestyle modification and aids to overcome motor disability or limitation.

Antiparkinsonian medication should not be withdrawn abruptly or allowed to fail suddenly due to poor absorption (e.g. gastroentritis, abdominal surgery) to avoid the potential for acute akinesia or nueroleptic malignant syndrome.

References

NETHROTIC SYNDROME

A clinical complex characterized by profuse proteinuria (>3.5 g/1.73 m^2/24 h), oedema and hypoalbuminaemia. More than 90% of cases of nephrotic syndrome in adults are due to one of these—minimal change disease, membranous glomerulopathy, focal and segmental glomerulosclerosis, membrano-proliferative glomerulonephritis, diabetic nephropathy and amyloidosis.

SALIENT FEATURES

Periorbital and generalized pitting oedema, transudative pleural effusions, ascites, xanthomata. Hypercoagulability predisposes these individuals to peripheral arterial or venous thrombosis, renal vein thrombosis, and pulmonary embolism. Proteinuria of >3-3.5 g/24 h. Renal biopsy is indicated in all adults and children >10 years with nephrotic syndrome for establishing a definitive diagnosis, guiding therapy and estimating prognosis.

Other associated abnormalities are hyperlipidaemia, lipiduria and hypercoaguability.

Treatment

Nonpharmacological

Moderate salt restriction, usually 1-2 g/day (no cooking salt) and low cholesterol diet.

There is no consensus regarding the optimal protein in diet for these patients. High protein diet is not recommended, as it may hasten the progression of renal disease by increasing proteinuria. A protein intake of 0.8-1 g/kg/24 h of mainly first-class proteins is recommended.

Fluid restriction is not usually required unless the oedema is severe.

Pharmacological

Nonspecific measures.

1. To reduce proteinuria in patients with diabetic nephropathy.
Tab. Captopril 6.25-25 mg/day in 4 divided doses. Or
Tab. Enalapril 1.25-5 mg/day as a single dose Or Tab. Losartan 25-50 mg/day as single dose.

2. NSAIDs reduce proteinuria in some patients by altering glomerular haemodynamics but benefit must be weighed against risks.

3. Tab. Frusemide 80-250 mg/day in two divided doses (8 AM, 2 PM), depending upon the severity of oedema. The aim is to remove up to 1.0 kg/day of oedematous fluid.
   In addition, if required, Tab. Spironolactone 100 mg once daily may be added.

4. Only in-patients with symptomatic thrombosis, Tab. Warfarin 2-4 mg/day (to titrate the dose to INR of 1.5-2.0).
   Patients may be relatively resistant to heparin.

**Specific. Immunosuppression**

**Minimal change disease**

Tab. Prednisolone 1-1.5 mg/kg/day for 4 weeks; followed by 1 mg/kg/day on alternate day for up to 16-24 weeks, depending upon the time to go into remission. Up to 90% of adults go into remission when Tab. Prednisolone is continued for up to 24 weeks. 50% relapse on withdrawal of steroids. Monitor for presence of symptoms and proteinuria. Treatment of relapse is same unless the patients are resistant to steroids or relapse shortly after withdrawal of steroids (steroid dependent) or relapse occurs more than three times in a year, introduce following second line drugs:

   Tab. Cyclophosphamide 2-3 mg/kg/day or Chlorambucil 0.1-0.2 mg/kg/day for 8-12 weeks.

   **(Caution: Adequate hydration must be maintained and monitor for side effects, e.g. cystitis, alopecia, infection, infertility, secondary malignancies).**

   If patients are resistant to the above cytotoxic drugs (third line) may induce remission in 60-80% of patients:

   Tab./Cap Cyclosporin A 5 mg/kg daily in 2 divided doses as maintenance treatment reduced to lowest effective dose according to proteinuria and serum creatinine measurements; discontinue after 3 months, if no response. Monitor these patients for renal functions.

**Focal and segmental glomerulosclerosis**

Specific treatment—same as above.
Response rate is poor.

**Membranous glomerulopathy**

Treat underlying disease. If idiopathic, steroids and immunosuppressive treatment have no role. About 40% respond spontaneously; 30-40% remit and relapse spontaneously; 10-20% show progressive decline in GFR over 10-15 years to end stage renal disease (ESRD).
If patient goes into remission in 6 months time, maintenance treatment with low dose prednisolone alternating with Chlorambucil to be given by a specialist.

Membranoproliferative glomerulonephritis
No effective therapy; usually progress to ESRD over 5-10 years.
(Caution: Patients who do not respond to steroids are excellent candidates for renal transplant).

**Rapidly progressive glomerulonephritis. Needs aggressive management preferably by a specialist**

Inj. Methylprednisolone 1 g/day for 3 days followed by oral prednisolone as above.
Anti-GBM disease needs plasmapheresis.
(For treatment of Nephrotic Syndrome in children see Chapter-19).

**References**


**ACUTE RENAL FAILURE (ARF)**

A significant decline in the renal excretory function, mostly associated with oliguria (<500 ml/day), occurring over hours or days, detected clinically by a rise in plasma concentration of urea and creatinine. Most of the times, ARF is reversible.

**SALIENT FEATURES**

The clinical picture is usually dominated by the primary condition, which causes ARF. Manifestations of uraemia like anorexia, nausea, vomiting, muscular cramps and signs of encephalopathy may appear later.

For purposes of diagnosis and management, ARF is divided into three categories:
– Pre-renal due to renal hypoperfusion (55%).
– Renal due to disease which involve renal parenchyma (40%).
– Post-renal due to diseases causing urinary obstruction.

Complications of ARF include hyperkalaemia, intravascular volume overload, hyponatraemia, hypocalcaemia, hyperphosphataemia, metabolic acidosis, anaemia, coagulation abnormalities and infections; arrhythmias, pericardial effusion, pulmonary oedema, GI bleeding due to stress ulceration.
Treatment

Identify the causative factors and triggering event and treat accordingly for disease-specific therapy and prevention and management of uraemic complications.

**Nutrition:** Restrict dietary protein to 0.6 g/kg/day and carbohydrate to 100 g/day.

**Prerenal ARF**

1. Replacement fluids—tailored according to the composition of lost fluids, e.g. in haemorrhage blood transfusion/packed RBCs (if oliguria despite fluid correction).
   - Normal saline (0.9%) in case of burns, pancreatitis, diabetic ketoacidosis.
   - Hypotonic saline (0.45%) if increased urinary or GI losses.
   - (Fluid intake = 500 ml + urine output + fluid loss from other sources)
2. Management of pulmonary oedema, if present.
3. In patients with cirrhosis complicated by ARF, fluids should be administered slowly and titrated against JVP. Large volume paracentesis should be accompanied by IV albumin.

**Intrinsic renal ARF**

It should be managed by a specialist. Approach for treatment depends upon the likely cause.
1. Acute glomerulonephritis, vasculitis—glucocorticosteroids, cyclophosphamide, and/or plasmapheresis.
3. Malignant hypertension, toxaemia of pregnancy—aggressive control of blood pressures.

**Postrenal ARF**

1. Suprapubic catheterization.
2. Referral to a urologist for removal of obstructing lesion.

**Other essential measures.**

1. Strict intake/output recording.
3. Reverse causative renal insult, e.g. restore haemodynamics, eliminate nephrotoxins.
5. Volume overload
   - Restrict salt (1-2 g/day—avoid all table/cooking salt and avoid food rich in sodium like milk) and water.
   - Inj. Frusemide IV dose depending upon extent of overload, usual dose is 40-200 mg/day as bolus or intravenous infusion.
   - Dialysis.
Standard Treatment Guidelines

**Hyponatraemia**
1. Restrict free water intake (<1 liter/day).
2. Avoid hypotonic IV solutions.

**Hyperkalaemia**
1. Restrict dietary potassium \((K^+\)) 40 mmol/d (no food containing \(K^+\)).
2. **Inj. Glucose insulin drip**—50 ml of 50% of dextrose with 10 units of plain insulin over 10 min.
   And/Or
   Inj. Sodium bicarbonate 50-100 ml of 4.2% IV 10 min. And/Or
   Inj. Calcium gluconate 10 ml of 10% solution over 5 min.
   (More than one step taken, if levels of serum \(K^+\) > 6.5)
3. Cation exchange resins, e.g. Sodium or Calcium polystyrene sulphonate 15 g orally 6 hourly.

**Metabolic acidosis**
1. Restrict dietary protein (0.6 g/kg/day).
2. **Inj. Sodium bicarbonate IV** to maintain an arterial pH of >7.2.

**Hypocalcaemia**
1. **Tab. Calcium carbonate** 1 g/day Or
   IV Calcium gluconate 10% 10-20 ml given over 20 minutes (if tetany).

**Hyperphosphataemia**
1. Restrict dietary phosphate intake (<800 mg/day).
2. Calcium carbonate as above.

**Hyperuricaemia**
Treatment necessary only if uric acid is >10 mg%.
Tab. Allopurinol 100 mg three times a day

**Dialysis is indicated for any of the following:**
- Overt uraemia manifesting as encephalopathy, pericarditis, uraemic bleeding. Intractable fluid overload.
- Refractory hyperkalaemia.
- Rise in urea >150-180 mg% or creatinine >6-7 mg%.
- Severe acidosis producing circulatory compromise.
  Doses of all essential drugs for the underlying disease should be adjusted according to the degree of renal impairment (See Appendix VII).

**Prevention**
Since there is no specific therapy for ischaemic or nephrotoxic ARF, prevention is very important and includes:
1. Aggressive restoration of intravascular volume in case of losses, e.g. during surgery, trauma, burns, gastroenteritis, etc.
2. Avoid/reduce the dose of nephrotoxic drugs appropriately.
3. Hypovolaemia should be avoided in patients receiving nephrotoxic drugs.

References

CHRONIC RENAL FAILURE (CRF)

Chronic kidney disease (CKD) is defined as an irreversible, substantial and usually gradual loss of renal function leading to a clinical and laboratory syndrome of uraemia or GFR of less than 60 ml/min/1.73 m² for 3 months or longer with or without kidney damage. End stage renal disease (ESRD) GFR < 15 ml/min/1.73 m² would result in death without renal replacement therapy. The important underlying causes are diabetes mellitus, hypertension, chronic glomerulonephritis, chronic pyelonephritis, analgesic nephropathy and polycystic disease.

SALIENT FEATURES

The symptoms of uraemia develop gradually and late. Fatigue, dyspnoea, anorexia, nausea, vomiting, ankle oedema, pruritis, purpura, and neuromuscular disturbances. Nocturia may be present.
Examination may show the presence of pallor, nail dystrophy, purpura, hypertension, cardiomegaly, CHF, features of pulmonary oedema, pleural effusion and pericarditis with or without effusion.
Fundus examination may show changes of hypertensive or diabetic retinopathy. The abnormalities in blood urea and creatinine may be detected during evaluation of anaemia.
Elevated blood urea and creatinine, hypocalcaemia, hyperphosphataemia, hyperkalaemia and a partially compensated metabolic acidosis. Peripheral smear shows a normocytic, normochromic anaemia and urinalysis usually reveals proteinuria and low fixed specific gravity. Presence of shrunken kidneys on ultrasound suggests ESRD. Kidney biopsy to be done if the kidneys are of normal size. A skeletal survey may show evidence of renal osteodystrophy. In certain diseases like diabetic nephropathy, polycystic kidney disease, kidney size may be normal.

Treatment
1. Identification and management of associated factors precipitating acute or chronic renal failure, e.g. drugs, hypovolaemia, infections, obstructive uropathy, hypertension, CHF, pregnancy or presence of any life-threatening emergency,
STANDARD TREATMENT GUIDELINES

requiring urgent treatment, e.g. hyperkalaemia, pulmonary oedema, metabolic acidosis, uraemic encephalopathy or accelerated hypertension (Treat as mentioned under respective conditions).

2. Identification of specific cause of CRF and their treatment so as to delay the progress of CRF.

3. Modify loading and maintenance doses of drugs that are excreted through renal route.

Nonpharmacological
- Decrease protein intake to 0.6 g/kg/day of high quality protein.
- Phosphate restriction to 1000 g/day to reduce soft tissue calcification (avoid milk, egg, etc.).
- Moderate sodium restriction to 60 mmol/day (low salt during cooking and avoiding foods rich in sodium) to control BP and oedema.
- Potassium restriction, if CRF is moderate to severe (foods rich in $K^+$ include banana, citrus fruits, coconut water, papaya, etc.)
- Fluid restriction is not generally necessary until late in renal failure.
- Sodium bicarbonate (baking powder) 600 mg 4 times a day, if plasma $HCO_3^-$ is less than 20 mmol/liter.

Pharmacological

Control of hypertension, cardiovascular and pulmonary abnormalities
- Target BP is 130/80-85 mmHg and in-patients with proteinuria >1 g/day, target BP is 125/75 mmHg (for details see section on hypertension).
- The preferred drugs are:
  - Tab. Frusemide 40-160 mg per day. Or
  - Tab. Amlodipine 5-20 mg per day. And/Or
  - Tab. Atenolol 50-100 mg per day (contraindicated if concomitant cardiomyopathy with failure).
- In diabetic nephropathy or CRF with proteinuria—ACE inhibitor/angiotensin receptor blocker with or without diuretic are preferred.

Treatment of pericarditis
- Uraemic pericarditis is an absolute indication for initiation or intensification of dialysis. Heparin free dialysate should be used.

Treatment of anaemia
- 1. Look for common aggravating causes of anaemia, e.g. GI blood loss, iron deficiency and chronic infections and treat accordingly. Assess iron status of patient before erythropoietin (EPO) therapy.
2. Iron supplementation to ensure adequate response to EPO. (See section on Anaemia)

3. Inj. EPO subcutaneous 80-120 units/kg/week (divided into 2-3 times a week)

   The target Hb should be 10-12 g/dl and optimal rate of correction should be to increase haematocrit by 4-6% over 4-week period.

*Treatment of bleeding diathesis*

Usually problem arises when a patient of CRF needs to undergo some surgery.

Inj. Vasopressin (DDAVP) 0.3 mcg/kg in 100 ml of saline in 30 min, to be administered before surgery.

*Treatment of bone, phosphate and calcium abnormalities and acid base disturbances*

1. Phosphate restricted diet.
2. Calcium carbonate – minimum of 1 g/day.
3. Vitamin D$_3$/Calcitriol – 0.25-2 mcg/day.

   Maintain serum calcium at about 10 mg% and phosphate at about 4.5 mg%.

*Treatment of hyperuricaemia (gout), if it is symptomatic*

Tab. Allopurinol 100-200 mg/day preferably after food, then adjusted according to plasma or urinary uric acid concentration. Management of metabolic acidosis should aim to maintain a near normal value of bicarbonate. Calcium carbonate is usually adequate. If needed, sodium bicarbonate can also be added. For monitoring the progression of renal failure, measure serum creatinine and creatinine clearance. ECG may show evidence of left ventricular hypertrophy (LVH), pericarditis or hyperkalaemia.

*Absolute indications for dialysis*

Development of complications that cannot be controlled by conservative and pharmacological means, i.e. fluid overload, severe hypertension, pericarditis, refractory hyperkalaemia, severe metabolic acidosis, encephalopathy and progressive neuropathy attributable to uraemia. Renal replacement therapy (RRT) should not be initiated when the patient is totally asymptomatic.

*Renal replacement therapy (RRT)*

The choice of modality include—haemodialysis, continuous ambulatory peritoneal dialysis or renal transplantation; the choice depends on many factors—their availability, patient’s preference and availability of potential donors. Only kidney transplantation offers the potential for nearly complete rehabilitation.
Patient education

Counselling as most of these patients have varying reactions to illness from anger to depression. Prepare the patient physically and psychologically for renal replacement therapy, when ESRD is inevitable.

References


URINARY TRACT INFECTIONS (UTIs)

UTI is defined as an infection of any part of the urinary tract. UTIs are common bacterial infections managed in general practice, particularly in sexually active women except in first year of life and in elderly. UTIs predominantly affect females.

SALIENT FEATURES

Lower UTI includes infections of the urethra and bladder and can present with pain and burning during micturition, frequency of micturition, urgency, dysuria, pyuria or sometimes even haematuria. Fever is usually absent in lower UTI. Acute cystitis may present with suprapubic pain or discomfort.

Upper UTI includes infections of the kidneys and ureters. The symptoms usually develop rapidly, sometimes within a few hours. In addition to symptoms of lower UTI, these patients may have high fever, chills, rigours and pain in the loins, nausea and vomiting.

Sometimes UTIs may be asymptomatic, and are detected accidentally when the urine is tested. Asymptomatic infections are more common in pregnant women and the elderly. Untreated, asymptomatic bacteriuria in pregnancy can progress to upper UTI which can further lead to premature delivery and poor foetal outcome.

Urine—microscopic exam >10 pus cells/HPF and on culture bacterial growth, i.e. $>10^5/\text{mm}^3$ is diagnostic. In asymptomatic patients, two consecutive urine specimens should be examined and $>10^7/\text{mm}^3$ bacteria of a single species should be demonstrable in both specimens before therapy is instituted. The presence of bacteriuria of any degree in suprapubic aspirates or $>10^7/\text{mm}^3$ in urine obtained by catheterization indicates infection.

Collection of urine sample. Collection of urine sample for culture should be from the midstream and should be preceded by adequate cleaning of external genitalia avoiding any antiseptic washes. Patients with recurrent UTIs should undergo ultrasonography of the genitourinary tract and micturating cystourethrogram to detect underlying structural or functional abnormality.
Treatment

General principles

Except in acute uncomplicated cystitis in women, diagnosis must be confirmed before treatment is begun and antimicrobial sensitivity should direct the therapy. Identify the predisposing factors and correct, if possible. Relief of clinical symptoms does not always mean bacteriologic cure. Each course of treatment should be defined as failure or cure on the basis of symptoms and eradication of bacteria. Uncomplicated lower UTIs generally respond to short courses of therapy while upper UTIs and complicated lower UTIs require longer treatment. Recurrences more than two weeks after cessation of therapy nearly always represent reinfection. Community acquired infections particularly the first infections are usually due to more antibiotic sensitive strains. In hospitalized patients, those requiring instrumentation and having recurrent infections, antibiotic resistant strains are the more likely causes of UTI.

Nonpharmacological

Plenty of oral fluids.

Pharmacological

If symptoms are severe, antibiotics may be started empirically, after sending the urine samples. If symptoms are not severe, the antibiotics can be started as suggested by the culture and sensitivity report.

1. The specific treatment regimen is shown in Table 10.1.
2. Alkalizing agents may be used with certain antibiotics like cotrimoxazole to prevent precipitation of crystals.
3. Tab. Pyridium up to 2 tablets 3 times a day for the first 2-3 days as a urinary analgesic to relieve dysuria.

Prophylaxis

Antibiotics for prevention are recommended to women who have two or more episodes of infection within 6 months or three or more infections within one year. The recommended antimicrobials include daily or thrice weekly administration of a single dose of Trimethoprim-sulfamethoxazole (TMP-SMZ) (80/400 mg), TMP alone (100 mg) or Nitrofurantoin (560 mg). Prophylaxis should be initiated only after bacteriuria has been eradicated with a full dose treatment regimen. Same regimen can be used as a single dose after sexual intercourse in women in whom episodes of symptomatic UTIs are related to sexual intercourse. Frequent urine cultures are essential during this period.
### Table 10.1. Treatment regimen for bacterial urinary tract infections

<table>
<thead>
<tr>
<th>Condition</th>
<th>Characteristic pathogens</th>
<th>Mitigating circumstance</th>
<th>Recommended empirical treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute uncomplicated cystitis in women</td>
<td><em>E. coli</em>, <em>S. saprophyticus</em>, <em>P. mirabilis</em>, <em>K. pneumoniae</em></td>
<td>None</td>
<td>3-day regimen: Oral TMP-SMZ 160/800 mg BD, TMP 100 mg BD, Norfloxacin 400 mg BD, Ofloxacin 200 mg BD, Ciprofloxacin 500 mg BD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diabetes, symptoms for &lt;7 days, recent UTI use of diaphragm age &lt;65</td>
<td>Consider 7-day regimen: Oral TMP-SMZ, TMP Quinolone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pregnancy</td>
<td>Consider 7-day regimen: Oral Amoxicillin 250 mg TDS, Cefpodoxime 100 mg BD</td>
</tr>
<tr>
<td>Acute uncomplicated pyelonephritis in women</td>
<td><em>E. coli</em>, <em>S. mirabilis</em>, <em>S. saprophyticus</em></td>
<td>Mild to moderate illness-outpatient therapy</td>
<td>Oral Ciprofloxacin 500 mg BD, Ofloxacin 400 mg BD, Amoxicillin 500 mg TDS, Cefpodoxime 100 mg BD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe illness-hospitalization required</td>
<td>Parenteral Ciprofloxacin 200-400 mg BD, Ofloxacin 1 mg/kg TDS, Ampicillin 1g QID, Ceftriaxone 1-2 g/d for 14 days.</td>
</tr>
<tr>
<td>Complicated UTI in men and women</td>
<td><em>E. coli</em>, <em>Proteus</em>, <em>Klebsiella</em>, <em>Pseudomonas</em>, <em>Staphylococci</em></td>
<td>Mild to moderate illness-outpatients therapy</td>
<td>Oral Quinolone for 10-14 days (Doses as above)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe illness or possible hospitalization required</td>
<td>Parenteral, Ampicillin and Gentamicin, Quinolone, Ceftriaxone (Doses as above) until defervescence.</td>
</tr>
</tbody>
</table>

**Suppressive antibiotics**

Indicated in patients with repeated infections with an underlying cause, till the underlying cause is removed or controlled, e.g. infants and children with vesico-ureteric reflux till 3-5 years of age and elderly requiring prolonged catheterization. The recommended drugs are same as above.

**Note:** See also UTIs in paediatric section.

**Note:** See also UTIs in paediatric section.
Treatment of specific cases

UTIs in pregnancy. Asymptomatic bacteriuria in pregnancy must be treated appropriately.

(Caution: Cotrimoxazole and fluoroquinolones are not recommended during pregnancy).

UTIs in elderly. Treatment is not recommended for asymptomatic infections among the elderly, particularly men.

UTIs in catheterized patients. Need for treatment and optimal type and duration of treatment for such patients with asymptomatic bacteriuria have not been established.

- Removal of catheter with a short course of antibiotic may be appropriate.
- If catheter cannot be removed, bacteriuria should be ignored unless patient is symptomatic or at high risk of developing bacteriuria.

Follow-up

Patient should be re-evaluated within 3-5 days for relief of symptoms and urine microscopic examination and culture examination should be repeated. In upper UTIs, fever and other symptoms normally subside within 2-3 days after starting the treatment. If symptoms do not subside within 5 days, underlying abnormalities like obstruction to the urinary tract, stones or collection of pus should be looked for. If the infection relapses after an initial treatment for 14 days, a six-week treatment is recommended.

Patient education

- To drink plenty of water, at least 10 glasses per day.
- Not to control the urge to pass urine. To empty the bladder completely and very often.
- To empty the bladder after sexual intercourse.
- Both the partners to clean the genitalia before and after sexual intercourse.
- Avoid diaphragm with spermicide as a contraceptive.
- Wipe from front to back during eblution.

For treatment of UTI in children, see Chapter 19.

References

HYPOTHYROIDISM

Hypothyroidism could be primary; common causes are autoimmune, and iatrogenic due to $^{131}$I, antithyroid or lithium treatment and thyroidectomy, or secondary to pituitary or hypothalamic disease.

**SALIENT FEATURES**

Coarse dry skin, hoarse voice, facial puffiness, weight gain, cardiac enlargement and/or pericardial effusion, goiter with or without prolonged relaxation phase of deep tendon reflexes.

Myxoedema coma is a rare complication of severe hypothyroidism with hypothermia, hypoventilation, hyponatraemia, hypoxia, hypercapnia and hypotension.

Diagnosis is confirmed by low serum free thyroxine (FT$\textsubscript{3}$ and FT$\textsubscript{4}$), serum TSH raised in thyroid types and low in suprathyroid types. Thyroperoxidase (TPO) antibodies are present in 90-95% patients with autoimmune hypothyroidism.

**Treatment**

*Pharmacological*

Tab. L-thyroxine 50-100 mcg/day. Dose to be adjusted based on TSH levels. Goal is normal TSH (lower half of reference range). Measure TSH levels after about 2 months of instituting therapy. Adjust by 12.5 or 25 mcg increments, if TSH is high; decrement of same, if TSH is suppressed.

Full replacement achieved then follow up measurement at annual intervals and later at 2-3 years interval. Ensure ongoing compliance.

*Special treatment considerations*

Hypothyroid woman should be euthyroid prior to conception and during early pregnancy (affect on foetal neuronal development).
Elderly require less thyroxine (less by up to 20%), especially those with coronary artery disease. Starting dose 12.5 mcg/day with similar increments every 2 to 3 months until TSH is normalized.

In hypothyroidism cases with low TSH (suprathyroid), cause is suspected, requires detailed investigations. Patient should be referred to a tertiary care level. Assess the response clinically and by serum TSH (serum T₃ in suprathyroid type) at 8 weekly intervals; once euthyroid state restored, follow-up at 6-12 months intervals.

**Myxoedema coma**

1. Warm blankets, mechanical ventilation for respiratory failure.
2. Correction of metabolic disturbances and treat precipitating factors.
3. L-thyroxine 500 mcg IV bolus, then 50-100 mcg IV daily; if IV preparation not available, same dose via Ryle’s tube. Once acute phase is over, maintain L-thyroxine as above.
4. Inj. Hydrocortisone 100 mg IV stat, 25-50 mg 8 hourly. *(Caution: Avoid sedatives)*

**Patient education**

L-thyroxine to be taken as single daily dose, ideally on awakening, at least 30 minutes before eating.

Fibre and bran products (e.g. Isaphula husk) may impair absorption, as also cholestyramine, colestipol, iron sulphate, sucralfate, aluminium hydroxide. Metabolism of L-thyroxine is increased by phenytoin, rifampicin, carbamazepine. Explain to the patient that the treatment is life long. Do not modify dose or stop treatment without consultation.

Over treatment may lead to decreased bone mineral density and adverse cardiac consequences.

*(For treatment of hypothyroidism in children, see in Chapter-19).*

**References**


**HYPERTHYROIDISM**

Classically occurs in Graves’ disease, which is characterized by diffuse goiter, ophthalmpathy and dermopathy in varying combinations. Other important causes are toxic multinodular goiter (TMN) and toxic adenomas.
SALIENT FEATURES

Sweating, tremors, wide pulse pressure, sinus tachycardia and atrial arrhythmias; worsening of angina or cardiac failure may predominate in older patients. Graves’ disease—goiter, ophthalmopathy and dermopathy.

Diagnosis is confirmed by low to undetectable serum TSH and increased serum free thyroxine (FT₃) and free (FT₄).

Treatment

Pharmacological

1. Adjunctive treatment—for adrenergic symptoms like sweating, tremor and tachycardia.
   
   Tab. Propranolol 40-120 mg a day. Or
   Tab. Atenolol 50-200 mg a day to be continued until patient becomes euthyroid.

2. Tab. Propylthiouracil 100-150 mg every 6-8 hours. Or
   Tab. Carbimazole 10-20 mg every 8-12 hours; after euthyroid state achieved in 6-8 weeks once daily dose possible.

   Review with serum TSH and FT₃ after 3-4 weeks treatment has been initiated.
   Once controlled reduce to smallest effective dose or continue initial dose combined with L-thyroxine. Drugs are given for average of 2 years.

Definitive treatment is surgery/ablation of thyroid tissue (for details see thyroid swelling in surgery section Chapter 18).

Surgery. Subtotal thyroidectomy in younger patients (<30 years) in whom antithyroid therapy has been unsuccessful and in very large goiters.

Radioactive iodine (I¹³¹). Method of choice in the elderly, younger patients (completed family) with recurrent thyrotoxicosis following surgery or when surgery is refused/ contraindicated.

(Caution: Radioiodine should never be given in pregnancy. In women of child bearing age, if radioiodine treatment is planned, a pregnancy test must always be carried out).

Pregnancy

In pregnant women, surgery should not be performed in the 1st and 3rd trimesters. Antithyroid drugs are less risky but may induce hypothyroidism in the foetus and should be used in the smallest necessary dose to keep serum TSH and FT₄ in normal range.

Propylthiouracil is preferred—usual maintenance dose is 200 mg/day. If >300 mg/ day required during 1st trimester, subtotal thyroidectomy indicated in the 2nd trimester. Propranolol should be avoided as it can cause foetal growth retardation and neonatal respiratory depression.
**Ophthalmopathy**

Refer to an ophthalmologist.

Initiate therapy in mild cases with elevation of the head at night, diuretics to decrease oedema, use of tinted sunglasses and 1% methylcellulose eyedrops to prevent drying and refer patients with severe and progressive exophthalmous to an ophthalmologist.

**Toxic multinodular goiter**

Radioactive iodine is the treatment of choice. Large doses are usually required. Treatment with antithyroid drugs given till patient is euthyroid.

Propranolol may be useful before and after radioactive iodine administration.

**Thyrotoxic crisis or thyroid storm**

Refer to a tertiary care.

Life-threatening exacerbation of hyperthyroidism with fever, vomiting, diarrhoea, jaundice, delirium and coma; usually precipitated by acute illness like stroke, infection, trauma, diabetic ketoacidosis, patients undergoing surgery or radioiodine treatment in a poorly prepared patient:

1. Tab. Propylthiouracil 600 mg loading dose, then 200-300 mg every 6 hours orally or through Ryle’s tube.
   Or
   Tab. Carbimazole 15-25 mg 6 hourly.
2. One hour after 1st dose of antithyroid drug, saturated solution of Potassium iodide (SSKI) 5 drops every 6 hours.
   Or
   Lugol’s iodine 10 drops 3 times a day.
   Or
   Sodium iodide 1 g IV slowly.
3. Tab. Propranolol 40-60 mg 4 hourly or 0.5-2 mg IV every 4 hours.
4. Inj. Dexamethasone 2 mg IV 6 hourly.

Continue iodides and dexamethasone until normal metabolic stage achieved and supportive treatment like cooling, antipyretics, antibiotics for infection, IV fluids, etc.

Once euthyroid status is achieved, manage as already outlined.

**Patient education**

If fever or sore throat develops on antithyroid drugs, complete blood count should be done; discontinue, if PMN count $1500/mm^3$.

If allergic rash or drug sensitivity develops, give antihistamines and preferably change to another drug. If agranulocytosis, hepatitis, drug fever, arthralgias develop, preferably stop antithyroid treatment.

Iodide—useful in impending thyrotoxic crisis and patients with severe cardiac disease; must be used only after following antithyroid drugs.
HYPOCALCAEMIA

Hypocalcaemia may be caused by hypoparathyroidism, pseudohypoparathyroidism, vitamin D deficiency states, chronic renal failure, malabsorption syndrome and hypomagnesaemia.

**SALIENT FEATURES**

- Circumoral paraesthesias, muscle cramps, confusion, tetany, convulsions.
- Positive Chvostek’s and Trousseau’s signs.
- ECG may reveal prolongation of the QT interval.
- Total serum calcium <8.5 mg/dl (ionized calcium <4 mg/dl). In hypoalbuminaemia, add 1 mg/dl of calcium to the estimated level for every one gram fall of albumin below 4 g/dl (corrected serum calcium).

**Treatment (severe symptomatic hypocalcaemia)**

Calcium gluconate solution 20 ml of 10% over 10-15 min followed by 60-80 ml of 10% solution in 1 L 5% dextrose (0.5-2.0 mg/kg/h elemental Calcium).

(Caution: Should not be mixed with bicarbonate solution as it may result in precipitation of calcium carbonate).

Measure serum calcium every 4-6 h. Aim is to maintain the total serum calcium concentration at 7-9 mg/dl. Note that untreated hypomagnesaemia will often make hypocalcaemia refractory to therapy.

If associated with hypomagnesaemia, Inj. Magnesium sulphate 1-2 g IV on day 1 followed by oral Magnesium oxide 600-1200 mg 3 times a day to replenish stores.

**Asymptomatic hypocalcaemia/Maintenance treatment**

Treat the underlying cause, if possible. Usually long-term treatment required in conditions like hypoparathyroidism, pseudohypoparathyroidism, and chronic vitamin D deficiency states.

Tab. Calcium carbonate (40% elemental calcium by weight) 1-2 g elemental calcium orally 3 times a day initially and subsequently maintenance dose of 0.5-1 g 3 times a day.

In chronic renal failure, calcium alone gives an inadequate response.

However, correct concomitant hyperphosphataemia before instituting following therapy:
Vitamin D 50000 IU/day for 1-2 weeks, then weekly or bimonthly. Or
Calcitriol 1,25(OH)\textsubscript{2}D\textsubscript{3} 0.25 mcg orally daily—more expensive but less toxic than vitamin D for hyperphosphataemia—advise low phosphate (low cereal) diet and phosphate binding agents, e.g. aluminium hydroxide.

**Patient education**

- Side effects of oral calcium carbonate are dyspepsia and constipation.
- Absorption requires gastric acid and is impaired in achlorhydria or when acid suppressive therapy is being given.
- Serum calcium should be monitored frequently (daily in severe hypocalcaemia, weekly in moderate condition for first month) and maintained at 8.0-8.6 mg/dl, and PTH and 24 h urinary calcium within 2-4 weeks of starting treatment.
- Once serum and urinary calcium is normal and PTH falls, maintenance treatment as described with reassessment at 3 monthly intervals.

**References**


**HYPERCALCAEMIA**

The common causes are hyperparathyroidism and malignancy; others include excessive vitamin D action, high bone turnover or renal failure. Hypercalcaemia is defined as 10.5 mEq/L (or an elevation in ionized calcium > 4.8 mg/dl)

**SALIENT FEATURES**

- Generally symptoms appear when serum Ca >11.5-12.0 mg/dl; severe hypercalcaemia (>15-18 mg/dl) can result in death.
- Fatigue, depression, confusion, anorexia, nausea, vomiting, constipation, polyuria, short QT interval on ECG and occasionally cardiac arrhythmias.

**Treatment**

Treatment varies with severity; mild hypercalcaemia can be treated with rehydration only, while severe hypercalcaemia is treated as a medical emergency.

1. Rehydration infusion of 0.9% saline at 300-500 ml/h (saline diuresis) until fluid deficit is replaced and diuresis occurs (urine output ≥ 200 to 300 ml/h). Once adequate rehydration has occurred, the saline infusion rate is reduced to 100 to 200 ml/h.
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2. Monitor electrolytes especially potassium and magnesium and replace accordingly.

3. Haemodialysis is the treatment of choice to rapidly decrease serum calcium in patients with heart failure or renal failure. For extreme conditions, chelating agent (e.g. 50 mmol PO₄ over 8 to 12 hours or EDTA 10 to 15 mg/kg over 4 hours).

4. Tab. Phosphorus (sodium and potassium phosphate) 1-1.5 g per day in 4 divided doses for several days, when hypophosphataemia is present.

Definitive treatment, wherever possible, is parathyroidectomy in hyperparathyroidism.

Patient education

In patients with mild asymptomatic hypercalcaemia due to hyperparathyroidism, advise to keep active, avoid immobilization, drink adequate fluids and avoid thiazide diuretics, large doses of vitamin D or A and calcium supplements and calcium containing antacids.

Check serum calcium and albumin twice a year, renal function and urine calcium once a year and bone density of distal radius once every 2 years.

References


DIABETES MELLITUS

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycaemia. DM is divided into 2 broad categories: Type 1 DM characterized by insulin deficiency, and type 2 DM characterized by variable degree of insulin resistance, impaired insulin secretion and increased glucose production.

**SALIENT FEATURES**

Polyuria, polydipsia, polyphagia and unexplained weight loss with a *random or casual plasma glucose ≤200 mg/dl or **fasting plasma glucose ≥126 mg/dl or 2 h plasma glucose ≥200 mg/dl after a 75 g glucose load. In the absence of unequivocal hyperglycaemia, the result should be confirmed by repeat testing.

Impaired fasting glucose (IFG) 100-125 mg/dl and impaired glucose tolerance (IGT)-2 h plasma glucose 140-199 mg/dl are considered “pre-diabetes” and are risk factors for future diabetes and cardiovascular disease (CVD).

* Random/casual is defined as any time of day without regard to last meal

**Fasting is defined as no caloric intake for at least 8 hours.
Treatment of DM Type 1

This type of DM will always require insulin in addition to dietary management.

Nonpharmacological

Principles of dietary therapy

1. Caloric requirement for normal weight individual: According to nature of work:

<table>
<thead>
<tr>
<th></th>
<th>Sedentary</th>
<th>Moderate</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (Kcal/d)</td>
<td>1800-2000</td>
<td>1800-2200</td>
<td>2200-3200</td>
</tr>
<tr>
<td>Female (Kcal/d)</td>
<td>1200-1500</td>
<td>1400-1600</td>
<td>1600-2400</td>
</tr>
</tbody>
</table>

2. Caloric distribution

Carbohydrate 45-65% of total calories; Protein—10-35% of total Kcal/day (10% for those with nephropathy); 20-35% from fat: saturated fat <7% of total Kcal/day polyunsaturated fat 10% of Kcal/day. Intake of trans-fats should be minimized.

Low carbohydrate diets (<130 g/day) not recommended in the treatment of overweight/obesity. Routine supplementation with antioxidants (vitamins E, C and carotene) not advised.

Use of caloric sweetners including sucrose is safe when consumed within the intake levels recommended by FDA.

Fibre 20-35 g/day and sodium 3000 mg/day. Cholesterol 300 mg/day.

Pharmacological

Insulin therapy.

1. Therapy should be started with insulin (human) in a dose of 0.5 units/kg/day to 1.0 unit/kg/day.
2. Combination of regular + lente/semilente insulin should be used (now available as Premix preparation as well).
3. One-third of the total insulin requirement is given as regular and two-thirds as lente/semilente.
4. One-third of the total dose is used before dinner and two-thirds before breakfast.
5. Insulin is given SC 30-45 min before meals.
6. Medial aspect of thigh and abdominal wall are generally used for injection. Rotate injection site frequently. There is no need to use spirit swab, if the skin is clean.
7. Dose, type and timing of insulin is adjusted according to pre-prandial blood sugar levels (80-150 mg%). Level of blood glucose estimated depends on dose of plain insulin taken 3-4 hours before or intermediate/long-acting insulin taken 8-12 hours before the test.
8. Increment of dose should not be more than 10% of existing dose and dose readjustment should not be made earlier than 3 days.
9. Use of insulin analogs in select cases when it is justified on clinical grounds, preferably under guidance of a specialist. Patients must be properly trained for administration of SC injections.
10. Meals must be ensured after injection.

11. Explain features of hypoglycaemia to the patient (see section on Hypoglycaemia).


**Treatment of DM Type 2**

It is possible to control mild DM type 2 with nonpharmacological therapy (dietary control and exercise), however, moderate and severe forms will require, in addition, one or more oral hypoglycaemics and occasionally insulin therapy.

**Nonpharmacological**

**Diet.** Basic principles of the diet are same as in DM Type 1. Most of the patients in DM type 2 are, however, obese and should be put on dietary restrictions for weight reduction as above.

**Exercise.** Regular physical exercise for 1/2 to 1 hour (for sedentary workers) is recommended to have a better control of diabetes. Lifestyle modification of increasing physical activity in day-to-day work is also recommended: at least 150 min/week of moderate-intensity aerobic physical activity (50-70% of maximum heart rate) and/or at least 90 min/week of vigorous aerobic exercise (>70% of maximum heart rate). The physical activity should be distributed over at least 3 days/week and with no more than two consecutive days without physical activity. In the absence of contraindications resistance, exercise three times a week should be encouraged.

**Pharmacological**

If nonpharmacological measures not sufficient, oral agents may be used alone and in combination. Level of hyperglycaemia influences the initial choice of oral hypoglycaemic agents. Therapy usually started with metformin unless contraindicated. Metformin has the advantage of promoting mild weight loss in obese patients. Patient with fasting plasma glucose 200-250 mg/dl respond well. Treatment may be started with any of the following drugs and dose individualized and dose can be increased every 2-3 weeks as determined by blood glucose response:

Tab. Metformin 500 mg once or twice a day in obese patients and increase the dose to 1000 mg 2 times a day with meals.

Or

Tab. Glimipride 1-8 mg/day once daily to be taken at the same time every day with breakfast or Tab. Glipizide 2.5-40 mg/day before breakfast or Tab. Glipizide ER 5-10 mg/day with breakfast or Tab. Gliclazide MR 30 mg-120 mg/day as single dose at breakfast time.

(Caution: MR and ER tablets should be swallowed whole and not broken, chewed or crushed, as this would damage the modified release action)

Or

Tab. Glyburide (Glibenclamide) 1.25-20 mg/day administered with breakfast or with the first main meal.
Or
Tab Pioglitazone initially 15-30 mg, up to 45 mg usually once daily without regard to meals.

**Combination therapy.** If monotherapy fails with oral hypoglycaemics at maximal tolerated doses as does not achieve or maintain A1C target over 3-6 months, add a second oral agent or GLP-1 receptor agonist or insulin. Following combination can be given, if inadequate glycaemic control with single oral hypoglycaemic agent:
- Sulphonylurea + metformin
- Sulphonylurea + pioglitazone
- Sulphonylurea + alpha glucosidase inhibitor (Acarbose)
- Insulin + metformin

Insulin may be required in patients with primary (markedly symptomatic and/or elevated blood glucose levels or A1C) or secondary failure to oral agents; often as single dose of intermediate acting insulin 0.3-0.4 units/kg/day either before breakfast or at bedtime in combination with Tab. Metformin. Insulin is also required in situations like pregnancy, surgery, infection, etc.

Consider insulin as initial therapy in patients with:
- Fasting plasma glucose >250-300 mg/dl since more rapid glycaemic control will reduce glucose toxicity to islet cells, improve insulin secretion and possibly make oral hypoglycaemic agents more effective.
- Lean patients or those with severe weight loss.
- Underlying renal or hepatic disease, or acutely ill or hospitalized patients.

**Glucose monitoring**

Self-monitoring of blood glucose (SMBG) should be carried out three or more times daily for patients using multiple insulin injections or insulin pump therapy. For patients using less frequent insulin injections, noninsulin therapies, or medical nutrition therapy (MNT) alone, when adding to or modifying therapy, type 1 and 2 should test SMBG more often than usual. To achieve postprandial glucose targets, postprandial SMBG may be appropriate. When prescribing SMBG, ensure that patients receive initial instruction about correct SMBG technique and their ability to use data to adjust therapy during every follow-up visit.

Continuous glucose monitoring (CGM) in conjunction with intensive insulin regimens is a useful tool to lower A1C in selected adults (age ≥25 years) with type 1 diabetes.

Perform the A1C test at least two times a year in patients who are meeting treatment goals (and who have stable glycaemic control). Perform the A1C test quarterly in patients whose therapy has changed or who are not meeting glycaemic goals. Use of point-of-care testing for A1C provides the opportunity for more timely treatment changes.
Glycaemic goals

Glycaemic control is fundamental to the management of diabetes and glycaemic goals are shown in Table 11.1. Lowering A1C has been associated with a reduction of microvascular and neuropathic complications of diabetes and possibly microvascular disease.

Table 11.1. Summary of recommendations on glycaemic goals for adults with diabetes

<table>
<thead>
<tr>
<th>Glycaemic control</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C  &lt;7.0%.</td>
</tr>
<tr>
<td>Preprandial capillary plasma glucose</td>
</tr>
<tr>
<td>Peak postprandial capillary plasma glucose</td>
</tr>
<tr>
<td>Blood pressure</td>
</tr>
<tr>
<td>Lipids</td>
</tr>
<tr>
<td>LDL  &lt;100 mg/dl (&lt;2.6 mmol/L)</td>
</tr>
<tr>
<td>Triglycerides</td>
</tr>
<tr>
<td>HDL  &gt;40 mg/dl (&gt; 1.0 mmol/L)</td>
</tr>
</tbody>
</table>

Key concepts in setting glycaemic goals:
• A1C is the primary target for glycaemic control
• Goals should be individualized based on duration of diabetes, age/life expectancy, comorbid conditions, etc.
• Certain populations (children, pregnant women, and elderly) require special considerations
• More stringent glycaemic goals (i.e. a normal A1C, <6%) may further reduce complications at the cost of increased risk of hypoglycaemia
• Less intensive glycaemic goals may be indicated in patients with severe or frequent hypoglycaemia
• Postprandial glucose may be targeted, if A1C goals are not met despite reaching preprandial glucose goals

PREVENTION AND MANAGEMENT OF DIABETES COMPLICATIONS

Cardiovascular disease (CVD)

CVD is the major cause of mortality for individuals with diabetes. It is also a major contributor to morbidity and direct and indirect costs of diabetes. Emphasis should be placed on reducing cardiovascular risk factors, when possible, and clinicians should be alert for signs and symptoms of atherosclerosis.

1. Hypertension/blood pressure control

Screening and diagnosis

Blood pressure should be measured at every routine diabetes visit. Patients found to have systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥80 mmHg should have blood pressure confirmed on a separate day.
Goals
Patients with diabetes should be treated to a systolic blood pressure <130 mmHg and diastolic blood pressure <80 mmHg. (for details see section on Hypertension).

2. Dyslipidaemia/lipid management

Screening
In adult patients, test for lipid disorders at least annually and more often if needed to achieve goals. In adults with low-risk lipid values (LDL <100 mg/dl, HDL >50 mg/dl, and triglycerides <150 mg/dl), lipid assessments may be repeated every 2 years.

Treatment recommendations and goals
Lifestyle modification focusing on the reduction of saturated fat, trans-fat, and cholesterol intake; weight loss (if indicated); and increased physical activity has been shown to improve the lipid profile in patients with diabetes.
In individuals without overt CVD
- The primary goal is an LDL < 100 mg/dl (2.6 mmol/l).
- For those over the age of 40 years, statin therapy to achieve an LDL reduction of 30-40% regardless of baseline LDL levels is recommended.
- For those under the age of 40 years but at increased risk due to other cardiovascular risk factors who do not achieve lipid goals with lifestyle modifications alone, the addition of pharmacological therapy is appropriate.
In individuals with overt CVD
- All patients should be treated with a statin to achieve an LDL reduction of 30-40%.
Lower triglycerides to <150 mg/dl (1.7 mmol/l) and raise HDL cholesterol to >40 mg/dl (1.0 mmol/l). In women, an HDL goal 10 mg/dl higher (>50 mg/dl) should be considered.
Statin therapy is contraindicated in pregnancy.

3. Antiplatelet agents
Use aspirin therapy (75-162 mg/day) as a secondary prevention strategy in those with diabetes with a history of CVD.
Use aspirin therapy (75-162 mg/day) as a primary prevention strategy in those with:
- Type 1 and 2 diabetes at increased cardiovascular risk, including those who are >40 years of age or who have additional risk factors (family history of CVD, hypertension, smoking, dyslipidaemia, or albuminuria).

4. Smoking cessation
Advertise all patients not to smoke.
Include smoking cessation counselling and other forms of treatment as a routine component of diabetes care.
5. Coronary heart disease (CHD) screening and treatment

In patients >55 years of age, with or without hypertension but with another cardiovascular risk factor (history of CVD, dyslipidaemia, microalbuminuria, or smoking), an ACE inhibitor (if not contraindicated) should be considered to reduce the risk of cardiovascular events.

In patients with a prior myocardial infarction or in patients undergoing major surgery, β-blockers, in addition, should be considered to reduce mortality.

In asymptomatic patients, consider a risk factor evaluation to stratify patients by 10 year risk and treat risk factors accordingly.

6. Nephropathy screening and treatment

Goal is to reduce the risk and/or slow the progression of nephropathy, optimize glucose and blood pressure control.

Screening

Perform an annual test for the presence of microalbuminuria in type 1 diabetic patients with diabetes duration of ≥ 5 years and in all type 2 diabetic patients, starting at diagnosis and during pregnancy.

Serum creatinine should be measured at least annually for the estimation of glomerular filtration rate (GFR) in all adults with diabetes regardless of the degree of urine albumin excretion. The serum creatinine alone should not be used as a measure of kidney function but instead used to estimate GFR and stage the level of chronic kidney disease (CKD).

Reduction of protein intake to 0.8-1.0 g/kg/d individuals with diabetes and the earlier stages of CKD and to 0.8 g/kg/d in the later stages of CKD may improve measures of renal function (urine albumin excretion rate and GRF) and is recommended.

7. Retinopathy screening and treatment

Diabetic retinopathy is a highly specific vascular complication of both type 1 and type 2 diabetes. The prevalence of retinopathy is strongly related to the duration of diabetes. Diabetic retinopathy is estimated to be the most frequent cause of new cases of blindness among adults aged 20-74 years. Glaucoma, cataracts, and other disorders of the eye may occur earlier in people with diabetes and should also be evaluated.

General recommendations

Optimal glycaemic and blood pressure control can substantially reduce the risk and progression of diabetic retinopathy.

Screening

Adults and adolescents with type 1 and 2 diabetes should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist within 3-5 years after the onset of diabetes.
Treatment

Laser therapy can reduce the risk of vision loss in patients with high-risk characteristics (HRCs).

Promptly refer patients with any level of macular oedema, severe non-proliferative diabetic retinopathy (NPDR) or any PDR to an ophthalmologist.

Intensive diabetes management with the goal of achieving near normoglycaemia prevents and/or delays the onset of diabetic retinopathy. The presence of nephropathy is associated with retinopathy. High blood pressure is an established risk factor for the development of macular oedema and is associated with the presence of PDR. During pregnancy and 1 year postpartum, retinopathy may be transiently aggravated; laser photocoagulation surgery can minimize this risk.

8. Neuropathy screening and treatment

Recommendations

All patients should be screened for distal symmetric polyneuropathy (DPN) at diagnosis and at least annually thereafter, using simple clinical tests. Electrophysiological testing is rarely ever needed, except in situations where the clinical features are atypical.

Once the diagnosis of DPN is established, special foot care is appropriate for insensate feet to decrease the risk of amputation.

Simple inspection of insensate feet should be performed at 3- to 6-month intervals. An abnormality should trigger referral for special footwear, preventive specialist, or podiatric care.

Screening for autonomic neuropathy should be instituted at diagnosis of type 2 diabetes and 5 years after the diagnosis of type-1 diabetes. Special electrophysiological testing for autonomic neuropathy is rarely needed and may not affect management and outcomes.

Diagnosis of neuropathy

Patients with diabetes should be screened annually for DPN using tests such as pin-prick sensation, temperature and vibration perception (using a 128-Hz tuning fork), and 10 g monofilament pressure sensation at the distal plantar aspect of both great toes and ankle reflexes. Combinations of more than one test have >87% sensitivity in detecting DPN. Loss of 10 g monofilament perception and reduced vibration perception predict foot ulcers. A minimum of one clinical test should be carried out annually, and the use of two tests will increase diagnostic ability.

Diabetic autonomic neuropathy

The symptoms of autonomic dysfunction should be elicited carefully during the history and review of systems, particularly since many of these symptoms are potentially treatable. Major clinical manifestations of diabetic autonomic neuropathy include resting tachycardia, exercise intolerance, orthostatic hypotension, constipation,
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gastroparesis, erectile dysfunction, pseudomotor dysfunction, impaired neurovascular function, “brittle diabetes,” and hypoglycaemic autonomic failure.

Most patients will require pharmacological treatment for painful symptoms (Table 11.2).

Table 11.2 Drugs to treat symptomatic DPN

<table>
<thead>
<tr>
<th>Class</th>
<th>Examples</th>
<th>Typical doses*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricyclic drugs</td>
<td>Amitriptyline</td>
<td>10-75 mg at bedtime</td>
</tr>
<tr>
<td></td>
<td>Nortriptyline</td>
<td>25-75 mg at bedtime</td>
</tr>
<tr>
<td></td>
<td>Imipramine</td>
<td>25-75 mg at bedtime</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>Gabapentin</td>
<td>300-1,200 mg 3 times daily</td>
</tr>
<tr>
<td></td>
<td>Carbamazepine</td>
<td>200-400 mg 3 times daily</td>
</tr>
<tr>
<td></td>
<td>Pregabalin</td>
<td>100 mg 3 times daily</td>
</tr>
<tr>
<td>5-Hydroxytryptamine and norepinephrine uptake inhibitor</td>
<td>Duloxetine</td>
<td>60-120 mg daily</td>
</tr>
<tr>
<td>Substance P inhibitor</td>
<td>Capsaicin cream</td>
<td>0.025-0.075% applied 3-4 times daily</td>
</tr>
</tbody>
</table>

*Dose response may vary; initial doses need to be low and titrated up.

Amputation and foot ulceration are the common consequences of diabetic neuropathy and major causes of morbidity and disability in people with diabetes. The presence of erythema, warmth, or callus formation may indicate areas of tissue damage with impending breakdown. Examine the patient’s feet at every encounter and annual comprehensive foot examination to include inspection assessment of pulses, testing for loss of protective sensation (monofilament, pinprick, etc.) and adopt multidisciplinary approach at the first sign of foot ulcer and for those with high-risk feet. Bony deformities, limitation in joint mobility, and problems with gait and balance should be assessed.

Patient education

Explain the nature of the disease and potential complications arising due to poorly controlled diabetes.

Stress the importance of maintenance of normal weight, adhering to regular dietary and regular exercise schedule include counselling regarding the “better” choices from items available in the commissary. Encourage weight loss, if BMI >25 and education about diet portion control.

Lifestyle modifications may have other beneficial effects (reduced cardiovascular complications).

Exercise 150 minutes/week of moderate intensity aerobic activity.

Patient should always carry identification card along with diagnosis, medication and contact numbers in emergency.

Explain about the warning symptoms and signs of hypoglycaemia and need to take sweets/candies/drinks in such a situation.
Regular follow-up to monitor BP (quarterly), HbA1c testing (2-4 times/year), eye examination (annual), foot examination (1-2 times/year by physician; daily by patient); screening for diabetic nephropathy (annual); lipid profile (annual).

In patients with long-standing diabetes, give instructions for care of feet, choice of footwear and avoid walking barefoot.

Advise all patients not to smoke and counsel on smoking cessation.

Limit alcohol to one drink/day or less in adult women and two drinks/day or less in adult men.

*(See also diabetes mellitus in Chapter 19)*

**DIABETIC KETOACIDOSIS**

Ketoacidosis is acute complication of diabetes, usually occurs in type 1 but can occur in type 2 and characterized by hyperglycaemia, hyperketonaemia and acidosis. Important precipitating factors include poor compliance to treatment and infections/stress.

**SALIENT FEATURES**

- Nausea, vomiting, abdominal pain, dehydration and altered sensorium.
- Diagnosis is confirmed by demonstration of ketones in urine (or elevated levels in blood), hyperglycaemia, low arterial pH, low bicarbonate (>15 mmol/l) and high anion gap (>15 mmol/l).

**Treatment**

Treatment includes confirmation of diagnosis and continuous monitoring of the response to treatment as follows:

- Suspect and confirm diagnosis, assess fluid loss and degree of acidosis.
- Suspect and complete blood counts, glucose, renal functions, electrolytes and arterial blood gases.
- Evaluate for precipitating factor(s)/sepsis.

**First hour**

- If blood pressure is normal, infuse 1000 ml of normal saline.
- If shock and oligoemia, rapid infusion of normal saline until blood pressure rises to normal and subsequently continue with infusion, saline at the rate of 1 liter/hour.

1. Inj. Insulin (regular) 5-10 units/hour IV infusion.
   
   Or
   
   Inj. Insulin (regular) 20 units IM immediately followed by 5 units/hour.

2. Inj. Potassium chloride (KCl) 10-20 mmol (max 40 mmol), if serum K⁺ not more than 5 mmol/l and urine output is adequate.

3. Inj. Sodium bicarbonate 50-100 mmol infused over 30-60 minutes, if arterial blood pH <7.00.

4. If infection/sepsis suspected, Inj. Cefixime 1-2 g IV 12 hourly to be started.
Second hour

Continue IV normal saline 500 ml/hour (use 0.45% saline, if serum sodium >150 mmol/l).
Continue insulin infusion as above (if blood glucose >250 mg/dl).
Continue IV infusion of KCl (rate of infusion adjusted according to serum level).

Third and fourth hours

Continue as for second hour.
Observe for cognitive/neurological functions.

Fifth to eighth hours

Normal saline infusion 250 ml/hour; change to dextrose saline, if blood glucose <250 mg/dl.
Neutralizing insulin (1 unit per 2 g of glucose infused) infusion to continue until ketonuria disappears.

After eight hours

Continue IV fluids and insulin.
Change to subcutaneous insulin when ketones disappear.
Stop KCl infusion when plasma levels are normal.
Change antibiotic, if culture sensitivity report demands.

(For complications of diabetes mellitus see also Diabetic Retinopathy in Chapter-13).

Patient education

Explain about the importance of regular intake of insulin and diet as per requirement.
They should consult the physician soon, if there is any symptom suggestive of infection.

References

1. Executive Summary: Standards of Medical Care in Diabetes—2012. Diabetes Care 2012; 35 2001; (Suppl. 1).

NON-KETOTIC HYPEROSMOLAR COMA

It is characterized by profound dehydration due to sustained hyperglycaemic dehydration and hyperosmolarity, usually seen in elderly patients with type 2 DM, associated with stroke or sepsis.
HORMONAL DISORDERS

SALIENT FEATURES
Severe dehydration, altered sensorium and marked hyperglycaemia. There may be features of venous thrombosis due to hyperviscosity.
Other features include focal neurological deficit and sepsis.
Diagnosed by finding very high blood glucose (>500-1000 mg/dl), high plasma osmolality, acidosis and azotaemia.
Features like nausea, vomiting, abdominal pain and Kussmaul’s respiration are characteristically absent.

Treatment
1. Normal saline or half normal saline (0.45%) 2-3 liters rapidly infused over 2-3 hours. Administration of 0.45% normal saline is indicated, if serum sodium is >150 mEq/L.
2. Inj. Insulin (regular) 5 units/hour as IV infusion.
3. Potassium chloride and sodium bicarbonate infusion as per requirement and administered as in ketoacidosis.

HYPOGLYCAEMIA
Hypoglycaemia occurs due to increased utilization of glucose by the body (as during fasting, exercise or in alcoholics) or over dose of hypoglycaemic drug(s).

SALIENT FEATURES
Symptoms due to sympathetic stimulation (like anxiety, sweating, palpitation, tremors); neuroglycopenia (light headedness, confusion/altered sensorium, convulsions, focal neurological deficits) or general (weakness, hunger or blurred vision). Prolonged hypoglycaemia may result in permanent neurological deficits.
Diagnosis confirmed by estimation of blood glucose (< 70 mg/dl) by glucometer/ diastix, etc.

Treatment
Immediate
1. If patient presents early signs and is conscious, oral glucose (15-20 g) preferred or sweets/biscuits/sweet drink, etc.
2. If unconscious diabetic patient on treatment and glucometer is not available, give Inj. Glucose (25-50%) 50-100 ml infused rapidly IV.
Or
Inj. Glucagon 1 mg IM or SC. If patient receiving long-acting insulin/oral hypoglycaemic agents, continue IV infusion of 5% glucose with regular monitoring of blood glucose hourly. Contraindicated in hypoglycaemia caused by sulphonylureas as glucagon stimulates insulin secretion.

**Note:** In case of doubt between hypoglycaemia and diabetic ketoacidosis, always choose to give 25% dextrose because hypoglycaemia can kill a patient whereas slight rise in glucose in diabetic ketoacidosis will not alter the prognosis of the patient.

**After 15-20 minutes**

Check blood glucose after 15-20 minutes and confirm recovery. On recovery:
- Identify cause and re-educate patient to avoid future episodes.

If recovery is delayed or patient was on long-acting insulin or oral hypoglycaemic agents:
- Patient unconscious give infusion of 5-10% Dextrose
- Patient conscious give more oral glucose.

**Note:** Slow recovery from coma may be due to cerebral oedema, but may respond to IV mannitol and forced ventilation with high inspired oxygen concentration.

**Patient education**

Explain about the symptoms of hypoglycaemia. Stress upon regular intake of meals along with hypoglycaemic agents and advise them to keep some sweet candies with them all the time. They should use these or any other sugar/glucose containing snacks/drinks at the earliest, if symptoms of hypoglycaemia are experienced.

**References**

1. Executive Summary: Standards of Medical Care in Diabetes—2012. Diabetes Care 2012; 35 2001; (Suppl.

**ERECTILE DYSFUNCTION**

Psychogenic factors are very important. Other important aetiological factors are diabetes mellitus, atherosclerosis and many drugs especially antihypertensives. Besides a complete history, examination and routine investigations like complete blood picture, plasma glucose and lipid profile, special investigations like serum prolactin, serum testosterone and plasma gonadotrophins and at times vascular testing or psychological tests may be helpful.
Treatment

**Vacuum constriction devices**
Surgery, e.g. surgical implant of semirigid or inflatable penile prosthesis.

**Pharmacological**

Tab. Sildenafil 25-100 mg; the onset of action is within 60-90 minutes.

Lower initial doses in the elderly, in renal insufficiency, or patients on drugs like erythromycin, cimetidine and ketoconazole which may increase the serum concentration.

(Caution: Contraindicated with concomitant nitrate therapy, congestive heart failure and cardiomyopathy; cautious use in coronary artery disease, borderline hypotension, hypovolaemia and patients on complex antihypertensive treatment).

Or

Inj. Testosterone enanthate 100-200 mg IM every 1-2 weeks in low testosterone states.

Or

Intraurethral Alprostodil (Prostaglandin E₁) semisolid pellets of 125-1000 mcg. Or Intracavernosal Alprostodil self-injection 1-40 mcg.

**Patient education**

Counselling of both partners.

Explain the side effects of sildenafil and other drugs. Sildenafil can cause headache, facial flushing, dyspepsia, nasal congestion and transient altered colour vision.

**Reference**

ACUTE SUPPURATIVE OTITIS MEDIA (ASOM)

ASOM is caused by inflammation of the mucous membrane lining the middle ear cleft (consisting of the eustachian tube, tympanic cavity, mastoid antrum and mastoid air cells) produced by pus forming organisms.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Severe throbbing pain in the ear, difficulty in hearing, and rarely giddiness and excessive crying in children.</td>
</tr>
<tr>
<td>• Often bilateral in children, preceded by upper respiratory tract infection.</td>
</tr>
<tr>
<td>• Congestion and bulging of ear drum leading to perforation and discharge.</td>
</tr>
</tbody>
</table>

**Treatment**

**Nonpharmacological**

Steam inhalation and to keep the ear clean in case of pus discharge.

**Pharmacological**

1. For fever Tab. Paracetamol 500 mg SOS (for details see section on fever in chapter 1).
2. Cap. Amoxycillin 250-500 mg 8 hourly for 7 days. In complicated cases and children <2 years longer course i.e., 10 days is given. In Children 20-40 mg/kg in 3 divided doses for 7 days. Or Cap. Cephalexin 250-500 mg 8 hourly. In Children 20-40 mg/kg/day in 3 divided doses. Switch antibiotics if no clinical improvement by 3rd day. Or Cap. Amoxicillin plus Clavulanic acid 625mg 12 hourly, in children 2-6 years 375mg 12 hourly, for children <2 hours Suspension 5ml 12 hourly.
3. Xylometazoline HCl 0.1% 1-2 nasal drops in each nostril 1-2 times daily. In Children (0.05%) 1-2 nasal drops 1-2 times daily. Or Oxymetazoline 0.05% 1-2 nasal drops in each nostril 2 times daily. In Children (0.01%) 1-2 drops 2 times daily.

**Surgical Treatment**

Refer to an Otolaryngologist if there is intense pain, bulging of the ear drum or persisting fever despite treatment for myringotomy.
Patient education

- Treat upper respiratory and sinus infections at the earliest.

References

CHRONIC SUPPURATIVE OTITIS MEDIA (CSOM) (TVBO-TYMPANIC TYPE)

CSOM is characterized by the presence of a central perforation resulting from acute otitis media. It may present as an active disease when infection may occur through the nasopharynx or through the perforation thus causing ear discharge. In the inactive disease the only presenting feature is deafness.

SALIENT FEATURES

- Discharge - mucoid, intermittent, copious during acute exacerbation.
- Deafness - usually conductive type.

Treatment

Nonpharmacological
Aural toilet by dry mopping or careful suction.

Pharmacological
Topical antibiotics:
1. Ciprofloxacin HCl 0.3% w/v ear drops 2-3 drops 3-4 times daily
2. When ear infection is associated with marked inflammation combine with Prednisolone 0.5% + Chloramphenicol 5% + Lignocaine 2% + Acetic acid 2% to be used as 3-4 drops 3-4 times daily.
3. In case of profuse mucopurulent discharge and for any associated upper respiratory tract infection give systemic antibiotics Cap. Amoxycillin 750-1500 mg in 3 divided doses
   In Children 20-40 mg/kg in 3 divided doses.
   The choice of antibiotic depends on the culture and sensitivity report of the pus.
4. Tab. Cetrizine 10mg once daily, in children suspension 5ml.

Surgical Treatment
Once the ear is dry and any local nidus of infection has been treated the ear can be taken up for myringoplasty after assessing the hearing status.

Patient education

- Explain the patient not to allow water or dust to enter the ear.
Explain the patient to take immediate treatment in case of upper respiratory tract infection.

- Do not instill oil if there is a discharge from the ear or if the patient is known to have perforation of ear drum.

References

OTITIS MEDIA WITH EFFUSION

It is characterized by the presence of non-purulent fluid in middle ear cleft which may be because of eustachian tube dysfunction, unresolved otitis media or allergy.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Deafness- conductive type and tinnitus.</td>
</tr>
<tr>
<td>• Otoscopy may show retraction of the drum or air fluid level and air bubbles behind the drum.</td>
</tr>
</tbody>
</table>

Treatment

Pharmacological
1. Cap. Amoxycillin (as trihyd 250 mg) with Clavulanic acid (as pot. Salt) 375 mg, 1 Tab. thrice daily before meals for up to 21 days.
2. Tab. Psuedoephedrine 120 mg 8 hourly.
   In Children 1-2 mg/kg twice daily.

Surgical
Surgical measures may be necessary if patients do not respond to long term pharmacological measures. Surgery may include myringotomy with or without grommet insertion, adenoidectomy, treatment for sinusitis and even mastoidotomy in refractory cases.

Patient education

Do not instill oil in the ear.

References

WAX
Wax (cerumen) is a mixture of the secretions of the ceruminous and pilosebaceous glands located in the cartilaginous portion of the external auditory canal.
**SALIENT FEATURES**

- Pain, deafness, tinnitus, vertigo and reflex cough.

**Treatment**

**Pharmacological**

1. If pain is severe Tab. Ibuprofen 400 mg SOS.
   
   In Children 20 mg/kg/day divided into 3 doses.

2. Wax softener - (Turpentine oil - 15%, Benzocaine - 2.7%), Chlorbutol - 5%, Paradichlorobenzene - 2%) 3-4 days before cleaning the ear when the wax is hard.

   Followed by surgical removal (to be carried out by an Otolaryngologist). Syringing with sterile saline solution at body temperature pushed along the posterior wall of the meatus to take out the wax. The meatus should be mopped dry after syringing.

   (Caution: if there is previous history of ear discharge or perforated drum).

   Or

   Instrumental manipulation with ring probe, hook or forceps and suction cleaning.

**Patient education**

Wax is a normal secretion and provides protection to the ear drum and should be removed only if it disturbs hearing.

Cleaning the ear with buds can push the wax to the deeper canal.

**Reference**


**OTOMYCOsis**

It is the fungal infection of the external auditory meatus seen more commonly in tropical and subtropical climates. The fungi commonly found are *Aspergillus niger* and *Candida albicans*. Otomycosis may develop as a primary infection or as a mixed infection with bacteria.

**SALIENT FEATURES**

- Itching with or without pain, grayish -white fungal debris with or without black specks and ear blockage.

**Treatment**

**Nonpharmacological**

Regular ear toilet- by suction/dry mopping/instrumentation.
**Pharmacological**

1. Topical Clotrimazole as 1% powder or liquid 3-4 times a day to be continued for at least a week after clinical resolution of the infection.
2. Tab. Ibuprofen 400 mg as and when required.
   In Children 20 mg/kg/day in 3 divided doses. Or
   Tab. Nimesulide 100 mg as and when required.

**Patient education**

Ear is to be kept dry; entry of water into the ear should be prevented.

**References**


**EXTERNAL EAR FURUNCULOSIS**

It is due to staphylococcal infection of hair follicle in the outer cartilaginous part of the external meatus. It may be single or multiple. Abrasions facilitate infection, which is more common in diabetic patients. Careful history and local examination helps in differentiating it from mastoiditis.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pain, tenderness, swelling, ear blockade.</td>
</tr>
<tr>
<td>• Regional lymphadenitis and sometimes discharge.</td>
</tr>
</tbody>
</table>

**Treatment**

**Nonpharmacological**

Local heat.

**Pharmacological**

1. 10% Ichthamol in glycerine wick pack.
   Or
   Antibiotic steroid cream wick pack (PolymyxinB sulphate 500 IU, Neomycin sulphate 3400 IU, Zinc bacitracin 400 IU, Hydrocortisone 10 mg, per g) wick packing to be done on alternate day till swelling subsides followed by/or
2. Local ear drops (Polymyxin B sulphate 1000 U, Neomycin sulphate 3400 U, Hydrocortisone 10 mg/ml).
3. Systemic therapy with antibiotics (see section on furunculosis in chapter 14 on skin diseases)
4. Tab. Ibuprofen 400 mg as and when required.
   Or
   Tab. Nimesulide 100 mg twice a day.
   Incision and drainage may be necessary in some patients.

**Patient education**
In patients having recurrent boils, diabetes mellitus should be ruled out and patients are instructed not to do ear picking.

**COMLVIONCOLD (CORYZA)**

This is one of the most common acute viral infections affecting upper respiratory tract.

**SALIENT FEATURES**

- Rhinorrhoea, nasal obstruction, malaise and fever.

**Treatment**

*Nonpharmacological*

Steam inhalation via nose 2-3 times/day for 2-3 days; rest; home remedies (ginger, tulsi, honey).

*Pharmacological*

1. Tab. Chlorpheniramine 4 mg 8 hourly for 5-7 days. In Children 0.35 mg/kg/day divided in 3 equal doses.
   Or
   Tab. Pheniramine maleate 25 mg 2-3 times daily for 5-7 days. In Children 0.5 mg/kg/day divided in 3 equal doses.

2. If patient has malaise and fever:
   Tab. Paracetamol 500 mg 3-4 times a day for 2-3 days and then as and when required.
   In Children 40-60mg/kg/day divided in 4 doses or 10 mg/kg/dose as and when required.

3. If nasal obstruction or rhinorrhoea is profuse:
   Saline nasal drops, 1-2 drops in each nostril 2-3 times daily.

4. If nasal obstruction is severe.
   Ephedrine 0.75% nasal drops, 1-2 drops in each nostril 3 times a day for 2-3 days.
   In Children 0.5% nasal drops, 1-2 drops in each nostril 2-3 times daily
   Or
   Oxymetazoline HCl 0.05% nasal drops, 1-2 drops in each nostril 2 times a day for 2-3 days.
   In Children 0.025%, 1 drop, 2 times daily.
   Or
   Xylo metazoline 0.1%, 1-2 drops in each nostril 2 times a day for 2-3 days. In Children 0.05%, 1-2 drops, 1-2 times
daily.
(Caution: Not recommended in children below 6 years of age) Medicated nasal drops should NOT be used for more than 7 days.

Symptomatic improvement occurs within 48 hours in the form of decreased rhinorrhea, nasal obstruction, paroxysmal sneezing, malaise and fever.

Patient education
- This is a self limiting viral infection and usually subsides in one week requiring only symptomatic relief. Antibiotics have no role. Chlorpheniramine and pheniramime can cause sedation and cognitive impairment, therefore, patient should avoid tasks requiring alertness and skill. Medicated nasal drops used for longer period can cause rebound congestion and rhinitis medicamentosa.

Reference

ALLERGIC RHINITIS
This is an IgE mediated hypersensitivity of the mucous membrane of the nasal passage.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sneezing, itching, watery nasal discharge and a feeling of nasal obstruction.</td>
</tr>
<tr>
<td>• It may be associated with allergic conjunctivitis and bronchial asthma.</td>
</tr>
<tr>
<td>• It can be divided into the following types</td>
</tr>
<tr>
<td>- Seasonal allergic rhinitis (SARIHay fever), sneezing, itching watery rhinorrhea and conjunctivitis are prominent symptoms.</td>
</tr>
<tr>
<td>- Perennial allergic rhinitis (PAR). This differs from SARAs this is due to long standing nasal mucosal congestion. In this condition, nasal discharge is more viscous or purulentUsllal <del>yplpto.tns ar</del> nas(4.1&gt;1)(fka~e.post nasal disch--rga and hyposmia. Diagnosis can be made if patient is having two or more symptoms (viz. sneezing/itching, nasal discharge and nasal blockage) occurring for more than one hour on most days.</td>
</tr>
</tbody>
</table>

Treatment
Nonpharmacological
Avoid allergens.

Pharmacological
1. Tab. Cetirizine 10-20 mg in a single daily dose for 7 days
   In Children 5 mg in a single daily dose.
   Or
   Tab. Chlorpheniramine maleate 4 mg 6-8 hourly for 7 days.
   In Children 1-2 years 1 mg twice daily; 2-5 years 1 mg every 3-6 hours;
   6-12 years 2 mg every 4-6 hours.
   (Caution: Not recommended for children under 1 year)
   Or
Tab. Pheniramine maleate 25-50 mg 8 hourly for 7 days.
In Children 0.5 mg/kg/day divided in 3 doses.
The duration of treatment may need to be extended depending upon the response of the patient.

2. If nasal obstruction and rhinorrhoea,
   Normal saline nasal drops 1-2 drops in each nostril 2 times daily.
   Or
   Xylometazoline 0.1% nasal drops 1-2 drops 2-3 times daily for 5-7 days.
   In Children 0.05% 1-2 drops 2 times daily.
   Or
   Oxymetazoline 0.5% nasal drops 2-3 drops 2-3 times daily for 5-7 days.
   In Children 0.025% 1-2 drops 2 times in each nostril

3. If case signs and symptoms are persistent
   Betamethasone nasal drops 2-3 drops 2-3 times a day.
   Or
   Hydrocortisone nasal drops 2-3 drops 2-3 times a day.
   Or
   Beclometasone inhaler (50 meg/puff) 2 puffs 12 hourly.
   Or
   Budesonide (50-100 meg/puff) 1-2 puffs a day.
   Or
   Fluticasone 150 meg/puff 1-2 puffs a day.
   Or
   Topical Azelastine intranasal spray 2-3 times a day.

4. If case of no response to the treatment outlined above,
   Tab. Prednisolone 5-60 mg/day in 3-4 divided doses for 5-7 days.
   Or
   Tab. Dexamethasone 0.5-5.0 mg/day in 3-4 divided doses for 5-7 days.
   Or
   Tab. Betamethasone 0.5-5.0 mg/day in 3-4 divided doses for 5-7 days.

5. Tab. Ranitidine 150mg 12hourly,
   Or
   Tab. Omeprazole 20mg once daily empty stomach.

**Patient education**

This disease is due to hypersensitivity and there is no cure but symptoms can be controlled effectively by the judicious use of drugs and the patient can lead a normal life.
Prolonged use of topical decongestant nasal drops to be avoided as it can cause atrophic rhinitis, anosmia and rhinitis medicamentosa.

- Chlorpheniramine, pheniramine etc. can cause sedation, cognitive impairment. Patient should avoid tasks requiring alertness and skill. These drugs can also cause dryness of the mouth and urinary hesitancy.
- Systemic steroids should not be stopped abruptly. Dose to be tapered off before cessation of therapy.
- Medicated nasal drops should not be used for more than seven days.

**Reference**


**FURUNCULOSIS OF NOSE (VESTIBULITIS)**

Furunculosis is an acute infection of hair follicle with *Staphylococcus aureus.*
SALIENT FEATURES

- Severe pain and tenderness over the tip of nose.
- There may be headache, malaise and pyrexia.
- Examination reveals congestion and swelling of the vestibule.

Treatment

Nonpharmacological

Local application of icecold fomentation will enhance the localization of infection and promote drainage.

Pharmacological

1. Cap. Amoxycillin 500 mg 8 hourly for 5-7 days.
   In Children 25-50 mg/kg/day in 3 divided doses.
   Or
   Cap. Amoxycillin 250 mg + Cloxacillin 250 mg 8 hourly for 5-7 days.
   In Children 25-50 mg/kg/day in 3 divided doses.
   Or
   Cap. Amoxycillin 250/500 mg + Clavulanic acid 125 mg 12 hourly for 5-7 days.
2. Tab. Ibuprofen 400-600 mg 3 times a day for 5 days.
   In Children 10 mg/kg/dose.
   Or
   Tab. Paracetamol 500 mg 6 hourly for 2-3 days then as and when required till pain and fever subsides.
   In Children 10 mg/kg/6-8 hourly
   Or
   Tab. Chymotrypsin 8 hourly.

Usually improvement in pain, tenderness and inflammation occurs within 24-48 hours after initiation of treatment. Patient should be monitored regularly. If there is flaring of infection in the form of spreading facial cellulitis then patient should be hospitalized and shifted to systemic intravenous antibiotics. If patient is having recurrent furunculosis, then the patient should be investigated for diabetes mellitus.

Patient education

- Do not fidget with the furuncle as this lies in the dangerous area of the face and can cause serious complications.
- Complete antibiotic therapy to avoid risk of developing antimicrobial resistance.

Reference


EPISTAXIS

The most important causes of epistaxis includes trauma in the form of nose-picking; hypertension, bleeding disorders, nasal mass and acute inflammation.
SALIENT FEATURES

- Bleeding from the nose and mouth.
- Shock due to excessive toss of blood.

Treatment

The treatment instituted will depend on a number of factors such as Type and severity of bleeding. Condition of the patient. Identification of a local or systemic cause for the bleeding.

1. In cases with active epistaxis, Check the vitals and pinch the nose (apply firm pressure below the nasal bone) then wait for 15 minutes and again check nose for bleeding. If bleeding does not stop refer to an Otolaryngologist for nasal cautery. Patient should be admitted in the hospital for nasal cautery.

If nasal cautery is not able to stop bleeding do nasal packing (anterior, posterior, merocel). If bleeding is controlled start antibiotics and remove the pack after 48 hours. If bleeding not controlled arterial ligation, angiography and embolization may be required.

2. Simultaneously treat the underlying cause.

Recurrent epistaxis

Identify the cause and treat accordingly.

Patient education

Patients must be advised against inserting fingers into the nose, especially children.

As first aid, explain how to pinch the nose tightly and apply ice pack over the nose, while waiting for proper medical attention.

Reference


ACUTE RHINO SINUSITIS

This condition often occurs due to secondary bacterial infection after viral rhinitis.
SALIENT FEATURES

- Headache, facial pain, nasal obstruction, hawking and postnasal drip.
- Examination shows congested nasal mucosa, pus in the middle meatus and tenderness over sinuses.

Treatment

**Nonpharmacological**

Steam inhalation via nose 2-3 times/day for 2-3 days; rest.

**Pharmacological**

1. Tab. Paracetamol 500 mg 3-4 times a day for 5 days.
   - In Children 10 mg/kg/dose.
   - Or
   - Tab. Ibuprofen 400 mg - 600 mg 3 times a day for 5 days.
   - In Children 10 mg/kg/dose.
2. Cap. Amoxicillin 500 mg 8 hourly for 5-7 days.
   - In Children 50 mg/kg/day in 3 divided doses.
   - Or
   - Tab. Ciprofloxacin 250-500 mg twice a day for 5-7 days.
   (Caution: not recommended in children)

**In sinusitis of dental origin**

1. Cap. Amoxicillin 500 mg 3 times a day for 5-7 days.
2. Tab. Metronidazole 400 mg 3 times a day for 5-7 days.
   - Or
   - Tab. Ciprofloxacin 500 mg 2 times a day for 5-7 days.
   - Tab. Tinidazole 600 mg 2 times a day for 5-7 days.
3. Tab. Bromhexine 8 mg 3 times a day for 7 days.
4. If nasal obstruction or rhinorrhoea,
   - Normal saline nasal 1-2 drops in each nostril 2-3 times a day.
   - Or
   - Ephedrine 0.75% nasal drops in isotonic saline 1-2 drops in each nostril 2 times a day;
   - In Children 0.5% 1-2 drops in each nostril 2 times daily.
   - Or
   - Oxymetazoline HCl 0.05% nasal drops. 1-2 drops in each nostril 2 times a day.
   - In Children 0.025% 1-2 drops in each nostril 2 times daily.
   - Or
   - Xylometazoline 0.1% nasal drops 2-3 drops in each nostril 2-3 times a day.
   - In Children 0.05% 1-2 drops in each nostril 2 times daily.
   (Caution: Medicated nasal drops should not be used for more than 7 days).

Improveent is seen in symptoms viz. pain tenderness, nasal obstruction and discharge within 48-72 hours after initiation of therapy. If there is no desirable response patient should be referred to an Otolaryngologist.
Patient education

To take full course of systemic antibiotics to avoid the risk of developing antimicrobial resistance.

Prolonged use of topical decongestants more than a week to be avoided as it can cause atrophic rhinitis, anosmia and rhinitis medicamentosa.

Reference


ACUTE TONSILLITIS

It is the acute inflammation of the palatine tonsils, generally bacterial in aetiology.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pain in the throat aggravated on swallowing and congestion of the tonsils and the anterior pillars.</td>
</tr>
<tr>
<td>• Fever and malaise.</td>
</tr>
<tr>
<td>• Enlarged and tender jugulodigastric lymph nodes.</td>
</tr>
</tbody>
</table>

Treatment

Nonpharmacological

Plenty of oral fluids and rest and warm saline gargles.

Pharmacological

1. Cap. Amoxycillin 500 mg 3 times a day.
   In Children 50 mg/kg/day in 3 divided doses for 7 days. Or
   Cap. Erythromycin 500 mg four times a day.
   In Children 50 mg/kg/day in three divided doses for 7 days.

2. Tab. Paracetamol 8-10 mg/kg 6-8 hourly and then as and when required, till fever subsides.
   Or
   Tab. Nimesulide 1.5-2 mg/kg/day and then as and when required, till fever subsides in adults.

Patient education

In case of development of any complication such as peritonsillar abscess or peritonsillitis, the patient should be admitted for intravenous antibiotic treatment and/or surgical drainage, if required, under the supervision of an ENT surgeon.

In case of recurrent episodes of acute tonsillitis, more than 4-5 annually, the patient must be referred for surgery.
ACUTE PAROTITIS

It is an acute bacterial infection of the parotid gland.

SALIENT FEATURES

- Swelling at the angle of mandible pushing ear lobule laterally, generally unilateral, induration and tenderness of gland. Purulent saliva may be expressed from the duct opposite the upper second molar.

Treatment

Nonpharmacological

Adequate hydration, good oral hygiene, repeated massage of the gland.

Pharmacological

1. Cap. Cloxacillin 20-40 mg/kg in 3 divided doses for 7 days.
   Or
   Tab. Ciprofloxacin 500 mg twice daily for 7 days in adults.

2. Tab. Paracetamol 8-10 mg/kg thrice daily for 3 days and then as and when required, if pain and fever persists.
   Or
   Tab. Nimesulide 1.5-2 mg/kg twice daily for 3 days in adults and then as and when required, if pain and fever persists.

3. Antiseptic mouthwash containing (Povidone Iodine 1% or Chloroxylenol 1.02%, Menthol 0.12%, Absolute Alcohol 60.8%) to be used 3 times a day. in case parotitis is not responding, and there is increasing swelling over the parotid region or development of induration over the gland, it may require incision and drainage. This should be done by an Otolaryngologist in a direction parallel to the direction of the facial nerve.

Patient education

To maintain good oral hygiene.
FACIAL PARALYSIS

The VII cranial nerve is frequently affected in diseases of the ear. The central causes (upper motor neuron type) are brainstem infarction, tumours and multiple sclerosis. The peripheral causes are inflammatory (ASOM, CSOM or herpes zoster oticus), traumatic (accidental or iatrogenic), neoplastic or idiopathic (as in Bell's palsy or Melkersson's syndrome) and due to systemic diseases such as diabetes mellitus, sarcoidosis and demyelinating diseases etc. The paralysis is of the lower motor neuron type, i.e., it affects the entire face on the ipsilateral side.

Treatment

Nonpharmacological

Treat the underlying cause of the lesion. Surgical intervention is often indicated in peripheral causes like ASOM, CSOM and tumours.

Pharmacological

(Idiopathic paralysis of the Facial Nerve - Bell's palsy)

Tab. Prednisolone 2 mg/kg/day in single or two divided doses for 1 week (maximum: 60 mg/day). Review after one week.

Tab. Ranitidine 150mg 12hourly, Or
Tab. Omeprazole 20mg once daily empty stomach.

If clinical improvement is present, taper steroids over 4-5 days. If no clinical improvement: continue for another week before tapering the dose. If recovery does not occur: surgical intervention may be required.

Patient education

Wear an eye pad over the affected eye or use lubricant eye drops to avoid exposure keratitis.
Facial exercises to be done.

Reference

STYE (HORDEOLUM EXTERNUM)

Acute suppurative inflammation of lash follicle and its associated glands of Zeis or Moll caused by *Staphylococcus aureus* presenting as painful swelling at the base of cilia.

**Treatment**

**Nonpharmacological**

Hot fomentation and epilation of infected cilia 2-3 on either side.

**Surgical treatment**

Nick the pustule using sharp tip of a needle and blade and express the purulent material. Do not attempt squeezing.

**Pharmacological**

- Topical antibiotics:
  - Gentamicin 0.3% eyedrops 1 drop 6 hourly. Or
  - Ciprofloxacin 0.3% eyedrops 6 hourly. Or
  - Ciprofloxacin eye ointment 2 times a day.

- Systemic antibiotics, if excessive oedema or cellulitis. Tab. Roxithromycin 150 mg 2 times a day for 5-7 days. Or
  - Cap. Amoxycillin 250-500 mg every 8 hours for 5-7 days.
  - Tab. Ibuprofen 400 mg 3 times a day after meals.

- Exclude refractive error and diabetes mellitus and chronic blepharitis in recurrent cases.

**Patient education**

Avoid rubbing of eyelids with dirty hands.
Use glasses for refractive errors.
Maintain proper ocular hygiene to prevent recurrence.
CHALAZION

It is a chronic inflammatory lipogranuloma of Meibomian glands presenting as solitary or multiple nodular swelling of tarsal plate.

Treatment

Nonpharmacological

Warm compresses for 4 weeks may relieve small chalazia of short duration.

Pharmacological

Tiny chalazia may be ignored.
Topical antibiotic as above.

Surgical treatment

For small chalazia, intralesional Triamcinolone (40 mg/ml)–inject 0.05 to 0.2 ml from the conjunctival side after local anaesthesia or from skin side. Repeated after 2-4 weeks, if no resolution.

For large chalazia (>6 mm) or those who present for more than 3-4 months duration, incision and curettage.
Recurrent and hard chalazia in elderly—excisional biopsy.

Patient education

The condition may recur at the same site or different site, involving any eyelid. Some of the common causes of recurrences are uncorrected refractive error, blepharitis and diabetes. Recurrence of chalazia at the same site may be harbouring malignant disease.
Intrallesional triamcinolone can cause steroid-induced glaucoma and hypopigmentation of skin.

Reference


VITAMIN A DEFICIENCY (XEROPHTHALMIA)

Xerophthalmia is characterized by night blindness, epithelial conjunctival xerosis, Bitot’s spots and, keratomalacia and fundus changes in severe cases.

Treatment

Pharmacological

(a) Cap of Vitamin A (Vitamin A) should be administered immediately on diagnosis as mentioned below:
<6 months of age: Three doses of oral Vitamin A 50,000 IU each immediately on diagnosis, the next day and at least 2 weeks later.
6-12 months of age: Three doses of oral Vitamin A 100,000 IU immediately on diagnosis, the next day and at least two weeks later.

>12 months of age: Three doses of oral Vitamin A 200,000 IU each immediately on diagnosis, the next day and at least 2 weeks later. Women of reproductive age with night blindness or Bitot’s spots: <10,000 IU Vitamin A daily or weekly dose of < 25,000 IU.

Women of reproductive age whether or not pregnant with severe signs of active xerophthalmia (acute corneal lesions): Three doses of oral Vitamin A 200,000 IU each immediately on diagnosis, the next day and at least 2 weeks later.

Water miscible Vitamin A preparation (dose is half of oral dose) is given IM for children suffering from persistent vomiting, severe diarrhoea and intestinal parasites. If there is gross purulent discharge due to bacterial superinfection in keratomalacia.

- 
  G
  entamicin/Tobramycin eyedrops 14 mg/ml drops hourly.

- 
  C
  efazolin 50 mg/ml eyedrops 1 hourly till infection resolves. If corneal ulcer present (see section on Corneal Ulcer).

Patient education

Regular consumption of Vitamin A rich foods particularly fresh dark green leafy vegetables which constitute very rich and cheap sources of Vitamin A. Pregnant women and lactating mothers should also consume Vitamin A rich diet regularly. Breastfeeding including feeding of newborn with rich colostrum.

High dose universal distribution schedule for prevention of Vitamin A deficiency.
- Infants < 6 months of age.
- Non-breastfed infants—50,000 IU orally.
- Breastfed infants whose mothers did not receive supplemental Vitamin A—50,000 IU orally.
- Infants 6-12 months of age—100,000 IU orally.
- Children >12 months—200,000 IU orally every 4-6 months till 5 years of age.
- Mothers—200,000 IU orally within 8 weeks of delivery.

Excessive consumption of Vitamin A can cause hypervitaminosis A.

Reference


RED EYE

This is a common condition. It is divided into non-painful and painful red eye.

NON-PAINFUL RED EYE

Non-painful red eye is caused by conjunctivitis, lid abnormalities, e.g. trichiasis, entropion, blepharitis, meibomitis, ectropion, lagophthalmos, molluscum contagiosum, episcleritis, subconjunctival haemorrhage, inflamed pinguecula and pterygium. Painful red eye is caused by acute attack of primary angle closure glaucoma, phacomorphic glaucoma, corneal ulcer/keratitis, acute anterior uveitis, scleritis and endophthalmitis; may be associated with circumcorneal congestion (ciliary injection).

Conjunctivitis may be classified into:
I. Infective conjunctivitis caused by bacterial, chlamydial or viral microorganisms.

II. Allergic conjunctivitis.

I. Infective Conjunctivitis

A. Bacterial conjunctivitis

Bacterial conjunctivitis manifests as acute mucopurulent, purulent, angular and membranous conjunctivitis.

**Acute mucopurulent conjunctivitis**

Common aetiological microorganisms are *Staphylococcus aureus*, *Haemophilus ae-gyptius* (Koch-Week’s bacillus), *Streptococcus pneumoniae*, *Streptococcus viridans* and *pyogenes*.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
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</thead>
<tbody>
<tr>
<td>Unilateral or bilateral red eye, conjunctival congestion, mucopurulent or purulent discharge, stickiness of eyelids, matting of cilia; no photophobia in uncomplicated cases.</td>
</tr>
<tr>
<td>Cornea, pupil and visual acuity are normal, however, in case of corneal involvement—pain, photophobia and circumcorneal congestion.</td>
</tr>
</tbody>
</table>

**Nonpharmacological treatment**

Do not patch or bandage the eye; use dark glasses to prevent photophobia; maintain good personal and ocular hygiene. Clean the eye with plain water 3-4 times a day or irrigate conjunctiva with sterile normal saline or Ringer's lactate twice a day. Patient’s towel, handkerchief or other fomites should not be shared.

**Pharmacological**

1. Eyedrops Gentamicin 0.3% eyedrops or Ciprofloxacin 0.3% or Chloramphenicol 0.5 to 1% or moxifloxacin eyedrops 1 drop every 2-3 hourly during day time and Gentamicin or Ciprofloxacin eye ointment instilled in inferior fornix at bedtime for 5-7 days.

If there is evidence of cellulitis or fever, treat accordingly (see section on Cellulitis and Orbital Cellulitis).

(A**Caution**: Corticosteroid drops are contraindicated.)

If there is no response to empirical therapy after 7 days, stop all antibiotics and conjunctival scrapping should be obtained for Gram’s stain and culture and sensitivity studies. Appropriate antibiotic should be selected based on culture sensitivity reports.

**Acute purulent bacterial conjunctivitis**

Acute purulent conjunctivitis can affect newborn babies, adolescents and adults. The most fulminant form of purulent conjunctivitis occurs due to *N. gonorrhoeae*. It is characterized by severe lid oedema, erythema, chemosis, thick purulent discharge, preauricular lymphadenopathy and frequent corneal involvement.

**Ophthalmia Neonatorum**

It is also called conjunctivitis of the newborn, neonatal conjunctivitis and occurs during the first 28 days of life. It may be due to gonococcal or nongonococcal bacteria. In the later type, Herpes simplex II is the aetiological agent in 80% of the cases. The infection is acquired from the maternal birth canal.

<table>
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<tr>
<th>SALIENT FEATURES</th>
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<tbody>
<tr>
<td>Complications like corneal blindness, cataract, nystagmus, endophthalmitis or</td>
</tr>
</tbody>
</table>
panophthalmitis and metastatic stomatitis and arthritis can occur.

**Treatment**

**Nonpharmacological**

Irrigate conjunctival sac with warm normal saline before antibiotic instillation, wipe away the discharge with moistened cotton wool.

**Pharmacological (gonococcal ophthalmia neonatorum)**

1. Crystalline Benzyl penicillin aqueous solution 10,000 to 20,000 U/ml (mix 5-10 ml of distilled water in a vial containing 5 lacs units of Penicillin G) instilled 1 drop every hour for 6 to 12 days and then 1 drop every 2-3 hours till the infection is resolved.
   Or
   Tobramycin 0.3% eyedrops every two hourly for 10 days. Or
   Gentamicin 0.3% eyedrops at every one hour interval. Or
   Ciprofloxacin 0.3% eyedrops every hour and 0.3% eye ointment at night.
2. If corneal involvement (see section on Corneal Ulcer).

Systemic treatment in full term babies with normal birth weight after sensitivity testing.
   - Inj. Procaine Penicillin G 4.8 million units in 2 divided doses IM for 7 days. In preterm low birth weight babies,
   - Inj. Procaine Penicillin G 20,000 units/kg/day 2-3 divided doses IM or IV for 3 days.
   Or
   - Inj. Ceftriaxone 125 mg as a single IM dose (for penicillin allergic patients). Or
   - Inj. Cefotaxime 100 mg/kg IM as a single injection.
3. Also treat mother with systemic therapy.
4. Treat chlamydial infection simultaneously as it may also coexist.

**Pharmacological (non-gonococcal neonatorum)**

This is a milder disease occurring within 5-14 days after birth. It is caused by chlamydial, bacterial or herpetic infection.

1. Ciprofloxacin 0.3% eyedrops 1 drop every 2-4 hours and 0.3% eye ointment at night for 2 weeks.
   Or
   - Gentamycin 0.3% eyedrops every 1 drop 2-4 hours and eye ointment at night for 2 weeks.
2. If evidence of systemic involvement:
   - Syr. Erythromycin 50 mg/kg/day in 4 divided doses for 14 days.
   - If extensive conjunctival or corneal involvement, also treat the parents, primarily mother. If no response after 1 week of therapy, refer for an appropriate culture and sensitivity testing to a tertiary care level.

**Antenatal care**

**Prophylaxis.** Screening of high-risk pregnant women (pregnant women with vaginal discharge, dysuria, STI such as syphilis, genital herpes, etc.; multiple sexual partners, sexual contact with a partner with an unspecified STI) and treatment of maternal urogenital infections during pregnancy and sexual partner.
**Pharmacological treatment (gonorrhoea in pregnant women)**

1. Inj. Procaine penicillin 4.8 million IV/IM with 1 g oral probenecid.
2. In Penicillin-resistant cases, Inj. Spectinomycin 4 g in 2 divided doses IM single injection in gluteal region.

**Pharmacological treatment (chlamydial urogenital infection in pregnant women)**

Tab. Roxithromycin 150 mg 2 times a day orally for 2 weeks (esteolate salt is contraindicated).

Or

Cap. Amoxycillin 500 mg orally 3 times a day for 7 days (in late pregnancy Erythromycin is preferred).

**Intranatal care.** Meticulous aseptic precautions during delivery. **Postnatal care.** Careful cleaning of closed eyelids immediately after birth. Povidone - Iodine 2.5% in both eyes 1 drop within 20 minutes of birth. Or

- Tetracycline hydrochloride 1% eye ointment
- Silver nitrate 1% solution
- Gentamicin 0.3% eyedrops and ointment
- Norfloxacin 0.3% eyedrops and eye ointment
- Ciprofloxacin 0.3% eyedrops and ointment application after cleaning the eye. Suspect ophthalmia neonatorum, if there is any mucopurulent discharge from the eyes during first week.

**References**


**B. Chlamydial Conjunctivitis - Trachoma**

Trachoma is a chronic bilateral cicatrizing follicular keratoconjunctivitis caused by *Chlamydia trachomatis* and is the leading cause of preventable blindness worldwide.

**SALIENT FEATURES**

Presence of at least two of the following signs: superior tarsal follicles, limbal follicles (Herbert’s pits), typical conjunctival scarring and vascular pannus. Diagnosis is confirmed by conjunctival cytology.

**Treatment**

**Pharmacological**

Key to treatment is SAFE (Surgery for entropion/trichiasis, antibiotics, facial cleanliness, and environment change such as control of disease-spreading flies and access to clean water) strategy developed by the WHO.

3. Cap Azithromycin 1 g single dose in adults In children: 20 mg/kg single dose Alternatively following can be given:
   - Tab. Roxithromycin 150 mg 2 times a day for 7 days. In children: 5.8 mg/kg in 2 divided doses.
   - Or
Cap. Doxycycline 100 mg 2 times a day for two weeks.  
(Caution: Contraindicated in children, pregnant women and nursing mothers). Or  
Tab. Sulfamethoxazole 400 mg + Trimethoprim 80 mg 2 tablets twice daily for 3 weeks.  
In children 6-12 years: half the above dosage for 3 weeks. And/Or  
Tetracycline 1% eye ointment at night for 6 weeks. Or  
Sulfacetamide 10-20% eyedrops 3-4 times for 6 weeks. Or  
Ciprofloxacin 0.3% ophthalmic solution 4 times a day and Ciprofloxacin 0.3% eye ointment at night for 8 weeks.

Surgical treatment

Eyelid surgery for correction of trichiasis and entropion to prevent corneal blindness.

Patient education

Treat the whole family even if only one child has active trachoma. Improve ocular hygiene—facial cleanliness in children.  
Environmental improvement—eliminate flies, provision of adequate running water supply and latrines, etc.

References


C. Viral Conjunctivitis

Viral conjunctivitis often occurs in epidemics. It includes following entities: epidemic keratoconjunctivitis, pharyngoconjunctival fever, acute haemorrhagic conjunctivitis and Newcastle conjunctivitis.

<table>
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<tr>
<th>SALIENT FEATURES</th>
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<tbody>
<tr>
<td>Conjunctival congestion, chemosis, watery discharge, conjunctival haemorrhages, preauricular lymphadenopathy and swollen lids; vision is unaffected; photophobia is uncommon.</td>
</tr>
</tbody>
</table>

Treatment

Nonpharmacological

Avoid patching, use dark goggles; avoid close contact with other persons and swimming for 2 weeks. The doctor must wash his hands after examination of such patient and tonometer should be disinfected after each use.

Pharmacological

It is usually a self-limiting illness. Antiviral agents are not effective. Corticosteroids are contraindicated; however, these are used, if vision is threatened.

1. Antibiotic eyedrops (as in mucopurulent conjunctivitis) prevent secondary infection.
2. Naphazoline 0.05% eyedrops 1 drop 4 times a day or Zinc sulphate 0.125% eye, drops 1 drop 4 times a day. Patient should be referred to an ophthalmologist, if there is no response in 7 to 10 days.
Patient education

Not to share towels, handkerchief and other objects with other persons.

References


5. Conjunctival Allergic Disorders

Conjunctival allergic disorders include acute allergic conjunctivitis (Hay fever conjunctivitis—seasonal allergic conjunctivitis, perennial allergic conjunctivitis), atopic keratoconjunctivitis, vernal keratoconjunctivitis, giant papillary conjunctivitis, phlyctenular keratoconjunctivitis, conjunctivitis medicamentosa, etc.

A. Acute allergic conjunctivitis (hay fever conjunctivitis)

It is a recurrent, bilateral type I, IgE mediated hypersensitivity to a variety of exogenous air-borne allergens such as pollens, animal dander, dust, moulds, etc. and may be seasonal, perennial, (chronic) or acute type.

Nonpharmacological treatment

Avoid allergen or minimize exposure to allergen, if possible dilution of allergen and washing away by instillation of tear substitutes and cold compresses to the eye.

Pharmacological

1. Topical combination of antihistamine (Antazoline 0.5% or Pheniramine) and vasoconstrictor (Naphazoline hydrochloride 0.05%) eyedrops 4 times a day till the resolution of symptoms

2. Disodium cromoglycate 4% eyedrops 2 times a day or 2% eyedrops 4 times a day till resolution of symptoms.

Or

Ketorolac tromethamine 0.5% eyedrops 4 times a day till resolution of symptoms.
(Caution: Topical corticosteroids are contraindicated as a first line therapy. If required should only be prescribed by an ophthalmologist, in low concentrations.

3. If severe, systemic antihistaminic should be administered. Tab. Cetirizine hydrochloride 10 mg once a day for duration of acute symptoms. In children, 5 mg once a day.

4. Olopatadine Eye drops 0.1% BD to QID can also be given as first line treatment.

Patient education

Symptomatic therapy and avoidance of allergen as far as possible is the mainstay of the therapy.
Minimum use of topical eyedrops should be advocated.

B. Phlyctenular keratoconjunctivitis
It is characterized by presence of red nodule at bulbar conjunctiva, most often at nasal limbus of one eye. It is a cell mediated type (type IV) conjunctival hypersensitivity to tubercular protein, the commonest endogenous allergen and others include staphylococcal antigens, worm infestations, fungal antigens and idiopathic.

**Topical treatment**

1. Dexamethasone 0.1% eyedrops or Betamethasone 0.1% eyedrops combined with antibiotic Neomycin 0.5%, or Chloromycetin 0.5% eyedrops 4 times a day for 7 days.
2. If cornea is involved (see section on Corneal Ulcer).
3. Rule out any systemic cause and treat accordingly, especially if recurrent or bilateral keratoconjunctivitis.

**Spring catarrh (vernal keratoconjunctivitis)**

It is a bilateral, recurrent papillary conjunctivitis occurring in a warm climate due to hypersensitivity to exogenous allergens.

<table>
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<tr>
<th><strong>SALIENT FEATURES</strong></th>
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<tbody>
<tr>
<td>Itching, ropy discharge, gelatinous thickening at limbus and papillae (cobblestones) in upper palpebral conjunctiva.</td>
</tr>
</tbody>
</table>

**Nonpharmacological treatment**

Avoidance of allergen, wind, and rubbing of eye; tear substitutes (barrier function, dilute allergen, wash away allergen); wear glasses or goggles; air conditioning with appropriate filters.

**Pharmacological**

In mild cases:
- Topical antihistamine + vasoconstrictor combinations. Boric acid 1.25%; Naphazoline 0.05%; Zinc sulphate 0.12%; Antazoline hydrochloride 0.5%, Chlorpheniramine 0.01% 4 times a day.
- Disodium cromoglycate 4% eyedrops 2 times a day or 2% eyedrops 4 times a day.
  - Or Ketorolac tromethamine 0.5% Or Ketotifen eyedrops 4 times a day. Or Olopatadine eyedrops 0.1% twice a day, or 0.2% once daily
- In acute attacks and severe cases not resolving with above treatment, refer to an ophthalmologist for treatment with following:
  - Prednisolone sodium phosphate 1% eyedrops Or Dexamethasone 0.1% or Betamethasone 0.1% four times a day for 2 days, twice daily for 4 days, once daily for next 3 days and then discontinue.
  - Or diluted steroids, dexamethasone eyedrops 0.01% or Loteprednol eyedrops 0.2% four times a day till acute symptoms subside and then tapered.
  - **Caution**: Treatment should be given under the close supervision of an ophthalmologist.

**Patient education**

Long-term use of a steroid may cause glaucoma and cataract.

**References**
PAINFUL RED EYE

All painful red eye or visual loss should be referred immediately to a tertiary care level.

Glaucoma

Glaucoma is an optic neuropathy which manifests as typical visual field defects (nerve fibre bundle defects), the aetiology of which is in some way related to intraocular pressure (IOP).

### SALIENT FEATURES

The classical triads of increased IOP, optic nerve head cupping and visual field changes are always present and are sign of progress of the disease and are the benchmark for assessing the response to therapy.

The width of the angle of anterior chamber further differentiates the glaucoma into open and closed angle varieties.

Treatment modalities differ according to the type of glaucoma.

Congenital glaucoma/ buphthalmos

### SALIENT FEATURES

IOP is usually normal as sclera in children distends leading to increased corneal diameter.

Excessive tearing and photophobia.

**Pharmacological treatment**

Aim is to control IOP till definitive treatment, i.e. surgery is performed.

- Timolol drops 0.25% eyedrops; one drop instilled at 12 hourly interval. Or
  Betaxolol 0.25% eyedrops one drop instilled at 12 hourly interval.
- Tab. Acetazolamide 12 mg/kg in 3-4 divided doses.

Surgical treatment at a tertiary care centre includes goniotomy and trabeculotomy or trabeculotomy with trabeculectomy. Monitor corneal diameter, IOP, disc changes and refraction periodically.
Secondary childhood glaucoma
It is secondary to certain developmental anomalies, which need to be treated along with the glaucoma.

Patient education
It is a slowly progressive disease, usually amenable to surgery. Regular follow-up lifelong is must for early detection of any failure/complications.

Eye is vulnerable to trauma and thus contact sports may be restricted in these children.
Screening of any child particularly the siblings who have a large cornea, photophobia or excessive watering of the eyes should be done.

Angle closure glaucoma – acute

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
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<tbody>
<tr>
<td>Acute pain and blurring of vision along with headache and vomiting, in some cases.</td>
</tr>
<tr>
<td>Chronic angle closure glaucoma ensues when repeated subacute attack lead to peripheral synechiae, zipping up of the angle, and persistent rise of IOP with subsequent optic atrophy.</td>
</tr>
<tr>
<td>The intraocular pressure is raised due to pupillary block.</td>
</tr>
</tbody>
</table>

Pharmacological treatment
2. Inj. Mannitol 20%, 1.5-2 g/kg, IV infusion over half an hour. Or
   Glycerol 50%, 1 to 1.5 g/kg in 50% solution orally, mixed with cold lemon or orange juice in 3-4 divided doses.
   *(Caution: It can cause hyperglycaemia in diabetic patients. Do not drink water for 1 hour after ingesting tablet; contraindications include dehydration or cardiac decompensation).*
3. Pilocarpine 2% eyedrops every 15 min for 1 hour and thereafter 6 hourly started after IOP has been lowered by hyperosmotics as above.
4. Tab. Acetazolamide 500 mg stat followed by 250 mg every 6 hours and maintained till the definitive treatment of laser peripheral iridotomy relieves the pupillary block.
5. Timolol 0.5% eyedrops 2 times a day (if pressure is still high) to be continued till surgery.
   Or
   Betaxolol 0.5% eyedrops 2 times a day (Preferred in asthmatics and patients with cardiac conduction defects).
   *(Caution: All mydriatics/cycloplegic drugs which dilate pupils are contraindi-cated)*
   Once the IOP falls to early 20’s by the treatment listed above—usually in a day or so, evaluated by gonioscopy, disc cupping and visual field charting. Definitive treatment is iridotomy by laser or surgery depending on the facilities available. Prophylactic laser peripheral iridotomy should be performed on the fellow eyes as soon as possible.
   IOP is the most significant and titrable response. The disease can recur after a successful iridotomy so the patient should be under follow-up at 6 monthly intervals at least.

Patient education
Do not ignore headache and chronic ache in the eyes and report to the eye specialist, if coloured halos appear around light.
Pilocarpine can induce myopia, increase inflammation and cause accommodative spasm in the young
patient and miosis in an older patient who has concomitant cataract leading to diminished vision.
Topical beta-blockers need to be used with caution in chronic obstructive pulmonary disease, myasthenia gravis, cardiac arrhythmias, diabetes mellitus, etc.

**Angle closure glaucoma - chronic**

IOP is raised due to progressive angle closure or by repeated intermittent subacute attacks secondary to pupillary block. Commonly asymptomatic until significant visual loss has occurred. The presentation is thus more akin to open angle glaucoma.

**Pharmacological treatment**

- Timolol 0.5% or Betaxolol 0.5% eyedrops 2 times a day usually required life-long.
- Pilocarpine 2-4% eyedrops 4 times a day usually required for life. Laser or surgical iridotomy is done to eliminate any element of pupillary block in affected as well as fellow eye. If the glaucoma is still uncontrolled on maximal tolerable medical therapy (i.e. 2 topical antiglaucoma medications), then glaucoma filtering surgery or trabeculectomy should be performed.

**Patient education**

Since the disease is asymptomatic, patients who complain of nonspecific headache or eye ache should not be ignored.

**Primary open angle glaucoma**

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<tbody>
<tr>
<td>The IOP is usually above 21 mmHg with associated nerve head cupping and visual fields defects. Usually asymptomatic, however, some complain of frequent change in spectacles and mild ache of the eyes. Gonioscopically the angle of anterior chamber (AC) is widely open.</td>
</tr>
</tbody>
</table>

**Pharmacological treatment**

3. Timolol 0.5% or Betaxolol 0.5% eyedrops 1 drop 12 hourly and the morning dose should be as early upon waking as possible. 
   Or
   Latanoprost 0.005% eyedrops given only once at bedtime.

   *(Caution: Maintain constant cold chain)* Or
   Bimatoprost 0.03% eyedrops once at bedtime. Or
   Travoprost 0.004% eyedrops once at bedtime. (both do not require cold chain)
   If initial therapy fails, refer to a higher centre and substitute with another agent preferably belonging to a different group.
   *(AA)* Dorzolamide 2% eyedrops 2 to 3 times a day. Or
   Brimonidine tartarate 0.2% twice daily (also increases uveoscleral outflow and confers neuroprotection).
Or
Pilocarpine 1–4% eyedrops 3 times a day or 4% gel once at bedtime.
If patient is not controlled on 2 topical drugs, then consider alternative treatment with either laser trabeculoplasty or glaucoma filtering surgery.

Ideally all parameters—IOP, optic nerve head and visual field assessment should be checked at 3-6 monthly intervals.

Patient education

Pilocarpine can cause accommodative spasm and induce myopia leading to brow ache and a need to readjust reading spectacles of patient.
Avoid instillation of more than one drop of the drug or double doses in case morning dose is missed.
Most drugs especially beta-blockers cause burning and stinging sensation on instillation. Chronic use can lead to dry eyes and tear supplements may be required.
Punctual occlusion, i.e. pressing medial end of lower lid to increase drug and cornea contact time should be explained to patients.
In diabetics, use of Timolol eyedrops can mask the warning symptoms of hypoglycaemia.
Avoid sedentary lifestyle.
High-risk individuals, i.e. high myopia, large cups more than 0.5:1 or asymmetry in cups of more than 0.2 or any person with a positive family history of glaucoma, or aged >35 years should routinely get his intraocular pressures and fundus evaluated on an annual basis.

Lens-induced glaucoma

Lens-induced glaucoma occurs secondary to the cataractous lens either by leakage of lens protein or by lens intumescence. In addition to medically lowering the IOP, the cataractous lens needs to be removed, under steroid cover to suppress the inflammatory element.

Reference


Corneal ulcer (ulcerative keratitis)

Corneal ulcer may be classified as: (i) bacterial corneal ulcer, (ii) fungal corneal ulcer (mycotic keratitis), (iii) viral corneal ulcer (herpetic keratitis), (iv) acanthamoeba keratitis. Corneal ulcers frequently occur in the eyes with some predisposing factors.

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<tr>
<th>SALIENT FEATURES</th>
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<tbody>
<tr>
<td>Pain, redness, excessive tearing, photophobia, sticky discharge, swollen lids and blurred vision, blepharospasm, ciliary congestion, corneal haziness, infiltration of cornea, ulcer/abscess in the cornea.</td>
</tr>
<tr>
<td>Decreased corneal sensitivity, hypopyon, iritis, secondary glaucoma and superficial corneal vascularization. Corneal ulcer is stained green with fluorescein 2%.</td>
</tr>
<tr>
<td>Complications: corneal thinning, ectasia, descematocele, secondary glaucoma, perforation and its sequelae including endophthalmitis or panophthalmitis and loss of eye.</td>
</tr>
</tbody>
</table>
Treatment (to be managed by an ophthalmologist)

Perform corneal scrapings from the base and edges of the ulcer to make smears for Gram and Giemsa stains and culture and sensitivity testing. Initiate therapy based on clinical picture and findings obtained on smears of corneal scrapings. As a first line therapy, broad-spectrum antibiotics are started in all cases. Antifungal agents are given, if confirmed by scrapings or in case of strong clinical suspicion. The treatment is modified according to the clinical response and result of culture and sensitivity of microorganisms.

A. Bacterial corneal ulcer

Nonpharmacological treatment

Avoid patching. 
Maintain proper ocular hygiene by regular cleaning of discharge twice a day. Removal of contributory factors, e.g. trichiasis, foreign body, entropion, dacryocystitis, etc.
Removal of necrotic tissue increases efficacy of antibiotics.
Prevention and treatment of complications—secondary glaucoma should be detected and treated adequately.

Pharmacological

Start empirical therapy and refer to an ophthalmologist

- Cefazolin 5% eyedrops (50 mg/ml) [mix 5 ml of distilled water in 250 mg of Cefazolin] solution or moxifloxacin eyedrops instilled 1 drop every 30 minutes or 1 hourly round the clock for at least 24 hours.
- Topical fortified Gentamicin [mix 2 ml 80 mg injectable solution of Gentamicin in one vial of commercially available 0.3% 4 ml Gentamicin eyedrop solution (prepared fresh)] or Tobramycin 14 mg/ml (1.4%), instill 1 drop every 1/2-1 hour for first 24 hours.
- Ciprofloxacin or Ofloxacin 0.3% eyedrops every 2 hours.
Frequency of administration is reduced according to the response and continued for 2-3 weeks. If compliance with frequency of topical instillation as above is not possible:
  a. Cefazolin 100 mg subconjunctival injection after anaesthetizing the conjunctiva (if required).
  b. Subconjunctival Gentamicin 20 mg, if compliance to topical drops is unreliable.
      Or
      Fortified Tobramycin 14 mg/ml solution may be used in place of Gentamicin. Definitive therapy is started based on the culture and sensitivity of microorganisms.
- Atropine sulphate 1% eye ointment to be applied 2 or 3 times per day.
- Parenteral antibiotics are indicated in perforated corneal ulcer, impending perforation, corneal ulcer following perforating injury and infections caused by Neisseria or Haemophilus microorganism.
  (Caution: Corticosteroids are contraindicated. If associated with secondary glaucoma, see section on Glaucoma).

B. Fungal corneal ulcer (mycotic keratitis)
Mycotic keratitis usually develops 2-3 weeks following corneal injury with an organic or vegetative matter. The common fungi causing fungal keratitis in order of frequency are *Fusarium, Aspergillus, Candida* and *Curvularia*.

**SALIENT FEATURES**

- Severe signs, less symptoms, dry, rough or cheesy appearance with feathery margins, satellite lesions, immune ring, endothelial plaque, thick immobile infected hypopyon.

**Treatment**

1. Regular debridement of the necrotic tissue.

   Cauterization of the edges with Trichloroacetic acid/povidone iodine under topical anaesthesia (preferably under the supervision of an ophthalmologist).

   Natamycin 5% suspension 1 to 2 hourly. And/or

   Fluconazole 1% eyedrops 1 hourly round the clock.

   In case of no response within 48 hours, substitute fluconazole with Amphotericin B.

   Amphotericin B 0.15 to 0.25% formulation prepared in distilled water, every 15 to 30 minutes for 24-48 hours then 1-2 hourly continued for 2-3 weeks or till resolution of keratitis.

   In case of immunocompromized patients, spreading ulcer, perforation or impending perforation

   Cap. Ketoconazole 200-400 mg 2 times a day for 2-3 weeks. Or

   Cap. Fluconazole 200 mg 2 times a day for 2-3 weeks.

   Since superadded bacterial infection is common, add Ciprofloxacin or Tobramycin eyedrops (see section on Bacterial Conjunctivitis).

C. Viral corneal ulcer (*Herpes simplex keratitis*)

It is characterized by unilateral or bilateral recurrent attacks of keratitis in the form of infections, epithelial keratitis, stromal keratitis, or endothelialitis, etc. The attack is often precipitated by trivial trauma, fever, cold, emotional stress, menstruation, etc.

**Treatment (epithelial keratitis)**

1. Acyclovir eye ointment 3% five times a day for 2-3 weeks. Or

   In refractory cases, Ganciclovir ophthalmic gel 0.15% five times a day till healing of ulcer, followed by three times a day for 7 days.

2. Topical Cyclopregics–Homatropine 2% eyedrops 2 times a day.

3. Broad-spectrum antibiotic as in the treatment of mucopurulent conjunctivitis till ulcer heals.

4. Artificial tear substitutes 3-4 times a day.

   Refer to an ophthalmologist, if more than two recurrences occur, Tab. Acyclovir 400 mg 2 times a day for 3-6 months for prevention of recurrence.

**References**


**Treatment (stromal keratitis)**
Nonpharmacological
Dark glasses with UV filter.

Pharmacological
1. Moderate to severe disease
   Dexamethasone 0.1% or Prednisolone 1% eyedrops every 3 hours, tapered gradually on the basis of clinical
   response. For milder disease, lower concentration of 0.12% Prednisolone or 1:10 dilution Dexamethasone 0.1%
   eyedrops 4 times a day, tapered slowly to once daily or once a week before stopping.
2. Prophylactic Acyclovir eye ointment 2 times a day.
3. Homatropine 2% eyedrops 1 drop 2 times a day.
   (Caution: Avoid corticosteroids in presence of epithelial ulceration; 1% Medroxyprogesterone may
   be used)
4. Artificial tears 3-4 times a day.

Patient education
To report to an ophthalmologist in every case of eye redness, pain or diminution of vision.
Regular follow-up at 6 monthly intervals since viral keratitis is known to recur.

Reference

SENILE CATARACT

While cataract refers to the age-related opacification of crystalline lens, the exact cause of senile cataract is not known.

SALIENT FEATURES

Gradual painless progressive diminution of vision in one or both eyes.
Excessive glare, monocular diplopia or polyopia, coloured halos around lights, diurnal variation in vision, change in colour values and fixed black spots before eyes.

Ocular examination reveals greyish white or whitish lenticular opacity on torch light examinations depending on the stage of cataractogenesis, i.e. immature, mature or hypermature. Detailed evaluation of cataract changes and fundus examination is done after dilating the pupils using distant direct ophthalmoscopy, slit-lamp examination, direct ophthalmoscopy, etc.

Treatment
Pharmacological
Till date no proven drug treatment exists to delay, prevent or reverse the development of senile cataract. Definitive treatment of senile cataract is lens extraction. Indications

of lens extraction are visual handicap, interference in patient activities due to poor vision or glare disability even if cataract is immature. In mature, hypermature cataract, urgent lens extraction is done to prevent further complications such as glaucoma, iritis, or displacement of lens.
**Optical treatment**

In early cataract, decreased vision may be improved by accurate refraction and prescribing corrective spectacles.

Pupillary dilatation by instillation of 2.5% Phenylephrine eyedrops, or Tropicamide 0.5% eyedrops or Cyclopentolate 1% eyedrops in the morning may provide visual improvement in patient with minimal lenticular opacities in the axial area.

*(Caution: Dilatation of pupil is contraindicated in patients with shallow anterior chamber).*

The choice of the procedure depends on the patient, the type of cataract, the availability of proper instruments and equipments and the degree to which the surgeon is comfortable and proficient in performing standard extracapsular cataract extraction (ECCE), phacoemulsification or nonphaco small incision surgery. Posterior chamber intraocular lens placed inside the capsular bag is the preferred modality.

**Patient education**

Do not wait for maturation of cataract for undergoing cataract operation. Secondary glaucoma and other complications may develop if total cataract remains unoperated for a long time.

Visual rehabilitation in the early postoperative period is faster in small incision cataract surgery.

Laser is not used for cataract surgery as such, however, Nd: YAG laser is used for posterior capsulotomy which is required in a large percent of intraocular lens patients.

**References**


**DRY EYES SYNDROME**

It represents a diverse group of conditions characterized by symptoms of ocular discomfort and is associated with decreased tear production and/or abnormally rapid tear film evaporation. Abnormality in preocular tear film results in ocular surface damage and dry eyes and affects 15% in elderly, especially females and 20-30% in contact lens wearers.

**Common causes for dry eyes syndrome**

**Environmental:** Excessive heat and air-conditioning.

**Systemic:** Ageing and menopause, side effect of antihistamines, birth control pills, diuretics, psychotropic drugs, etc. Diseases like Sjogren’s syndrome, rheumatoid arthritis, collagen vascular diseases, etc.

**Local:** Abnormality of lacrimal gland, eyelids, ocular surface and lacrimal drainage system; topical medications and contact lens use.

**SALIENT FEATURES**

Symptoms usually precede signs. Symptoms are ocular irritation and pain, dryness, grittiness, foreign body sensation, itching, burning, photophobia, redness, excessive tearing and blurring of vision.

Signs: Conjunctival congestion, decreased tear, meniscus, irregular corneal
surface and debris in the tear film.
Also presents as corneal epithelial keratitis, fine or coarse, fluorescein/Rose Bengal staining and inflammation of ocular surface in advanced cases. In severe cases, mucous laques, corneal filaments, epithelial defects, secondary infections, thinning and perforation of cornea can occur. There may be associated blepharitis, meibominitis and eyelid abnormality.
Various tests for dry eyes include Schirmer’s test, break up time, conjunctival cytology, tears osmolarity.
In severe cases, complications like persistent epitheliopathy, sterile corneal ulcerations and secondary microbial infections can occur.

Treatment
Lack of correlation between signs and symptoms makes it difficult to diagnose mild to moderate forms of dry eyes.

Nonpharmacological
Hot compresses, eyelid massage

Pharmacological
Mild dry eyes
Artificial tear substitutes with preservatives up to four times a day [methylcellulose 0.5-1%, hydroxypropyl methylcellulose (HPMC), polyvinyl alcohol (1.4%), polyvinyl pyrrolidone (3-5%)].

Moderate dry eyes
1. Artificial tears without preservatives 4 times to 1 hourly a day (carboxymethyl cellulose 0.05 and 0.1%).
2. Lubricating eye ointment at bedtime.
3. 10% acetyl cysteine eyedrops 1-2 drops into the affected eye 3-4 times daily for excessive mucin secretions.
4. Topical anti-inflammatory treatment with cyclosporine-A 0.05% twice a day.

Severe dry eyes
Same as in moderate cases, along with temporary/permanent occlusion of all four puncta, moist environment (humidifier, moisture shields), and hydrophilic bandage contact lenses.

Surgical treatment
Reversible inferior punctual occlusion (punctual plugs)
Tarsorrhaphy (lateral and medial), conjunctival/mucous membrane grafting, parotid duct transplantation, amniotic membrane transplant, stem cell transplant.

References
2. Ocular Surface Disease, Section 6. In: Smolin and Thoft’s The Cornea, Scientific Foundations and Clinical Practice. Foster SC,
REFRACTIVE ERRORS

Refractive errors (ametropia) are the optical defects of eye in which the parallel rays of light entering the eye do not come to focus on the fovea centralis. Ametryopia includes myopia, hypermetropia and astigmatism. Astigmatism may be combined with myopia or hypermetropia.

SALIENT FEATURES

Refractive errors are characterized by blurred vision, subnormal vision, eye strain or asthenopia, headache, tearing, latent or manifest strabismus, etc.

Treatment

Pharmacological

No pharmacological treatment is available for ametropia.

Surgical

Accurate retinoscopy and corrective spectacles or contact lenses. Keratorefractive surgery.

Patient education

Young patients opting for laser correction should wait till the refraction is stable for at least one year.

Reference


STRABISMUS (SQUINT)

Any child presenting with strabismus should have the following conditions ruled out:

Refractive error—refraction should be done under full cycloplegia, i.e. Atropine ointment 1% 3 times a day for 3 days prior to performing retinoscopy. If any refractive error is present, that should be fully corrected by spectacles for at least 3-6 months, before performing definitive surgical therapy for strabismus.

Any opacity in the media, e.g. cataract, corneal opacity, retinoblastoma, etc. Amblyopia element whether induced by strabismus or vice versa should be treated with occlusion therapy or other modality before treating strabismus.

Treatment

Nonpharmacological

Correct the refractive error or associated cataract, corneal opacity, etc. Fusion exercises for intermittent exotropia and other orthoptic exercises.

Surgical

Definitive therapy is surgical realignment of axis once other associated features have been treated.
Patient education

Functional improvement in strabismus is best between 3-5 years of age.
It is a misconception that squint is spontaneously corrected as the child grows; therefore, treatment of strabismus should not be delayed.

Reference


IRIDOCYCLITIS (ANTERIOR UVEITIS)

Uveitis is defined as inflammation of uveal tract, i.e. iris, ciliary body and choroid. Inflammation of iris and ciliary body constitutes iridocyclitis or anterior uveitis.

SALIENT FEATURES

Acute anterior uveitis is characterized by painful red eye, diffuse periorbital pain, photophobia, blurred vision, excessive tearing. There is no purulent or mucopurulent discharge.

Ocular examination reveals ciliary injection, normal or deep anterior chamber, small irregular pupil, posterior synechia, media opacities, tenderness of eyeball and variable decrease in vision.

Slit-lamp biomicroscopy is essential for diagnosis and monitoring the treatment. Slit-lamp examination in active cases, reveals marked flare and cells in anterior chamber and fine keratic precipitates at the back of cornea. Posterior segment involvement and changes in intraocular pressure may occur in anterior uveitis.

Treatment (Refer immediately to an ophthalmologist)

Nonpharmacological

Dark glasses.

Pharmacological

1. Dexamethasone 0.1% eyedrops or Betamethasone 0.1% eyedrops or Prednisolone sodium phosphate 1% eyedrops or Prednisolone acetate 1% eyedrops. 1-2 hourly, tapered gradually on the basis of slit-lamp evidence of anterior chamber activity. If topical steroids are required for long term, switch over to Loteprednol 0.5% or fluoromethonol 0.1% to decrease chances of secondary glaucoma.
2. Homatropine hydrobromide 2% eyedrop solution. Or
   Atropine sulphate 1% eye ointment once or twice a day.
3. If no response (within 7 days), severe anterior uveitis, bilateral involvement and panuveitis.
   Tab. Prednisolone 1 mg/kg or 40-80 mg per day orally every morning at breakfast or on alternate days. Gradually taper depending upon satisfactory clinical response over 2 to 4 week period.
4. If no response within 1 week or non-compliant, posterior uveitis or severe uveitis.
   Periocular corticosteroids – subconjunctival or posterior subtenon injection (preferred).
   Methylprednisolone acetate – 20, 40, 80 mg/ml or Triamcinolone acetonide (10, 40 mg/ml) 0.5-1.0 ml.
(Caution: Contraindication – infectious uveitis, e.g. herpetic or toxoplasmosis, known steroid responder, patients with glaucoma or elevated intraocular pressure.)

5. Close monitoring of intraocular pressure and treat appropriately, if elevated – Timolol maleate 0.5% eyedrops 2 times a day and/or Acetazolamide 250 mg 4 times a day 6 hourly.
6. Tab. Ibuprofen 400 mg 3 times a day.
7. Identify the specific cause and give specific therapy (syphilis, tuberculosis, herpes simplex, herpes zoster, toxoplasmosis, etc.)

Surgical treatment—surgical treatment is required for various complications of anterior uveitis.

Patient education
Recurrence/chronic nature of the disease, which may interfere with vision, should be explained.

Patients with a history of uveitis, juvenile rheumatic arthritis, ankylosing spondylitis should be instructed to report immediately to an ophthalmologist, even if there is mild diminution of vision.

Recurrent episodes of anterior uveitis and subsequent therapy may lead to various complications particularly complicated cataract and steroid-induced glaucoma. Possible side effects or toxic effects of long-term topical periocular and systemic corticosteroid therapy should be explained.

Reference

ORBITAL CELLULITIS

Suppurative inflammation of adipose and soft tissues of orbit is termed as orbital cellulitis. It occurs more frequently in children than adults. Spread of infection from paranasal sinuses, particularly ethmoid sinus is the commonest cause. Other causes include extension of infection from dental abscess, ear, face and lid infection, panophthalmitis, dacryocystitis, dacryoadenitis, postoperative to any facial or ocular surgery, perforating injury and haematogenous spread, etc.

SALIENT FEATURES
Marked unilateral axial irreducible proptosis, restricted and painful ocular motility, lid oedema, chemosis of conjunctiva, constitutional symptoms such as fever, headache, nausea, vomiting, malaise, prostration.

Treatment (Refer immediately to an ophthalmologist)
Nonpharmacological
Warm compresses.

Pharmacological
Severe cases are to be treated in the hospital.
1. Cap. Amoxycillin 500 mg plus Cloxacillin 500 mg in 3 divided doses for 10-14 days.
   Or
Cap. Amoxycillin 250 mg plus Clavulanic acid (125 mg) every 8 hours.

2. Inj. Gentamicin 5 mg/kg in 2 divided doses for 7-10 days. Or
   Inj. Cefotaxime 1-2 g in 10 ml sterile water for injection over a period of 3-5 min every 12 hours. In neonates—100-150 mg/kg in 2-3 divided doses. In infants and children—50-180 mg/kg/day in 4-6 divided doses. Antibiotics are changed according to the report of culture and sensitivity and continue till resolution occurs.

3. For anaerobic infections
   Inj. Metronidazole 500 mg IV infusion 8 hourly, shifted to oral dose of 400 mg 8 hourly based on the clinical response for 2 weeks.

4. Oxymetazoline 0.05% nasal drops 2-3 drops in each nostril 2 times a day, in children: 0.025%.


6. Lubricating eyedrops/artificial tears: 1-2 hourly or antibiotic eye ointment 5 times a day to prevent exposure keratopathy.

**Surgical treatment**

Surgical drainage is indicated, if orbital abscess forms, based on clinical features, USG and CT scan findings; poor response or no response to the IV antibiotic therapy, or if there is a threat to ocular function.

Tarsorrhaphy or Frost suture to prevent exposure keratopathy. Sinusotomy/craniotomy for pus in paranasal sinus or brain abscess respectively. All the patients must be carefully monitored for vision, fundus, corneal exposure, ocular motility, pupillary reaction, corneal sensations, proptosis, systemic status including CNS function.

**Patient education**

Any ear, sinus or dental infection especially in children should be treated promptly.

Any child presenting with unexplained lid oedema or cellulitis should be immediately referred to an ophthalmologist.

**Reference**


**ENDOPHTHALMITIS**

Endophthalmitis is of two types: (1) exogenous endophthalmitis caused by the direct inoculation of infecting agent through breach in the continuity of ocular coats, e.g. postoperative, post-traumatic, (2) endogenous endophthalmitis results due to haematogenous spread of infective agents. Depending upon the aetiology of infectious agents, both these categories may be bacterial or fungal.

**SALIENT FEATURES**

- History of eye surgery, penetrating injury, fever, infection or predisposing systemic diseases leading to metastatic endophthalmitis.
- Marked visual loss, ocular pain, headache, ocular discharge, photophobia, intense redness and lid swelling.
- Ocular examination reveals conjunctival and ciliary congestion, profound decrease in vision even up to perception of light with accurate or inaccurate projection of rays. Corneal oedema, hypopyon, signs of uveitis, reduction in intraocular pressure, exudation.
in vitreous leading to reduced or absent fundus reflex are the other associated features. The clinical picture is variable depending upon the route of entry, infectious process and duration of disease.

**Treatment (Refer immediately to an ophthalmologist)**

### Postoperative bacterial endophthalmitis

**Pharmacological**

1. Intravitreal injection of antibiotics—Inj. Vancomycin hydrochloride 1 mg in 0.1 ml plus Inj. Ceftazidime 2 mg in 0.1 ml or Inj. Amikacin sulphate 0.4 mg in 0.1 ml.
2. Subconjunctival injection Vancomycin 25 mg/0.5 ml plus Ceftazidime 100 mg/0.5 ml plus Dexamethasone 0.25 mg/0.5 ml.
3. Vancomycin eyedrops 50 mg/ml plus Amikacin eyedrops 15 mg/ml 1 drop every 6 hours.
4. Homatropine 2% eyedrops 3 times a day or Atropine 1% eye ointment 2 times a day.
5. Prednisolone acetate 1% eyedrops or Dexamethasone or Betamethasone 0.1% eyedrops every 6 hours.
6. Tab. Prednisolone 1 mg/kg/day in a single morning dose after 24 hours of antibiotic use and continue for 10-14 days.
7. Parenteral antibiotics are given as a supportive therapy.
8. Change the antibiotic according to vitreous culture and sensitivity, if required.

**Surgical treatment**

Vitrectomy—pars plana vitrectomy is indicated, if visual acuity is limited to light perception or if there is poor response to above treatment in 30-36 hours. Vitrectomy may also be required in the resolved phase of endophthalmitis for vitreous opacification/membranes.

### Treatment for traumatic endophthalmitis

**Pharmacological**

1. Hospitalize the patient and give immunization for tetanus.
2. Inj. Vancomycin 1 g IV infused over 1 hour every 12 hour.

Inj. Gentamicin 2 mg/kg every 12 hour. Or
   Inj. Ceftazidime 2 g IV every 12 hour. Or
   Inj. Ceftriaxone 2 g IV/day.
3. Clindamycin should be considered in all cases until *B. cereus* infection has been excluded
   Inj. Clindamycin 600-900 mg IV every 8 hour. In children 20-40 mg/kg/day IV 6-8 hourly. Continue antibiotics for 7-10 days.
4. Topical fortified eyedrops, subconjunctival injection and intravitreal injection and cycloplegic drops as in cases of postoperative bacterial, endophthalmitis.

**Surgical treatment**

Repair the ruptured eyeball at the earliest.

Pars plana vitrectomy—indications are similar to that of postoperative bacterial endophthalmitis.

### Treatment for fungal endophthalmitis

Exogenous fungal infections may occur postoperatively or secondary to trauma. Endogenous fungal
endophthalmitis should be treated as an emergency treatment.

**Pharmacological**

1. Vitrectomy to debulk the vitreous of fungi.
2. Intravitreal Amphotericin B 5-10 mcg/0.1 ml or Fluconazole 25 mcg/0.1 ml.
3. Inj. Amphotericin B 0.5-1.5 mg/kg/day slow infusion over 2-6 hours. (50 mg vial in powder form and is dissolved in 5% dextrose) for 10-14 days.
   
   Or
   
   Tab. Fluconazole 400 mg loading dose followed by 200 mg daily, total dose should not exceed 600 mg/day.
   
   In children 12 mg/kg loading dose followed by 6 mg/kg/day. Or
   
   Tab. Ketoconazole 200 mg orally 2 times a day or daily. In children above 2 years of age, 3.3-6.6 mg/kg/day.
4. Homatropine 2% eyedrops 4 times a day or Atropine 1% eye ointment 2 times a day.

**Patient education**

All patients with open globe injury must contact an ophthalmologist after getting initial treatment.

Cataract-operated cases should never ignore pain, tearing and photophobia and decrease in vision in the operated eye and must consult the ophthalmologist at the earliest.

**References**


**OPTIC NEURITIS**

Optic neuritis includes papillitis (inflammation of optic disc), retrobulbar neuritis (inflammation of retroocular portion of optic nerve) and neuroretinitis when both optic disc and retina are inflamed. The chief causes of optic neuritis are: demyelinating diseases (usually multiple sclerosis), systemic viral/bacterial infections, autoimmune diseases and secondary to ocular inflammations, e.g. uveitis, endophthalmitis, orbital cellulitis, etc. MRI of the brain to detect multiple white matter lesions should be done for diagnostic and therapeutic purposes.

**SALIENT FEATURES**

- Unilateral or bilateral, sudden severe visual loss, ipsilateral eye pain; markedly impaired colour vision, visual obscurations in bright light and episodic transient visual obscuration on physical exertion, hot bath, hot weather, fatigue, etc.
- Profound decrease in visual acuity, dyschromatopsia, central or paracentral scotoma, tenderness of the globe near superior rectus insertion and reduced visually evoked response.
- Marked abnormality in pupillary response to light reflex (sluggish or afferent pupil defect).
- Fundus examination reveals optic disc oedema with or without flame-shaped retinal haemorrhages in papillitis and neuroretinitis and a normal fundus in retrobulbar neuritis.
Treatment (Refer immediately to an ophthalmologist)

Usually does not respond to pharmacological therapy; very often some recovery of vision occurs spontaneously after weeks or months. However, proven case of multiple sclerosis may benefit with following:

Inj. Methylprednisolone 1 g/day (or 15 mg/kg/day) IV in 2-4 divided doses, or single dose for 3 days followed by Tab. Prednisolone 1 mg/kg/day orally for 11 days, taper by 20 mg on day 12 and then 10 mg/day on day 13 and 15.

In case of proven infective aetiology, administer appropriate systemic antibiotic to eliminate the focus of infection.

(\textbf{Caution:} Oral prednisolone alone is not recommended).

Patient education

- Explain recurrent nature of disease and permanent visual loss can occur.
- Risk of developing multiple sclerosis.
- Avoid factors provoking transient visual obscurations like physical exertion, hot bath, hot weather, stress, anxiety, anger, etc.

References


\textbf{DIABETIC RETINOPATHY}

Diabetic retinopathy (DR) is the microangiopathy of retinal vasculature occurring in long-standing diabetes mellitus. It is classified into nonproliferative DR and proliferative DR; diabetic macular oedema may be present at any of these stages.

\textbf{Treatment}

\textit{Nonpharmacological}

Early diagnosis, proper diabetic control, careful follow-up, fundus photography, fluorescein angiography and timely laser photocoagulation or vitrectomy surgery or both.

\textit{Pharmacological}

No time tested and proven pharmacological treatment exists which can delay, prevent or cure diabetic retinopathy.

\textbf{Patient education}

- Explain the importance of yearly fundus examination.
- Laser treatment can prevent deterioration of vision but cannot correct existing visual deficit.

(\textit{For details and prevention of complications of diabetes see section on Diabetes Mellitus}).

Reference

RETINAL DETACHMENT (RD)

Retinal detachment is defined as separation of the sensory retina from retinal pigment epithelium. It may be localized or entire retina may be involved. Retinal detachment involving macula results in profound visual loss. Retinal detachments are of three types:

(i) rhegmatogenous RD, (ii) exudative RD and (iii) tractional RD.

SALIENT FEATURES

Rhegmatogenous RD is caused by formation of a hole/tear in the retina. Clinical features include symptoms of flashes of light, sudden shower of black spots and veiled visions, loss of central vision, if macula also detached. The diagnosis is made by examination of fundus by distant direct ophthalmoscopy, direct and indirect ophthalmoscopy. The detached retina appears grey with oscillating folds.

Tractional RD is caused by gliotic bands on retina.

Exudative RD is caused by collection of serous fluid between neurosensory retina and retinal pigment epithelium.

Treatment (To be treated by an ophthalmologist)

Pharmacological

There is no pharmacological therapy, which can prevent delay or cure rhegmatogenous (RD). Exudative RD due to inflammatory conditions such as panuveitis (VKH syndrome, sympathetic ophthalmitis) or posterior scleritis is treated with systemic corticosteroid and/or pulsed methyl prednisolone therapy as described in the treatment of uveitis and optic neuritis. The cases which are refractory to corticosteroids or if serious steroid-induced complications develop, refer patient for treatment with immunosuppressive drugs to a tertiary care hospital.

Surgical treatment for rhegmatogenous RD

Treatment of choice is reattachment surgery involving:

Sealing of retinal break by creating aseptic chorioretinitis using cryotherapy or laser photocoagulation,

And/or

Scleral buckling. Or

Vitreoretinal surgery with internal tamponade using gases or silicone oil.

Patient education

Patients with high myopia, family history of RD, post-cataract surgery, past episodes of chorioretinal inflammation should be warned of the premonitory signs of impending RD (sudden onset of floaters, flashes of light and sudden obscuration of one field of vision). In such cases, they should immediately undergo a dilated fundus examination by indirect ophthalmoscopy by an ophthalmologist. Explain these patients not to indulge in contact sports.
Reference

BACTERIAL SKIN INFECTIONS

Superficial bacterial infections of the skin caused by pus-producing organisms are called pyoderma. These are classified as primary and secondary pyoderma and common infective organisms are Staphylococcus aureus and Streptococci.

SALIENT FEATURES

- Superficial infections can involve the skin or the hair follicle. Skin involvement present as impetigo contagiosa, bullous impetigo and ecthyma.
- Impetigo is a highly contagious superficial pyoderma common in infants and small children, glomerulonephritis can occur as a complication.
- Hair follicle involvement can lead to folliculitis, furunculosis or carbuncle. Clinically, a suppurative lesion of a hair follicle can be observed. A group of adjacent furuncles with subcutaneous involvement and multiple discharging sinuses is seen in a carbuncle.
- Invasive infection presents as erythematous indurated well-defined plaque with raised edge or frank cellulitis with constitutional symptoms and regional lymphadenopathy.

Treatment

Nonpharmacological

Advise for proper hygiene and nutrition. Advise on removal of dirt, crusts and necrotic debris by washing with non-medicated soap and water and drainage of pus.

Pharmacological (furunculosis, folliculitis)

Majority of purulent lesions of skin structures do not need systemic antibiotic therapy. However, more extensive lesions with collection of pus require drainage and antibiotic. Cover lesions with clean dressing.

A. Mild and localized superficial infection

Give topical therapy with following and should be applied locally twice a day as a thin film after thoroughly washing the affected sites with soap and water for 7-10 days.

- Cream Framycetin sulphate 1% in base
- Cream 2% Sodium fusidate base.
- Ointment 2% Mupirocin base.

B. Multiple site superficial pyoderma, invasive varieties and secondary pyoderma

Cap. Cloxacillin 250-500 mg 6 hourly for 5-7 days.
In Children 12.5-25 mg/kg 4 divided doses for 5-7 days.
Cap. Cephalexin 500 mg orally 6 hourly for 5-7 days.
In Children 12.5-25 mg/kg in 4 divided doses for 5-7 days.

Or

Tab. Cotrimoxazole (960 mg) 12 hourly for 5-7 days.
In Children 6 mg/kg of Trimethoprim in two divided doses for 5-7 days.

C. Impetigo

Cap. Cloxacill in or Cephalexin in same doses as above.
Or

Tab. Erythromycin stearate 250-500 mg every 6 hours for 7 days.
In Children: Syr. Erythromycin 40 - 50 mg/kg/day in 4 divided doses for 7 days.
If no response to the above treatment within 48 to 96 hours refer to a tertiary care level.

CELLULITIS AND ERYSIPELAS

Cellulitis and erysipelas are usually streptococcal or staphylococcal infections of the subcutaneous tissues, resulting from contamination of minor wounds.

SALIENT FEATURES

- Acute localized inflammation and oedema. Erysipelas is more superficial and has a well-defined, raised margin. Potentially fatal systemic toxaemia may supervene in patients who remain untreated.
- Recurrent cellulitis or erysipelas can result in chronic changes in affected skin and lymphatics.

Treatment

If patient has systemic features i.e., high grade fever, and symptoms of endotoxic shock either regimen A or regimen B depending on severity of disease condition.

Regimen A

Cap. Cloxacillin 500mg 6 hourly for 7 days
In children 12.5 - 25 mg/kg 6 hourly

Or

Cap. Cephalexin 500mg 6 hours for 7 days
In children 10 mg/kg per day orally in three divided doses.

Regime B

Inj. Amoxycillin 250 mg plus Clavulanic acid 125 mg 3 times a day for 7-10 days.
In children Amoxycillin 6.7 mg/kg plus Clavulanic acid 1.7 mg/kg 3 times day for 7-10 days.
Once improved, patients may be switched to oral equivalent dosages.

If localized cellulitis

Cap. Amoxicillin 500 mg orally 8 hourly. In children 10 mg/kg 8 hourly.
Or

Cap. Cephalalexin 500 mg orally 6 hourly.
In children 12.5-25 mg/kg up to 500 mg orally 6 hourly.

In patients hypersensitive to penicillin (or beta lactam) other class of antibiotic as per sensitivity of the organism may be used.

LEPROSY
Leprosy is a chronic granulomatous disease affecting skin and nerves caused by *Mycobacterium leprae*. Mode of spread is by respiratory droplet infection and close personal contact.

**SALIENT FEATURES**

- Cardinal signs of leprosy are hypo-pigmented, hypoaesthetic skin lesions and/ or nerve involvement in the form of tingling sensation, paraesthesia or gross sensory or motor deficit, thickening of nerves and demonstration of AFB within the skin.
- Leprosy may be classified as paucibacillary (PB): Patient with less than 5 hypoaesthetic, hypopigmented lesions (including localized single nerve); Multibacillary (MB): Patient with 5 or more lesions including skin and nerves.
- Baseline investigations before starting antileprotic drugs include: haemogram, LFT, slit skin smear (if facilities available), chest X-ray and tests to rule out G6PD deficiency or more than one nerve trunk involvement.

**Treatment**

Complicated leprosy with or without drug reactions should be referred to a tertiary care centre. Blister pack for MB and PB are available at all health centers; each contains all medicines for 28 days. Treatment requires for paucibacillary (PB) and multibacillary leprosy in children is shown in Table 14.1.

**Blister pack for MB patients**

**Dosage (adult MB)**

Supervised treatment on day 1. Following is a 28 day cycle which has to be repeated 12 times.

Day 1. Rifampicin (R): 600 mg, Clofazimine (C): 300 mg, and Dapsone (D): 100 mg. Domiciliary treatment for 2-28 days: C: 50 mg, D: 100 mg.

**Dosage (children < 10 years)**

Day 1. Supervised R: 300 mg, C: 100 mg, D: 25 mg.

Day 2-28 domiciliary: C: 50 mg twice a week D: 25 mg daily.

Duration: Patient has to take a total of 12 blister packs within 18 months.

**Blister pack for PB patients**

**Dosage (adult PB)**

Following is a 28 day cycle, which has to be repeated 6 times.

Monthly treatment

Day 1 (Supervised), R: 600 mg D: 100 mg.

Daily treatment: Day 2-28: D: 100 mg.

Dosage children < 10 years.

Day 1. (Supervised) R: 300 mg D: 25 mg.

Day 2-28, D: 25 mg.

**Adult (single dose therapy)**

Rifampicin: 600 mg, Ofloxacin: 400 mg, Minocycline: 100 mg.

Child (Single dose therapy): Rifampicin: 300 mg, Ofloxacin: 200 mg, Minocycline: 50 mg.

**Table 14.1. Regimen for paucibacillary (PB) and multibacillary (MB)**

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<td><strong>PB</strong></td>
<td>Rif 300 mg po/mth</td>
<td>Rif 450 mg po/mth</td>
<td>Rif 600 mg po/mth</td>
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<td></td>
<td>Dapsone 25 mg/d</td>
<td>Dapsone 50 mg/d</td>
<td>Dapsone 100 mg/d</td>
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If the treatment is interrupted for more than one month at a stretch the regimen should be recommenced where it was left off to complete the full course. The patient should be reviewed in detail for persisting disease at the end of therapy.

Management of complications (acute or subacute inflammation)

Reversal reaction or type 1 reaction and erythema nodosum leprosum or type 2 reaction

If the reaction is mild (no nerve involvement): Bed rest and paracetamol. If there is nerve involvement or suspected neuritis or signs of nerve damage - refer to a tertiary care hospital.

Tab. Prednisolone 40-60 mg once a day and gradually reduced weekly or fortnightly and eventually stopped (12 week course).

Continue treatment with multi-drug therapy (MDT) without interruption along with anti-reaction treatment.

After initiation of reaction treatment, the patient should be referred to tertiary care centre.

Patient education

Treatment of leprosy with only one drug or incomplete treatment will result in drug resistance. Explain that the treatment for leprosy has to be carried out without default for many months to obtain complete cure. Also explain the dangers of inadequate or no treatment.

• Explain the side effects of dapsone which include dapsone syndrome, fixed drug eruptions, exfoliative dermatitis; Clofazimine can cause darkening and staining of the skin which is reversible on stopping treatment. Rifampicin can cause discolouration of sweat, tears, urine, skin.

All patients who were earlier treated with dapsone monotherapy (prior to implementation of MDT programme) should be retreated with appropriate regime of MDT irrespective of disease activity.

• All patients who have either received irregular or doubtful treatment should also be given an appropriate MDT regime.

Reassurancethat the disease is completely curable and patients do not need segregation.

• All the members of the family in contact with the leprosy patient should be examined.

Daily inspection for any injury/ulcers and sensory/motor changes and appropriate medical attention is a must to prevent long term sequelae.

References

CUTANEOUS TUBERCULOSIS

Cutaneous tuberculosis affects skin and/or mucosa with or without underlying systemic involvement.

SALIENT FEATURES
• Commonly cutaneous tuberculosis presents as one of the following clinical disease entities:
  Lupus Vulgaris - granulomatous lesion with marginal activation central clearing and atrophy.
  Scrofuloderma - granulomatous ulcer with fibrosis, atrophy, sinus formation and deeper structure involvement as the focus of suppuration.
  Tuberculosis verrucosa cutis - verrucous plaque with atrophy.

Confirm the diagnosis with investigations viz. haemogram with ESR, Mantoux test, chest X-ray, sputum examination and AFB staining and FNAC/skin biopsy, if available. If the facilities are not available, it is advisable to refer the patient to a higher centre to confirm the diagnosis before starting antitubercular therapy.

Screen the patients for underlying immuno-suppression particularly if extensive or multifocal disease is present.

Treatment
The drug regimen should ideally be a daily treatment regime in TB, however, it should conform to national TB management guidelines.
  Treatment given in two phases:
  1. Initial phase - 2 EHRZ/2SHRZ (for details see section on tuberculosis).
  2. Continuation phase - 4 RH.

In specialized situations like scrofuloderma with an underlying focus in a bone/joint the regimen should be suitably prolonged in consultation with an orthopaedic specialist.

Patient education

• It is a curable disease.
• It shows excellent response to antitubercular therapy.
• Family members and contacts should be screened.

References

SCABIES
A common skin infestation caused by arthropod mite (Sarcoptes scabiei) and transmitted by close personal contact after an incubation period of 3-4 weeks.

SALIENT FEATURES
• Nocturnal itching, excoriated papules, papulovesicles, burrows and excoriation, lesions seen on interdigital clefts of hands, wrist, axillary folds, breasts, periumbilical region, medial side of thigh and genitals (in males).
• Burrows are pathognomonic and a family/contact history of similar complaints invariably present.
• Common complications are secondary pyoderma, eczematization and glomerulonephritis (post streptococcal).

Treatment
Nonpharmacological
  Maintenance of adequate personal hygiene by daily bath with soap and water.

Pharmacological
Secondary bacterial infection when present should be treated with antibiotics before specific antiscabetic therapy.

1. Specific therapy

   For infants, neonates, children, pregnant and lactating mothers. Permethrin cream 5% to be applied generously, after bath, at bedtime, covering entire surface of the body below neck (except face). Minimum contact period 8-12 hours; single application required and is to be washed off next morning.

   For children >10 years and adults. Permethrin cream 5% as outlined above.

   Or

   Gamma Benzene Hexachloride (GBHC) Lotion 1%. Single overnight application below neck on entire body surface after a thorough scrub bath. Minimum contact period 8-12 hours, to be washed off next morning.

   Or

   Tab Ivermectin 200mcg/kg as a single dose to be repeated after 2 weeks.

2. Supportive therapy

   Tab. Cetirizine 10 mg at night for 10-15 days.

   In children 0.3 mg/kg/day single dose for 2 weeks.

   Or

   Tab. Pheniramine maleate 25 mg 3 times a day for 10-15 days.

   In children 0.5 mg/kg/day divided in 3 doses.

   Follow up after one week, if problematic itching persists, a topical anti-pruritic such as crotamiton either alone or in combination with hydrocortisonemay be advised after ensuring adequacy of antiscabetic treatment.

Patient education

- Disinestation of bedding and clothing by ordinary laundering and/or sun exposure is required.

- In lactating mothers-before feeding, areola should be washed thoroughly with soap and water. After the feed, permethrin cream should be reapplied on breasts and hands.

- Itching will persist for few days but usually resolves within 1-2 weeks. The overuse/repeated treatment with topical antiscabetic is not required for persisting itching alone.

- All family members and close physical contacts symptomatic or not should be treated simultaneously to prevent recurrences.

- Repeated topical application of GBHC or accidental ingestion may lead to adverse neurological effects such as seizures.

- Adequate contact period of 8-10 hours/overnight must be ensured.

References


PEDICULOSIS (LICE INFESTATION)

Two species of lice are obligate parasites in man namely 1) Pediculus hominis which has two variants (a) Pediculus humanus capitis, the head louse (b) Pediculus hominis corporis, the body louse and ii) Phthirus pubis (the pubic louse).

SALIENT FEATURES
• Severe itching, frequently followed by secondary bacterial infection with regional lymphadenopathy and eczematization, resulting in matting of hair.

• Transmission occurs by head to head contact, sharing of combs and caps, infested clothing of bedding and poor personal hygiene; transmission of pubic lice is by sexual contact.

• Blue grey-maculæ (maculae eruleae) of altered blood maybe seen at the site of louse bite/feed.

Treatment

Nonpharmacological

Infested clothing and bedding should be washed properly in hot water and dried in sunlight. Cloths should be ironed from inside with special attention to seam line.

In pubic lice infestation, sex partner should be treated as well, and a search for other sexually transmitted infections (STI) should be undertaken.

Pharmacological

1. Specific therapy

Lotion GBHC 1% to be applied on scalp (in head louse infestation), whole body including pubic region, thighs, buttocks (in pubic and body lice infestation) for a period of 12 hours to be washed off later on.

Or

1% Permethrin in surfactant rinse, single one hour application on the affected area.

For scalp lice repeat application after one week after surviving eggs have hatched.

2. Supportive therapy

If persistent itching,

Tab. Cetirizine 10 mg once daily at night for 7 days.

In Children (2-6 years) 5 mg; (>6 years) 10 mg once daily.

Or

Tab. Pheniramine maleate 25 mg 3 times a day for 7 days.

In Children 0.5 mg/kg/day in 3 divided doses.

3. Treatment of the secondary infection

(see section on bacterial skin infections).

Patient education

Infested clothing and bedding should be washed properly in hot water and dried in sunlight.

• In case of pubic lice shave the area, if possible, and ensure adequate personal hygiene.

• Daily bath with soap and water and change of clothing. To remove nits with the help of a fine toothed comb in head lice. Other family members and schoolmates, if infested have to be treated simultaneously.

References


MYIASIS (MAGGOTS)

Myiasis is the infestation of body tissues of man and animals by the larvae of Diptera (two-winged flies). Clinically myiasis can be classified according to the part of the body
affected: cutaneous myiasis, wound myiasis and furuncular myiasis (larvae penetrate and develop within the skin); nasopharyngeal myiasis, intestinal and urogenital myiasis.

SALIENT FEATURES

- The eggs or larva (maggots) can be seen in large numbers in the denuded or raw lesions.
- In the furuncular form, boil like lesions develop gradually over a few days; each lesion has a central punctum, which discharges serosanguineous fluid. Posterior end of the larva is usually visible in the punctum.
- Regional lymphadenopathy, mild constitutional symptoms and eosinophilia may be present.

Treatment

Treatment of secondary bacterial infection as in treatment of cellulitis and erysipelas (see section on bacterial skin infections). Liquid paraffin and turpentine oil application is followed by gentle removal of the larva with the help of a forceps. Sometimes the punctum needs to be enlarged by cruciate incisions in furuncular myiasis.

Patient education

Explain the patient about personal hygiene and also explain about the proper care of the wound (not to allow flies to sit on raw/open wound).

Reference


ONYCHOMYCOSIS (TINEA UNGIUM)

Invasion of the nail plate by Dermatophytes, Candida, Scytalidium or other non dermatophyte moulds is called Onychomycosis.

SALIENT FEATURES

- The nail plate may appear to be discoloured (yellow, green or black), disfigured or, in extreme cases, might be totally destroyed. The nail folds may also show swelling, and redness.
- Other causes of nail plate involvement should be ruled out e.g. psoriasis, eczema, alopecia areata, lichen planus.

Treatment

Pharmacological

It is prudent to determine the type of organism causing onychomycosis.

Systemic therapy

Tab. Terbinafine 250 mg once a day for 6 weeks for finger nails and 12 weeks for toe nails.

In children <20 kg: 62.5 mg/day; <40 kg: 125 mg/day; >40 kg 250 mg/day.
No role of topical treatment.

For dermatophytes

Tab Griseofulvin (ultramicronized) 250mg twice daily after fat containing meals (or with milk) for 4-6 months for finger nails and 18-24 months for the toe nails.
In Children: 10-20mg/kg twice daily as above.
CANDIDIASIS

Candidiasis is an infection with protean clinical manifestations, caused by *Candida* species that are also part of normal skin/mucosal flora. The infections are usually confined to the skin, nails, mucous membrane, and gastrointestinal tract but can be systemic and affect multiple internal organs. Various mechanical, nutritional, physiological, systemic and iatrogenic factors predispose to *Candida* infection.

Treatment of oral candidiasis, vaginal and vulvovaginal candidiasis and balanitis or balanoposthitis are discussed in respective sections. Extensive candidiasis, resulting in internal organ involvement is an AIDS defining infection (See section on AIDS and opportunistic infections in chapter 7).

Cutaneous candidiasis

Intertrigo is the most common clinical presentation of candidiasis on glabrous skin.

Common locations for the infection include the genitourinary, perineal, axillary, gluteal, interdigital and submammary areas and between the folds of skin of the abdominal wall.

- Pruritus, erythematous macerated areas of skin with satellite vesicopustules are characteristic features.

CANDIDAL PARONYCHIA

It is common in individuals whose hands are chronically involved in wet work e.g. housewives, bakers, fishermen, paan vendors etc.

SALIENT FEATURES

- Redness, swelling and tenderness of the paronychial area with prominent retraction of cuticle toward the proximal nail bed. Occasionally pus can be expressed from beneath this area. The nails might also be infected and discolored.

Oral candidiasis

See section on gastrointestinal diseases.

Treatment

Nonpharmacological

To keep the affected area dry and clean.

Pharmacological (Candidal Paronychia)

Cap. Fluconazole 3-6 mg/kg (maximum 150 mg) orally once a week depending upon the area affected for 4-6 weeks. In case nail plate is also involved treat as onychomycosis (except Griseofulvin).

Pharmacological (Mucocutaneous candidiosis)

Topical 1% clotrimazole 2% miconazole nitrate or 1% ciclopirox cream gel or lotion twice daily for 14 days.

TINEA CAPITIS

Ringworm of the scalp in which the essential feature is invasion of hair shafts by a dermatophyte fungus. School going children (mostly prepubertal) are most commonly affected.
SALIENT FEATURES

Variable depending on the types of hair invasion, level of host resistance and degree of inflammatory host response.

• Gray scaly patch appears as patches of partial alopecia often oval or circular in shape with fine scaling. Green florescence under the wood's lamp is usual (in microsporum infection).
• Kerion is a painful inflammatory condition, seen as hair follicles discharging pus, thick crusting and matting of adjacent hair.
• Black-dot variety (relatively non-inflammatory type) of patchy alopecia- seen as black dots occur as the affected hair breaks at the surface of the scalp.
• Favus: yellowish, cup-shaped crusts known as scutula. Adjacent crusts enlarge to become confluent and form a mass of yellow crusting.
• Diagnosis is confirmed by demonstration of spores in KOH wet mount preparation of affected hair and/or brilliant green fluorescence in wood's lamp examination.

Treatment

No role of topical therapy alone.

Systemic therapy

Tab. Griseofulvin 10-20 mg/kg in 2 divided doses for 4-6 weeks.

Patient education

• All siblings, children in contact should be screened and treated simultaneously if required.
• Fomites such as combs should be kept separate.
• Maintain scalp hygiene.

TINEA CORPORIS AND CRURIS

• Circular, sharply margined, itchy and scaly plaques with raised edges with papulovesicles at margins and central clearing.
• Laboratory diagnosis made by KOH smear and culture.

Treatment

Topical Treatment in localized disease (not for Tinea pedis)
1. Ointment/Cream/gel/powder/spray
   Clotrimazole 1% twice daily for 4-6 weeks
   Or
   Miconazole 2% twice daily for 4-6 weeks
   Or
   Terbinafine 1% once daily for 2 weeks
   Or
   Butenafine 1% once daily for 2 weeks
   Or
   Ciclopiazole olate 1% twice daily for 4-6 weeks.
2. Systemic treatment (in extensive lesions and for Tinea pedis)
Tab Griseofulvin 10 mg/kg for 4-6 weeks
Or
Tab Fluconazole 3-6 mg/kg/week for 4-6 weeks
Or
Tab Terbinafine 250 mg/day for 2 weeks
Or
Cap Itraconazole 100 mg once daily for 4 weeks

NO use of steroid local or systemic.

**TINEA PEDISIMANNUM AND INTERTRIGINOUS TINEA**

**SALIENT FEATURES**

- Peeling, maceration, fissuring affecting the lateral toe clefts.
- Hyperkeratotic plaque (affected areas are pink and covered with fine silvery white scales).
- Vesiculobullous lesions particularly at periphery.

**Treatment**

**Nonpharmacological**

Improvement of hygiene in swimming pools such as frequent washing of changing room floors and walkways, use of personal towel and footwear.
Use of antifungal dusting powder.

**Pharmacological**

Same as Tinea corporis.

**Reference**


**DIAPER DERMATITIS**

It is a very common problem in small infants. It is induced by the occlusion of the areas covered by impermeable diapers, often triggered by an episode of diarrhoea.

**Treatment**

Zinc oxide paste (petroleum jelly 50%, zinc oxide 50%) may prevent skin irritation due to diarrhoea.
Problematic cases to be referred to a specialist.

**Parent education**

- Avoid impermeable diapers.
  Keep the skin dry.

**ECZEMA AND DERMATITIS**

Eczema is an "inflammatory skin reaction characterized by itching, redness, scaling and clustered papulovesicles, induced by wide range of external or internal factors acting singly or in combination"

Customarily the eczemas are divided into:

- Endogenous (constitutional) atopic dermatitis, seborrhoeic dermatitis, lichen simplex chronicus (LScH) and
- Exogenous (environmental): contact allergic dermatitis, primary irritant
dermatitis, photosensitive eczema) etc.

**SALIENT FEATURES**

- Itching and vesicular eruptions on erythematous skin with erosion and exudation in acute cases or thickening, accentuated skin markings, fissuring with pigmentation (described as lichenification) in chronic cases.

**Treatment**

A definitive diagnosis of the type of eczema is mandatory, as different varieties of eczema require different management strategies. However, at primary health care level the aim is to provide relief of symptoms and signs, appropriate to the stage of dermatitis and, subsequent referral to a tertiary care centre for diagnosis and appropriate management strategy.

1. **Local treatment**

   In acute exudative eczema

   Soak with dilute Potassium permagnate solution (1:10,000) and 0.25% Silver nitrate solution or 0.8% aluminium sub acetate solution.

   In longstanding situations:

   - Acute/subacute - appropriate topical steroid (Table 14.2) in lotion/gel or cream base for 2-4 weeks.
   - Chronic longstanding and/or lichenified lesions - appropriate topical steroid (Table 14.2) in ointment/emollient base for 2-4 weeks.

**Table 14.2.** Preparations of local corticosteroids available in the market as lotion, creams and ointments*

<table>
<thead>
<tr>
<th>Group 1 (mild)</th>
<th>(Hydrocortisone acetate 1%, Desonide 0.05%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Generally safe for chronic application. Safest amongst steroids for use on face, under occlusion/bandage, in neonates/infants. Not expected to cause local or systemic side effects in the course of normal use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2 (moderately potent)</th>
<th>(Clobetasone butyrate 0.05%, Mometasone furoate 0.1%, Fluticasone propionate 0.01%, Betamethasone valerate 0.05-0.1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydrocortisone butyrate 0.1% may be used on chronic dermatoses on extremities. Used for limited periods only on face and/or intertriginous areas of adults and children, under close supervision and follow-up. Potential for local side effects with prolonged use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3 (potent)</th>
<th>(Betamethasone dipropionate 0.05%, Halcinonide 0.025%-0.1%)</th>
</tr>
</thead>
</table>
To be used on recalcitrant chronic dermatoses of adult-elder children only. Can cause local or systemic side effects.

**Group 4 (super potent)**

(Clobetasol propionate 0.05%)

To be used for limited period of time (2 week at a time) as the risk of side effect is highest.

Use only in extremities and thickened skin lesions.

To be used only when follow-up/supervision is good.

Not to be used on face/fl exures or in infants/neonates.

*Note: Lotion preparation of some salts at identical concentration is less potent than cream, which is less active than the ointment of the same salt at the same concentration.*

2. **Systemic treatment**

Tab. Pheniramine maleate 25 mg '2 times a day till symptoms subside (about 7 days).

In children 0.5 mg/kg/day in 3 divided doses.

(Caution: side effect dry mouth).

Or

Tab. Cetirizine 10mg at bed time till symptoms subsides.

In children Syr. Promethazine 1 mg/kg/day 3 times a day till symptoms subside (about 7 days) or Syr. Cetirizine 0.3 mg/kg/day once daily till symptoms subside.

3. **Secondary bacterial infection**

It should be treated in the acute stage with systemic antibiotics (see section on bacterial skin infections).

If there is no response or in case of extensive eczema (preferably under the supervision of a specialist) give, Tab. Prednisolone 1 mg/kg (maximum 60 mg) as a single oral dose given in the morning after breakfast for 7-10 days. This should be tapered and withdrawn as early as possible after relief from symptoms and signs.

**Patient education**

Common skin irritants are: overexposure to water or dry air, soaps and detergents,solvents,cleaning agents,chemicals,rubber gloves, or ingredients in skin and personal care products.

Following local side effects can occur due to misuse or over use of corticosteroids: thinning of skin, striae distensae, increased facial redness and telangiectasia,purpura, tinea incognito, acneform papules and increased hair growth.

Systemic side effects can occur due to prolonged use of systemic corticosteroids or local applications on large surface area.

**References**

MILIARIA

Miliaria is caused by obstruction of the sweat gland duct during hot humid summer seasons.

SALIENT FEATURES

- Itching, stinging and secondary infection can occur and lead to periporitis (multiple staphylococcal abscesses) superimposed on miliaria rubra in young children. Eczematization can occur.

Treatment

Nonpharmacological
- Avoid causal factors like heat and occlusion due to oils, creams, cosmetics etc.
  Cool baths and aeration.

Pharmacological (miliaria rubra)
1. Emollients like anhydrous lanolin or Calamine lotion locally.
   Or
   - Tale or any commercially available powders.
2. In case of secondary infection (see section on bacterial skin infections).
3. For relief of itching Tab. Pheniramine 25 mg 2 times a day.

Patient education
- Frequent cool bath and aeration.
- To stay in cool environment to minimize the body's need to sweat.
- No oil application over scalp and body.

ACNE VULGARIS

Chronic inflammatory condition of the pilo sebaceous glands of the face, neck and upper back. Usually occurs in adolescents and young adults.

- Twotypes of lesions 1)non-illflammatory (comedones: blackheads or white heads) and inflammatory: pustules, nodules, cysts and abscesses.

  Acne can be secondary to mechanical friction/occlusion, detergents/chemicals, ultraviolet exposure, occupational, associated hirsutism/virilism exogenous, other climate/factor and drugs namely steroids topical or systemic, INH, rifampicin, phenytoin, lithium, halogenated drugs - bromides/chlorides, cosmetics/oils/petroleum! cream applications.

Treatment

Nonpharmacological
- Washing/cleaning of face to keep skin non-sticky, dry and dirt free; shampooing to keep scalp - non greasy.

Pharmacological
- Non-inflammatory acne. Retinoic acid cream/gel (0.025%; 0.05%) usually applied once a day - at bedtime or alternate day. A therapeutic response appears characterized by redness and scaling with in 3-6 weeks. Treatment is usually continued
for at least 3 months.
(Caution: Not to apply near/into eye/mouth; contraindicated in pregnancy and lactation)
Gel Retinoic acid if not tolerated may be substituted by Adapalene 0.1% gel (usage and precautions same as above).
Or Cream/gel Azelaic acid 20% applied once or twice a day after face-wash. Inflammatory acne. Inflammatory acne treatment may need to be combined with treatment for non-inflammatory acne.
Mild cases. As above.
Clindamycin gel 1% to be applied twice a day (or more) for 4-6 weeks.
Or Erythromycin gel/lotion 2%; 4% (safe in pregnancy) to be applied twice a day (or more) for 4-6 weeks. Begin with the lower strength.
Or Benzoyl peroxide gel 2.5%, 5% (safe in pregnancy) to be applied to clean skin initially once daily on alternate days then twice a day (or more) for 4-6 weeks.
Moderate to severe cases should be referred to a specialist preferably without treating with systemic antibiotics.
1. Topical therapy as above (same drug should not be used topically as well as systematically as no extra therapeutic benefit will result).
2. Cap. Doxycyclin 50-100 mg once daily for 4-12 weeks. The dosage can be reduced in accordance with the clinical response and discontinued.
Or Tab. Azithromycin 500mg OD for three consecutive days (repeat every three days on same days).
Treatment may need to be continued for up to 6 months. Severe and unresponsive cases should be referred to a tertiary care hospital.

Patient education

- Redness and scaling with retinoic acid indicates a therapeutic response. Gels are less irritating. Lasting benefit only after long duration use of comedolytic agents usually for more than 6 months. Concentration and frequency of application can be adjusted to minimize problematic side effects.
- Avoid oil application on the scalp and should wash scalp on alternate day.
- Not to use occlusive applications: oils, creams, pomades, foundation makeup, occlusive topical medications, if at all required, use preferably a gel or lotion.
- Avoid offending drugs.

References

ALOPECIA AREATA
Alopecia areata is presumed to be an immunologically mediated disorder characterized by non scarring patchy loss of hair.

SALIENT FEATURES

- In two-thirds of the cases, partial or complete re-growth of hair occurs within
5 years.
- Rule out patchy loss of hair secondary to tinea capitis and syphilis.

Treatment

1. Topical agents may stimulate localized hair growth. Hydrocortisone acetate ointments or cream 1% applied 1 to 4 times or Fluticasone propionate 0.1% applied once a day as thin film and frequency of application is reduced when response is observed. Application is stopped as soon as lesions resolve. see Table 14.2 in section on eczema use Group 2 and 3 topical steroid.
2. Retinoic acid 0.5%
   Or
   Intralesional Triamcinolone 10 mg/ml 0.2-0.5 ml per patch every 3 weeks (should be treated by a specialist).
   PUV A therapy is sometimes effective in unresponsive cases. In patients with extensive hair loss, a wig or partial hairpiece provides a more satisfactory solution.

Reference

PITYROSPORUM INFECTIONS OF THE SKIN

Tinea versicolor and Pityriasis capitis (Dandruff)

Tinea versicolor is an infection of the skin caused by the dimorphic fungus Malassezia furfur. Pityriasis capitis (Dandruff) is caused by Pityrosporum ovale.

SALIENT FEATURES

- Tinea versicoloris characterized by superficial, scaly, hypo or hyperpigmented, irregular macules most often occurring on the trunk and proximal extremities.
- Pityriasis capitis (dandruff) presents as diffuse itchy lesions over the scalp with hair loss; may be associated with erythema, scaly lesions over eyebrows, eyelashes, and nasolabial fold.

Treatment

To avoid oil application.

Pharmacological

1. Topical 2.5% Selenium sulfide lotion/shampoo.
   Or
   Topical Ketoconazole 2% lotion (shampoo in dandruff), apply once for 15 minutes before taking bath on affected areas daily till controlled then reduced to 2-3 times per week.
   Or
   Zinc Pyrithione 1% apply once for 15 minutes before taking bath on affected areas daily till controlled then reduced to 2-3 times per week.
2. In facial lesions (Tinea versicolor),
   Topical Miconazole 2% cream apply twice daily for several weeks.
   Or
   Topical Clotrimazole 1% cream.
3. Tab. Fluconazole 400 mg as a single dose (can be combined with topical therapy for faster relief). Tab Fluconazole 150 mg weekly for 4-6 weeks may be given to prevent early relapse.

PITYRIASIS ALBA (PATCHY HYPOCHROMIA)
Pityriasis alba affects over 80% children, its etiology is obscure.

**Treatment**

1. The topical preparations (emollients) should be applied at night and washed off in the morning. The treatment is maintained for 4-6 weeks.
2. Hydrocortisone-17 butyrate ointment or cream 0.1% apply thin layer of cream on the affected skin twice daily until symptoms resolve.

**ACUTE URTICARIA**

Urticaria (hives) is a nonspecific vascular response to a wide variety of stimuli. Acute urticaria presents with erythematous wheals, which may be associated with swelling of loose connective tissue (angioedema) affecting lips, face, scrotum, larynx and trachea.

**Treatment**

**Nonpharmacological**

Soothing applications - cold water sponging and clearance of airway in case of laryngeal oedema.

**Pharmacological**

Tab. Pheniramine maleate 25 mg 3 times a day for 1-2 weeks.
In children 0.15 mg/dose in 3 or 4 times a day. The dosage should be adjusted according to response and tolerance.
   Or
Tab. Hydroxyzine 10-25 mg 3 times a day.
   Or
Tab. Cetirizine 10 mg once daily.
   In children 5 mg once daily.

In severe cases, antihistaminics can be started intravenously and once controlled, patient is maintained on oral preparations as above.

**Angioedema of the larynx is a medical emergency**

Inj. Epinephrine in 0.5-1.0 ml of 1:1000 1M. Patients with severe airway obstruction may have to be intubated immediately (for details see section on anaphylaxis in chapter 2).

**Patient education**

Identify and avoid precipitating factors.

**CUTANEOUS REACTIONS TO DRUGS**

Drug eruptions may follow the use of topically or systemically administered drugs. A drug reaction should be suspected whenever there is a sudden worsening of dermatitis at a time when the patient should be improving.

**Treatment**

Stop the suspect drug, particularly if the drug eruption is severe. In some mild drug reactions, it may be possible to continue the drug if it is medically necessary. Treatment is symptomatic in a mild case. However, in severe drug eruptions such as exfoliative dermatitis and generalized bullous reactions, systemic corticosteroids may be required.
**CHICKEN POX OR VARICELLA**

Varicella is the primary infection caused by Varicella zoster virus (VZV). It is highly infectious and is transmitted by droplet infection. The incubation period is about 14 days. Reactivation of disease results in Herpes zoster or Shingles. Treatment of varicella is discussed in Chapter 19.

**HERPES ZOSTER (SHINGLES)**

Herpes Zoster occurs due to reactivation of VZV which lies dormant in sensory nerve root ganglion following primary infection as chickenpox.

**SALIENT FEATURES**

- Grouped vesicular lesions on an erythematous base in a dermatomal distribution with severe localized pain.
- Thoracic segment and trigeminal nerve area most commonly involved; involvement of ophthalmic division of trigeminal nerve (eruptions in the ophthalmic area including tip of nose) may lead to corneal ulcers and scarring.
- Post herpetic neuralgia defined as persistence of pain for more than 1 month after healing of zoster, motor nerve involvement leading to paralysis of facial muscles, ocular muscles and bladder can occur.
- Lesions in immuno-compromised and HIV patients may involve multiple dermatomes and course of the disease is painful and prolonged.

**Treatment**

**Nonpharmacological**

Rest and isolation alone in case of mild disease in an otherwise healthy person.

**Pharmacological supportive therapy**

1. Tab. Ibuprofen 400 mg 3 times a day till resolution of symptoms
   - In children 10 mg/kg/day.
   - Or
   - Tab. Nimesulide 100 mg 2 times a day in adults till resolution of symptoms
2. Tab. Pheniramime 25 mg 2 times a day till resolution of symptoms
   - In children 0.5 mg/kg/day every 8 hours.
3. Calamine lotion topically till resolution of symptoms.

**Pharmacological definitive therapy**

When patient reports within 24-72 hours or has disseminated lesions

1. Tab. Acyclovir 800 mg 5 times a day for 5-7 days.
   - In children 80 mg/kg/day in divided doses.
   - Or
   - Tab. Famcyclovir 250 mg three times a day or 750 once daily for 7 days.
2. Refer immediately to a tertiary care hospital in case of hearing defect and facial palsy, immuno-compromised patient (HIV/AIDS and patients with chronic debilitated disease), involvement of ophthalmic division, and non-responders for following treatment:
   - Inj. Acyclovir 10 mg/kg IV 8 hourly for 5-7 days.

**HERPES SIMPLEX**

Herpes simplex is the commonest infection caused by DNA virus, Herpes virus hominis (HSV). Type 1 classically associated with facial infections and type 2 is typically genital.
Following primary infection, virus remains latent in sensory nerve ganglia and its reactivation under various circumstances is responsible for recurrent episodes. Transmission occurs by direct contact or droplets from infected secretions. Incubation period is 4-5 days. Diagnosis is supported by Tzanck smear made from a vesicle, on Giemsa staining it shows multinucleated giant cells and ballooning degeneration of keratinocytes.

**SALIENT FEATURES**

- Gruped vesicular lesions on erythematous base are present in lips (herpes labialis) or tongue, palatine and buccal mucous membranes (herpes gingivostomatitis) or anywhere else on the body.
- Primary episode is painful and associated with regional tender lymphadenopathy. Recurrent episodes are relatively asymptomatic.
- Complications include disseminated herpes simplex in debilitated and immunosuppressed patients, herpetic encephalitis or meningitis, eczema herpeticum in patients with atopic dermatitis and erythema multiforme.

**Treatment**

*Supportive therapy in herpes labialis*

A. Mild case is self limiting (5-7 days) and no specific therapy is required.

B. Moderate to severe case. Tab. Acyclovir 200 mg 5 times a day for 5 days.

*Prophylaxis (Recurrent episodes more than 6 per year, Refer to a specialist)*

Tab. Acyclovir 400 mg 2 times a day Or 200 mg 3 times a day for 6 months to 1 year and, in addition, continue supportive therapy.

*Patient education*

It is an infectious condition transmitted by direct contact/droplet infection. Therefore, the patient should avoid contact until all the lesions get crusted. Herpes simplex 2 is transmitted via sexual route, so patient should take proper precautions (See section on genital ulcers).

**References**


**MOLLUSCUM CONTAGIOSUM**

A common pox virus infection of early childhood, transmitted by contact. In adults, infection can be transmitted sexually. Incubation period varies from 14 days to 6 months.

**SALIENT FEATURES**

- Lesions are usually multiple and distributed on exposed areas and individual lesion is shiny, pearly white, hemispherical papule with central umbilication.

- Central core contains a cheesy material.

- Untreated lesions usually get cleared following local inflammation in 6 to 24 months.

**Treatment**

*Nonpharmacological*

Do not share towels/clothing.
Pharmacological for extensive lesions

Extirpate molluscum body and touch the central core with Trichloroacetic acid (TCA) 10% to 20%.

Adult patients with genital molluscum or extensive molluscum should be screened for STD and immunosuppression.

Patient education

Avoid any kind of direct contact with the infected persons.

Avoid swimming pools, communal baths and contact sports.

Partner education for prevention of this disease.

References

VIRAL WARTS

Human papilloma virus (HPV) causes viral warts. Transmission occurs by inoculation of infected material in breaches in skin or mucous membranes. Incubation period varies from 1 to 4 months.

SALIENT FEATURES

- It can present in different clinical patterns viz. common warts (verruca vulgaris), palmoplantar warts, plane warts (verruca plana) and filiform warts commonly found in the beard area of an adult male.
- Lesions are asymptomatic except plantar warts, which may be painful.
- Genital wart is a sexually transmitted disease.

Treatment
1. Paring of the lesion.
2. Application of chemical cauterizing agent like 25-50% Trichloroacetic acid (TCA).

For genital warts (to be given by the treating physicians)

Podophyllin 20-25% in Tr. Benzoic Co. applied locally (after covering the surrounding normal skin with vaseline) weekly till complete resolution. To wash the affected area after four hours.

Or
Electrocautery/Cryosurgery.

Patient education

Avoid contact with the infected patients. Transmission occurs via contact with breach in the skin and mucous membrane.

Education on safe sex in case of genital warts.

References

LICHEN PLANUS

Lichen planus is a symptom complex of itching and self-limited eruptions which can involve the glabrous skin, mucous membrane, hair and nails. The natural history is variable with a usual course of 9-18 months. Oral and hypertrophic lesions run chronic course. Diagnosis is usually clinical, however,
should be confirmed by a specialist.

**SALIENT FEATURES**

- Violaceous polygonal papules, intensely pruritic plaques over the skin and grayish white streaky (Lacy pattern) mucous membrane lesions.
- Drugs causing lichenoid eruptions are - captopril, allopurinol, beta-blockers, gold, tetracycline, arsenic, penicillamine, NSAIDs, INH, chloroquine, carbamazepine.

**Treatment**

1. Topical Corticosteroids (Group 4: super potent; for details see Table 14.2 in section on eczema and dermatitis) ointment.
   Or
   In hypertrophic lesions: intralesional Triamcinolone acetonide injections given every 2-3 weeks till the lesions flatten.
2. In case of extensive lichen planus interfering with the patient's normal life, nail atrophy and pterygium formations, extensive ulcerative lesions of mucous membrane, follicular lichen planus of scalp and bullous lichen planus: Tab. Prednisolone (1 mg/kg) maximum 60 mg daily as single dose in the morning for 6 weeks and thereafter gradually tapering over a period of another 6 weeks.
   Or
   Tab. Dapsone 100 mg once a day.
3. If itching: Tab. Pheniramene 25 mg 3 times a day.
   Duration of the treatment is usually 3-6 months.

**Patient education**

Lichen planus is noninfectious disease and noncancerous. It is neither inherited nor related to nutrition and is selflimiting.
- Recurrences may occur.

**Reference**


**PSORIASIS**

Psoriasis is a common, genetically determined, inflammatory and proliferative disease of the skin characterized by chronic, red scaly plaques, particularly on the extensor prominences and on the scalp.

**SALIENT FEATURES**

- Asymptomatic erythematous, well-defined, dry scaly papules and plaques of various sizes.
- Grattage (Scratch) test: scales can be removed in layers (similar to one scratching a wax candle).
- Auspitz sign: when the scales are completely scraped off, multiple bleeding points are seen.
- Koebner phenomenon - lesion produced at trauma sites.

**Treatment**
Investigate for baseline parameters and counselling about chronicity of the disease.

**Nonpharmacological**

Identify and avoid triggering factors.

**Pharmacological**

Patient suffering from less than 10% body involvement may only be treated at a primary care level. Patient having greater than 10% body involvement should be referred to a tertiary care level for initiation of therapy, management thereafter may be continued under primary care physician.

**Avoid systemic corticosteroids.**

1. Tar (6% in white vaseline) - applied topically at bed time except face and flexures followed by sun exposure next morning.
   Or
   Group 4 potent topical corticosteroids applied once daily, with or without occlusion till improvement occurs (Table 14.2).
2. Salicylic acid (3%) in white vaseline, a thin layer is applied daily which the lesions have resolved.
3. Tab. Erythromycin 500 mg 4 times a day for 1 week.
   Or
   Cap Amoxicillin 250-500mg 8 hourly for 1 week.
4. Cap. Vitamin A 50,000 units to 1 lac units daily for 3 weeks followed by one week break.
5. Tab. Pheniramine maleate 25 mg 3 times a day or any suitable alternative.
   Refer to a tertiary care centre if patient shows no improvement in 6-8 weeks or develops pustular psoriasis, psoriatic arthropathy or erythroderma.
   In scalp psoriasis oil/lotion/Tar shampoo to be applied daily at night.
   Face and Flexural psoriasis Group 1 or 2 topical steroid (see section on eczema and dermatitis).

**Patient education**

It is a chronic disease characterized by remissions and relapses and prognosis is variable.

- Trauma infection, streptococcal throat infection, pregnancy, hypocalcaemia, winter, emotional stress, alcohol, AIDS and drugs like beta blockers, NSAIDs, lithium, chloroquine and rapid withdrawal of corticosteroid therapy can exacerbate psoriasis.

References


**VITILIGO**

Vitiligo is a pigmentation disorder in which melanocytes in the skin, mucous membranes. The cause of vitiligo is not known. It is more common in people with certain autoimmune diseases including hyperthyroidism, adrenocortical insufficiency, alopecia areata and pernicious anaemia. Vitiligo may also be hereditary.

**SALIENT FEATURES**

- Depigmentation of the skin and hair is common in sun-exposed areas, including hands, feet, arms, face, and lips. Other common areas for white patches to appear are the armpits and groin and around the mouth, eyes, nostrils, umbilicus, and genitals.
- There is no way to predict if vitiligo will spread. Some people have reported additional depigmentation following periods of physical or emotional stress.
Treatment

To be treated at a tertiary care center.

Investigations

Complete blood picture, blood sugar, Liver function test, T3 T4 TSH.

Pharmacological

Therapy for vitiligo takes a long time - it usually must be continued for 6 to 18 months. The choice of therapy depends on the number of white patches and how widespread they are and on the patient’s preference for treatment. Each patient responds differently to therapy, and a particular treatment may not work for everyone.

1. Topical Group 2-4 steroid for 4 to 6 months depending on the sites involved (for details see Table 14.2 in a section on eczema and dermatitis).
   Or
   Topical psoralen photochemotherapy.
   Or
   Tab. Methoxsalen (10 mg) 0.4-0.6 mg/kg administered 2 hours before exposure to ultraviolet radiation. 12-24 sessions are usually necessary. The sessions should be given 2 or 3 times weekly (at least 48 hours apart).

2. Depigmentation of the unaffected area if greater than 90% area is already affected to get uniformity in colour.

3. Surgical therapies (at tertiary care level)
   Autologous skin grafts, skin grafts using blisters, micropigmentation (tattooing), Autologous melanocyte transplants.
   Cosmetics that cover the white patches improve their appearance and help patients to feel better about them.

Patient education

Counselling and reassurance as it can cause a lot of emotional stress.
Talking with other people who have vitiligo may also help a person to cope up.

The National Vitiligo Foundation can provide information about vitiligo and refer people to local chapters that have support groups of patients, families, and physicians. Family and friends are another source of supp

MELASMA

Melasma often appears during pregnancy in women living in dry, sunny climates, but is most frequently seen in those taking oral contraceptives. Melasma of pregnancy usually resolves in few months after delivery but, otherwise, spontaneous remission is rare.

Treatment

Avoid oral contraceptives
And
Depigmenting agent hydroquinone 5% lotion/cream once daily topically
Or
Glycolic acid 6-12% cream once daily
Or
Azelaic acid 10-20% cream once daily
Sunscreens containing either cinnamates or benzophenones a sun protection factor (SPF) rating of at least 15,
Or
Topical preparations containing Calamine, Zinc oxide, Titanium dioxide or other constituents which reflect incident light (physical sunblock) can also provide useful protection when they are applied carefully.

ALBINISM
Albinism is an autosomal recessive inherited disorder. Patients are at risk of skin damage from sunlight and usually develop cutaneous malignancies at an early stage.

Treatment
There is no effective therapy other than total avoidance of direct sunlight from early childhood.
Sunscreens to be given under the supervision of a specialist.

Reference

DERMATOTOLOGICAL EMERGENCIES
A quick assessment of the condition of the patient can be made by assessing whether eruptions involve large areas of skin or blisters and erosions present or does patient appear ill.

Serious emergencies involve blisters and erosions covering large areas of skin with toxic symptoms like fever, tachycardia, tachypnoea and dehydration. These patients require urgent referral to a specialist centre.

Three broad groups are:
Group I. Extensive blistering and erosions, e.g. pemphigus, toxic epidermal necrolysis, Stevens Johnson Syndrome.
Group II. Extensive skin involvement without blisters - erythroderma, viral exanthems, drug rashes.
Group III. Localized skin lesions - cellulitis, necrotizing fascitis.

Treatment

Group I
Pemphigus, Toxic epidermal necrolysis, Stevens-Johnson syndrome.

Nonpharmacological (general)
1. Identify the causative factor and stop exposure immediately.
2. Dressing (see section on burns in Chapter 2).
3. IV fluid replacement as per grade III burns depending on the area affected (see section on burns).
4. Care of eye and mucous membranes: Clean eye lesions by irrigation with normal saline and frequent change of position in bed (see section on eye infections in chapter 13).

5. If oral candidiasis (see section on acute oropharyngeal candidiasis in Chapter __).

**Pharmacological**

Systemic antimicrobial therapy may be needed for patients with secondary infections (see section on bacterial infections).

- Topical applications with Povidone iodine cream/lotion.
- Or Silver sulfadiazine cream.
- Or Silver nitrate sol 0.5% compresses soaked in a 1:100 dilution of the stock solution are applied every 4 hours.
  - For erosions in mucosa. Povidone iodine mouth wash.
  - For erosions in eye. Antibiotic eye drops (e.g. Ciprofloxacin eye drops 6 hourly).
  - Specific measures. Systemic immunosuppressive therapy to be decided by the specialist.

**Group II**

Non-bullous skin eruptions (erythroderma, viral exanthems, drug rash)

**Nonpharmacological**

- Bath with soap and water, high protein diet and to maintain normal body temperature and hydration.

**Pharmacological**

1. Tab. Pheniramine maleate 25 mg 3 times a day for duration of symptoms.
2. Emollients like white vaseline or coconut oil.
   - After initiating the above therapy patient may be referred to a specialist for further management.

**Group III**

Localized skin lesions (cellulitis, necrotizing fascitis)

For management of cellulitis (see section on cellulitis and erysipelas) and irritant dermatitis (see section eczema and dermatitis),

---

**SEXUALLY TRANSMITTED DISEASES**

**(SYNDROMIC APPROACH)**

Syndromic approach is designed to follow diagnostic logic and provide ready-made tool to health workers.
I. Urethral Discharge

Patient complains of urethral discharge or dysuria

Take history and examine
Milk urethra if necessary

Discharge confirmed

No

Yes

Ulcers present

No

Yes

Treat for Gonorrhoea and chlamydia

• Educate
• Counsel
• Promote and provide condoms
• Offer HIV counseling and testing
• Partner management
• Advise to return in 7 days if symptoms persist

Use appropriate flow chart


All STD patients should be assessed for risk factors. Risk factors for STD/HIV transmission are: Symptomatic partner.
Recent new partner.
Multiple partner.
Spouse returning home after a long stay away.
All patients should be educated and counseled for prevention of STDs
Cure your infection
Do not spread STD
Help your sexual partner to get treatment
Come back to make sure you are cured Stay cured with condoms
Keep safety by staying with just one sexual partner
Protect yourself against AIDS and protect your baby - attend ANC during pregnancy.

Treatment

Uncomplicated gonococcal urethritis
Tab Azithromycin, 2 g orally as a single dose (for both gonococcal and chlamydial infections).
Or
Inj. Ceftriaxone, 250 mg IM as a single injection
Or
Tab. Cefixime, 400 mg orally as a single dose
**Chlamydial urethritis or cervicitis**

Tab. Azithromycin 2g orally as a single dose (for both gonococcal and chlamydial infections).

Or

Cap. Doxycycline 100mg orally twice daily for 7 days.
(Caution: Doxycycline is contraindicated during pregnancy).

Or

Tab. Erythromycin base/erythromycin stearate, 500 mg orally for 7 days

**11. Vaginal Discharge**

**Flowchart 14.2.** Algorithmic approach to vaginal discharge without facilities for pelvic/speculum examination.
Vaginal discharge using speculum and bimanual examination

**Flowchart 14.3.** Algorithmic approach to vaginal discharge using speculum and bimanual examination.
Vaginal discharge using speculum and microscope examination

**Flowchart 14.4.** Algorithmic approach to vaginal discharge using speculum and microscope examination.

**Treatment of cervical discharge (cervicitis)**

**A. Treatment of Gonococcal cervicitis and chlamydial cervicitis**
Same as in urethral discharge.

**B. Trichomoniasis**
Tab. Metronidazole, 2g orally in a single dose/metronidazole 400mg orally twice daily for 7 days.
Or
Tab. Tinidazole, 2g orally in a single dose.

**C. Bacterial vaginosis**
Tab. Metronidazole, 2g orally in a single dose/metronidazole 400mg orally twice daily for 7 days.
Or
Tab. Tinidazole, 2g orally in a single dose.

However, in symptomatic woman, in the first trimester and those intolerant to metronidazole/tinidazole, imidazole pessaries/cream may be given for 7 days.

**D. Vulvo-vaginal candidiasis**
Cap. Fluconazole 150 mg orally as a single dose.
(Caution: safety in pregnancy is not established.
Or
Clotrimazole 500 mg vaginal pessary intravaginally as a single dose.
Or
Miconazole/Clotrimazole 100 mg vaginal pessary intravaginally daily for 6 days.

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**III. Genital Ulcer**

Treatment of common aetiologies of genital ulcer

**A. Genital herpes (first clinical episode)**
Tab. Acyclovir 200 mg orally five times a day for 7 days or Tab. Acyclovir 400 mg orally 3 times daily for 7 days.

**Recurrent infections**
Tab. Acyclovir 200 mg orally 5 times daily for 5 days or Tab. Acyclovir 400 mg orally 3 times daily for 5 days or Tab. Acyclovir 800 mg orally twice daily for 5 days.

**Suppressive therapy**
In patients with six or more recurrences per year.
Tab. Acyclovir 400 mg orally twice a day continuously for at least 6 months to 1 year.

**B. Syphilis**
Early syphilis (includes primary, secondary and early latent infection up to 2 years duration).
Inj. Benzathine benzylpenicillin, 2.4 million IU deep IM in a single session (two equally divided doses in each buttock) after intradermal sensitivity test for penicillin.
Or
Inj. Procaine benzylpenicillin, 1.2 millions IV (3 vials, each having combination of 1 lakh units of benzyl penicillin or sodium plus 3 lakh units of procaine benzylpenicillin) IM once daily for 10 days.
Flowchart 4.5. Algorithmic approach to genital ulcer.

Alternative regimes for penicillin hypersensitive, non pregnant patients

Cap. Doxycycline 100mg orally twice daily for 15 days
Or
Cap. Minocycline 100mg orally twice daily for 15 days
Or
Tab. Erythromycin (as stearate) 500mg orally 4 times a day for 15 days
Or
Tab. Tetracycline 500mg orally 4 times a day for 15 days

C. Chancroid
Tab. Azithromycin 19 orally as a single dose.
Or
Inj. Ceftriaxone, 250 mg IM as a single dose.
Or
Tab. Ciprofloxacin, 500mg orally twice a day for 3-5 days or till clearance of lesions
Or
Cap. Doxycycline 100mg orally twice daily for 7 days.
Or
Tab. Trimethoprim (80mg) + sulphamethoxazole (400mg), 2 tab orally twice a day for 2 weeks.

IV. Inguinal Bubo

Lymphogranuloma venereum (LGV)

**Flowchart 14.6.** Algorithmic approach to lymphogranuloma venereum (LOV).

D. **Candidal balanitis/balanoposthitis**

If presents as well defined irregular erythematous erosions over glans and prepuce; may be associated with itching and whitish discharge which can easily be scraped off.

For treatment see candidiasis on page 263.

A. **Treatment of LGV (chlamydial infection)**

Cap. Doxycycline 100mg orally twice daily for 21 days

Or
Cap. Tetracycline 500mg orally 4 times a day for 21 days
Or
Tab. Trimethoprim (80 mg) + suphemathoxazole (400 mg) 2 tablets twice daily for 21 days.
Or
Tab. Erythromycin stearate or base 500 mg orally 4 times a day for 2 weeks.

**B. Treatment of chancroid, see genital ulcer treatment**

**V. Scrotal Swelling**

![Flowchart](image)

**Flowchart 14.7. Algorithmic approach to scrotal swelling.**

For treatment of epididmorhitis see Chapter 18.

**Patient education**
Education and counselling for patients
Cure your infection
Do not spread STD
Help your sexual partner to get treatment
Come back to make sure you are cured
Stay cured with condoms
Keep safety by staying with just one sexual partner
Protect yourself against AIDS and protect your baby - attend ANC during pregnancy.

Lower abdominal pain
For lower abdominal pain see section on pelvic inflammatory disease (PID) in Chapter 15.

References
2. NACO. STD Treatment Recommendations. 2002.
4. Sexually Transmitted Infections In: Gynaecology, Robert W Shaw, W Patrick Soutter, Stuart L Stanton
NORMAL PREGNANCY

Antenatal care

This is a transient physiological state during a woman's reproductive years, but it requires important considerations regarding diet, life-style and drug therapies to achieve a good foetal outcome with minimal maternal morbidity and mortality.

Instruct the woman regarding

1. **Diet.** Caloric requirements depend on the physical work done by the women. The increased requirement of 300 Cals for the pregnancy state is to be made available by exogenous supply of diet. An ideal pregnancy diet should be light, nutritious, easily digestible and rich in proteins, vitamins and minerals. The diet should consist of at least half-a-liter if not one liter of milk, plenty of green leafy vegetables (one katori serving in each meal) & fruits as available, in addition to normal Indian diet consisting of a balanced cereals and pulses combination. Foods rich in iron like green vegetables, jaggary, and protein rich foods like nuts should be stressed upon. Fat consumption can be predominantly of animal source so as to take care of vitamins A & D.

2. **Exercise.** Any exercise, the woman is accustomed to can be continued, but not to the point of fatigue. Antenatal exercises done under medical supervision are useful in pregnancy and labour. No new exercise should be initiated during pregnancy. Sedentary women should be allowed only walking. Women with multiple foetuses and complications like heart disease, pregnancy induced hypertension, intrauterine growth retardation, history of preterm labour, APH, threatened abortion should not exercise.

3. **Clothing.** Should be non-constricting.

4. **Travel.** Road travel is allowed with safety belt. Traveling in a pressurized aircraft is of no risk, should walk about every 2 hours.

5. **Employment.** Jobs requiring prolonged standing (>8 hours/day) are associated with a minimum risk of pre-term delivery.

6. **Clinical workup** during each antenatal visit. BP, weight-gain, oedema feet, cardio-vascular, respiratory and breast examination symphyseal-fundal height, presentation, foetal heart rate(s), amniotic fluid volume, inquiry about daily foetal movement charting, and pelvic assessment at 38 weeks. Rh-ve women (with Rh+ve husband) need to be monitored on similar lines with additional testing with Indin Coomb's test (ICT) at first visit, 28 weeks and 34-36 weeks. Antenatal Ant;
immunoglobulin 300 mcg 1M is recommended in ICT negative patients at 28 weeks of pregnancy and postpartum 300 mcg 1M if baby is Rh+ve. ICT +ve patients are to be managed only at centers with facilities for amniocentesis and/or cordocentesis, amniotic fluid optical density estimation and intrauterine foetal transfusions.

7. Tab. folic acid supplements 5 mg once daily, at least 3 months before conception, and continue till 12 weeks of gestation.

8. Dose of iron (60-100 mg elemental iron) and folic acid (Tab. iron folic acid) once daily and calcium gluconate 500 mg tablet twice daily from 16 weeks till 3 months postpartum.

9. Immunization. 2 doses of tetanus toxoid 4-6 weeks apart, (mumps, measles and rubella vaccines are contraindicated). Rest of the vaccines can be administered, if indicated as in nonpregnant state.

10. Lab workup during pregnancy as Table 15.1.

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>Lab assessment</th>
</tr>
</thead>
</table>
| Initial (as early as possible) | - Haemoglobin  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
| 16-18 weeks     | - Haemoglobin  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
| 26-28 weeks     | - Haemoglobin  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
| 32-36 weeks     | - Haemoglobin  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  
|                  |  

Patient education

Determine if there are important taboos about foods which are nutritionally important for good health. Advise the woman against these taboos.

Advise the woman on how to prepare for delivery, when to go, what to bring and where to go in emergency.

Explain the danger signals when she should report to the health center immediately, day or night, without waiting such as vaginal bleeding, convulsions, severe headaches with blurred vision, severe abdominal pain, fast or difficult breathing, escape of fluid from vagina or change in frequency or intensity of foetal movements, persistent vomiting, oliguria. She should go to the health centre as soon as possible if any of the following signs: swelling on face or hands, abdominal pain, fever, dysuria, feels ill.

Explain about black staining of stools due to oral iron, therefore, not to worry about it.

Iron and calcium supplements should be taken at different times of the day at least 2 hours apart.
Discuss birth spacing after delivery and counsel on the importance of family planning. Give advice on correct and consistent use of condoms for dual protection from sexually transmitted infections or HIV and pregnancy (for details on methods of contraception see section on contraceptives). Sexual intercourse should be avoided when abortion/pre-term labour threatens, and during last 4 weeks in any pregnancy. Bowel constipation, fissures and haemorrhoids are common during pregnancy and should be treated with fluids, exercise and bulk laxatives and stool softeners. Smoking, alcohol and drug abuse are contraindicated. Caffeine is best avoided.

- Daily foetal movement charting (DFMC): After 28 weeks, the woman should keep foetal movement count. Follow-up visits: every 4 weeks till 28 weeks, every 2 weeks till 36 weeks and weekly thereafter.

Reference

NORMAL LABOUR

Normal labour is defined as labour when foetus presents as vertex, starts spontaneously at term, terminates naturally without artificial aid and without complications. It is a retrospective diagnosis. Broadly there are 3 stages of labour (Table 15.2).

**Diagnosis of labour**

- Painful uterine contractions at regular intervals with increasing intensity and frequency.
- Cervical dilatation and effacement.
- Formation of bag of membranes.
- Show.

**Table 15.2. Stages of labour**

<table>
<thead>
<tr>
<th>Stages of labour</th>
<th>Definition</th>
<th>Duration Nullipara</th>
<th>Duration Multipara</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latent phase</td>
<td>Cervical dilatation less than 3 cm</td>
<td>12 h</td>
<td>8 h</td>
</tr>
<tr>
<td>Active phase</td>
<td>Cervical dilatation more than 3 cm</td>
<td>6-8 h or rate of Cx dilatation 1 cm/h</td>
<td>4-6 h or rate of Cx dilatation 1.5 cm/h</td>
</tr>
<tr>
<td><strong>Second stage</strong></td>
<td>Full dilatation of cervix to expulsion of foetus</td>
<td>1 h</td>
<td>30 min</td>
</tr>
<tr>
<td><strong>Third stage</strong></td>
<td>From expulsion of foetus to the delivery of placenta</td>
<td>30 min</td>
<td>15 min</td>
</tr>
</tbody>
</table>
Management of labour

When the patient reports to the hospital with labour pains, examination should be conducted by a doctor on duty and risk category to be assigned (Table 15.3).

Table 15.3. Common risk factors during labour

<table>
<thead>
<tr>
<th>Maternal factors</th>
<th>Past reproductive history</th>
<th>Present pregnancy</th>
<th>Associated medical/surgical problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;16, &gt;35</td>
<td>&gt;1 abortion</td>
<td>Bleeding in pregnancy</td>
<td>Heart disease</td>
</tr>
<tr>
<td>Parity - 0, &gt;5</td>
<td>Previous stillbirth</td>
<td>Prematurity, PROM</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Obesity</td>
<td>Previous caesarean section</td>
<td>Postmaturity</td>
<td>Anaemia</td>
</tr>
<tr>
<td>Height &lt;145 cm</td>
<td>Prev PPH/MRP</td>
<td>PIH</td>
<td>Jaundice</td>
</tr>
<tr>
<td></td>
<td>PIH</td>
<td>IUGR</td>
<td>Hypertension</td>
</tr>
<tr>
<td></td>
<td>TUGR</td>
<td>Multiple pregnancy</td>
<td>Renal disease</td>
</tr>
<tr>
<td></td>
<td>Congenital anomaly in baby</td>
<td>Malpresentation</td>
<td>Thyroid disease</td>
</tr>
<tr>
<td></td>
<td>Previous early neonatal death</td>
<td>Malposition</td>
<td>Epilepsy</td>
</tr>
</tbody>
</table>

General examination

- Record height and weight.
  - Pulse rate (PR), blood pressure (BP), respiratory rate (RR), temperature.
- Look for pallor, pedal oedema, jaundice and cyanosis.
  - Auscultate cardiovascular and respiratory system.

Per abdomen examination

Note:
- Height of the uterus POG.
- Presentation, attitude, palpable foetal head (rule of fifths).
- Foetal heart rate.
- Uterine contractions - +/−, intensity, duration and frequency per 10 minutes.
- **Amount** of liquor.
  - Size of the baby/estimated baby weight.
  - Look for overriding of foetal head over symphysis pubis.
  - Features of obstructed labour and contour of the uterus.

Per vaginum examination

Observe aseptic precautions - hand washing and sterile gloves.

Note:
- Cervical dilatation and effacement.
- Presentation and station of presenting part.
- Position and degree of flexion (sutures and funtanelle).
- Status of membranes and if leaking present then colour of liquor.
- Cord prolapse or presentation to be ruled out.
- Pelvic adequacy and rule out cephalopelvic disproportion (CPO).
Investigations
Minimum investigations required during labour are:
- Hb, urine albumin and sugar, blood grouping.
- Urine acetone in prolonged/obstructed labour.

Risk category
Should be assigned to the patient (low Risk or high Risk) and mentioned on top of partograph. Table 15.3 shows common risk factors. Trained midwife or doctor in primary health center after ensuring adequate back up of transport facility and communication with referral center may deliver low risk patient. All primigravidas and patients with any of the risk factor should be delivered in hospital with facilities for emergency caesarean section and blood transfusion.

First stage of labour
Supportive care. Sympathetic attitude towards the patient.
- Inform the patient about her status.
- Clip long pubic hair.
  - No routine enema unless rectum is loaded or the patient requests.
  - The patient is instructed to wear loose clothes.
  - Allow mobility and let her choose position during labour.
  - Encourage her to empty bladder frequently.

Nutrition
Low risk patient: Bland diet like fat-free dalia and khichri; glucose biscuits.
- Encourage her to drink plenty of fluids.
- Patients likely to need caesarean section: Clear fluids only
  - IV line not mandatory
  - IV line indicated for - fluid infusion in dehydration, vomiting.
- Fluid requirement during labour is 60 - 120 ml/h.

Pain relief. To be given only in active labour if required.
- Inj. Tramadol 100 mg IM may be used, causes less respiratory depression, can be repeated after 4-8 h.
- Antibiotics: No routine antibiotics.

Monitoring during labour. It is recommended for all patients (Fig. 15.1).
- Record of the patient should be meticulously maintained.
  - Complete details of the patient on the partograph.
  - Chart PR every half hourly, BP 4 hourly and temperature 12 hourly (more frequently if abnormal).
  - Contractions are recorded every half hourly - frequency (contractions per 10 min), intensity and duration.
  - Assess descent in terms of fifths of foetal head above pubic symphysis.
  - PY exam: should be done - at admission, every four hourly in active labour, at ROM or earlier if indicated.
  - Artificial rupture of membrane (ARM) if done, indication should be mentioned - note colour of liquor.
Fig. 15.1. The Simplified Partograph
Using the partograph

- Start the partograph only when the woman is in active labour and does not have complications which need immediate delivery.
- Record observations in all sections of partograph.
- The dilatation of cervix is plotted with ‘X’.
- When the patient is admitted in active phase of labour, the dilatation of cervix is plotted on alert line and the clock time written directly under the ‘X’ in space for time.
- Vaginal examination should be done every 4 h after admission unless specifically indicated e.g. at ROM.
- If cervicogram moves to the right of alert line, it indicates prolonged labour and the patient should be reassessed by senior resident.
- At action line, the woman must be carefully reassessed for reason of lack of progress and decision made on further management.
- The time of fetal heart abnormality and rupture membranes and its colour should be highlighted, using the following abbreviations:

**Amniotic fluid**

I - Intact membranes
C - Membranes ruptured; clear fluid
M - Meconium stained liquor
B - Blood stained liquor

- Complete all the columns of partograph
- Partograph passes to the right of Alert line - reassess and consider criteria for referral; call senior person, if available.
- Partograph passes to the right of Action line - refer urgently to hospital unless birth is imminent.
- Foetal heart monitoring should be done by intermittent auscultation with help of stethoscope or foetoscope.
- Foetal heart rate (FHR) should be counted for 60 seconds following contraction (Normal FHR is 110-160 beats per minute).
- Frequency of FHR recording - every 30 minutes in first stage and every 15 minutes in second stage and every 5 minutes during pushing.
- Oxytocin if used, record amount of oxytocin in mU/min
- Drugs and IV fluids if administered are recorded.
- Maintain intake-output chart.

**Second stage of labour**

Shift the patient to delivery table.

- Inform the paediatrician. Ensure all delivery equipment and supplies, including newborn resuscitation equipment, are available, and place of delivery is clean and warm (25°C).
- Put her in dorsal/squatting position.
  - Observe universal precautions (for details see section on newborn care and prevention of infection in Chapter 19).
Clean and drape the parts.
Infiltrate the perineum with local anaesthetic agent if episiotomy is planned. Woman is encouraged to bear down.
Episiotomy is given if required (See Episiotomy)
To control birth of the head, keep the baby's head flexed and gently support the perineum as the head delivers. Suction of the nose and mouth.
After external rotation, deliver the shoulders one at a time followed by rest of the foetus.
Clamp and cut the umbilical cord.
- Ensure establishment of respiration in baby or institute resuscitation if required.
- Administration of oxytocin 5 Units 1Mat the delivery of the anterior shoulder to prevent PPH.

**Third stage of labour**
Recognizes signs of placental separation: Uterus becomes globular and firmer, suprapubic bulge appears, sudden gush of blood and permanent lengthening of cord.
Deliver the placenta by controlled cord traction. As the placenta passes through the introitus, care is taken to prevent the membranes from being torn off and left behind.
- **Examine** the placenta for its completeness and anomalies.
  - Administer Inj. Oxytocin 5-10 U IM.
  - Active management of third stage should be done unless contraindicated.
  - Examine the woman for any tears and repair if any. Stitch the episiotomy.
  - Observe the woman closely for one hour after delivery, record her PR and BP.
  - Evaluate the uterus frequently, and inspect the perineum to detect excessive bleeding and haematoma formation.

**Transfer from labour room**
Observe for 2 hours
- Check the following before transfer: pulse rate, BP, uterus, bleeding per vaginum, inspect external genitalia for condition of stitches and any haematoma, passed urine.

**Episiotomy (Incision of the perineum)**
Not to be performed routinely.
- Applied selectively for: breech, forceps or vacuum delivery, occiput posterior positions, rigid perineum, scarred perineum, and shoulder dystocia.
- Timing of episiotomy. At crowning of head, during a contraction.
- Procedure.
  - Clean the area with antiseptic solution.
  - Infiltrate beneath the vaginal mucosa, beneath the skin and deeply into the perineal muscle using 10ml 0.5 - 1% lignocaine.
Check at the incision site for effect of local anaesthetics by pinching with a forceps before giving incision.
Perform episiotomy at crowning. Place two fingers between the baby's head and the perineum and cut 3-4 cm of perineum in mediolateral direction.
After delivery of the baby and placenta, carefully examine for extensions of tears.
Repair the episiotomy with vicryl rapide 2-0 suture (chromic catgut if vicryl is not available). Close the vaginal mucosa with continuous suture starting 1 cm above the apex. Perineal muscles are approximated using interrupted sutures. Skin is closed with subcuticular (or interrupted) sutures.

**Care of episiotomy**
- Perineal hygiene: Clean the area with antiseptic solution after urination and defaecation.
  Analgesics are prescribed for allaying pain.

**Respond to following problems during labour and delivery**
Assess facilities and expertise available and appropriate timely referral if
- Foetal heart rate <120 or >160 beats per minute
- Prolapsed cord
- Breech presentation
- Stuck shoulders
- Multiple births

**Advice on postpartum care**
- To always have someone near her for the first 24 hours to respond to any change in her condition.
- Not to insert anything into the vagina.
- To have adequate rest and sleep.
- The importance of hand washing to prevent infection of the mother and her baby.
- To wash perineum daily and after faecal excretion.
- To avoid sexual intercourse until the perineal wound heals.
- Counsel for birth spacing and family planning (for details see section on contraception).
- Advise on routine postpartum care visits- within the first week, preferably within 2-3 days and second visit after 4-6 weeks. Earlier if problems- fever, UTI, perineal infection, hypertension, urinary incontinence, severe anaemia, postpartum blues, HIV positive.

**Counsel on exclusive breastfeeding**
Babies should start breastfeeding within 1 hour of birth. The baby should not be given any other food or drink before breastfeeding.
Babies should be exclusively breastfed for the first 6 months of life.
Breast milk contains exactly the nutrients a baby needs, is easily digested and protects the baby against infection.

(for care of the newborn and control of infection see chapter 19 and chapter 13).

References

7. RCOG National Evidence Based Guidelines No. 29 on Electronic Foetal Monitoring on Website www.rcog.org.uk.

CONTRACEPTION

A method or a system, which allows intercourse and yet prevents conception, is called a contraceptive method. This contraception may be temporary when the effect lasts only till the couple uses the method but the fertility returns after the use is discontinued. The permanent contraceptive methods are surgical and are aimed to achieve sterility after the surgical procedure.

A couple in the reproductive age group, who desires contraception should be provided information about all the available methods of contraception and should be counselled and helped so as to choose a method most suitable for that couple. Various contraceptive methods available are:

I. Temporary methods

A. Hormonal contraceptives Combined oral contraceptive pills.
   Injectable hormonal contraceptives (DMPA and NET-EN)
   Progesterone only pill [ketodesogestrel]
B. Non-hormonal contraceptive pills
   Centchroman.
C. Intrauterine contraceptive device
   CuT 200B.
   Multiload 280 and Multiload 375.
   CuT 380A
   LNG IUCD [mirena]
D. Barrier methods
   Male condoms.
   Vaginal diaphragms with spermicidal jelly.
   Contraceptive sponge.

II. Permanent methods
A. Female sterilization
   Postpartum sterilization.
   Interval ligation (laparoscopic or minilap ligation).
   Ligation concurrent with MTP.
B. Male sterilization
   Vasectomy (traditional or non-scalpel).

I. Temporary contraceptive methods

A. (i) Combined oral contraceptive pills

   Any of the low dose combined oral contraceptive pill containing 30 meg Ethinyl oestradiol and a Progestin (0.3 mg Norgestrel or 0.15 mg Norgestrel or 0.15 mg Desogestrel) can be prescribed. One tablet to be taken daily with meals at consistent time. It should be started during first seven days of the menstrual cycle or at any other time when it is reasonably certain that she is not pregnant. If started after first 7 days of menstrual cycle, back up method (abstinence or barrier method) should be used for 7 days. Pills should be taken for three weeks followed by 1 week of pill-free interval during which placebo tablets are to be taken if pack contains 28 tablets.

   In women >40 years of age very low dose pills containing Ethinyl oestradiol 20 meg and Desogestrel 0.15 mg can be used. After age 50 years, if woman on oral pills, check FSH during 5 - 7 days of pill free interval. If FSH >30 IU/l change to HRT regimens.

   **Contraindications**

   Combined oral contraceptive pills are contraindicated in cases with current or history of
   thromboembolic disease, cerebrovascular disease, coronary artery disease.
   complicated valvular heart disease
   acute liver disease.
   current or past breast cancer.
   undiagnosed vaginal bleeding.
   pregnancy.
   heavy smokers over 35 years of age.
migraine with neurological symptoms.

diabetes >20 years or with vascular disease.
current gall bladder disease.

uncontrolled hypertension (BP >160/100).

Combined oral contraceptive pills should not be taken during first 6 months postpartum if breastfeeding and first 3 weeks postpartum in non-breastfeeding females. Pills can be started immediately after spontaneous or induced abortion; can be used with caution in cases with controlled hypertension, diabetes, migraine without neurological symptoms, non-smokers with age more than 35 years of age without any other medical illness.

Follow up. First follow up should be within 3 months and then annually. Follow up involves history, blood pressure, urinalysis, breast examination, liver palpation and pelvic examination.

Patient education

Common side effects are nausea, vomiting, GI upset, breast changes, weight gain, acne, breakthrough bleeding, amenorrhea, rash, vaginal candidiasis. Side effects decrease usually after 2 - 3 months of use.

Report immediately to the clinician in case of symptoms like chest pain, leg pain, severe headache, severe stomachache, swelling of one or both legs, visual impairment.

It is one of the most effective contraceptive methods with failure rate of about 0.1%.

It has non-contraceptive health benefits like regular periods with less pain and bleeding, improves premenstrual symptoms, and decreases functional ovarian cysts, pelvic inflammatory disease, ovarian and endometrial cancer, endometriosis.

Forgotten pill - if one pill is forgotten, take as soon as remembered and next day take next pill and continue the schedule. Use back up method for 7 days.

If 2 pills are forgotten take 2 pills and next day again take 2 pills, and then continue as per schedule. Use back up method for 7 days.

If 3 pills are forgotten, this cycle is not protected, use back up method till next cycle and then restart with new pack.

Should be discontinued at least 4 weeks prior to any planned major surgery. Medicines like rifampicin, barbiturates, phenytoin, carbamazepine, primidone, griseofulvin interfere with the effects of oral pills. So use alternative method during their intake.

A. Injectable hormonal contraceptives

Highly effective oestrogen free long acting contraceptive not linked to coitus; can be given in women where oestrogens are contraindicated like sickle cell disease, seizure disorders, age >35 years who smoke; can be given in breastfeeding females after first 6 weeks. In non-breastfeeding females, injections can be safely given immediately postpartum.
Depot Medroxy Progesterone Acetate - 150 mg injection to be given deep IM every three months. Next injection can be delayed by 2 weeks.

Or

Norethisterone enanthate - 200 mg injection to be given deep IM every 2 months. Next injection can be delayed by 1 week.

**Absolute contraindications**

- pregnancy
- unexplained genital bleeding.
- severe coagulation disorder.
- previous sex steroid induced liver adenoma, active liver disease.
- breast feeding during initial 6 weeks.
- current or history of thromboembolic disease, cerebrovascular disease, coronary artery disease.
- current or past breast cancer
- diabetes >20 years or with vascular disease
- uncontrolled hypertension (BP >180/110).

**Patient education**

- Common side effects are irregular bleeding, breast tenderness, weight gain, depression, headache, dizziness, abdominal pain.
- Beneficial effects and efficacy is same as that of oral contraceptive pills.
- Fertility return is slightly delayed after discontinuation of use.
- Drug interactions are same as with oral hormonal pills.

B. Non-hormonal oral contraceptive pills (Centchroman)

30 mg tablet started on first day of periods. Take twice weekly for three months and then continue as once weekly.

**Contraindications**

- Polycystic ovarian disease, cervical intraepithelial neoplasia, severe allergy, recent history of liver disease, and first 6 months of lactation.

**Patient education**

- It is a non-steroidal contraceptive pill. It has no hormonal effects.
- Failure rate is 1-2%.
- Delayed periods can occur in 6% cases. If delay is> 15 days, perform urine pregnancy test.
- If one tablet is missed take as soon as possible and resume scheduled intake.
- Add back up method till next period. If tablet missed for >7 days, start fresh regimen.

C. Intrauterine contraceptive devices (IUCD)

Any of the following devices can be inserted inside uterus by trained health personnel. It should be inserted during or shortly after menstruation during the follicular phase of menstruation. After spontaneous or induced abortion IUCD can be inserted immediately. After delivery it should be inserted during 4-8 weeks postpartum. It can
be inserted within 5 days of unprotected coitus. These devices need to be changed after the duration of their lifespan (Table 15.4).

**Table 15.4.** Lifespan of intrauterine contraceptive devices (IUCD)

<table>
<thead>
<tr>
<th>Device</th>
<th>Lifespan</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuT 200B</td>
<td>3 years</td>
</tr>
<tr>
<td>Multiload 250</td>
<td>3 years</td>
</tr>
<tr>
<td>Multiload 375</td>
<td>5 years</td>
</tr>
<tr>
<td>CuT 380 A</td>
<td>10 years</td>
</tr>
</tbody>
</table>

Follow up - first follow up should be after next period to check for complications and to rule out expulsion. After that follow up annually.

**Contraindications**

Pregnancy, postpartum <4 weeks, septic abortion, distorted uterine cavity, uterine fibroids, current or within past 3 months PID or STD, increased risk of STD, HIV positive, AIDS, pelvic tuberculosis, unexplained vaginal bleeding, trophoblastic disease, genital tract malignancy, complicated valvular heart disease.

**Patient education**

Common side effects are increased menstrual bleeding and dysmenorrhea. These decrease after initial 2-3 months.

No protection for STDs.

Failure rates are 0.5 - 3%. Ectopic pregnancy can still occur. ruCD can be spontaneously expelled. Therefore monthly palpation of IUCD string is important. If not palpable, report immediately.

**D. Barrier methods**

These are cheap, over the counter available, coitus dependant methods. Male condoms, vaginal diaphragm, spermicidal jellies, vaginal sponge can be used.

**Male condoms**

Any of the available condoms can be used. For each act of coitus a new condom is to be used. If during intercourse, condom breaks or if there is spillage or leakage, woman should contact a clinician within 72 hours and emergency contraception should be provided to her. **Contraindication.** Only contraindication is in cases with severe allergy to latex rubber.

**Vaginal diaphragm**

Available in different sizes. Proper size should be checked by a clinician by pelvic examination. Can be inserted 6 hours prior to intercourse. About a tablespoonful of spermicidal cream or jelly should be placed in the dome of diaphragm prior to insertion; should be left in place for approximately 6 hours (but not >24 hours) after coitus. Additional spermicide should be placed in vagina before each additional episode of sexual intercourse. After removal wash with soap and water, rinse and dry.

**Follow up.** Annually to assess proper fitting of diaphragm.
**Contraceptive sponge**

Contains spermicidal agent Nonoxynol 9. It should be removed at least 6 hours after sexual intercourse. Maximal wear time is 30 hours.

**Patient education**

Barrier methods provide protection against STDs and PID. Only condom has been proven to prevent HIV infection.

Other advantages are prevention of diseases like pelvic inflammatory disease, carcinoma cervix, chronic pelvic pain.

It can be used soon after delivery.

No hormonal side effects.

Side effects like vaginal dryness, itching, irritation, allergic reactions can occur.

Failure rates are very high. Typical failure rates are with condoms 14%, diaphragm with spermicidal jelly 20%, highest with sponge 28%.

**II. Permanent contraceptive methods**

Permanent contraception is provided by sterilization operation in male or female partners.

Male client should be <60 years of age.

Female client should be >22 years and <45 years of age.

Client must make informed decision voluntarily and must give consent on the consent form for sterilization.

**A. Female sterilization**

Can be done by laparoscopic ligation in interval ligation and first trimester abortions or tubectomy.

**Timing**

Interval sterilization - within 7 days after menstrual period is over.

Postpartum sterilization - after delivery till 7 days but preferably within 48 hours. Later on after 6 weeks postpartum.

MTP - concurrently.

Spontaneous abortion - concurrently but under antibiotic cover and in the absence of infection and anaemia.

**Contraindications**

There are no absolute contraindications. Relative contraindications are psychiatric disorder, acute febrile illness, jaundice. Hb< 8 g%, chronic systemic disease, malignancy, bleeding disorder, severe nutritional deficiency. Postpartum sterilization is contraindicated in puerperal sepsis or fever, severe pre-eclampsia/eclampsia, premature rupture of membrane >24 hours, severe APH or PPH, genital tract trauma.

Post abortal sterilization is contraindicated in sepsis, fever, haemorrhage, severe trauma, uterine perforation, acute haematometra.

**Follow-up.** First follow up should be done seven days after the surgery for
wound examination. Second follow up is recommended after one month or next menstrual period whichever is earlier. Subsequent follow-ups if client develops any complication or has query.

B. Male sterilization

**Contraindications**

There are no absolute contraindications. Relative contraindications include psychiatric and physical illness, local genital conditions, including large varicocele, hydrocele, inguinal hernia, filariasis, cryptorchidism, previous scrotal surgery, intra scrotal mass.

Follow-up. First follow up after 7 days of surgery for wound examination and stitch removal. Second follow up after 3 months with semen analysis. Subsequent follow up required in cases of any complication or queries.

**Patient education**

In non scalpal vasectomy stitches are not required.

It is a safe and simple procedure.

It is a permanent method to prevent future pregnancies.

It does not affect sexual pleasure, ability or performance.

It has a small chance of failure even if performed under optimum circumstances.

After vasectomy it is necessary to use a back up contraceptive method either for 20 ejaculations or for a period of 3 months.

Sterilization does not provide protection against reproductive tract infections/STDs or HIV/AIDS.

Failure rates with female sterilization are < 0.5% and male sterilization < 0.1%.

**Emergency contraception**

Method used to prevent pregnancy after a likely fertile unprotected act of sexual intercourse; can be used in cases of condom rupture, rape or other circumstances of unprotected sex.

First dose should be taken within 72 hours following unprotected sex and second dose 12 hours after the first dose. Any of the following can be used:

- Levonorgestrel 0.75 mg 1 tablet 12 hourly for 2 doses.
- Combined oral contraceptive pills containing 50 mcg Ethinyl oestradiol with 0.5 mg Norgestrel 2 tablets 12 hourly for 2 doses.
- Low dose combined oral contraceptive pills containing 30 mcg Ethinyl oestradiol with 0.3 mg Norgestrel 4 tablets 12 hourly for 2 doses.

**Patient education**

- Side effects are nausea, vomiting, dizziness, fatigue, headache, lower abdominal pain, breast tenderness, vaginal bleeding.
- It must be used under medical supervision.
It decreases risk of pregnancy by 70 - 90%. Earlier it is taken, success is more.
If vomiting occurs within 2 hours of the dose, it must be repeated.
There are no contraindications for emergency contraception.
After this use a barrier method for each act of intercourse until next menstrual period.
If period delayed >5 days, rule out pregnancy.
Use regular contraceptive method.

Reference

NAUSEA AND VOMITING IN PREGNANCY

Nausea and vomiting of mild to moderate intensity are especially common complaints from early pregnancy until about 16 weeks. In few cases it may progress to hyperemesis.

SALIENT FEATURES

- Common complaint on rising in the morning but sometimes occurs at other times of the day; vomitus is usually small and clear and doesn't produce any impairment of health or restrict the normal activities of the pregnant woman.
- Severe nausea and persistent vomiting progress to hyperemesis leading to weight loss, ketosis and there may be muscle wasting. There are usually signs of dehydration with postural hypotension and tachycardia.
- Diagnosis is by exclusion of medical and surgical causes of vomiting like liver or GIT disorders, pylonephritis, diabetes mellitus etc. and molar (and multiple) pregnancy should be ruled out in all cases of hyperemesis by ultrasound.

Treatment

Nonpharmacological
Reassurance and advice to take frequent small, dry carbohydrate rich meals and avoid fatty or spicy foods, especially avoid large volume of drinks in the morning.

A. Mild to moderate cases

Pharmacological
Tab. Doxylamine succinate 10 mg + Pyridoxine HCl 10 mg 1-2 tablets at bed time. If required one more tablet can be added in the morning and afternoon.
Or
Tab. Metoclopramide 10 mg 2-4 times a day in moderately severe cases.
B. Hyperemesis Gravidarum

Nonpharmacological
1. Admit all cases in the hospital away from a stressful home environment.
2. Stop oral intake of fluids and nutrition.
3. Serum electrolytes and urinary ketones to be checked at admission and 6 hourly.
4. Emotional support, psychiatric referral if required.
5. Rule out multiple or molar pregnancy and liver disorders.

Pharmacological
Adequate and appropriate fluid and electrolyte replacement. Normal saline or Ringer's lactate solutions are appropriate solutions and KCl is added as required. If urinary ketones are present, then 1 liter of 10% dextrose is transfused over 3-4 hours.

In prolonged vomiting
1. Tab. Thiamine 25-50 mg 3 times a day (if orally tolerated). If vomiting are not controlled with fluid and electrolytes replacement in 6 - 8 hours.
2. Inj. Metoclopramide 10 mg IV or IM 8 hourly.
3. Inj. Ranitidine 50-100 mg 6 hourly.
4. If not controlled, Inj. Promethazine chloride 25-50 mg IM or IV 8 hourly
   Or
   Inj. Chlorpromazine 25-50 mg IM 4-6 hourly.
   Once vomiting is controlled for 24 hours, oral intake is gradually started.
   If well tolerated then only IV fluids are omitted. At first dry carbohydrate foods are given in the form of small meals at frequent intervals. Gradually full diet is introduced. In prolonged and severe disease, parenteral nutrition may be necessary. Give Tab. Metoclopramide 10 mg 3 times a day and Tab. Ranitidine 150 mg 2 times a day.
   If well tolerated for 48 hours, patient can be discharged from the hospital with dietary advice, reassurance and continue Tab. Metoclopramide for 5-7 days or longer depending on the response.

Patient education
Adjust timing of medication in relation to the time of sickness.
- This is a benign disorder and gets relieved by 14 - 16 weeks of pregnancy.

References
BLEEDING IN FIRST TRIMESTER OF PREGNANCY (ABORTION)

SALIENT FEATURES

- Bleeding in first trimester of pregnancy can be due to pregnancy related complications such as abortion (threatened/inevitable/ incomplete/missed), ectopic pregnancy and molar pregnancy or due to local causes such as trauma, erosion, polyp, infection, premalignant or malignant lesions.
- Diagnosis is based on the findings of clinical examination, sonography and serum hCG levels as shown in Table 15.5.
- Local lesions are diagnosed on oer sclerum examination.

Treatment

Abortion can be treated at a primary care level.
Molar and ectopic pregnancy should be treated at a secondary/tertiary care level.
Hospitalize all patients of bleeding in the first trimester.
Assess for blood loss and take immediate measures to combat hypovolaemia as indicated.
Check BT, CT, CRT in missed abortion

Table 15.5. Evaluation of patients presenting with bleeding in the first trimester of pregnancy

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Clinical findings</th>
<th>USG/hCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened abortion</td>
<td>Uterine size = period of gestation (POG) Internal Os closed</td>
<td>Consistent with live foetus</td>
</tr>
<tr>
<td>Inevitable abortion</td>
<td>Uterine size = POG Internal Os open, excessive bleeding and pain</td>
<td>Cardiac activity + Internal Os dilated</td>
</tr>
<tr>
<td>Incomplete abortion</td>
<td>History of passing products of conception (POC) Uterine size &lt; POG Internal Os open/ closed</td>
<td>POC in uterine cavity</td>
</tr>
<tr>
<td>Missed abortion</td>
<td>Uterine size &lt; POG Internal Os closed Brownish discharge +</td>
<td>Cardiac activity absent</td>
</tr>
<tr>
<td>Molar pregnancy</td>
<td>History of passing vesicles ≥ Uterine size or ≤ than POG Internal Os open/closed</td>
<td>Honeycomb appearance 1hCG levels very high</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>Cervical excitation + Unilateral tender fornix, adnexal mass</td>
<td>Pseudogestational sac empty uterine cavity</td>
</tr>
</tbody>
</table>

adnexal mass, hCG rise <66% in 48 hours
Surgical therapy

Manul vacuum aspiration or suction evacuation, dilatation and evacuation or only evacuation in all cases of abortion and molar pregnancy except threatened abortion.

Laparotomy/laparoscopic removal of ectopic pregnancy except a few selected cases of unruptured ectopic pregnancy (for details see respective section).

Patient education

Exact aetiology of abortions is not always apparent.
Very early abortions are often nature's selection to abort a nonviable, chromosomally abnormal conceptus.
Increased abortions are seen with increasing parity and maternal age.
Recurrent abortions 3 or more consecutive abortions should be investigated before planning the next pregnancy.
Effective contraception should be initiated soon after abortion as ovulation can occur as early as 2-3 weeks after an abortion.

TIREATENED ABORTION

Nonpharmacological
Bed rest.

Pharmacological

1. Inj. Morphine 10 mg IM stat for those who have pain and are anxious.
   Or
   Inj. Pethidine 50 mg + Promethazine 25 mg IM stat for those who have pain and are anxious. If not available Inj. Diazepam 10 mg IM or Tab. Alprazolam 0.5 mg.
2. Tab. Folic acid 5 mg daily.
3. Monitor for the continuation of pregnancy after confirming cardiac activity by USG.
   Discharge the patient 48 hours after bleeding stops.
4. Progesterone supplementation if serum progesterone < 15 ng/ml only after confirming cardiac activity in cases of spontaneous conception.

Patient education

To report immediately if bleeding recurs or it is more than normal periods.
Continue bed rest for at least 2 weeks.
Abstinence till at least two follow-up visits in the next 4 weeks when normal continuation of pregnancy is documented.
High fiber diet to avoid constipation.
Need of follow up after 2 weeks for foetal growth by clinical and/or USG parameters.

After suction evacuation for abortion:
   Reassurance if no living child.
   Need for contraceptive - can be started immediately after evacuation.
   When to resume coitus - after 4 weeks if no complications.
   When to attempt conception - after at least 6 months.
References


SEPTIC ABORTION

Any abortion associated with fever and signs of pelvic or generalized sepsis is considered septic abortion. Most septic abortions result from illegal abortions but sepsis may follow spontaneous and elective abortions.

SALIENT FEATURES

- Fever, tachycardia, abdominal distension and tenderness, pelvic tenderness, and purulent vaginal discharge. In seven! cases there may be endotoxic shock and end organ failure.
- Complications like injury to viscera like uterus and bowel, internal or external haemorrhage, peritonitis, disseminated intravascular coagulation, renal failure, hepatic failure, endotoxic shock and tetanus can occur.

Treatment (to be managed at a tertiary care level)

Before starting antibiotic therapy, high vaginal or cervical swab and blood culture should be obtained.

Pharmacological

1. IV fluids for correction of electrolyte imbalance (see section on shock in chapter 2).
2. Oxygen by facemask in severe cases. In cases of adult respiratory distress syndrome intubation and ventilatory support is required, and hydrotherapy if required.
3. If blood pressure is not controlled with fluid replacement, Inj. Dopamine infusion in 5% Dextrose 2 - 5 meg/kg/min and dose titrated according to clinical and haemodynamic response (for details see section on shock).
4. In case of shock, acidosis is corrected by IV Sodium bicarbonate 50-100 mEq in normal saline.
5. Inj. Ampicillin 2 g stat followed by 500 mg IV 6 hourly (after test dose).
   Or
   Inj. Cefuroxime or Ceftazidime 1-2 g IV 2 times a day (after test dose).
6. Inj. Gentamicin 1.5 mg/kg then 1 mg/kg IV 8 hourly.
   Or
   Inj. Amikacin 250 - 500 mg IV 8 hourly.
7. Inj. Metronidazole 500 mg IV 8 hourly.
   Or
   Inj. Clindamycin 600 mg IV 6 hourly.
Continue antibiotic therapy for 48-72 hours until culture sensitivity results provide an indication for changing the initial antibiotic regimens or patient does not respond to therapy. Monitor pulse, temperature, blood pressure, respiratory rate, urine output, and serum electrolytes. In severe cases CVP and ABG monitoring is required. Therapeutic goals are to maintain systolic BP >90 mmHg, urine output >30 ml/min, arterial P02 >60 mmHg, and CVP 6 - 12 cm of H2O.

8. (i) Uterine curettage: if patient's condition is stable, within 1 hour of antibiotic therapy, evacuation of the uterus by gentle curettage to remove infected products. If general condition is low at admission, curettage after 6 - 8 hours of antibiotic therapy and treat hypovolaemia.

(ii) Laparotomy in case of injury to the uterus, suspected injury to the gut, presence of foreign body in the abdomen as evidenced by X-ray or felt through the fornix, peritonitis.

Or

Colpotomy in cases of pelvic abscess.

References

ECTOPIC PREGNANCY

Treatment of ectopic pregnancy should be undertaken at a secondary/tertiary care level set up. Laparoscopic surgery or laparotomy is done in all cases of ectopic pregnancy except in a few selected cases that are highly compliant and reliable and fulfill the following criteria:

- Unruptured ectopic pregnancy in haemodynamically stable patient.
- Gestational sac size <3.5 cm in greatest diameter.
- Serum hCG titer <10,000 mIU/ml.
- Gestation <6 weeks.
- Absence of foetal cardiac activity.

Treatment

Pharmacological (for unruptured ectopic pregnancy)

1. Obtain pretreatment hCG titers, haemogram, liver and renal function tests.
2. Inj. Methotrexate 50 mg/sq meter body surface area 1M given on day 1.
3. Repeat hCG titers on day 4 and 7.
4. If day 7, hCG titers reflect a drop of at least 15% from maximum levels then weekly hCG titers till negative.
5. If fall <15% or there is rise then repeat Inj. Methotrexate.
**Patient education**

Resolution of ectopic pregnancy may take up to 6 weeks.
5 - 10% cases require surgery despite medical therapy.
Signs and symptoms of tubal rupture such as vaginal bleeding, abdominal pain, weakness, dizziness or syncope must be reported promptly.
Patient should refrain from alcohol and folic acid containing vitamins during this period.
Sexual intercourse should be avoided during therapy.

**Reference**


**MEDICAL TERMINATION OF PREGNANCY**

The government of India has legalized medical termination of pregnancy up to 20 weeks of gestation by MTP Act 1971. Under this act, pregnancy can be terminated under following clauses:

**Clauses and requirements**

1. Damage to the life of the pregnant woman.
2. Grave injury to the physical or mental health of the pregnant woman.
3. Pregnancy caused by rape.
4. Substantial risk, that if the child was born, it would suffer from such physical or mental abnormalities as to be seriously handicapped.
5. Failure of any contraceptive method or device.

Necessary consent form as laid down in the Act should be duly filled and signed. Opinion of two registered medical practitioners is mandatory for second trimester MTP (>12 weeks).

**First trimester MTP methods**

**Medical method.** It can be done upto 49 days amenorrhoea after proper counselling and excluding contraindications. Oral Mifepristone 200-600mg given on day 1. On day 3 Misoprostol 400mg orally or 800 mg vaginally in hospital. Woman generally aborts in next 4-8 hours and USG on day 14 to confirm complete abortion. Asked to report if excessive bleeding anytime in between. The procedure should be done only in centers approved under MTP Act.

**Surgical method.** Suction and evacuation done in all centers approved under MTP Act. Manual Vacuum Aspiration (MVA) can be done in all PHCs.

**Patient education**

Details-of the method and small risk of complications should be explained. Medical method fails in around 5% cases and these will require surgical curettage.
Patient should be motivated for concurrent contraception and option of all available methods both temporary and permanent should be discussed.

**Second trimester MTP methods**

To be conducted in secondary and tertiary care level. None of the second trimester methods are 100% safe and effective. That is why many methods both surgical and medical, are available and being used. For second trimester MTP medical methods are preferred.

Methods are usually combined so as to increase the success rate and to shorten induction abortion interval. Most commonly extra amniotic ethacridine is combined with oxytocin or prostaglandins by various routes. Better results if some method for cervical ripening is used 6 - 12 hours before. If some method fails switch over to other method or surgical method.

**Table 15.6. MTP methods for second trimester**

<table>
<thead>
<tr>
<th>Method</th>
<th>Drug</th>
<th>Mean induction-abortion interval</th>
<th>Success rate</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra-amniotic instillation</td>
<td>0.1% Ethacridine lactate 10ml/week of gestation maximum 150 ml with IV Oxytocin after 6-24 hours Or</td>
<td>32-36 hours</td>
<td>75 - 80%</td>
<td>Nausea, vomiting, diarrhoea, broncho-spasm</td>
</tr>
<tr>
<td>Intra-muscular</td>
<td>15 methyl PGF&lt;sub&gt;2a&lt;/sub&gt; 250 mg IM 3 hourly x 10 doses</td>
<td>15-17 hours</td>
<td>95%</td>
<td></td>
</tr>
</tbody>
</table>

**ANAEMIA IN PREGNANCY**

Prevalence of anaemia in pregnancy in India is 80% and severe anaemia is 10-15%. Causes of anaemia in pregnancy are the same as those encountered in the non pregnant state. However, iron deficiency anaemia is commonest in pregnancy. In about 40-50% of cases there is associated folic acid deficiency.

Anaemia in pregnancy is defined as haemoglobin concentration of less than 11 g/dl and haematocrit of less than 33%. It is further classified depending on Hb levels as mild 10-11 g%, moderate 7-10 g% and severe <7 g%.

**SALIENT FEATURES**

- In mild to moderate cases, symptoms are weakness, exhaustion, lassitude, anorexia, glossitis, and stomatitis, while severe cases present with palpitation, dyspnoea, oedema and cardiac failure.
- Important basic investigations required are haemoglobin, haematocrit, total RBC counts, peripheralsmear for type of anaemia and haematologicalindices, plasma proteins and stool for ova and cyst.
Treatment (iron deficiency anaemia)

All cases of severe anaemia to be admitted especially those with features of anoxia or cardiac failure.

Nonpharmacological

1. Diet rich in iron - jaggery, green leafy vegetable, sprouted pulses, meat, cooking food in iron utensils.
2. Diet rich in protein - pulses, lentils, milk and milk products, nuts.

Pharmacological

1. Oral iron therapy: Ferrous sulfate and Ferrous fumarate. Recommended dose is 200 mg elemental iron daily in divided doses. Not to be taken with meals, milk, coffee or tea. Continue therapy till blood picture returns to normal and then continue with 100 mg elemental iron for 3 months to build up the stores. Government of India recommends minimum of 100 mg of elemental iron and 5 mg folic acid for 100 days starting at 20 weeks (Common side effects are epigastric pain, nausea, vomiting, constipation, and diarrhoea).
2. Deworming to be done after first trimester, if necessary. Tab. Mebendazole 100 mg 2 times a day for 3 days.
   Or
   Tab. Albendazole 400 mg single dose.

Monitoring of response to therapy

Subjective improvement of feeling better, weight gain and improved appetite after 1-2 weeks. Reticulocyte response observed in 5-10 days (increases to 5-6%) and rise in Hb/haematocrit in 2-3 weeks. The concentration is expected to rise at the rate of 0.1-0.25 g/dl/day or 0.8 -1 g/dl/week.

If no improvement in 3 weeks reevaluate for: incorrect diagnosis, non compliance, defective absorption, continuing loss, associated deficiencies.

Role of parenteral therapy is limited as rate of rise of haemoglobin with parenteral iron is similar to oral iron preparation.

Specific indications. Severe intolerance to oral iron, malabsorption, non compliance and moderate to severe anaemia in advanced pregnancy.

Total dose of iron to be given is calculated using following formulae:

% deficiency of Hb x weight in lbs x 0.03 + 300 mg.

Or

Simple method 250 mg of elemental iron needed for each gram of Hb deficit.

(Caution: Oral iron is suspended at least 24 hours prior to therapy to avoid reaction).

Inj. Iron dextran or Iron sorbitol complex (available as 50 mg/ml) 1M after an initial test dose of 0.5 ml intramuscularly, the injections are given daily or on alternate days in doses of 2 ml 1M using Z technique. To prevent staining of skin one can pass small amount of saline/air down the needle before withdrawing it.

(Caution: Emergency drugs to be kept ready for resuscitation in case of anaphylactic reaction).
Intravenous route is rarely used, to be given as inpatient.

Total Dose Infusion (TDI) after test dose-
Inj. Iron Dextran is diluted in 5% dextrose. Initial infusion is given slowly at 8 drops per min. for half an hour to watch for reaction, and then increase gradually to 40 drops/min. Total iron dose is administered in a single sitting.
If >2000 mg then only half dose is given in one day.
IV without dilution to be administered over 20 minutes time slowly in fractional doses.
Monitor for adverse reactions like rigours, chest pain, and hypotension. If present stop the infusion.

Indications for blood transfusion
Severe blood loss, severe anaemia beyond 36 weeks of pregnancy or anaemia refractory to oral and parental therapy or anaemic patient with anoxia or cardiac failure.

Management of anaemic patients during labour
1. Propped up position, oxygen therapy.
2. Sedation and pain relief.
3. Digitalization may be required in cardiac failure due to severe anaemia.
5. Active management of 3rd stage of labour with Inj. Methylergometrine maleate 0.2 mg IV at the delivery of anterior shoulder. Inj. Methylergometrine to be avoided in patients of anaemia with cardiac failure.
6. Packed cell transfusion if necessary and if Hb < 5 g after giving diuretics.

MEGALOBLASTIC ANAEMIA IN PREGNANCY

Folic acid deficiency

SALIENT FEATURES

- Patients may be asymptomatic or may have vomiting, diarrhoea, pallor, hepatosplenomegaly, and polyneuropathy.
- Diagnosis: is by MeV > 96fl, MCH > 33 pg and MCHC normal.
- Peripheral smear macrocytic anaemia with hypersegmentation of neutrophils, neutropenia and thrombocytopenia.

Treatment
Tab. Folic acid 5 mg daily to be continued for at least 4 weeks in puerperium.

Vitamin B_{12} deficiency

Treatment
Inj. Cyanocobalamin 250 meg IM every month.

Dimorphic anaemia

Both iron and folic acid in therapeutic doses.
Patient education

Dietary advice as mentioned earlier.
Common side effects of therapy should be explained to the patient.
Explain to the patient that stools turn black after oral iron therapy, so no need for concern.
Iron supplementation should continue for at least 3 months in postpartum period.
Adequate spacing of at least 3 years between two pregnancies.

References

PRE-ECLAMPSIA

Pre-eclampsia is one of the commonest causes of maternal and perinatal morbidity and mortality. It affects around 5-8% of all pregnancies.

Pre-eclampsia is principally a syndrome of signs, occurring more frequently in primigravida. When superimposed with convulsions it is termed as eclampsia. Other high risk factors are - multiple pregnancy, hydramnios, and molar pregnancy.

SALIENT FEATURES

- **Hypertension** (blood pressure >140/90 mmHg recorded at 4-6 hours interval) with proteinuria and/or non-dependant oedema, developing after 20 weeks of gestation in a previously normotensive nonproteinuric patient.
- Pre-eclampsia is considered mild if diastolic SP <100 mmHg, proteinuria trace to 1+ with minimal elevation of liver enzymes.
- Signs of severe pre eclampsia are: SP >160/110, 24 hour's urinary proteins > 2 g, elevated serum uric acid, thrombocytopenia (platelet count <50,000/mm³), microangiopathic haemolysis, raised liver enzymes, has diastolic SP > 110 mmHg and foetal growth retardation.

Treatment

Hospitalize all cases. Definitive therapy is to terminate pregnancy. The choice between immediate delivery and expectant management depends on:

1. Severity of disease.
2. Condition of mother and foetus and
3. Period of gestation (POG).
A. Mild pre-eclampsia

Expectant management: in cases of mild pre-eclampsia without foetal and maternal compromise, with gestational age <37 weeks.

**Nonpharmacological**

Complete bed rest preferably in left lateral position and regular diet adequate in proteins and calories with omission of extra table salt.

**Pharmacological**

Antihypertensive treatment is started if there is persistent diastolic blood pressure over 100 mmHg. Aim of treatment is to achieve a systolic BP about 130 mmHg and diastolic BP around 90 mmHg.

Tab. Methylldopa 250 mg 8 hourly or 6 hourly (maximum dose 2 g/day).

Or

Tab. Atenolol 50-100 mg once a day.

If BP is not controlled in 72 hours with the above, add any of the following:

Cap. Nifedipine 10 mg 8 hourly.

Or

Tab: Nifedipine retard 10 mg 12 hourly (maximum 30 mg 12 hourly).

Or

Tab. Labetalol100-200 mg 8 hourly (maximum 600 mg 6 hourly).

**Monitoring**

Daily monitoring of weight gain, BP, urine albumin, urine output. Weekly lab investigations - haemogram with platelet count, liver and kidney function tests specially serum uric acid, fundoscopy.

Foetal monitoring by clinical and USG growth assessment, daily foetal movement count, non stress test twice weekly and biophysical score weekly, Doppler studies in IUGR.

In case of mild pregnancy induced hypertension without proteinuria, if after hospitalization BP is controlled with rest without any antihypertensive drug, patient can be discharged after initial evaluation if no maternal/foetal compromise is detected. It can be practiced only in reliable patients who will follow instructions for monitoring as above, and also will report ominous symptoms immediately (Ominous symptoms are persistent severe headache, visual disturbances such as dimness of vision, double vision or blindness, epigastric pain, nausea, vomiting and oliguria).

**Definitive management**

Termination of pregnancy by labour induction/caesareansection in the following conditions:

Gestational age 37 weeks, foetal compromise like severe growth retardation, oligohydramnios, abnormal non-stress test or biophysical score, maternal compromise like development of features of severe pre-eclampsia, onset of labour, rupture of membrane or bleeding.
B. Severe pre-eclampsia

Treatment is preferably done in a tertiary care center.

Nonpharmacological

Observation in intensive care unit for 24 hours.
Assessment of maternal and foetal conditions. BP monitoring 2-4 hourly, hourly urine output monitoring, watch for sign and symptoms of impending eclampsia and foetal distress.
Lab Investigations: haemogram with platelet count, liver and kidney function tests, urinary proteins, coagulation profile, fundus examination, obstetric ultrasound with BPS.
Intravenous fluids Ringer's lactate at rate of 60 ml/h (maximum 125 ml/h).

Pharmacological

The aim of the treatment is gradual lowering of blood pressure so that diastolic BP is maintained between 90-100 mmHg.

1. Immediate management.
   Tab. Nifedipine 10 mg orally can be repeated after 30-60 min. (maximum dose 20 mg 4 hourly).
   (Caution: Side effects- Tachycardia, headache, flushing, and aggravation of angina. Rapid fall in BP can cause foetal distress).
   If BP is not controlled with oral treatment then IV drugs are started with intensive monitoring.
   Inj. Labetalol initial dose is 50 mg slow IV followed by infusion at 60 mg/h, doubling every 15 min until BP is controlled or maximum dose 220 mg in 24 hours is reached.

2. Maintenance therapy. After initial control of acute hypertension, patient is started on maintenance therapy with antihypertensives as described in management of mild pre-eclampsia.

3. Prophylactic anticonvulsants in women with severe pre-eclampsia especially in cases with signs and symptoms of impending eclampsia. Dose is same as for eclampsia. Loading dose is Magnesium sulfate - 4g IV as 20% solution over 20 minutes and 10 g intramuscular as (50%) solution, 10 ml (5 g) in each buttock (total of 14 g) followed by second dose in alternate buttocks every 4 hours. Before each dose monitor for presence of patellar reflex, respiratory rate> 16/min and urine output> 25 ml/h. It should be discontinued after 24 hours after BP is lowered if expectant management is planned.

After initial evaluation and stabilization of the patient further management is decided depending on foetal maturity and maternal response:

Expectant management. Considered if pregnancy is between 24-34 weeks and hypertension controlled with maximum of two drugs, urine output is normal, lab investigations are normal and no foetal compromise. Patient should be hospitalized till delivery.
Managed as mentioned in the mild pre-eclampsia with antihypertensives, bed rest and more frequent maternal and foetal monitoring.

Definitive management is termination of pregnancy:

Pregnancy beyond 34 weeks - stabilize maternal condition and terminate pregnancy.

Pregnancy less than 24 weeks - stabilize maternal condition and terminate pregnancy.

Patient on expectant management develops following features: uncontrolled hypertension despite maximum dose of 2 antihypertensive drugs, eclampsia, raised liver enzyme >2 time with right upper quadrant pain and tenderness, pulmonary oedema, platelet < 1 lac/nun', creatinine > 1 mg/dl over baseline, persistent headache, vomiting and visual disturbance suggestive of impending eclampsia and foetal compromise.

After delivery, intensive monitoring should be continued for 72 hours with prophylactic anticonvulsant continued till 24 hours postpartum. Dose of antihypertensives should be gradually reduced.

## ECLAMPSIA

### SALIENT FEATURES

- Occurrence of generalized convulsions associated with signs of pre eclampsia during pregnancy, labour or within 7 days of delivery and not caused by epilepsy or other convulsive disorders.
- Eclampsia occurs antepartum in 46%, intrapartum in 16% and postpartum in 36% cases.
- Patient may develop acute left ventricular failure, cerebral haemorrhage, renal cortical necrosis, DIC, foetal distress, abruptio placentae, foetal death and even maternal death can occur.

### Treatment (To be managed at a tertiary care level)

Principles of management are control and prevention of recurrence of convulsion and control of hypertension. Treat any complication that arise and deliver safely as soon as possible. Continue anticonvulsant therapy 24 h after delivery or last fit whichever is latest.

**Nonpharmacological**

Place the patient in left lateral position in a separate, quiet room. Secure and maintain airway. Use mouth gag or airway to prevent tongue biting/tongue falling back. Intubate if patient is deeply unconscious, poor arterial blood gases, extensive laryngeal oedema, and extreme restlessness.

Suction to remove oropharyngeal secretions.

Oxygen by face mask.
Set up IV access.  
Monitor heart rate and respiration, BP, urine output. 
Lab. Investigations: haemogram with platelet count, liver and kidney function tests, urinary proteins, coagulation profile, serum electrolytes, fundus examination.

**Pharmacological**

1. **Inj. Magnesium sulphate** loading dose of 14 g of which, 4 g as 20% solution given slowly IV over 5 - 10 minutes and 5 g as 50% solution given deep 1M in each buttock (total 10 1M) If fits are not controlled in 15 min, give 2 g Magnesium sulfate as 20% solution slow IV. 
   Maintenance dose 5 g magnesium sulfate as 50% solution deep 1M every 4 hours in alternate buttock Or Continuous IV regimen 4 g loading dose over 20 minutes followed by 1 g/h slow continuous IV infusion. 
   (Caution: Side effects are respiratory depression and neuromuscular depression in mothers. Neonatal respiratory and neuromuscular depression). 
If respiratory depression occurs, give calcium gluconate 1 g IV as 10% sol. If respiratory arrest occurs, immediate endotracheal intubation and ventilation is to be done. 
   Monitoring: Check for respiratory rate to be more than 16/min, patellar reflex to be present and urine output >25 ml/h before giving magnesium sulfate. 
   Or 
   Inj. Phenytoin loading dose of 15-25 mg/kg slow IV not exceeding 25 mg/min diluted in normal saline for first 750 mg and then 12.5 mg/min followed by 100 mg IV 8 hourly. 
   ECG tracing to be taken every minute for 10 min during infusion of first 750 mg. 

2. **Fluid management** should be closely monitored to prevent complications such as pulmonary oedema, left ventricular failure and adult respiratory distress syndrome. 

3. **Anti hypertensives:** as described in pre-eclampsia. Aim is to gradually lower the BP to 140-150/90-100 mm Hg. 

**Definitive management** is termination of pregnancy irrespective of the foetal maturity. Terminations by labour induction and vaginal delivery or caesarean section. 

Indications of caesarean section are: all deeply unconscious patients unless delivery is imminent, uncooperative patient due to restlessness, if vaginal delivery is unlikely to occur within 6-8 hours from the onset of 1st eclamptic seizure or eclamptic seizures are not controlled in 6-8 hours, and other obstetric indications.

**Care after delivery**

Patients of eclampsia and severe pre-eclampsia need intensive monitoring for at least initial 72 hours. 
Continue anticonvulsant till 24 hours after delivery or fit, whichever occurs later.
Gradually decrease the dose of antihypertensives. Patient is discharged after 10-14 days of delivery or earlier if BP controlled without antihypertensives. Follow up after 6 weeks for reevaluation.

Patient education

Delivery is the only definitive treatment. Underlying disease remains till delivery and complications can arise despite control of BP on treatment. Symptoms of severe pre-eclampsia like headache, vomiting, epigastric pain, decreased urine output, blurring of vision should be immediately reported. Need for prolonged hospitalization. Early booking in next pregnancy as there is 25-30% risk of recurrence. Prophylactic measures like low-dose aspirin can be started in early pregnancy. Need for reevaluation at 6 weeks postpartum for reclassification and investigations of hypertension and need for long-term antihypertensives. High risk of development of chronic hypertension in later life.

References


PREGNANCY WITH HEART DISEASE

Organic heart disease in pregnancy is commonly due to rheumatic heart disease or congenital heart disease. Pregnancy with its increased cardiovascular stress is a potential cause for worsening of the existing heart disease.

SALIENT FEATURES

- Severe or progressive dyspnoea, progressive orthopnoea, paroxysmal nocturnal dyspnoea, haemoptysis, syncope with exertion or chest pain related to effort or emotions.
- Echocardiography is diagnostic.

Treatment

All pregnant women with heart disease should be managed at a tertiary level center with multidisciplinary approach. Depending on the limitation of physical activity, patient is classified into class I to IV of New York Heart Association (NYHA). Much of the clinical approach to the pregnant women with heart disease is according to NYHA class irrespective of the aetiology of the heart disease.

Nonpharmacological

NYHA class III and IV patients are to be hospitalized throughout the pregnancy while class I and II can be managed as outdoor patients with more frequent antenatal visits and admission at 38 weeks.
Rest for 10 hours each night and 1 to 2 hours after each meal. Light housework and walking without climbing stairs is permitted. No heavy work is allowed.
Avoid high salt intake.
Screen and treat at the earliest for excessive weight gain, abnormal fluid retention, anaemia, pregnancy induced hypertension, infections.

**Pharmacological (in consultation with the cardiologist)**
(for details see section on CHF in chapter 3)

In case of rheumatic heart disease,
1. Inj. Benzathine penicillin 1.2 mega units 1M3 weekly.
2. Treat any infections with appropriate antibiotics.
3. In patients with mechanical prosthetic valves.
   Inj. Heparin throughout pregnancy to maintain PTT at 1.5 to 2.5 times the normal control.
(Caution: Oral anticoagulants are not safe during pregnancy because of risk of congenital anomalies in the foetus. But if required, can be given after first trimester and continued till 4 weeks before delivery. However, oral anticoagulants are safe during lactation).

**Labour management**
1. Caesarean is performed for only obstetrical indications.
2. Pain relief is important during labour. Best option is to give continuous epidural analgesia. It is contraindicated in women with intra cardiac shunts, aortic stenosis, pulmonary hypertension, and hypertrophic cardiomyopathy. Inj. Morphine can also be given for pain relief.
3. Fluids should be restricted to 75 ml/min. Bolus Oxytocin and Methyl ergometrine should be avoided.
4. Antimicrobial prophylaxis for infective endocarditis required in all patients with cardiac lesions undergoing any operative procedure or in labour.
   Inj. Ampicillin 2 g + Inj. Gentamicin 1.5 mg/kg (maximum 120 mg) IV or 1M 30 min before procedure followed by Cap. Ampicillin 1 g 1M or IV; or Cap. Amoxycillin 1 g orally 6 hours after initial dose.
   If patient is allergic to penicillin Inj. Vancomycin 1 g IV (over 1-2 hours) plus Inj. Gentamicin 1.5 g/kg (maximum 120 mg). Infusion to be completed within 30 min before procedure.

**Patient education**
Depending on the type and severity of cardiac lesion maternal risk of pregnancy should be discussed with the patient ideally before pregnancy.
Option of corrective surgery preferably before pregnancy.
2 - 5% risk of congenital heart disease in foetus if mother has congenital heart disease.
Contraceptive advice: sterilization after 2 weeks, progestogen only method or barrier method. Counsel husband for male sterilization preferably by non-scalpel vasectomy.
In severe cases option of medical termination of pregnancy if pregnancy <12 weeks.

References

DIABETES IN PREGNANCY
Pregnancy can be complicated by pre-existing insulin-dependent or non-insulin-dependent diabetes or gestational diabetes. Gestational diabetes is defined as the carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.

Treatment
All pregnancies in diabetic females should be managed at a tertiary care center.

Nonpharmacological
Dietary advice. Total daily calorie intake should be 30 KCal/kg current pregnancy body weight if her current weight is 80-120% of ideal pre-pregnancy weight. In case current weight is <80% or >120% of ideal pre-pregnancy weight, then calorie intake is 36-40 Kcal/kg current pregnancy weight or 24 Kcal/kg current pregnancy weight respectively. Total daily calorie intake should be 30-35 KCal/kg current pregnancy weight. Complex carbohydrates should provide about 50% of the total calories, which should be well distributed throughout the day. High fiber diet is beneficial with 30-50 g fibers daily. Total diet should be distributed in 3 major meals and 3 mid meal snacks.

General measures. Ultrasound assessment of foetal gestational age is to be done as early as possible. Foetal congenital anomalies should be ruled out by Level II USG scan at 16 - 18 weeks, foetal echo at 22 weeks. Serial USG for foetal growth monitoring and biophysical scoring for assessment of foetal well being after 32 weeks of gestation.

Pharmacological
A. Antenatal management. Initial evaluation should include blood sugar, KFT and fundoscopy.
   (a) Pre-existing diabetes. Oral hypoglycaemic agents are contraindicated during pregnancy. If patient is on oral hypoglycaemics, switch over to insulin therapy as soon as pregnancy is diagnosed.
      1. Inj. Insulin: 0.6-0.8 U/kg in 1st trimester, 0.7 - 0.9 U/kg in 2nd trimester and 0.8 - 1.2 U/kg in 3rd trimester.
Usually a combination of intermediate acting and regular insulin in proportion of 2:1 is given. 2/3 of the total requirement is given in the morning before breakfast and 1/3 is given at night with regular insulin before dinner and intermediate at bedtime. Dose adjustment is done to maintain blood sugar level between fasting <95 mg% and postprandial between 70 and 120 mg%. Sampling of blood should be done initially fasting, pre and post breakfast, pre and post lunch, pre and post dinner and 2 AM regularly till controlled and then daily monitoring by fasting and postmeal sugars.

2. Hospitalization is required in cases of excessive vomiting, infections, maternal complications like hypertension, retinopathy, nephropathy, foetal compromise like macrosomia or intra uterine growth retardation (IUGR) or poor diabetic control.

(b) Gestational diabetes.
1. General management is same as outlined above.
2. Diet control. Patient is reassessed after 1 week. If control not achieved insulin therapy is started. Confirmation of blood sugar and regular insulin if required may be given before breakfast, before lunch and before dinner or combination of regular and long acting can be given before breakfast and dinner. Hypoglycaemia should be avoided.
3. If fasting plasma sugar is >105 mg% insulin is usually required for control. Regular insulin is adjusted to normalize post breakfast glucose and intermediate for post lunch glucose control. If evening or fasting glucose is elevated, 2nd daily injection is added. If both are elevated, mixture of intermediate and regular insulin before dinner is added. If only fasting is elevated, add intermediate acting insulin at bedtime.

Or

Inj. Regular Insulin 3 times a day before each main meal which can be combined with one dose of intermediate acting insulin at bed time in case there is fasting hyperglycaemia.

Apart from routine antenatal monitoring, blood sugar monitoring is required throughout pregnancy. Therapeutic goal is to achieve plasma blood sugar levels fasting <95 mg% and 2 hour postprandial <120 mg%. When levels are high daily monitoring with insulin dose adjustment is required.

Once control is achieved, patient can be managed at home with weekly blood sugar profile.

4. Glycosylated Hb (HbA1c) to be done in 1st trimester. Value of 9% or above indicates poor glycemic control, carries higher risk of congenital malformation; MTP may be offered after proper evaluation.

B. Management during labour. In uncomplicated case with good glycaemic control pregnancy can be continued till expected date of delivery. In presence of complications or foetal compromise pregnancy is terminated at 38 weeks or earlier if required. If estimated foetal weight is >4 kg, caesarean section is performed. Labour is managed with intensive monitoring. Blood sugars are monitored 3-4 hourly aim is to keep blood sugars between 100-120 mg%, using the sliding scale method using regular insulin.
In the postpartum period, the requirement of insulin is decreased.

Patient education

In known diabetics, good blood sugar control should be achieved in preconception period to avoid high risk of congenital anomalies. Strict adherence to the dietary advice and insulin therapy is essential throughout pregnancy. As insulin requirements change throughout pregnancy, frequent blood sugar monitoring is required throughout pregnancy. Patient on insulin therapy should be told about symptoms of hypoglycaemia like palpitations, sweating, dizziness, and its management.

In cases of gestational diabetes, there is risk of recurrence in subsequent pregnancies and later on risk of frank diabetes is there.

Contraceptive advice- Combined oral contraceptive pills and intrauterine devices are preferably avoided. Barrier methods, progestogen only pills/implants/injectables or sterilization can be offered.

(For other details see section on diabetes in chapter 11)

References

PRETERM LABOUR

Onset of labour pains in pregnant women after 20 weeks and before 37 weeks of gestation associated with progressive dilatation and effacement of the cervix is known as preterm labour.

SALIENT FEATURES

- Uterine contraction of duration of 30 sec or more at interval of 10 minutes or less accompanied by cervical dilatation and effacement with or without leaking or bleeding per vaginum,
- Risk factors include: low socioeconomic status; heavy manual labour, extremes of age <20 years and >40 years), previous history of abortion or preterm delivery, cervical or vaginal infection, multiple gestation or over distended uterus, hypoxic conditions like anaemia, heart disease, pre-eclampsia, IUGR, foetal congenital malformations and antepartum haemorrhage in present pregnancy.
Treatment

Nonpharmacological

Hospitalization with complete bed rest, preferably in a centre with neonatal intensive care unit.

Laboratory investigations: haemogram, urine culture, and endocervical swab for culture and sensitivity.

Pharmacological

1. Inj. Pethidine 50 mg + Inj. Promethazine 25 mg 1M stat and can be repeated 8 hourly.
2. Immediate tocolysis in pregnancies <35 weeks, if membranes are intact and labour is not advanced (cervical dilatation <4 cm), there is no indication for immediate delivery and no contraindication for tocolysis.

   Inj. Isoxsuprine HCl 10 mg 1M every 6 hours in case of mild contraction; Intravenous infusion if strong contractions are established 0.2-0.4 meg/min in 5% dextrose. Maximum dose is 0.8 meg/min to be continued at least 2 hours after the contractions cease. Followed by 1M therapy for 24 hours.

   (Caution: Side effects tachycardia and hypotension, hypokalaemia, neonatal tachycardia, hypotension and rarely pulmonary oedema and acute respiratory distress syndrome).

   Or

   Inj. Ritodrine infusion 3 ampoules (150 mg) in 500 ml of 5% dextrose or ringer lactate at 50-100 meg/min (5-6 drops/min), increase by 50 mcg every 10 min till contractions cease or side effects appear (maximum dose 350 meg/min), continue for 12 hour after contractions stop. This is followed by oral treatment - 10 mg every 2 hours then 10-20 mg every 4-6 hours.

   (Caution: Contraindications: Poorly controlled diabetes or thyroid disease, sickle cell disease).

   Or

   Inj. Magnesium sulfate 4-6 g as 20% solution bolus over 30 minutes followed by infusion of 4-6 g/h.

   (Caution: Contraindicated in patients with myasthenia gravis, cardiac decompensation. Use with caution in renal disease. It can cause flushing, lethargy, headache, muscle weakness, dryness of mouth, nausea and foetal distress, transient non-reactive non-stress test (NST).

   Or

   Cap. Nifedipine 30 mg loading dose followed by 10-20 mg every 4-6 hours.

   (Caution: Do not administer along with magnesium sulfate; contraindicated in maternal hypotension < 90/50 mmHg), cardiac disease. Use with caution in renal disease. Maternal side effects include flushing, headache, nausea, dizziness, hypotension). Monitor pulse, BP, and cessation of the uterine contractions. If pulse rate> 120/min and BP < 90/50 mmHg stop tocolysis. Monitoring in magnesium sulfate therapy is as outlined in eclampsia. Monitor for onset of chorioamnionitis (fever, tachycardia with uterine tenderness).
**Maintenance therapy.**

1. Tab. Isoxsuprine orally 10 mg 6 hourly or 20 mg 12 hourly (maximum daily dose is 40 to 80 mg/day) to be continued till 34 weeks of pregnancy (long term therapy is controversial).

2. In pregnancies at 28 - 34 weeks of maturity, steroids are given for foetal lung maturity.
   - Inj. Betamethasone 12 mg 1M 2 doses 24 hours apart.
   - Or
   - Inj. Dexamethasone 6 mg 1M four doses 12 hours apart or 12 mg 1M two doses 12 hours apart.
   - (Caution: Contraindicated if clinical or laboratory evidence of chorioamnionitis is present).

3. Cap. Ampicillin 500 mg or Erythromycin 500 mg 4 times a day for 5-7 days, only if PROM is present.
   - Patient may be discharged after 1 week of tocolysis followed by regular antenatal surveillance.

**Delivery**

- In cases of ineffective tocolysis or with contraindications for tocolysis, labour is allowed to progress and mode of delivery is decided as per obstetric indications. Careful foetal monitoring required throughout labour.

- If any sign of hypoxia, caesarean section is better but foetus should have a fairly good chance of survival depending on neonatal care facility.

**Patient education**

- Restricted physical activity after discharge.
- Sexual abstinence till at least 34 weeks of gestation.
- Explain the risk of recurrence in subsequent pregnancy. Therefore need for early booking and prophylactic measures in next pregnancy.

**References**


**ANTEPARTUMHAEMORRHAGE (APH)**

Antepartum haemorrhage is defined as bleeding from genital tract after 20 weeks of pregnancy and before completion of second stage of labour. It is a major cause of
maternal morbidity, mortality and perinatal loss. APH is due to placental cause in as high as 70% cases and in 25-30% of cases cause may remain undetermined.

**SALIENT FEATURES**

- Clinical presentation varies depending on the severity of blood loss (Table 15.7) and cause of bleeding (Table 15.8). In mild haemorrhage there may be no maternal or foetal compromise, while massive haemorrhage can lead to hypovolaemic shock, coagulation failure, renal failure, foetal distress and may result in maternal and foetal death.
- Ultrasound is confirmatory for placenta praevia.

<table>
<thead>
<tr>
<th>Acute blood loss</th>
<th>Clinical findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 ml</td>
<td>None</td>
</tr>
<tr>
<td>1000 - 1500 ml</td>
<td>Orthostatic blood pressure changes, positive tilt test, Pulse Pressure = 30 mmHg, reduced peripheral perfusion, prolonged capillary refill time</td>
</tr>
<tr>
<td>1500-2000 ml</td>
<td>Cold clammy skin, tachycardia, tachypnoea, hypotension</td>
</tr>
<tr>
<td>&gt; 2000ml</td>
<td>Profound shock, non-palpable pulse, intrauterine death of the foetus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Causes of bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placenta praevia</td>
</tr>
<tr>
<td>Abruptio placentae</td>
</tr>
<tr>
<td>Painless recurrent bleeding</td>
</tr>
<tr>
<td>Associated pain abdomen</td>
</tr>
<tr>
<td>Relaxed non-tender uterus</td>
</tr>
<tr>
<td>Tense tender uterus</td>
</tr>
<tr>
<td>Free-floating presenting part</td>
</tr>
<tr>
<td>Foetal parts not easily palpable</td>
</tr>
<tr>
<td>Abnormal lie</td>
</tr>
<tr>
<td>Foetal heart irregular or absent</td>
</tr>
<tr>
<td>Pregnancy induced hypertension</td>
</tr>
</tbody>
</table>

**Treatment**

All patients of APH should be hospitalized in a well equipped center with facilities for blood transfusion, emergency caesarean section and neonatal care unit.

**A. Massive haemorrhage**

Following resuscitative measures are started immediately in massive haemorrhage. Simultaneously prepare the patient for termination of pregnancy by vaginal/caesarean section depending on the cause of bleeding.

**Nonpharmacological**

1. Establish intravenous line (one or two 14G gauge cannula)
   a. Draw 20 ml blood for cross-match, haemogram, coagulation profile.
   b. Start fluid therapy rapidly as described below.
2. Head down tilt, keep the patient warm.
330 STANDARD TREATMENT GUIDELINES.

3. Oxygen by mask at 8 liters/minute.
4. Empty bladder (Foley’s catheter for urine output).

Pharmacological

1. IV fluids and blood replacement therapy (for details see section on shock in chapter 2).
2. Definitive treatment is termination of pregnancy by caesarean section in cases of placenta praevia and by vaginal/caesarian section in cases of abruptio placentae.

B. Mild APH

Expectant management

In a case of placenta praevia without maternal and foetal compromise, expectant management is planned if pregnancy is less than 37 weeks and patient is not having active bleeding and labour pains.

1. Hospitalize and bed rest with foetal and maternal monitoring.
2. Inj. Dexamethasone 12 mg IM 12 hourly for 2 doses should be given for foetal lung maturity if POG < 35 weeks.
3. Definitive treatment is termination of pregnancy in case of following: occurrence of life-threatening bleeding, pregnancy > 37 weeks, patient is in labour, in all cases of abruptio placentae, baby is dead, congenitally malformed baby and bleeding recurring or premature rupture of membranes on expectant management leading to maternal or foetal compromise.

a. Indications for caesarean section are: Major degree placenta praevia, non vertex presentation, in case of abruptio placentae with live foetus if cervix is unfavourable (labour is likely to be longer than 6 hours), failure to progress after amniotomy and oxytocin infusion and other obstetrical indications for caesarean section.

b. Indications for vaginal delivery in APH are: Minor degree placenta praevia with vertex presentation and slight bleeding with favourable cervix and abruptio placentae with mild bleeding and no increased uterine tone, foetus is dead or has major congenital malformation incompatible with life.

For induction artificial rupture of membranes followed by oxytocin infusion is done. Oxytocin infusion is continued in the postpartum period to prevent postpartum haemorrhage. In abruptio placentae monitoring is done to detect maternal complication early (pulse, BP, uterine height girth chart, vaginal bleeding, urinary output, BT, CT, clot retraction time).

Patient education

APH irrespective of type and cause results in increased perinatal morbidity and mortality.

Incidence of placental abruption and placenta praevia are both increased with increasing age and parity.
Hypertension, cigarette smoking, cocaine abuse etc. predispose to placental abruption.

References

POSTPARTUM HAEMORRHAGE (PPH)

Postpartum haemorrhage is excessive blood loss from the genital tract after delivery of the foetus exceeding 500 ml or affecting the general condition of the mother.

SALIENT FEATURES

- Primary PPH i.e. bleeding within 24 hours of delivery is commonly due to atonic uterus (90% cases) or cervical/vaginal tears (traumatic PPH). It can also be due to occult uterine inversion, rupture uterus or coagulation defect.
- Abnormal bleeding can also occur between 24 hours and 6 weeks of delivery (secondary PPH) due to sepsis, retained placental bits, or placental polyp, choriocarcinoma.
- PPH requires prompt and effective management, failing which it may result in complications like hypovolaemic shock, coagulation failure, renal failure, hepatic failure, adult respiratory distress syndrome and may also result in maternal death.
- Monitor pulse rate, blood pressure, respiratory rate and urine output. While resuscitative measures are underway, a thorough clinical examination is made to ascertain the cause of PPH and definitive treatment is planned accordingly.

Pharmacological

Same as in APH (for details see section on shock in Chapter 2).

Atonic PPH

Prevention

Identify risk factors and anticipate the problem.

Active management (oxytocin 5 units intramuscularly at the birth of anterior shoulder or after delivery of placenta) should be done in all cases unless contraindicated.

Nonpharmacological

Placental removal with cord traction if already separated uterine massage and bimanual compression.

Pharmacological

1. Oxytocin Infusion (10-40 units in 500 ml Ringer's Lactate/Normal Saline at 125 ml/min).
2. Methyl ergometrine maleate 0.2 mg IV may be repeated 1Mafter 5-10 min. (Caution: Contraindicated in heart disease, hypertension).

3. If bleeding is not controlled IS-Methyl PGF2α 0.25 mg IM intramyometrial, may be repeated every 15-90 min up to a maximum of 2 mg. (Caution: Contraindicated in bronchial asthma, epilepsy).

4. In patients with bronchial asthma and epilepsy, administer with caution Tab. Misopristol 600 meg per rectum.

**Indication for referral**

If patient is still bleeding despite medical therapy and if facilities for transfusion and further management are not available arrange for transfer to a higher center. Intrauterine packing may be done in the mean time.

**Surgical treatment** *(Table 15.9)*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained placenta</td>
<td>Manual removal of placenta under general anaesthesia (GA)</td>
</tr>
<tr>
<td>Cervical-vaginal tears</td>
<td>Exploration and repair</td>
</tr>
<tr>
<td>Rupture uterus</td>
<td>Laparotomy with repair/hysterectomy</td>
</tr>
<tr>
<td>Uterine inversion</td>
<td>Reposition under GA</td>
</tr>
<tr>
<td>Atonic PPH not controlled</td>
<td>Laparotomy with uterine artery ligation with medical measures</td>
</tr>
</tbody>
</table>
<pre><code>                                  | Internal artery ligation/Hysterectomy           |
</code></pre>

**Patient education**

- Higher parity and previous atonic PPH predispose to PPH.
- Hospital delivery is mandatory in women with PPH in a previous pregnancy, grand multipara, multiple pregnancy, APH and severe anaemia.

**References**


**VAGINAL DISCHARGE**

It is discussed in section on Sexually Transmitted Diseases in Chapter 14.

**PELVIC INFLAMMATORY DISEASE (PID)**

PID is a spectrum of infections involving female upper genital tract i.e. cervix, uterus, tubes, ovaries and pelvic peritoneum. The disease may have acute or chronic presentation. Most cases of acute PID are the result of polymicrobial infection. The commonest cause is sexually transmitted diseases and other causes are post abortal and puerperal sepsis, operative procedures like dilatation and curettage, endometrial biopsy, and insertion of intrauterine device.
SALIENT FEATURES

• Lower abdominal pain, cervical motion tenderness and adnexal tenderness, fever, cervical discharge and leucocytosis.
• In severe cases patient may be toxic with high-grade fever, vomiting, dehydration, and abdominal distension.
• Long term sequelae can be infertility, ectopic pregnancy, chronic pelvic pain and even mortality can occur in case of ruptured tube-ovarian abscess.
• Failure of acute PID to resolve completely results in chronic PID with features of severe, persistent and progressive pelvic pain, repeated acute exacerbation of PID, tubo-ovarian inflammatory mass, dyspareunia or bilateral ureteral obstruction from ligamentous cellulitis.

Treatment (Acute PID)

The patient can be treated as an outpatient or inpatient depending on the severity of clinical features.

I. Outpatient treatment

Patient of mild PID with slight pain and tenderness, without toxic features like high-grade fever, vomiting, and abdominal distension can be managed as outdoor patients with the following drug regimens:

Either of the following two regimens can be given:

Regimen A
1. Inj. Cefoxitin 2 g 1M, plus Probenecid 1 g orally, as a single dose.
   Or
   Inj. Ceftriaxone 250 mg 1M as a single dose.
   Or
   Inj. Ceftizoxime or Cefotaxime 500 mg 1M as a single dose.
2. Cap. Doxycycline 100 mg 2 times a day for 14 days.

Regimen B
1. Tab. Ofloxacin 400 mg oral 2 times a day for 4 days.
2. Tab. Clindamycin 450 mg oral 4 times a day for 14 days.
   Or
   Tab. Metronidazole 500 mg 2 times a day for 14 days.

Follow up after 2 - 3 days of initiation of therapy; patient is reevaluated for clinical response. If poor response, patient is to be admitted for intravenous antibiotics.

II. Indoor treatment

If diagnosis is uncertain and surgical emergencies such as appendicitis and ectopic pregnancy cannot be ruled out, patient is pregnant, post-abortai or puerperal and if the patient is adolescent (among adolescents, compliance with therapy is unpredictable), severe illness or nausea and vomiting, HIV positive, unable to follow or tolerate an out patient regimen and outpatient therapy failed.
Bed rest.  
Hydrotherapy, if febrile.  
IV fluids in cases of vomiting and dehydration and correction of electrolyte imbalance.  
Investigate and obtain haemogram with ESR, LFT, KFT, serum electrolytes, blood culture, endocervical swab culture, ultrasonography if adenexal mass.  
Monitoring by clinical condition, vital monitoring, signs and symptoms of pelvic abscess and peritonitis.  
 Either of the following regimens may be instituted at the earliest without waiting for culture reports:  
**Regimen A**  
1.  **Inj. Cefoxitin**  2 g IV every 6 hours.  
    Or  
    **Inj. Cefotetan**  2 g IV every 12 hours.  
2.  **Inj. Doxycycline**  100 mg IV or orally every 12 hours.  
3.  **Inj. Metronidazole**  500 mg IV 8 hourly.  
**Regimen B**  
1.  **Inj. Clindamycin**  900 mg IV every 8 hours.  
2.  **Inj. Gentamicin**  2 mg/kg IV followed by 1.5 mg/kg every 8 hours.  
3.  **Inj. Diclofenac sodium**  75 mg deep IM 8 hourly.  
    Or  
    **Inj. Paracetamol**  500 mg IM SOS.  
4.  **Inj. Metronidazole**  500 mg IV 8 hourly.  
    Injectable regimen should be continued for at least 48 hours after the patient demonstrates clinical improvement (becomes afebrile, decrease in lower abdomen and pelvic tenderness, improvement in constitutional symptoms).  
    After this, Doxycycline  100 mg 2 times a day orally or Clindamycin 450 mg oral 4 times a day should be continued for total of 14 days.  
    Clinical improvement should occur within 3 days of initiation of therapy. Consider further diagnostic tests/laparoscopy if symptoms do not improve or worsen.  
Different procedures may be required in the following situations:  
    Colpotomy for drainage of midline pelvic abscess  
    Dilatation and evacuation of septic products of conception in post abortal sepsis.  
    Laparotomy in cases of pyoperitoneum, resistant peritonitis, intestinal obstruction, ruptured tubo-ovarian abscess, enlarging pelvic mass despite medical therapy.  
    Laparoscopy: if diagnosis is uncertain, in cases of no response to treatment, to reconfirm the diagnosis, obtain cultures from cul de sac and fallopian tubes and drain pus if necessary.  
**Treatment of the sexual male partner**  
Asymptomatic male partner:  
    **Inj. Ceftriaxone**  125 mg IM followed by oral Doxycycline 200 mg 2 times a day for 14 days.
Treatment (Chronic PID)

Chronic PID can also be caused by pelvic tuberculosis. Treatment of chronic PID is surgical. Type of surgery is decided considering pathological lesion, patient's age, and desire for child bearing. Definitive surgery is total abdominal hysterectomy with bilateral salpingo-oophorectomy, but in young females conservative surgery is preferred. Injection placentrex (Extract of fresh human placenta) and pelvic diathermy may help.

Treatment (Pelvic tuberculosis)

Primary treatment is medical therapy with anti tubercular drugs for 6 months. Daily dose of the drugs is:
1. Tab. Isoniazid 5 mg/kg (maximum 300 mg).
2. Cap. Rifampicin 10 mg/kg (maximum 600 mg).
3. Tab. Pyrazinamide 15-30 mg/kg (maximum 2 g).
4. Cap. Ethambutol 15-25 mg/kg (maximum 2.5 g).
(for details see section on tuberculosis in Chapter 1).

All these 4 drugs are given in the initial phase for 2 months followed by INH and rifampicin for 4 months. Indications of surgery are: primary unresponsiveness, persistence or enlargement of adnexal mass after 4-6 months of treatment, persistence or recurrence of pelvic pain on treatment. Definitive surgery is total abdominal hysterectomy with bilateral salpingo-oophorectomy.

Patient education

Emphasize behavioural and contraceptive methods to prevent the acquisition of STDs.
Patients must be encouraged to complete the recommended antibiotic treatment for the full course i.e., 14 days.
Sexual abstinence until complete treatment. Sexual partner of patient diagnosed with PID must be treated to prevent reinfection.

References


PREMENSTRUAL SYNDROME (PMS)

It is a cyclic recurrence of physical, psychological or behavioural symptoms that appear after ovulation and resolve after the onset of menstruation. PMS requires treatment when the symptoms are severe enough to interfere with the woman's lifestyle, relationships and occupational functioning.
SALIENT FEATURES

- Common somatic symptoms include feeling of bloating, body aches, breast-tenderness, headache, food cravings and poor concentration. Emotional symptoms include emotional hypersensitivity, depression, irritability, mood swings, anxiety, tension, fear of loss of control and confusion.
- Diagnosis is confirmed by excluding the concomitant medical or psychiatric disorders with which it may be confused (depending on the symptoms).

Treatment

Nonpharmacological

Life-style advice should be offered to all women as first line of treatment.
1. Daily charting of symptoms for two months.
2. Dietary modifications like: increase complex carbohydrate meals, reduce or eliminate, especially in the luteal phase - salts, chocolate, caffeine and alcohol; and several small meals per day.
3. Moderate regular aerobic exercise like brisk walk 1-2 miles per day for 4-5 days/week.
4. Stress management courses/counselling.

Pharmacological

1. Tab. Pyridoxine 100 mg/day for 10-14 days (during luteal phase) (maximum daily dose is 150 mg).
   Or
   Tab. Evening primrose oil 500 mg 3 times a day.
2. In case of headache or premenstrual dysmenorrhoea, Non steroidal anti-inflammatory drugs - like mefenamic acid 500 mg 3 times a day for duration of symptoms till onset of menstruation.
3. In case of predominantly physical symptoms (bloatedness, irritability swelling, weight gain, breast tenderness),
   Tab. Spironolactone 100 mg/day for
   Or
   Tab. Bromocriptine 1.25 - 5 mg/day in the luteal phase for mastalgia.

Common side effects are nausea and vomiting. Tablet can be given vaginally if side effects are very severe.

If no relief in symptoms with above measures in 2 - 3 cycles and symptoms are predominantly emotional, then the following drugs are used preferably in consultation with a psychiatrist:

Tab. Fluoxetine 5-20 mg/day

In non-responders to the above therapy, ovulation suppression may be beneficial; any of the following can be used:
Low dose combined oral contraceptive pills, I pill daily from 5th to 25th day of the cycle.
Or
Progestins: Medroxyprogesterone acetate (MPA) 15 - 30 mg/day (10 mg 3 times a day) or Depot MPA 150 mg 1M 3 monthly: Irregular bleeding is very common.
Or
Tab. Danazol 200-800 mg/day. Side effects like weight gain, facial hair, acne are the usual limiting factors.
Treatment may be stopped after 3 - 6 cycles and look for return of the symptoms. If symptoms return treatment is required till menopause. If no response to the above treatment refer to a higher centre.

Patient education
Explain the importance of the life-style modification.

References

DYSFUNCTIONAL UTERINE BLEEDING (DUB)
It is abnormal uterine bleeding in the absence of organic disease of the genital tract.

SALIENT FEATURES
- Disturbances of the menstrual cycle, regular and irregular uterine bleeding and alteration in the amount or duration of the menstrual blood loss.
- Commonly due to anovulatory cycles but can occur in the ovulatory cycles also. Anovulatory cycles are usual in postmenarche and premenopausal age groups and are usually irregular, variable in duration and amount of bleeding.

Treatment (Acute bleeding - first episode)

A. Severe bleeding (haemodynamically unstable patient)
1. Usual steps taken for any serious haemorrhage should be instituted immediately like IV line, fluid replacement, blood transfusion, oxygen inhalation and monitoring of vitals.
2. Dilatation and Curettage is the quickest way to arrest bleeding except in cases of puberty menorrhagia where medical management is preferred. IV Tranexamic acid can be tried before resorting to surgical intervention.

B. Less severe bleeding (haemodynamically stable patient)
High dose Progestogen: Norethisterone 10mg 3 times a day until bleeding stops (not >3 days) followed by Norethisterone 5-10 mg.
Or
Medroxyprogesterone acetate 10 mg per day for 21 days. Withdrawal bleeding occurs after 2-4 days of stopping the drug and stops in 4-5 days.

Or
Combined oral contraceptive pills (OCs) containing 50 mg ethinyl oestradiol 1 pill 2 times a day for 7 - 10 days followed by progestins for 7-10 days, followed by withdrawal bleeding.

C. If bleeding is not controlled with progestogens

Patient is having heavy bleeding for many days, endometrial curettage yields minimal tissue, or when the patient has been on progestogen medication (OC's or Depot MPA) and the endometrium is shallow and atrophic.

Treatment schedules of high dose oestrogens, depending on the severity of the bleeding the following can be used:
1. Conjugated oestrogen 25 mg IV every 4 h till bleeding abates or for 12 h. Progestin treatment is started at the same time.
2. Oral treatment conjugated oestrogen 1.25 mg or 2 mg oestradiol valerate given orally every 4 h for maximum of 24 h followed by single daily dose for 7-10 days.

All treatments must be followed by progestin coverage (10 mg MPA daily) along with oestrogen for 7 days.

Monitoring
Clinical monitoring by vital charting and observation of blood loss per vaginum.

Treatment (Chronic DUB - not actively bleeding)
1. Iron therapy: elemental iron maximum 60 mg 3 times a day depending on the degree of anaemia.
2. Histopathological diagnosis is must before starting hormonal therapy in all cases except puberty menorrhagia.

A. Anovulatory DUB
1. If contraception is desired: OCPs for 3 - 6 cycles Or Norethisterone 5-10 mg.
2. Medroxyprogesterone acetate (MPA) 10 mg 16-25th day of the cycle for 3-6 cycles.
3. In cases of endometrial hyperplasia without atypia on histology Norethisterone acetate 5 mg three times a day or MPA 10 mg twice a day 5-25th day of cycle for 3-9 cycles followed by repeat endometrial biopsy.
4. Infertility desired: ovulation induction is advised.
5. Levonorgestrel IUeD can be offered after counselling and is beneficial in DIJB.

B. Ovulatory DUB
1. NSAIDs: Mefenamicacid 500 mg 3 times a day for 3 -5 days during periods.
Or
Oral combined contraceptive pills if contraception is desired. If the above treatment is not effective in first cycle patient should be referred for tertiary care by a gynaecologist. Following treatment can be considered as an alternative to surgery:

Tab. Danazol 200 mg daily for 3 months. Levonorgestrel rUCD can be offered after counselling and is beneficial in DUB.

Follow up
Follow up is done after 1, 3, 6 months of therapy. Treatment is stopped after 3-6 months. If symptoms recur medical treatment is to be continued or surgery can be offered.

Role of surgery - endometrial curettage
Acute bleeding in haemodynamically unstable patient to quickly control the bleeding.
In acute episode if bleeding doesn't decrease significantly in 12-24 hours with medical treatment, then reevaluation is mandatory and surgical curettage should be done.
If age is >35 years - premenstrual dilatation and curettage for endometrial histology is a must to rule out endometrial pathology.

Definitive therapy
If medical therapy is not effective then endometrial ablation or hysterectomy is to be performed.

Patient education
In majority of patients, medical management cures the problem.
Common side effects of high dose oestrogens are: nausea, vomiting, headache, depression, and fluid retention. Contraindicated in liver disease, history of thromboembolic disorder, cardiovascular disease, and oestrogen dependant neoplasm.
Common side effects of progesterogens are depression, fluid retention, fatigue, insomnia, dizziness, nausea, and breast tenderness.
Common side effects are acne, weight gain, fluid retention, hoarseness of voice.

References

MENOPAUSE
Permanent cessation of menses for 1 year is known as menopause. It usually occurs between 40 to 50 years, mean age being 48 years. Long term consequences due to decreased oestrogens can increase the risk of ischaemic heart disease due to adverse effects on lipid profile and pathological fractures due to osteoporosis.
**SALIENT FEATURES**

- Hot flushes, night sweats, palpitations, vaginal dryness, itching, atrophy of the breast and skin, urethral syndrome, stress incontinence, mood changes like anxiety, irritability, depression, insomnia and joint pains.
- Diagnosis is always clinical, however, in doubt endocrine evaluations for serum FSH levels and serum oestradiol levels may be helpful.

Treatment

*Nonpharmacological*

Balanced diet with fruits, vegetables, semi-skimmed milk adequate in vitamins and minerals. A reduction or avoidance of smoking and alcohol consumption. Exercise: walking or swimming for 20-30 min every day.

*Pharmacological*

1. Tab. Calcium 1500 mg daily.
2. Hormone replacement therapy (HRT). Rule out contraindications to HRT namely present endometrial/breast cancer, acute phase myocardial infarction, undiagnosed breast lump/abnormal vaginal bleeding and acute liver disease. Hypertension and diabetes if present should be controlled before HRT is prescribed.

*Oestrogen therapy*

i. Single therapy with oestrogens in hysterectomized patients. Conjugated equine oestrogen 0.625 -1.25 mg. Or Oestradiol 1-2 mg is given daily I-25th day every month or daily without any break. If symptoms recur during drug free period then give continuous therapy. Or Transdermal oestradiol patch 50 or 100 meg/day applied twice a week away from breast, preferably on the shaved skin of buttock, thigh or legs (Limiting factor is local skin reactions). Transdermal oestradiol patch is preferred in case of gall bladder disease, hypertriglyceridaemia, history of thromboembolism, poorly-controlled hypertension, recent myocardial infarction, vascular diseases, migraine, chronic hepatic dysfunction, malabsorption syndrome.

ii. Combined therapy with oestrogens and progestin in women with intact uterus. a. Oestrogen therapy as above. b. Progestogen-Medroxyprogesterone acetate 5 - 10 mg. Or Dihydrogesterone 10 - 20 mg or Norethisterone 2.5 mg) Or 200 ml micronized Progesterone is added from 13th to 25th days in cyclic sequential regimen and 1st to 12th of every month in continuous sequential regimen.
If withdrawal bleeding is not acceptable then give continuous combined treatment (0.625 mg conjugated equine oestrogen + 2.5 mg Medroxy progesterone acetate Or 1 mg micronized oestrogen + 100 mg micronized progesterone).

If conventional HRT is contraindicated
Tab. Tibolone 2.5 mg per day (major side effects are weight gain, oedema, breast tenderness, GIT symptoms and vaginal bleeding).

In symptomatic elderly women with atrophic vaginitis and other urogenital symptoms who do not desire long term HRT:
Oestriol cream daily application of 0.5 g delivering 0.5 mg of oestriol for 3 weeks followed by twice weekly application for? - 4 weeks.
Key indicator of response to therapy are improvement in symptoms.
Follow up at 2-3 months then at 6 monthly interval. Yearly mammography, Pap's smear, pelvic USG and serum oestradiol are advisable.
Short term treatment is advocated for acute symptoms and oestrogen use for long term benefits is controversial.

Patient education
Explain the patients that following side effects due to oestrogens can occur: fluid retention, breast tenderness, nipple sensitivity, nausea, headache, leg cramps. Side effects due to progestogens are fluid retention, breast tenderness, oedema, headache, acne, premenstrual syndrome, abdominal cramps, vaginal bleeding.
Follow up visits at 2 - 3 months then at 6 monthly interval are necessary.

References

POSTMENOPAUSAL BLEEDING

Postmenopausal bleeding (PMB) is bleeding that occurs after menopause has been established for at least one year. It is different from infrequent, irregular periods that occur around the time of menopause.

SALIENT FEATURES
- Obese women and women taking hormone replacement therapy (HRT) are more likely to experience postmenopausal bleeding.
- Vaginal atrophy is the most common cause of bleeding from the lower reproductive tract. Lesions and cracks on the vulva may also bleed. Sometimes bleeding occurs after intercourse. Bleeding can occur with or without an associated infection.
• Bleeding from the upper reproductive system can be caused by hormone replacements, endometrial cancer (5-10%), endometrial polyps, cervical cancer; cervical lesions, uterine tumours, ovarian cancer or oestrogen-secreting tumors in other parts of the body.

• Diagnosis is confirmed by endometrial or cervical biopsy. Non-invasive tests include saline infusion sonography (SIS), a refinement of vaginal probe ultrasound.

• Dilatation and curettage (D & C) is often necessary for definitive diagnosis.

Treatment
Treatment depends on the cause (Table 15.10)

<table>
<thead>
<tr>
<th>Cause</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign &amp; malignant neoplasm of vulva, cervix, uterus or ovaries</td>
<td>Refer to higher center or treat vagina, according to cause and facilities available.</td>
</tr>
<tr>
<td>Indiscriminate use of oestrogen for HRT</td>
<td>Stop oestrogen therapy</td>
</tr>
<tr>
<td>Infections</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>Injuries Coagulation</td>
<td>Repair</td>
</tr>
<tr>
<td>disorders</td>
<td>Treat accordingly</td>
</tr>
<tr>
<td>Endometritis</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>Postmenopausal atrophic vaginitis</td>
<td>Vaginal oestrogen cream/ointment</td>
</tr>
</tbody>
</table>

Indication for referral to a higher level of care

Urgent referrals:
- Palpable pelvic mass or lesions suspicious of cancer on vulva or vagina or cervix on examination or on ultrasound.
- More than one or a single heavy episode of PMB in women aged > 55 years (not on HRT).
- Postcoital bleeding (PCB) in a woman aged > 35 years that has persisted for more than 4 weeks.
- Prolonged or unexpected bleeding that persists for more than 4 weeks after stopping HRT.

Early Referral (within 4-6 weeks)
- Any other woman with PMB not on HRT who does not satisfy the criteria for 'urgent referral' of postmenopausal bleeding.
- unexplained repeated postcoital bleeding.
- Note - in women over 45 years with persistent abdominal distension or pain, ovarian cancer should be considered and therefore a pelvic examination should be performed.
- If excessive bleeding, give hemostatic drugs (oral or intravenous) Postmenopausal bleeding that is not due to cancer and cannot be controlled by any other treatment usually requires a hysterectomy.
OBSTETRICS AND GYNAECOLOGY


CARCINOMA CERVIX

Invasive cancer of the uterine cervix is either the leading or second leading cause of death from cancer among women worldwide and is the leading cause of death from cancer among women in developing countries. There are two main types of cancer of the cervix: squamous cell carcinoma (about 85%) and adenocarcinoma (15%). Cervical intraepithelial neoplasia and adenocarcinoma in situ are precursors to invasive squamous cell cancers and invasive endocervical adenocarcinoma respectively and if diagnosed can be treated by simple methods with good results.

SALIENT FEATURES

- Abnormal bleeding may present with postcoital, intermenstrual or post menopausal bleeding; smelly vaginal discharge not responding to treatment may also occur; pain and urinary symptoms occur late in the course of disease.
- Growth or ulcer seen on the cervix, and is friable and bleeds on touch. Diagnosis is confirmed by cervix biopsy.
- Initial work-up of invasive cervical cancer patients includes a history and physical examination, haemogram, urine examination, kidney function tests, chest radiography, intravenous pyelogram (IVP), CT/MRI scan, cystoscopy, proctosigmoidoscopy. HIV testing (especially for the younger, at-risk patient) after counselling and consent.
- Staging of carcinoma cervix - simple per speculum examination of cervix for any abnormality done by medical/paramedical personnel will help in early detection of carcinoma cervix.

Screening tests are performed to detect pre-invasive lesions. Various methods used are:

Pap smear - is the most effective cancer reduction programme yet devised and has resulted in evaluating incidence of cancer cervix in many countries.
VIA (visual inspection after acetic acid) - inspection of cervix after application of 1% acetic acid can also detect pre-invasive lesions.
Colposcopy - needs special equipment and trained personnel; it is reserved for patients with abnormal Pap smear.
Schillertest - application of Lugol's iodine demarcates abnormal areas on cervix.

Staging of cancer of the cervix

This is done after thorough clinical examination.
Stage I tumours: tumour confined to cervix.
Stage II tumours: the tumour has spread into surrounding structures-upper part of the vagina or tissues next to the cervix (parametrium).
Stage III tumours: the tumour has spread to surrounding structures-lower
part of the vagina, nearby lymph nodes, or tissues at the sides of the pelvic area. Sometimes a tumour that has spread to the pelvis may press on one of the ureters. There may then be a build up of urine in the kidney.

Stage IV tumours: the tumour has spread to the bladder or bowel or beyond the pelvic area. This stage includes tumours that have spread into the lungs, liver or bone.

**Grading of cervical cancer**

Grading is done by a histopathologist. There are three grades: grade 1 (low grade), grade 2 (moderate grade) and grade 3 (high grade). Low grade are usually slowly growing and less likely to spread. In high grade tumours the cells look very abnormal and grow more quickly and are more likely to spread.

**Treatment**

All three treatment modalities surgery, radiotherapy and chemotherapy are used in treatment of cancer cervix.

**Stage I**

The results of surgery and radiotherapy are similar in stage I. The surgical procedure is radical hysterectomy with pelvic lymphadenectomy and is generally preferred in young patients as ovaries can be saved from radiation. Radiotherapy is preferred in older patients who may be at high risk for surgery and may be accompanied or preceded by chemotherapy.

**Stage II**

Radiotherapy is usually the preferred treatment. It is usually given in combination with chemotherapy. Radiotherapy may also be used after surgery (sometimes with chemotherapy) if there is a high risk of recurrence, for example if the lymph glands were affected. Bulky tumours do better with chemotherapy.

**Stage III & IV**

Radiotherapy is the main treatment modality in this stage may be given alone or with chemotherapy.

**Invasive cervical carcinoma during pregnancy**

Diagnosis of invasive cervical carcinoma with a coexisting pregnancy occurs in about 3% of cases. The treatment and timing of treatment are dependent on stage of the disease, duration of the pregnancy, and the patient's wishes. Patients with carcinoma-in-situ of the cervix diagnosed by cytology and colposcopic-directed biopsies can be followed throughout the pregnancy and definitive treatment can be delayed until after reevaluation of the cervix 6 weeks postpartum. When there is suspicion of micro invasive or invasive carcinoma, a biopsy should be performed for diagnosis even during pregnancy. Micro invasive carcinomas can be followed throughout the pregnancy.

Early pregnancy up to 20 weeks is ignored for treatment purpose and adequate surgery or radiotherapy can be given depending upon the stage. In late second
trimester, pregnancy can be taken up to period of viability, however, chemotherapy can be considered. Foetus delivered after viability and then appropriate surgical treatment at same sitting or radiotherapy/chemo-radiotherapy after 2 weeks can be instituted. In third trimester, patient can be delivered by classical caesarean section followed by surgery in operable cases or radiotherapy/chemo-radiotherapy after 2 weeks can be given.

Follow-up after primary therapy

As the majority of treated patients who develop recurrences do so in the first 2 years following their therapy, physical examination, including nodal assessment (especially supraclavicular), rectovaginal examination, and Pap smears, should be performed at 2- to 3-month intervals during this time. Thereafter, 4- to 6-monthly examinations are appropriate and, beyond 5 years, annual examinations. Symptoms of pain, vaginal bleeding, and gastrointestinal or genitourinary dysfunction must be promptly investigated.

Interval chest films and abdominal-pelvic CT scans should be considered in those patients with high risk of recurrence, especially in the first 2 years. CT scan or IVPs post-treatment may also diagnose ureteral obstruction (pathologic or treatment-related) at potentially early stages.

Patient education

Awareness in community about risk factors like early age at marriage, multiple sex partners, multiparity and smoking.

Emphasize importance of screening with Pap smears and visual inspection after acetic acid (VIA).

Early reporting for suspicious symptoms like postcoital, postmenopause and intermenstrual bleeding and persistent white discharge.

References


SCHIZOPHRENIA AND ACUTE PSYCHOTIC DISORDER

Schizophrenia is a psychotic disorder, characterized by disturbances in thinking, emotions and perception and disorganized behaviour. The illness tends to be chronic. Patients may present to a physician when they develop a physical or behavioural problem.

### SALIENT FEATURES

Socially disorganized behaviour (abusive, aggressive, violent, destructive, roaming aimlessly).
Talking irrelevantly, suspiciousness, fearfulness, thoughts of being harmed or controlled by some external agencies.
Laughing, smiling or crying without any obvious reason.
Muttering or talking to self or imaginary figures.
Remaining quiet and withdrawn, neglecting personal care and disturbed sleep. Symptoms of schizophrenia are often present for a long time varying from a few months to many years. In acute psychotic disorder, duration varies from a few days to weeks.

### Treatment

In patients already on treatment from a psychiatrist, the same may be continued. In others, the treatment as given below may be started but the patient should preferably be referred to a psychiatrist.

**Nonpharmacological**
- Psychological support by family
- Psychoeducation

**Pharmacological**

**Goals of treatment in acutely violent patients**
- Prevent harm
- Control disturbed behaviour
Reduce the severity of psychosis and associated symptoms, viz. agitation, aggression, negative symptoms, and affective symptoms.

Determine and address the factors that led to the occurrence of the acute episode. Effect a rapid return to the best level of functioning.

Develop alliance with the patient and family.

Formulate short- and long-term treatment plan.

Connect the patients with appropriate after care in the community.

**In a newly diagnosed case, select medication depending on the following factors:** Prior response to treatment; past experience of side effects; side effect profile of the prospective medication; patients’ preference for a particular medication including route of administration; availability of the medicine locally.

Treatment can be started as below:

- Tab. Risperidone 1 mg/day, gradually increased to 2-4 mg/day in 2 divided doses after 2-4 days, which can be further increased depending on tolerability and clinical response (Usual therapeutic dose 4-8 mg/day, though most patients are likely to respond at 4 mg/day).
  - Or
    - Tab Olanzapine 5 mg/day as a single night-time dose; can be gradually increased up to 20 mg/day over 2-3 weeks depending on response and tolerability. Usual therapeutic dose is 10-20 mg/day
      
      **(Caution:** Olanzapine has a potential to cause hyperlipidaemia and precipitate diabetes mellitus. Patients on olanzapine may require lipid and blood sugar monitoring every 6 months)
  - Or
    - Tab Aripiprazole 5-10 mg/day as a single night dose, can be increased up to 30 mg/day over 2-3 weeks depending on response and tolerability.
  - Or
    - Tab. Quetiapine 100-200 mg/day as a single night dose, can increase up to 600 mg/day over 2-3 weeks depending on the response and tolerability.
      
      **OR**
    - Tab. Haloperidol 5 mg/day, which can be increased up to 10 mg/day (in 2 divided doses) over 1-2 weeks.
      
      **Or**
    - Tab. Trifluoperazine 10 mg/day, which can be increased to 15-20 mg/day (in 2-3 divided doses) over 1-2 weeks.

  Risperidone and olanzapine have been associated with weight gain when used for long period. Patients should be encouraged for lifestyle modification like regular physical exercise, diet control.

  In case of acute excitement or violent behaviour, the patient may be given Inj. Haloperidol 5-10 mg IM Stat. + Inj. Promethazine chloride 25-50 mg IM. Or
  - Inj Olanzapine 10 mg IM Or
  - Inj Lorazepam 2 mg IM
The injection can be repeated after 8 hours.

The antipsychotic medicine may cause mild to moderate side effects like sedation, slowness of movements, changes in facial expression and gait, rigidity, excessive salivation, dryness of mouth and constipation. Patient usually develops tolerance to these over a few weeks.

If the patient develops extrapyramidal symptoms like tremors, parkinsonian face, silorrhoea, add

Tab. Trihexyphenidyl 2 mg once in morning and once in afternoon (attempts may be made to taper it off after 3 months)

For sleep disturbance, give

Tab. Lorazepam 1-2 mg or clonazepam 0.25-1 mg at bedtime may be given in the initial period (usually for 10-15 days, to be tapered off thereafter).

Follow-up is required weekly initially. Once the symptoms stabilize, frequency of follow-ups may be gradually reduced to once in fortnight to once in 1-3 months. Improvement starts within one week. However, it may take few weeks to months for full response to come. The illness needs long-term treatment, which may go on from one to many years in schizophrenia. Treatment for acute psychotic disorder is usually required for 6-9 months.

Patient/family education

Both the patient and the caregivers to be educated that schizophrenia is a psychiatric illness, which can be effectively treated by medicines. Family should be advised to be supportive and not to criticize the patient.

Sensitise the patient to the common side effects. If the patient develops spasm of a part of body like neck or extremities or high grade fever or alterations in sensorium, immediately contact the treating doctor or the psychiatrist.

Antipsychotics are often associated with weight gain. Encourage the patient for lifestyle modification like avoidance of fats and regular physical activity.

Treatment should not be stopped abruptly without the advice of the treating psychiatrist.

References


BIPOLAR AFFECTIVE DISORDER

The illness is characterized by episodes of mania and depression or mania alone with intervening periods of normalcy. Patients may present to a physician in a new episode or when they develop a physical or behavioural problem, while on treatment with a psychiatrist.

SALIENT FEATURES

Episodes of mania are characterized by:

- Elevated, expansive or irritable mood, inflated self-esteem, or grandiosity,
- Decreased need for sleep, overtalkativeness, overactivity, interfering behaviour, and excessive involvement in pleasurable activities that have a potential of harmful consequences (buying sprees, sexual indiscretions).
- Symptoms should be present for a minimum duration of one week for a diagnosis of mania to be made (for details about depressive episodes see section on Depression).

Treatment

Treatment is for the current episode and for prophylaxis, since the episodes tend to recur. Prophylaxis is usually indicated, if there are more than 2-3 episodes in the previous 4-5 years.

- Treatment of acute mania is given in Fig. 16.1.
- In patients of bipolar affective disorder already on treatment, the same may be continued. Patient should preferably be referred to a psychiatrist.
- In a newly diagnosed case, treatment can be started as below:
  - Tab. Risperidone 1 mg/day gradually increased to 2-4 mg/day in 2 divided doses after 2-4 days, which can be further increased depending on tolerability and clinical response (Usual therapeutic dose 4-8 mg/day, though most patients are likely to respond at 4 mg/day)
  - Or
  - Tab Olanzapine 5 mg/day as a single night-time dose; can be gradually increased up to 20 mg/day over 2-3 weeks depending on response and tolerability. Usual therapeutic dose is 10-20 mg/day
    (Caution: Olanzapine has a potential to cause hyperlipidaemia and precipitate diabetes mellitus. Patients on olanzapine may require lipid and blood sugar monitoring every 6 months.)
    - Or
  - Tab. Haloperidol 5 mg/day, which can be increased up to 10 mg/day (in 2 divided doses) over 1-2 weeks.
    - Or
  - Tab. Divalproex (combination of sodium valproate and valproic acid) and lithium carbonate are other medications (mood stabilisers), also used for treatment of mania, but should be used only under strict psychiatric supervision.
Step 1
Review general principles & assess medication status

Step 2
Initiate/optimize, check compliance

No response

Step 3
Add-on or switch therapy

No response

Step 4
Add-on or switch therapy

No response

Step 5
Add-on or Experimental agents

Assess safety/functioning
Establish treatment setting
D/C antidepressants
Rule out medical causes
D/C caffeine, alcohol and illicit substances

Not on medication or first line agent

Initiate Li.DVP AAP, or 2 drug combination

Lithium or DVP
Atypical antipsychotic
2 drug combination (Li or DVP+AAP)

Add or switch to AAP
Add or switch to Li or DVP
Relapse one or both agents to second or third line agents

Relapse one or both agents with other first line agents
Consider adding or switching to second or third line agents

Consider adding levetiracetam, phenytoin, omega-3-fatty acids, rapid tryptophan depletion, allopurinol, amisulpride

D/C = discontinue; Li = lithium; DVP = divalproex; AAP = atypical antipsychotic

First line medications are valproate, olanzapine, and lithium. Carbamazepine, and oxcarbamazepine are more often used as second line, but can be used at first in mania.

Fig. 16.1. Treatment algorithm for acute mania

Risperidone and olanzapine have been associated with weight gain when used for long period. Patients should be encouraged for lifestyle modification like regular physical exercise, diet control.

If the patient develops extrapyramidal symptoms like tremors, parkinsonian face, silorrhoea while on antipychotics; add,
Tab. Trihexyphenidyl 2 mg once in morning and once in afternoon (attempts may be made to taper it off after 3 months)

For sleep disturbance
Tab. Lorazepam 1-2 mg or Clonazepam 0.25-1 mg at bedtime may be given in the initial period (usually for 10-15 days, to be tapered off thereafter). In case of acute excitement or violent behaviour, the patient may be given
Inj Olanzapine 10 mg
IM Or
Inj Lorazepam 2 mg IM
The injection can be repeated after 8 hours.
Improvement starts within one week. The treatment may need to be given for
a period of 3-6 months, usually at least for 3-4 months after the patient becomes
asymptomatic. If there is no improvement in a week, the patient should be referred to
a psychiatrist.

**Current episode of depression**

Treatment algorithm for management of bipolar I depression is shown in Fig. 16.2.

Line of treatment is similar to that as described under depression section. However, the patients of bipolar depression should also be prescribed mood stabiliser along with the antidepressant.

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Fig. 16.2. Treatment algorithm for the management of bipolar I depression.

DVP = divalproex; OLZ = olanzapine; RIS = risperidone; ARI = aripiprazole; ZIP = ziprasidone; SSRI = selective serotonin reuptake inhibitor; BUP = bupropion; Li = lithium; LAM = lamotrigine; QUE = quetiapine; ECT = electroconvulsive therapy.

a Or switch the SSRI to another SSRI.
b Or switch the SSRI or BUP to another SSRI or BUP.
**Prophylactic treatment**

Tab. Lithium carbonate 900-1500 mg/day in 2-3 divided doses. Or
Tab. Carbamazepine 600-1200 mg/day in 3 divided doses. Or
Tab. Sodium valproate or divalproex 500-1500 mg/day in 2-3 divided doses.

**Note:** Prophylactic treatment should only be given under psychiatric supervision. Prophylaxis is required generally after 2-3 episodes. Prophylactic treatment may continue for a duration varying from 3 years to lifelong. Patients on lithium require regular blood level monitoring. Liver function test and blood cell counts should be performed at baseline and once in 6 months in patients on carbamazepine and sodium valproate.

**Patient education**

General guidelines about the illness and medications similar to that for schizophrenia.

Emphasize on recurrent course of illness and not to get too much worried on recurrences.

Relapses can be treated as successfully as the first episode.

When on lithium, advice to take plenty of fluids, especially during summer; not to restrict salt.

If the patient develops fever, vomiting or diarrhoea while on lithium, reduce the dose of lithium to half and contact the physician or the psychiatrist.

**References**


**DEPRESSION**

Depression is one of the commonest psychiatric disorders. Patients often present to the general practitioners and the physicians. Patients of depression often present with vague somatic symptoms or aches and pains in general clinical practice, for which no physical cause is found on assessment. A careful screening for depressive symptoms (as outlined under salient features) usually elicits the diagnosis.
SALIENT FEATURES

Sadness of mood, loss of pleasure in activities, which one enjoyed earlier, generalized lack of interest, anxiety is often associated.
Lack of energy, slowness of thought, decreased concentration and efficiency. Lack of sleep, appetite and libido.
Ideas of insufficiency, inadequacy and worthlessness, unexplained ideas of guilt, death wishes, suicidal ideas, history of suicidal attempt.
Disruption of social and occupational functioning.
Symptoms should be present for a minimum period of 2 weeks for a diagnosis of depression to be made.

Treatment

Nonpharmacological

Counselling, reassurance, psychological support, encouragement.
Cognitive therapy (to be given by a psychiatrist/clinical psychologist).

Pharmacological

Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 20 mg/day which can be increased up to 60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response.
Or
Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 50 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response.
Or
Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased to 10 mg/day over a week, and further up to 20 mg/day after 5-6 weeks in case of non-response. Most patients would respond at 4 mg/day.
Or
Tab. Venlafaxine 75 mg/day, can be increased up to 225 mg/day. Or
Tab. Mirtazapine 15-45 mg/day as a single night-time dose starting with 15 mg/day which can be increased up to 45 mg/day in increments of 15 mg after 5-6 weeks in case of non-response.
Or
Tricyclic antidepressants (TCAs) like Tab. Imipramine or Tab. Amitriptyline 75-150 mg/day in 2-3 divided doses; to be started at 25 mg twice a day, and increased by 25 mg every third day till 150 mg/day.
(Caution: TCAs to be avoided in patients with epilepsy, heart disease, glaucoma, and benign prostatic enlargement).
Antidepressant medication begins to improve sleep, appetite and anxiety feelings within about one week. Feelings of depression may take from 2 to 4 weeks to improve. By about 12 weeks, most of the patients substantially improve. If no response to treatment seen in 5-6 weeks, confirm if the patient has been taking the medication as prescribed. If yes, increase the dose. If the dose has been adequate, one may need a change of antidepressant or augmentation to another SSRI or antidepressant from another class or use of augmentation strategies. One may need to refer to a psychiatrist at this stage.

For the first episode of depression, treatment needs to be continued for 6-9 months. Dose may be tapered off over a period of 6-8 weeks. However, if symptoms recur during this period, treatment needs to be continued for another 3-4 months. In case of multiple episodes of depression, treatment may need to be continued indefinitely.

In cases of bipolar depression, patients while on antidepressants may have a sudden switch to mania. In such cases, antidepressants should be stopped immediately.

**Patient education**

Explain the nature of illness, consequences of untreated depression, suicidal risk, need for adequate doses for adequate duration, and other supportive measures. The therapeutic response takes time to appear but side effects may appear earlier. Common side effects of tricyclic antidepressants are dry mouth, constipation, postural hypotension (giddiness), blurred vision, sweating, palpitation, tremors, delayed micturition, sedation, etc. Common side effects of SSRIs are agitation, headache, nausea or heartburn, tremors, delayed ejaculation and loss of appetite.

Mirtazapine causes sedation, giddiness and increased appetites and weight gain. The drug may impair mental or physical abilities initially, avoid driving or operating machinery, if patient is drowsy.

One should avoid alcohol during treatment, as it may cause oversedation and dizziness.

Patient should be cautioned against increasing or decreasing the dose without medical advice.

Patient should be advised not to stop drug suddenly as it may result in withdrawal symptoms.

**References**

DEPRESSION IN CHILDREN

Depression in children is not uncommon, though the presentation may vary. The predominant mood is often irritable. Diagnosis is made on the same criteria as in adult depression. Depression should be suspected in a child presenting with decline in school performance, withdrawal from peers, and increased conflict with peers, siblings, parents and other adults, and irritability. Children may be anxious and tearful and may also present with somatic symptoms.

Treatment should mainly be supportive. Pharmacological treatment is generally not encouraged. TCAs and SSRIs can be used, if depression is severe. Imipramine and Fluoxetine, can be given. Other SSRIs may not be as safe as fluoxetine. Duration of treatment is as described in adult depression.

References


SUICIDAL PATIENT

Patients with suicidal ideation need immediate psychiatric intervention. Suicidal ideation can occur in the background of depression, schizophrenia, adjustment disorders and alcohol and other psychoactive substance abuse.

Assessment of suicidal risk-specific questions to be asked:

- Whether the patient often feels low, sad or dejected?
- Whether he or she has lost all hopes in life?
- Thoughts that it is better to be dead than to face the constant miseries of life. Recurrent thoughts of death
- Thoughts of causing harm to self or wishing to die.
- History of acts of self-harm or suicidal attempt in the past Suicide plans.

Risk factors for predicting the risk of suicide include:

- History of suicidal attempt in past – the strongest predictor Male sex
- Age above 45 years in men and above 55 years in women
- Presence of psychiatric illness, especially schizophrenia and depression, substance abuse or dependence
- Recent bereavement, social isolation, family history of suicide Unemployment
- Physical illnesses like malignancy, chronic pain, epilepsy, AIDS
- Recent declaration of will.
STANDARD TREATMENT GUIDELINES

Treatment

Treatment is specifically directed at the cause, if identifiable. The patient should be referred to a psychiatrist immediately after ensuring the following steps:

Patient should not be left alone and be kept under constant observation.

Family should be explained the seriousness of the problem and actively included in management.

Patient should be offered psychological support and reassurance and not criticized. No dangerous or potentially dangerous objects such as knife, blade, sharp edged objects, rope, medication supply, etc. should be available in immediate vicinity of the patient.

Specific treatment for depression, psychotic disorder or whatever may be the cause should immediately be started.

Patient/family education

Family should be advised to follow a supportive approach towards the patient and should not criticize.

Suicidal attempt is indicative of distress and needs treatment of the causative illness.

Reference


MIXED ANXIETY DEPRESSION

It is one of the commonest psychiatric disorder seen in general clinical practice presenting with anxiety and depressive symptoms.

SALIENT FEATURES

Presence of both anxiety and depressive symptoms.

Anxiety and depressive symptoms not sufficient enough to meet criteria for anxiety or depressive disorder respectively.

Symptoms of autonomic hyperactivity like palpitations, tremors, dry mouth, stomach churning, etc.

Treatment

Nonpharmacological

Psychological support, encouragement, relaxation exercises, yoga, and meditation.

Pharmacological

Antidepressants can be avoided unless the symptoms are severe. A short course of benzodiazepines for 2-3 weeks may suffice. If the patient does not show satisfactory improvement and needs medication for longer time, antidepressant can be started.
Tab. Diazepam 5-20 mg/day or Tab. Lorazepam 1-4 mg/day or Tab. Alprazolam 0.75-1.5 mg/day or Tab. Clonazepam 0.5-1.0 mg/day in 2-3 divided doses.

Treatment should be started at the lowest dose, which can be increased up to the maximum dose to achieve a therapeutic response, but attempt should be to keep it at the minimal possible level. Because of the abuse potential, benzodiazepines should not be given for more than 2-4 weeks.

Or

Tab. Buspirone 30-60 mg/day in 2-3 divided doses. It takes two to three weeks to show its effect.

Or

Tab. Paroxetine 12.5 mg/day as a single daily dose with or without food, usually in the morning, it can be increased up to 37.5 mg/day at the interval of 1 week.

(Caution: At least 14 days should elapse between discontinuation of an MAOI intended to treat depression and initiation of therapy with Paroxetine and conversely, at least 14 days should be allowed after stopping paroxetine before starting an MAOI antidepressant).

Or

Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 20 mg/day which can be increased up to 60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response.

Or

Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 50 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response.

Or

Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased to 10 mg/day over a week, and further up to 20 mg/day after 5-6 weeks in case of non-response. Most patients would respond at 10 mg/day.

Treatment may be continued up to a period of 6 months. If no response in 6 weeks, the patient should be referred to a psychiatrist.

Patient education

It is a mild illness, though symptoms may last for long time. Lifestyle changes like stress management, regular physical exercise, avoiding over work often help in reducing symptoms.

One should not stop treatment without consulting one’s doctor.

The drugs are quite safe and do not cause any harmful side effects even if taken for a long time.

Reference

GENERALIZED ANXIETY DISORDER

It is one of the common psychiatric disorder in general clinical practices, more common in women than in men. Patients often present in primary care with symptoms of sympathetic overactivity or vague aches or pains, sleep disturbance, forgetfulness or worrying too much.

SALIENT FEATURES

- Persistent anxiety, present all the time.
- Tremulousness, shakiness, generalized aches, restlessness.
- Apprehension, worries of future, irritability, sleeplessness.
- Palpitations, sweating, dry mouth, increased frequency, abdominal distress. Intensity, duration and frequency of the anxiety and worry are far out of proportion to the actual likelihood or the impact of the feared event and it interferes with the task in hand.

Treatment

Nonpharmacological

- Reassurance, psychological support, encouragement.
- Anxiety management – relaxation exercises, breathing exercises, meditation, and yoga.

Pharmacological

- Tab. Diazepam 5-20 mg/day Or
- Tab. Lorazepam 1-4 mg/day Or
- Tab. Alprazolam 0.75-1.5 mg/day in 2-3 divided doses. Or
- Tab Clonazepam 0.5-1.0 mg/day in 2-3 divided doses.

Treatment should be started at the lowest dose, which can be increased up to the maximum dose to achieve a therapeutic response, but attempt should be to keep it at the minimal possible level.

Treatment with above should not be given for more than 2-4 weeks because of the abuse potential.

Or

- Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 10 mg/day which can be increased to 20-60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response. Most patients may not require more than 20 mg/day.

Or
Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 25 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response. Most patients may not require more than 50 mg/day.

Or

Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased up to 20 mg/day after 5-6 weeks in case of non-response. Most patients may not require more than 10 mg/day.

(Caution: SSRIs may exacerbate anxiety symptoms in the first few days; usually a low dose is required for anxiety disorders).

Or

Tab. Buspirone 30-60 mg/day in 2-3 divided doses. It is effective in 60 to 80% of patients especially in reducing the cognitive symptoms. It takes two to three weeks to show its effect.

Or

Tab. Paroxetine 12.5 mg/day as a single daily dose with or without food, usually in the morning, it can be increased up to 37.5 mg/day at the interval of 1 week.

(Caution: At least 14 days should elapse between discontinuation of an MAOI intended to treat depression and initiation of therapy with Paroxetine and conversely, at least 14 days should be allowed after stopping paroxetine before starting an MAOI antidepressant.

Or

Tab. Propranolol 40-80 mg/day in 2 divided doses, given especially if the predominant symptoms are those of sympathetic overactivity.

(Caution: To be avoided in patients with history of chronic obstructive airway disease and bronchial asthma).

SSRIs to be used, if the patient needs treatment for longer period. Both SSRIs and benzodiazepines can be started together. Benzodiazepines can be withdrawn over 2-4 weeks, as the SSRIs take over the effect.

In another approach, buspirone may be combined with benzodiazepines initially as it shows its effect after two to three weeks after which benzodiazepines may be gradually withdrawn.

Patient education

Patient should be encouraged to bring changes in lifestyle like mild exercise such as morning walk, keeping some time for leisure or entertainment.

Patients should be informed about the abuse potential of the drug.

References


Panic disorder is a common psychiatric disorder, presenting often in primary care or general medical emergency settings. The patients are likely to be misdiagnosed as having acute cardiorespiratory problem.

**SALIENT FEATURES**

- Discrete episodes of sudden onset of palpitations, chest pain, choking sensations, dizziness, feelings of unreality; often accompanied by fear of dying, losing control.
- Individual attacks last for minutes.
- Not associated with situational trigger and occurs out of the blue.
- Onset and remission of individual attacks spontaneous.
- Often lead to persistent fear of going alone or the situation of attack.
- Diagnosis made when several attacks have occurred in previous month.

**Treatment**

**Nonpharmacological**

- Reassurance, encouragement, psychological support.
- Muscular relaxation exercises, meditation, yoga.
- Cognitive behaviour therapy (to be given by a psychiatrist/clinical psychologist).

**Pharmacological**

Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 10 mg/day which can be increased to 20-60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response. Most patients may not require more than 20 mg/day.

Or

Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 25 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response. Most patients may not require more than 50 mg/day.

Or

Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased up to 20 mg/day after 5-6 weeks in case of non-response. Most patients may not require more than 10 mg/day.
PSYCHIATRIC CONDITIONS

(Caution: SSRIs may exacerbate anxiety symptoms in the first few days; usually a low dose is required for anxiety disorders).

Or/and

Tab. Alprazolam 1.5-6.0 mg/day in 2-3 divided doses or Tab. Clonazepam 1-4 mg/ day in two divided doses. Treatment started at dose of 0.5-0.75 mg/day and increased every 2-3 days to the minimal effective therapeutic dose.

Or

Tab. Imipramine 50 mg/day in 2 divided doses, increased slowly by 25 mg every two to three days to a maximum dose of 150-250 mg/day.

Or

Tab. Venlafaxine 75-150 mg/day in 2-3 divided doses (max up to 225 mg total per day).

Response may take 2-3 weeks to begin and 8-12 weeks to stabilize. Treatment needs to be given for a minimal period of 8-12 months. Medicines should be tapered off thereafter slowly over a period of 6-8 weeks. If the patient does not show any response in 6 weeks, refer to a psychiatrist.

Patient education

General reassurance about benign nature of symptoms and spontaneous recovery of individual attacks.

Don’t avoid the anxiety provoking situations; try to face them. Breathing exercises.

References


SOCIAL PHOBIAS OR SOCIAL ANXIETY DISORDER

Social phobias often start in adolescence and are centred around fears of scrutiny by other people in comparatively small groups rather than in crowds. It is equally common in both the sexes.
SALIENT FEATURES

Strong and persistent fear of social or performance situations in which embarrassment or humiliation may occur and avoidance of such situations. Fear considered irrational by the individual.
Anticipatory anxiety before such exposure.
Exposure leads to panic attack.

Treatment

Nonpharmacological

- Reassurance, encouragement, psychological support.
- Muscular relaxation exercises, meditation, yoga.
- Cognitive behaviour therapy (to be given by a psychiatrist/clinical psychologist).
- Social skill training (to be given by a psychiatrist/psychiatric social workers).

Pharmacological

Tab. Paroxetine 12.5 mg/day as a single daily dose with or without food, usually in the morning, it can be increased up to 37.5 mg/day at the interval of 1 week.

(Caution: At least 14 days should elapse between discontinuation of an MAOI intended to treat depression and initiation of therapy with paroxetine and conversely, at least 14 days should be allowed after stopping paroxetine before starting an MAOI antidepressant.

- Or
  - Benzodiazepines like: Tab. Alprazolam 1.5-6.0 mg/day in 2-3 divided doses or Tab. Clonazepam 1-4 mg/day in 2 divided doses. Treatment started at dose of 0.5-0.75 mg/day and increased every 2-3 days to the minimal effective therapeutic dose.
  - Or
  - Tab. Venlafaxine 75-150 mg/day in 2-3 divided doses (max up to 225 mg total per day).
  - Or
  - Tab. Propranolol 10-20 mg 1 hour before the performance. Treatment needs to be continued for about one year. If no response in 8 weeks, patient should be referred to a psychiatrist.
  - Or
  - Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 10 mg/day which can be increased to 20-60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response. Most patients may not require more than 20 mg/day.
  - Or
  - Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 25 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response. Most patients may not require more than 50 mg/day.
Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased up to 20 mg/day after 5-6 weeks in case of non-response. Most patients may not require more than 10 mg/day. (Caution: SSRIs may exacerbate anxiety symptoms in the first few days; usually a low dose is required for anxiety disorders).

Patient education

Don’t avoid the anxiety provoking situations; try to face them. Take your medicines regularly as advised. Medicine helps in controlling the anxiety and building up the confidence. The symptoms can be treated effectively.

References


OBSESSIVE COMPULSIVE DISORDER

Obsessive compulsive disorder is characterized by obsessions and compulsions and often tends to be chronic. Illness usually begins in adolescent or early adult life and majority of patients have a chronic waxing and waning course.

SALIENT FEATURES

Recurrent obsessional thoughts may present in form of repetitive ideas, images or impulses (e.g. constantly thinking that the door has been left unlocked). Perceived as senseless by the sufferer, who feels distressed and tries to resist them unsuccessfully. Compulsive acts are repetitive behaviour which are not enjoyable and do not result in the completion of inherently useful tasks (e.g. constantly going back to check the door lock) and cause marked anxiety and distress in the individual. Significantly interfere with the person’s normal routine, occupational (or academic) functioning, or usual social activities or relationship.

Treatment

Nonpharmacological

Counselling, reassurance, support
Cognitive behaviour therapy (to be given by a psychiatrist/clinical psychologist) Exposure and response prevention (to be given by a psychiatrist/psychiatric social worker)
Pharmacological
Cap. Fluoxetine 20-60 mg/day as a single dose in morning with food; starting with 10 mg/day which can be increased to 20-60 mg/day in increments of 20 mg after 5-6 weeks in case of non-response. Most patients may not require more than 20 mg/day.

Or
Tab. Sertraline 50-200 mg/day as a single dose in morning with food; starting with 50 mg/day which can be increased up to 200 mg/day after 5-6 weeks in increments of 50 mg in case of non-response. Most patients may not require more than 50 mg/day.

Or
Tab. Escitalopram 10-20 mg/day as a single dose in morning with food; starting with 5 mg/day which can be increased up to 20 mg/day after 5-6 weeks in case of non-response. Most patients may not require more than 10 mg/day.

Or
Tab. Fluvoxamine 50 mg twice a day to be increased to 100-200 mg twice a day in 1-2 weeks.

(Caution: SSRIs may exacerbate anxiety symptoms in the first few days; usually a low dose is required for anxiety disorders).

Or
Tab. Clomipramine 75-150 mg/day in single or divided doses; to be started with 25 mg twice a day, increased by 25 mg/day every third day till 150 mg/day (to be avoided in patients with epilepsy, heart diseases, glaucoma, and benign prostate hypertrophy).

In the initial 2-4 weeks of treatment, one may need to add benzodiazepines like diazepam, lorazepam or alprazolam, if anxiety symptoms are troublesome. These can be given in doses as describe under generalised anxiety disorder.

Anxiety and distress are the first symptoms to respond. Obsessive and compulsive symptoms respond later. Doses of SSRIs required are often higher than in depression and response is slower than in depression. If no response is seen within 6-8 weeks, the patient should be referred to a psychiatrist.

Patient education
Reassure the patient that although disease is distressing and disabling, but is treatable.

The drug takes about 2 weeks for its therapeutic response to manifest.

Side effects may appear before the onset of therapeutic response. Common side effects of Clomipramine are dry mouth, constipation, postural hypotension (giddiness), blurred vision, and sedation. Side effects of fluoxetine include gastrointestinal distress, nausea, headache, nervousness, anorexia, restlessness and sexual side effects. Patient usually adapts to these side effects with time.

Advise the patient that treatment may continue for a long time. He/she should not leave drugs without medical advice.

In case of any untoward effects of drugs, he/she must immediately get in touch with his clinician.

Patient must continue all his regular activities as far as possible.

Yoga, meditation, physical exercises are useful measures along with drug therapy.
ACUTE STRESS REACTION

Acute stress reaction and disorder follow immediately a stressful event of exceptional nature and are characterized by severe anxiety symptoms accompanied by a daze. The symptoms last only for a short period varying from few hours to days.

SALIENT FEATURES

Marked symptoms of anxiety and increased arousal.
An initial state of daze followed by depression, anxiety, anger, despair, over activity and withdrawal.
Clinical picture often changes rapidly with a mixture of the above mentioned symptoms.
Symptoms appear usually within a few minutes of the impact of the stressful event and resolve rapidly, if stressor is removed, and within 1-3 days, even if it is not.
Triggered by an overwhelming traumatic experience (e.g. natural catastrophe, accident, battle, criminal assault, rape, multiple bereavement or domestic fire, etc.)

Treatment

Nonpharmacological
Address the individual’s requirements for medical care, rest, nutrition, and control of injury-related pain and establish a safe environment.
Detailed recollection of the traumatic event—psychological debriefing.
General support, reassurance, and assistance with coping resources.

Pharmacological
No significant role of medications. One may use diazepam 2.5-5 mg on as and when required basis and increased, if necessary, to 15-30 mg daily in divided doses; elderly (or debilitated) half the adult dose, if anxiety symptoms or the distress are uncontrollable. If insomnia is troublesome, 5-15 mg at bedtime.
Patient and family education

Reassure and educate the patient and the family that the symptoms are short lasting and the patient would recover fully within a short time.

References


POST-TRAUMATIC STRESS DISORDER (PTSD)

It is a relatively recent diagnostic category in the field of psychiatry and is being recognized as a common problem following traumatic events of catastrophic nature. Initially it was reported after the Vietnam War, but later similar syndrome has been seen in the victims of natural disasters and major accidents and personal injuries like rape or mugging. Prevalence of PTSD may be as high as 50-80% following the traumatic event.

SALIENT FEATURES

Symptoms follow a major traumatic event of threatening or catastrophic nature (natural or manmade disasters) after a delay.
Symptoms occur within 6 months of the event.
Repeated reliving of trauma in the form of flashbacks, nightmares, intrusive recollections of the event.
Emotional numbness, unresponsiveness and detachment from other people. Autonomic hyperarousal and hypervigilance on exposure.

Treatment

Nonpharmacological

- Emotional support, reassurance
- Behaviour therapy with focus on exposure and desensitisation
- Cognitive behaviour therapy

Pharmacological

SSRIs like fluoxetine, sertraline, escitalopram, venlafaxine or mirtazapine are effective in controlling the symptoms. Dosage is similar as in anxiety disorders and depression. Duration of treatment may vary from 6 months to a year depending on the response.
Patient education

Post-traumatic stress disorder is seen after traumatic events of catastrophic nature and usually seen after a period of few months. The patient often relives the trauma in the form of nightmares, flashbacks or recollection of the event.

One should contact one’s doctor, if he or she develops such symptoms after a major traumatic event.

References


INSOMNIA

Insomnia is one of the commonest complaints in psychiatric, medical and general clinical practice. Common causes include a recent stress, psychiatric illnesses like depression and anxiety disorders, pain in any body part or substance abuse.

SALIENT FEATURES

Difficulty in initiating sleep, frequent awakenings from sleep, early morning insomnia or non-restorative sleep. In the elderly, the physiological reduction in number of hours of sleep does not amount to insomnia. If the patient is distressed by decreased sleep, treatment may be given to increase the duration of sleep.

Stressful situation leading to insomnia or the symptoms of the causative illness can be elicited on careful enquiry. Duration of symptoms may vary from few days to many months or years depending on the cause.

Treatment

Treat the underlying cause. In both primary insomnia (where no cause is identifiable) and insomnia due to other causes, management includes introducing good sleep hygiene and medications for short period, if required.

Sleep hygiene

Set a schedule: Go to bed at a set time each night and get up at the same time each morning. Avoid day time naps. Limit daily inbedtime to the usual amount present before the sleep disturbance.
**STANDARD TREATMENT GUIDELINES**

Avoid large meals near bedtime; eat at regular times daily. No stimulant medication or food beverages (caffeine, nicotine, alcohol, etc.) especially in the evenings. Mild to moderate physical exercise in the morning.

Relax before going to bed: a warm bath, reading, or another relaxing routine can make it easier to fall sleep. Avoid evening stimulation: substitute television by radio.

Don’t lie in bed awake: If you can’t get to sleep, don’t just lie in bed. Do something else, like reading, watching television, or listening to music, until you feel tired. Practice evening relaxation routines, such as progressive muscular relaxation or meditation.

Maintain comfortable sleeping conditions: avoid extreme temperatures.

**Pharmacological**

Tab. Diazepam 5-10 mg or Tab. Lorazepam 1-2 mg, or Clonazepam 0.25-0.5 mg at bedtime.

Or

Tab. Zolpidem 5-10 mg at bedtime.

**Precautions**

Medication to be given ½-1 hour before the usual time of going to bed.

Medications should be prescribed at the lower dose for a period of 5-7 days. Benzodiazepines have risk of abuse potential if taken for more than 4-5 weeks. Zolpidem has also dependence potential and, therefore, long-term use should be discouraged.

**Patient education**

Stress on basic principles of sleep hygiene as above.

Patient to avoid exceeding the prescribed dose and should not take medicines beyond the prescribed period.

Sometimes these drugs can lead to sedation during daytime. In such case, reduce the dose to half and contact the doctor.

Diazepam and nitrazepam carry risk of dependence.

**References**


**ATTENTION DEFICIT/HYPERACTIVITY DISORDER**

Attention deficit/hyperactivity disorder is one of the commonest psychiatric disorders in children, seen more often in boys.
**PSYCHIATRIC CONDITIONS**

### SALIENT FEATURES

Persistent pattern of hyperactivity or inattention (more frequent and severe than typical of children at a similar level of development).
Onset usually before 7 years of age.
Difficulty in sustaining attention in tasks or play activities. Distracted easily by extraneous stimuli.
Irritability, temper tantrums, impulsivity, does not wait for his turn.

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**Treatment (to be treated by a psychiatrist)**

**Pharmacological**

Tab. Methylphenidate 2.5-5 mg twice a day after meals at 8 AM and 12 noon; can be increased up to 10-15 mg/day (0.3-2.0 mg/kg/day). Maximum dose 60 mg/day, to be given under strict psychiatric supervision.

Or

Tab. Atomoxetine started with 0.5 mg/kg/day and increased after a minimum of 3 days to 1.2 mg/kg/day, given as a single or two divided doses (morning and afternoon).

*(Caution: Common side effects include headache, insomnia, nausea, vomiting, decreased appetite and pain abdomen)*.

**Parent education**

Parental counselling; learning to anticipate the situations that allow behavioural problems to appear and plan ahead so as to minimize disruption.
Encouraging parents to screen the peer relationships of the child so as to protect the vulnerable child.
Recognizing the attention difficulties of the child and tailoring the work expectations by reducing the length and complexity of assignments.
A coordinated effort both at home and school.
Side effects include anorexia, headache, insomnia, weight loss, tachycardia, and growth suppression.

**References**

ALCOHOL DEPENDENCE SYNDROME

Persisting with drinking despite clean evidence of overtly harmful consequences and withdrawal state.

SALIENT FEATURES

Craving, compulsion to drink, difficulties in controlling alcohol consumption Tolerance (increasing amount required to achieve the same effect) Progressive neglect of alternative pleasures or interests
Withdrawal symptoms are—tremor, tachycardia, anxiety, sleep disturbance, nausea, vomiting, hallucination, generalised seizure and delirium in severe cases.

Treatment

I. Detoxification (treatment of the withdrawal state and associated problems).
Detoxification can be done in an outpatient or inpatient settings. Outpatient treatment is preferred when the withdrawal state is uncomplicated.

1. Inj. Thiamine 100 mg
   IM. Or
   Tab. Thiamine orally along with oral multivitamins and Tab. Folate 1 mg.
2. Tab. Chlordiazepoxide 10-40 mg 4 times a day, depending on severity of dependence.
   Or
   Tab. Diazepam 5-20 mg 4 times a day.

   Once the patient is well sedated and stable, the dosage should be decreased 20% per day over a maximum period of two weeks. The patient should be monitored over this period for the appearance of the signs of delirium.

   For elderly patients or in presence of significant liver disease, Tab. Oxazepam 15 mg or Tab. Lorazepam 2-4 mg every 6 hour should be started.

   Inpatient treatment is advised when withdrawal state is associated with seizures, delirium or emesis, fluid and electrolyte disturbance, medical conditions like pneumonia or surgical problem (e.g. head trauma), hallucinatory behaviour, suicidal risk and previous history of delirium tremens.

   The vital signs and withdrawal symptoms should be monitored 2-4 hourly. Once the patient is stable, the dose should be gradually tapered off (20% per day) over a period of 7-10 days.

Treatment of dependence with complications:
Basic treatment will be as described above, but the patient needs to be hospitalised. Guidelines are as below:
1. Fluid and electrolyte disturbance should be corrected, especially, if there is vomiting or fever.

2. Seizures—Rum fits (appearing within 24 hours of abstinence) can be treated with Inj. Diazepam 10 mg or Inj. Lorazepam 2 mg IV stat especially when seizures are repeated. Prophylactic treatment is not recommended for true alcohol withdrawal fits.

3. Delirium tremens—The patient should be preferably treated in an intensive care unit.
   a. An intravenous line should be started immediately and Inj. Thiamine 100 mg administered IV, or IM. Thiamine along with multivitamin should be continued parenterally till normal diet is resumed. Later oral thiamine should be continued for at least 3-4 months.
   b. Dextrose and saline IV should be given at a rate adequate to replace fluid losses and maintain blood pressure.
   c. Hyperthermia should be managed with cold sponge.
      Tab. Paracetamol 500 mg PO 4 times a day may be used in absence of any hepatic dysfunction.
   d. Inj. Diazepam 10 mg should be given slowly IV and should be repeated every 15-20 minutes till sedation is achieved.
   e. Physical restraint may be necessary, if the patient is combative.
   f. Associated medical and surgical problems should be simultaneously investigated and treated appropriately.

II. Long-term treatment (to be treated by a psychiatrist)

The goal of this treatment is to help the patient maintain long-term abstinence.

Nonpharmacological

Individual counselling and family support should be planned along with pharmacotherapy. After remission, the patient should be encouraged to join self-help groups like Alcoholic Anonymous (AA).

Pharmacological

Deterrents like disulfiram or anticraving agents like naltrexone or acamprosate are used for long-term treatment of alcohol dependence.

Tab. Disulfiram 250 mg a day may be used, if the patient desires enforced sobriety and who have remained alcohol free for at least 7-10 days.

Patients taking disulfiram develop an extremely unpleasant reaction on intake of even small amounts (e.g. 7 ml) of alcohol. The reaction occurs due to accumulation of acetaldehyde and includes flushing, headache, throbbing in head, dyspnoea, hyperventilation, tachycardia, hypotension, sweating and confusion.

In the event of disulfiram-ethanol reaction (DER), fall in BP should be controlled on priority basis. If DER is mild, assurance and oral fluids suffice. In case of moderate
or severe DER, IV fluids are required and some patients may even need dopamine infusion.

Generally, DER does not occur in the first week of disulfiram use and if alcohol is consumed after 5-7 days of stopping disulfiram, but can occur 2 weeks after stopping disulfiram.

Disulfiram should be continued for several months to establish a long-term pattern of sobriety.

Or

Tab. Naltrexone 50 mg orally once daily.

(Caution: Baseline hepatic functions should be assessed, and monitored once a month while on naltrexone treatment. The drug is usually continued for a period of 6 months. However, it may have to be withdrawn in presence of significant liver disease (i.e. several fold increase in the serum levels of transaminases).

Or

Tab. Acamprosate (333 mg) 1-2 g/day in 3 divided doses. There is no optimum duration of therapy but benefit beyond 12 months has not been demonstrated. (Caution: Contraindicated in severe renal and hepatic failure; reduce dosage in moderate renal impairment; monitor renal and liver function regularly).

Patient education

Patient should be told about nature of illness, course and treatment modalities available through individual sessions.

References


OPIOID DEPENDENCE SYNDROME

SALIENT FEATURES

Compulsive need to take the drug
Tolerance (increasing amount required to achieve the same effect) Progressive neglect of alternative pleasures or interests
Persisting with drinking despite clear evidence of overtly harmful consequences and a withdrawal state (aches and pains, lacrimation, rhinorrhea, yawning, tachycardia, piloerection, vomiting, loose motions, sleep disturbance and spontaneous ejaculation).
Treatment

Pharmacological

Buprenorphine or dextroproxyphene can be used for detoxification. The starting dose is decided according to the amount of opioid used by the patient in 24 hours. Subsequent doses need to be adjusted according to the severity of withdrawal symptoms, which usually peak during 3rd – 7th day of withdrawal.

Tab. Buprenorphine 1.2-4.0 mg/day orally in 4-6 divided doses. Or
Cap. Dextroproxyphene (65 mg) 2-4 capsules thrice a day.

Tapering off of the medication can be started from the 3rd day onwards, depending on the response. Usually detoxification medicines are required for 2-3 weeks. Withdrawal symptoms may need to be treated symptomatically as under:

- Hypnotics (e.g. zolpidem, long-acting benzodiazepines) for sleep disturbance
- NSAIDs for aches and pains
- Antidiarrhoeals for loose motions
- Antiemetics for nausea and vomiting
- Fluid and electrolyte balance for electrolyte imbalance
- Manage associated physical and mental disorders simultaneously.

Certain withdrawal symptoms like insomnia, restlessness and mild body aches persist even after 3 weeks, and can be managed symptomatically as above and by non-pharmacological interventions like relaxation therapy.

Long-term treatment

Nonpharmacological

Individual counselling, family support and encouraging the patient to join the self-help groups are also important to help him maintain long-term abstinence. However, opiate dependence is a highly relapsing disorder and prolonged inpatient stay in settings that also provide rehabilitative inputs may be required in some cases.

Pharmacological (to be treated by a psychiatrist)

Tab. Naltrexone 50 mg/day orally is used to reduce craving and thereby to help patient maintain long-term abstinence (who have remained opioid free) for at least 7-10 days.

A combination of Buprenorphine 2 mg and Naloxone 0.5 mg is also used for long-term treatment. The drug is dispensed only through the Oral Substitution Treatment (OST) Centres accredited by National AIDS Control Organisation (NACO) or the designated Deaddiction Centres

(Caution: Baseline hepatic functions should be assessed, and to be monitored once a month while on naltrexone treatment. The drug is usually continued for a period of 6 months. However, it may have to be withdrawn in presence of significant liver disease (i.e. several fold increase in the serum levels of transaminases).
STANDARD TREATMENT GUIDELINES

Patient education

Patient should be told about nature of illness, course and treatment modalities available through individual sessions.

References


NICOTINE DEPENDENCE

Nicotine dependence is a major public health problem. Nicotine is abused in the form of tobacco, smoked in bidis, cigarettes and hooka, and chewed as such or in pan masala.

SALIENT FEATURES

Most tobacco users smoke or use smokeless tobacco on a daily basis. Indicators of dependence include the time from waking to first use. About 15% of the dependent smokers light up within 5 minutes of waking, while almost half of smoke within the first half hour of the day. Typical physical symptoms following cessation or reduction of nicotine intake include craving for nicotine, irritability, anxiety, difficulty concentrating, restlessness, sleep disturbances, decreased heart rate, and increased appetite or weight gain.

Treatment

Nonpharmacological

Progressively lowering the number of cigarettes smoked or tobacco sachets used daily.
Using past quit experience.
Setting a quit date.
Throwing away items such as ashtrays, etc. the night before the quit day dawns, preferably as a ceremonial gesture.
Advise the patient that starting from the quit date, total abstinence is essential. Help the patient identify each of the environmental conditions that most likely lead to tobacco use and then develop a course of behaviour that avoids those conditions or prevents them from occurring.
Suggest that the patient develop an alternate plan to having a cigarette during the morning toilet, smoking after a meal, and smoking to manage stress at work or in traffic, being in an argument, and so on.
The five Ds to handle urges:
– Delay until the urge passes. It usually takes 3-5 minutes
– Distract yourself. Call a friend or go for a walk.
– Drink a glass of water
– Deep breaths—Relax! Close your eyes and take 10 slow, deep breaths
– Discuss your feelings with someone close to you.

**Pharmacological**

Nicotine gum, one piece of 2 mg gum/hour for light smokers, and 4 mg gum for highly nicotine-dependent smokers.

One piece of gum to be chewed slowly at one time until a peppery taste or tingling of gums occurs. Chewing can be stopped here and the gum is kept between the gums and cheek. The process is repeated over 30 minutes.

One should not eat or drink anything 15 minutes prior to and during the use of the gum. Absorption of nicotine in the buccal mucosa is decreased by an acidic environment. Therefore, patients should not use beverages (e.g. coffee, soda, juice) immediately before, during, or after nicotine gum.

Duration of treatment is 4-6 weeks. The gum is weaned off subsequently by tapering the frequency and strength of the gum over 2-3 months or less.

Or

Tab. Bupropion treatment is begun 1-2 weeks before the quit date. Usual dose is 300 mg/day given in two divided doses. It is started at 150 mg as a single daily dose in morning and increased to 150 mg twice a day on the 4th day. This is continued for 7-12 weeks after the quit date and maintenance therapy may go on for 6 months.

(Caution: It is important that patients continue to receive counselling and support throughout treatment with bupropion, and for a period of time thereafter.)

Adverse effects include feelings of agitation or restlessness that decreases in 1-2 weeks after starting medication. Insomnia, gastrointestinal upset, appetite suppression and weight loss, headache and lowering of seizure threshold also have been reported.

**Patient Education**

The patient should be sensitized to the ill effects of tobacco use.

**References**


**MANAGEMENT OF WANDERING MENTALLY ILL PATIENT OR A MENTALLY ILL PATIENT WITH NO FAMILY MEMBER OR ATTENDANT**

Mental Health Act, 1987 has provision for hospitalization of the mentally ill patients in mental hospitals. If one happens to come across a psychiatric patient wandering
aimlessly or indulging in socially disorganized behaviour in a public place, one can approach the local police station. The incharge of the local police station under whose jurisdiction the place lies, has a duty under the Act to take the patient to the concerned Subdivisional Judicial Magistrate or Chief Judicial Magistrate or any Magistrate of first class (in other cities). The Magistrate can issue a reception order for admission of the patient to Haryana State Institute of Mental Health, Rohtak after getting him examined by a medical officer. Admission to Haryana’s mental hospital can also be made on the request of the patient, if the patient is willing to consent (voluntary admission) or on the request of family members, if they so desire (admission under special circumstances). Immediate medical management is as of an excited psychotic patient as given under schizophrenia (see section on Schizophrenia).

**MENTAL RETARDATION (MR)**

It is a developmental disorder that first appears in children under the age of 18. It is defined as an intellectual functioning level (as measured by standard test for intelligence quotient - IQ) that is well below average and causes significant limitations in daily living skills and adaptive functioning. As many as 3 out of every 100 children in the country have mental retardation. The IQ testing is done by clinical psychologist.

<table>
<thead>
<tr>
<th>IQ</th>
<th>Category</th>
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<tbody>
<tr>
<td>70-79</td>
<td>Boarder line IQ</td>
</tr>
<tr>
<td>50-69</td>
<td>Mild MR</td>
</tr>
<tr>
<td>35-49</td>
<td>Moderate MR</td>
</tr>
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<td>20-34</td>
<td>Severe MR</td>
</tr>
<tr>
<td>Below 20</td>
<td>Profound MR</td>
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</table>

**Management**

By most definitions, it is more accurately considered a disability rather than a disease. Currently, there is no “cure” for an established disability, though with appropriate support and teaching, most individuals can learn to do many things. Disability certificates are issued on every Wednesday by Disability Board in Civil Surgeon office in every district.

Although there is no specific medication for “mental retardation”, many people with developmental disabilities have further medical complications and may take several medications. There are specific programmes that people with developmental disabilities can take part in wherein they learn basic life skills. These “goals” may take a much longer amount of time for them to accomplish, but the ultimate goal is independence. This may be anything from independence in tooth brushing to an independent residence. People with developmental disabilities learn throughout their lives and can obtain many new skills even late in life with the help of their families, caregivers, clinicians and the people who coordinate the efforts of all of these people.
OSTEOARTHRITIS (OA) KNEE

Osteoarthritis of the knee is an end result of the degeneration of articular cartilage.

SALIENT FEATURES

• Pain, stiffness after rest, difficulty in climbing stairs, difficulty in getting up from squatting position, grating sensations and off and on episodes of flare and swelling. Erythema and palpable warmth are possible but rare. Genu varum deformity and/or fixed flexion contracture in severe cases.
• Classical radiological triad - joint space narrowing, peripheral osteophyte formation and subchondral sclerosis.

Treatment

Nonpharmacological

Supportive adjunctive therapy is essential to improve functional adaptation and to diminish pain:

- Weight reduction (if overweight); cold fomentation for acutely swollen knee, however, hot fomentation may give symptomatic relief to some chronic patients.
- Supervised non-traumatic muscle conditioning and rehabilitation regimens e.g. isometric quadriceps strengthening exercise (all vigorous exercises to be avoided in acutely swollen/painful knee).
- Compressive bandage or crepe bandage for effusion.
- Assistive devices like cane (to be held in the hand contralateral to more painful side), walker for patients with severe deformities or unsteady gait.

Pharmacological

1. Topical applications- containing salicylates, capsaicin, nicotinates, menthol, camphor, NSAIDs in various combinations may provide symptomatic relief. (Caution: Avoid hot fomentation immediately after topical applications).
2. Non-steroidal anti-inflammatory drugs (NSAIDs) for pharmacological pain palliation. The choice of NSAID depends upon dosing convenience, physician and patients comfort, price and the past experience on its frequency and severity of side effects as all are equipotent in full therapeutic dose (Avoid intra-articular or oral steroids).

Table 17.1. Commonly used NSAIDs for OA Knee

A. Acute painful situation/moderate pain (for initial 7-14 days), preferably take NSAIDs after meals.

Tab. Paracetamol 500 mg 4-6 hourly (maximum daily dose 4000 mg).

Or
Tab. Ibuprofen 400 -600 mg 2 or 3 times a day (maximum daily dose 3200 mg).
Or
Tab. Diclofenac sodium 50 mg 3 times a day or 75 mg 2 times a day (maximum daily dose 200 mg).
Or
Tab. Nimesulide 100 mg 2 times a day (maximum daily dose 400 mg).
Or
Tab. Aspirin 350 mg 2 tablets 4-6 hourly (maximum daily dose 5000 mg).

B. For mild to moderate pain/chronic pain control (for 3-6 weeks and then SOS).
1. All above medicines in reduced frequency of dosages.
   Or
2. Alternative forms -Tab. Diclofenac sodium 100 mg/75 mg sustained release once a day.
   Or
Tab. Piroxicam 20 mg once a day.
   Or
Tab. Nimesulide 100 mg 2 times a day.

All patients do not uniformly respond to a particular NSAID. It is not unusual for several different NSAIDs to be tried before a suitably effective and well-tolerated agent is identified for a particular patient.

(Caution: NSAIDs may cause dose related gastric irritation, nausea, vomiting and dyspepsia; GI ulceration, perforation and haemorrhage. However, one-third remain asymptomatic. NSAIDs can interfere with antihypertensive therapy due to salt and water retention).

1. In case of epigastric burning or nausea or vomiting either discontinue and switch over to safer NSAID or administer Cap. Omeprazole 20 mg half an hour before breakfast.

In patients on prolonged therapy with NSAIDs monitor haemoglobin, stool for occult blood as these drugs may also cause leucopenia, thrombocytopenia and agranulocytosis.

Refer the patient to an orthopaedic surgeon in case of persistent swelling, presence of constitutional symptoms or mechanical symptoms like locking or frequent giving away sensations. Surgical intervention may be required for severe deformities, contractures and advanced disease with intractable pain, severe enough to affect independent performance of activities of daily living, for prolonged periods.

**Patient education**

There is no curative pharmacological agent for osteoarthritis knee and the disease is irreversible.

Nonpharmacological treatment has a major role to play in treatment.

Take minimal possible medication that provide symptomatic relief and to wait for 1-2 weeks for drug to show its effect.

Topical applications do not penetrate into the joint through skin directly. Intrarticular steroid injections give only temporary relief and risks of repeated intra-articular injections far outweigh its advantages.

To avoid activities which exacerbate pain like sitting cross legged or squatting on floor.
To use ramp instead of stairs wherever feasible.
Not to do vigorous exercises with acutely int1amm ed knee.
To report back if recurrent effusions in knee or systemic symptoms. Former may be caused by mechanical disorder along with OA knee like loose body or meniscal tear. Later situation could be caused by diseases of knee other than OA.

References

RHEUMATOID ARTHRITIS (RA)

Rheumatoid arthritis is characterized by persistent inflammatory synovitis (usually involving small and large peripheral joints in symmetrical fashion) causing cartilage destruction and bone erosion leading to changes in joint integrity. The revised criterion of American College of Rheumatology (1987) aids in diagnosis and classification.

Treatmen

t

Since the aetiology of RA is unknown, therapy remains empirical and palliative, aimed at relieving the signs and symptoms of the disease.

Nonpharmacologic

In acute pain rest and splint. Otherwise exercises directed at maintaining muscle strength and joint mobility without exacerbating joint inflammation. A variety of orthotic (splints) and assistive devices (cane, walker) can be helpful in supporting and aligning deformed joints to reduce pain and improve function.

Pharmacological (Fig. 17.1)

I. In acute inflammation any of the NSAIDs as given in section on osteoarthritis may be given except Paracetamol. The anti-inflammatory action of the NSAIDs may take 2-4 weeks to become evident.
Evaluation of persistent polyarthritis

Suspect rheumatoid arthritis if:
- > 3 swollen joints
- > 30 minutes of morning stiffness
- involvement of metacarpophalangeal or metatarsophalangeal joints
- symmetric arthritis
- rheumatoid nodules

Supportive investigations:
- ESR, Creactive protein, rheumatoid factor (RF)
- Radiographs of hands and feet

Start therapy:
- Patient education
- Physical/occupational therapy
- consider NSAIDs

Review symptoms and consider rheumatology referral for shared care

Mild RF-negative Disease

Hydroxychloroquin

Good response

inadequate response

Moderate/severe disease (RF +/-)

Specialist rheumatologist liaison to commence therapy with either a single drug or combination of:
- methotrexate
- sulfasalazine
- hydroxychloroquine
- leflunomide

Inadequate response

Consider other drugs:
- Intramuscular gold
- Cyclosporine
- Azathioprine
- Corticosteroids

Consider biological agents against TNFα depending on availability: Etanercept or Infliximab

Fig. 17.1. Management of rheumatoid arthritis.
Reduced NSAID dosages have to be used in the elderly and in patients with impaired renal function. Concomitant use of more than one NSAID only increases toxicity, and has no additional benefit. Patient not responding to one NSAID may still show a good response to another.

2. Topical applications- containing salicylates, capsaicin, nicotinates, menthol, camphor and NSAIDs in various combinations may provide symptomatic relief

Refer to a specialist (physician) at a higher centre. Begin DMARD early in the disease. Prediction of response to a particular disease modifying antirheumatic drugs (DMARD) is not possible. It takes 4-6 weeks to show its effect.

3. Tab Methotrexate 7.5 mg to 15 mg every week. Concomitant Folic acid 1 mg/day reduces side effects (give in gradual increment).

(CAUTION: Nausea, mouth sores, liver damage, increase in incidence of chest infection, macrocytic anaemia. Regular monitoring of LFT, CBC is required. Avoid alcohol during therapy).

4. Only in patients with severe disease, affecting activities of daily living and not responding to adequate trial of NSAIDs and DMARD for sufficient duration:

Tab. Prednisolone 40-60 mg/day for 2-4 weeks. Review periodically and possibly taper down slowly. If required for a longer duration administer at doses of 5-10 mg/day. Deflazacort 6mg 8 hourly can be give alternatively.

Intra-articular corticosteroids: Methylprednisolone acetate, 20-80 mg may be needed in selected cases with predominantly monoarticular arthritis of a large joint.

5. Refer the patient to a higher centre if no response to medical therapy after 4-8 weeks, severe extra-articular symptoms, deformities or contractures present, patient is crippled/or not able to carry out activities of daily living despite adequate medical treatment.

Surgical

Synovectomy in patients with predominantly monoarticular involvement, not responding to conservative therapy, might be helpful. Reconstructive surgery is indicated for disorganized joints.

Patient education

The disease can be controlled but no curative agent is known. There can be remissions and exacerbations.

At the onset of disease it is difficult to predict the natural history of an individual patient's illness.

No characteristic features of patients have emerged that predict responsiveness to a particular DMARD.

Life style modification may be required depending on the degree of disability. Regular mild exercises as prescribed by the doctor helps in prevention of deformity maintain range of motion of the joints and muscle strength.
Magic drug for rheumatic arthritis might contain steroids. Better to consult a qualified doctor before taking it.

References

CERVICAL AND LUMBAR SPONDYLOSIS
Spondylosis is a clinical syndrome resulting from degeneration of intervertebral discs and facet joints.

SALIENT FEATURES
- Pain and stiffness with decreased range of movement of gradual onset. Occasional acute flare ups of pain with muscle spasm. Neck pain may radiate to occiput, scapular area and down to one or both arms (may be associated with paraesthesias). Back pain is usually diffuse and may radiate up to knees through back of thighs.
- Radiological narrowing of one or more intervertebral spaces, spur formation (osteophytes) and subchondral sclerosis are the hallmark.

Treatment
Nonpharmacological
In acute painful situation rest, moist heat in cold weather and light massage (improves tone, circulation and elasticity) to paraspinal muscles. Cervical traction in the position of maximum comfort to neck (5-10 pounds) for 10-15 minutes. Ultrasonic exposure on painful trigger points in cervical and shoulder muscles. Removable soft cervical collar/backup corset! back belt for symptomatic relief. (Caution: No exercises in acute painful situation).
In chronic pain mobilization and strengthening exercises, moist heat and cervical traction.

Pharmacological
Same as described for osteoarthritis of knee.

Patient education
In cervical spondylosis avoid prolonged desk work, if must, then intermittent rest is required and proper writing, typing, sitting posture (avoid low table, use tilt table) and care of the neck.
In lumbar spondylosis explain the patient how to manage weight since extra weight puts greater stress on the back muscles and to maintain proper body
alignment while standing with feet slightly apart. When standing for long periods, use a small stool to keep one foot up with knee bent.

Do not tense up or concentrate on standing up straight, just stand naturally.

Try to avoid carrying heavy bags on shoulders.

Care of back while sitting by using well designed fully adjustable chair to provide plenty of support to the lower back. If chair is uncomfortable use a rolled up towel or small pillow to support the back. When sitting for long periods rest your feet on low stool and use arm rests to support weight of your body. Try not to sit in the same position for long periods.

If prolonged sitting is must take rest for a minute or two every hour.

To lift weight cautiously by keeping the back as much upright (vertical) and straight (not hunched over) as one can. Not to bend over at waist to pick up the object, instead squat, get under or next to object not on top of it. Lift with your leg muscles rather than back or abdominal muscles. Hold the object close to your body while lifting and carrying and do not twist your body.

To sleep safely on a firm bed. While sleeping supine legs should be supported with pillows. Not to sleep on your stomach. Sleeping on your side with knees bent and hips tilted forward is probably the best.

Refer to a higher centre in case of severe pain that disturbs sleep/not responding to conservative treatment for more than 2 weeks/associated with severe restriction of neck or back movements or torticollis or sciatic pain or constitutional symptoms/neurological symptoms with back or neck pain.

SPRAINS

An injury to a ligament(s), by sudden unnatural or excessive movement of a joint, is termed as a sprain. Symptoms are pain, swelling, discoloration of the skin, especially bruising and impaired joint function.

SALIENT FEATURES

- Mild or grade I sprains- partial tearing of ligament fibers, minimal swelling and no joint instability.
- Moderate or grade II sprains - pain, oedema, ecchymosis, joint tenderness with some loss of joint motion but no joint instability.
- Severe or grade III sprains- gross instability of the joint with complete tearing of all fibers, marked swelling and severe pain.

Treatment

Nonpharmacological

Check sensation and circulation distal to the injury. Obtain X-rays of the involved region to rule out a fracture. Stress X-rays may show abnormal opening of the joint in a grade III sprain.

Protection, support and rest.

Restrict the movement of the affected area.
Apply cold compresses immediately (this will help to reduce swelling).
Avoid using ice directly on the skin.
Elevation of the limb above the level of the heart- especially at night while sleeping.
In a grade I sprain, apply a compression bandage for a period of 5-7 days, patient may be allowed to bear weight after a week.
In a grade II sprain, splintage (slab later on converted to cast) may be used to restrict joint motion, but the patient has to remain non-weight bearing for 4-6 weeks.

Pharmacological
1. Tab. Ibuprofen 400 mg 3 times a day for 5-7 days.
   Or
   Tab. Diclofenac sodium 50 mg 3 times a day for 5-7 days.
   Or
   Tab. Nimesulide 100 mg 2 times a day for 5-7 days (in Adults, should be avoided in children).
Refer the patient to an Orthopaedic Surgeon if a fracture is suspected or if there has been a serious injury (grade III sprain with instability) or persistent pain (delayed recovery of grade I or II sprain), there is an audible popping sound and immediate difficulty in using the joint and distal neurovascular status is doubtful.

Patient education
Don't massage the area or do hot fomentation in acute stage; it will increase the swelling.
To give rest to the injured area until the pain subsides (usually 7 to 10 days for mild sprains and 3 to 5 weeks for severe sprains).
Avoid activities that cause pain or swelling.
Practice moderation in physical activities.
If the pain and swelling decreases within 48 hours after a sprain, move the affected joint in all directions.
To avoid high heeled shoes (for ankle sprains).

Reference

ACUTE PYOGENIC OSTEOMYELITIS
Acute osteomyelitis is acute infection of the bone, commonly seen in children less than 10 years of age. Require aggressive management and timely referral for surgical intervention.

SALIENT FEATURES
- Diagnosis considered if any of the following two criteria are present: classic symptom of localized pain, fever (with or without chills and rigours), swelling in the metaphyseal area, warmth, and limited range of motion of the adjacent
joint; pus aspirated from the bone; positive bone or blood culture for pyogenic organism; radiographic changes typical of acute osteomyelitis (soft tissue swelling, periosteal reaction, lytic areas in the metaphysis).

- The X-ray changes usually appear 7-10 days after the onset of illness.
- Initial diagnosis required high degree of suspicion

Treatment

Nonpharmacological

Rest, splintage to the part, elevation of the limb and sponging for fever. If aspiration is positive for pus, drain the pus (must be performed by an orthopaedic surgeon).

Postoperative duration of splintage depends upon extent of damage to the bone. Usual duration is 4-6 weeks. Gradually mobilize the limb and permit gradual weight bearing thereafter. In case of extensive destruction, bone might require support for a few months.

Pharmacological

Broad spectrum intravenous antibiotics are started depending upon most likely organism present. Commonest bacterial pathogen is *Staphylococcus aureus* (40-80% of cases). The antibiotic later on may be changed depending upon culture report or response to therapy. Intravenous administration of antibiotics is continued till favourable clinical response is achieved (15 days), followed by oral antibiotics (till 6 weeks). Total duration of antibiotic(s) administration ranges from 4-6 weeks.

1. Inj. Cloxacillin 50-100 mg/kg/day in four divided doses for 1-2 weeks.
2. Inj. Gentamicin 5-7.5 mg/kg/day in 2 divided doses for 1-2 weeks Or Inj. Amikacin 15 mg/kg/day in 2-3 divided doses if resistant *Pseudomonas aeruginosa*.
   Or
   Inj. Ceftriaxone 100 mg/kg/day in 2 divided doses for 1-2 weeks (maximum dose 2 g/day).
   Or
   Inj. Cefotaxime 100-200 mg/kg/day by IV infusion or 1M or IV in 2-4 divided doses for 1-2 weeks.
   Or
   If patient is hypersensitive to penicillins and cephalosporins,
   Inj. Clindamycin 40 mg/kg/day in 4 divided doses for 1-2 weeks.
   Or
   If Methicillin resistant *Staph. aureus* suspected, Inj. Vancomycin by IV infusion 500 mg over at least 60 minutes every 6 hours or 1g over at least 100 minutes every 12 hours; Neonates upto 1 week 15 mg/kg initially then 10 mg/kg every 12 hours; Infants 1-4 weeks 15 mg/kg initially then 10 mg/kg every 8 hours; Children over 1 month 10 mg/kg every 6 hours.
3. Oralln. Paracetamol for fever (see section on fever in chapter 1).
4. Monitor therapy by clinical response. Favourable response characterized by decrease in swelling and fever, improvement in general well being and
movements of limb, fall in ESR and C-Reactive protein (better indicator than ESR because CRP closely follows the clinical response). After 7-10 days of symptoms, repeat the X-ray to assess the extent of destruction and damage to bone. Oral therapy usually started 1-2 weeks offIV antibiotic therapy, if response is favourable. The choice of oral antibiotic largely depends on culture and sensitivity report. In the absence of culture report give oral:

Syr./Cap. Cloxacillin 50-100 mg/kg/day in 4 divided doses for 3-4 weeks.
( Monitor compliance as it has bitter taste).

Or
Syr./Cap. Cephalexin 25-50 mg/kg/day in 4 divided doses for 3-4 weeks.

Or
Inj. Clindamycin 25-40 mg/kg/day in 4 divided doses for 3-4 weeks.

Refer the patient to an orthopaedic surgeon if aspiration yields pus from bone or acute osteomyelitis suspected in an adult/diabetic/haemodialysis patient/IV drug user/patient with orthopaedic implant/immunocompromised host.

Patient education

Antibiotic therapy may be required for a few weeks depending upon the response.
Plaster (or any other splintage) might be required for prolonged periods.
Not to make the child walk (in case of lower limb bone involvement) unless permitted.

References


ACUTE SEPTIC ARTHRITIS

Acute septic arthritis is inflammation of joint caused by pyogenic microorganisms, usually seen in children <10 years. The key to early diagnosis and favourable outcome remains high index of suspicion since delay in diagnosis leads to permanent damage to the joint. Hip and knee are the commonest joints to be affected.

SALIENT FEATURES

- Inability to move the affected joint, refusal to walk or limp, hip pain referred to knee, acute local signs of inflammation (warm and painful joint with effusion) and clinical signs of sepsis (fever, malaise), however, more than two thirds of infant with septic arthritis are afebrile.
- Neonates present with pseudoparalysis of extremities, discomfort while
changing the diaper, unhappy or out of sorts but rarely appears to be ill or moribund.

- Ultrasound examination of suspected septic hip joint greatly aids in diagnosis.

Treatment

Refer the patient immediately to an orthopaedic surgeon.

Nonpharmacological

Keep the joint in position of comfort.

Aspiration of the joint for gram staining, culture and sensitivity.

If aspirate is purulent, drainage of the joint on an emergency basis.

Drain the joint even if the joint aspiration is doubtful in the presence of a strong clinical suspicion, because the risks of negative arthrotomy are far too less than not draining an infected joint having pus. The latter situation may be disastrous for the joint resulting in lifelong permanent disability to the patient.

After drainage splint the joint with a POP slab or skin traction to relieve pain and prevent contractures till the patient is afebrile, pain free and the joint is clinically quiescent. Intermittent mobilization is permitted to preserve the range of movement of the joint.

Pharmacological

The choice of antibiotics, duration of therapy and monitoring of the therapy are same as mentioned in the section on acute pyogenic osteomyelitis.

References

MEDICAL CARE OF THE SURGICAL PATIENT

Preoperative assessment of the patient

For achieving the desired optimum results in a surgical patient, apart from evaluating the nature and extent of the diseases and choice of surgery from available options, the assessment of the patient for his ability to withstand the stress of surgery and anaesthesia is very important. The factors that must be considered in preoperative assessment are

(i) The disease (and its extent) for which the surgery is planned.
(ii) The condition of the patient and his organ systems.
(iii) The relative urgency of the surgery.
(iv) The type of surgery and its alternatives.
(v) The relative morbidity and mortality of the disease.
(vi) The relative morbidity and mortality of the surgical procedure.

All these factors are interdependent and this assessment is the most fundamental task to be performed in a surgical patient. The best person to undertake this task is the surgeon himself. Surgeon may, at times, need the help of a physician, cardiologist or anaesthetist to take the right decision. The preoperative assessment should also include discussion on drugs being taken by the patient and documentation of known allergies.

Informed consent

Informed consent should be taken after a detailed discussion by the surgeon (or his responsible assistant) with the patient and his close relatives, informing them about the nature of the procedure planned, benefits expected, risks involved and possible alternatives, giving full opportunity to them to ask questions and clear doubts.

Preoperative preparation

Routine investigations Hb, TLC, DLC, CT, BT, urine routine examination, and in patients over 30 years, chest X-ray and ECG.

Special and specific investigations depending upon the nature of the procedure planned and the physical condition of the patient for evaluating fitness for surgery.

Lipstick, nail polish and other cosmetics which may mask cyanosis and interfere with pulse oximetry should be removed.
Dentures, spectacles, contact lenses, artificial limbs, artificial eyes, hearing aid and jewellery, cash and mobile phones should be removed before shifting the patient to operation theatre.

Withholding feeds before surgery depending upon age of the patient and nature of anaesthesia and surgery planned.

Bathing, if possible, patient should take a proper bath on the day prior and on the morning of surgery giving special attention to the operative area. Patient should wear only clean hospital clothing.

Hair removal should be done as close to the time of surgery as possible. If the skin is to be shaved, it is best done immediately before surgery. These are best removed with a clipper or chemical depilator. Shaving results in damage to skin and leads to abrasions that may not be visible.

One should ask for history of allergic reactions to any chemical solutions. While scrubbing, one should work away from the operative site. Visibly soiled skin should be washed with soap and water before using surgical scrub.

Pre anaesthesia medication as per policy.

Skin preparation for surgery
Preoperative surgical antisepsis aims at blocking infection into surgical wound and consists of hand washing, gloving along with application of antiseptic to surgical site.

Different surgical scrubs available for skin preparation before surgical procedure include any of the following:

Povidone iodine. It acts by oxidation/substitution of free iodine. Povidone iodine is used as a surgical scrub after combining with a detergent. It is effective against gram positive bacteria but weaker against other microorganisms. It has a residual activity and is active in presence of organic substance. It is absorbed through skin. It can be used on mucus membranes. Patient skin sensitivity is occasionally a problem.

Chlorhexidine gluconate. It is a broad spectrum antiseptic that is better than povidone iodine as a bactericidal. This has a residual activity that continues to kill microorganisms after application. It is not effective in presence of organic material like soaps and oils, blood and body fluids. It should be avoided in preparation of eye. It may be used alone or in combination with cetrimide.

Alcohol (70% ethyl or isopropyl alcohol), it is 95% effective against gram negative and gram positive bacteria, mycobacteria, fungi and viruses. It is not completely effective against spores. All traces of alcohol should be dry before drapes are put. Alcohol is never used on mucus membranes and open wounds as it may cause desiccation.

Drug treatment, e.g. prophylactic antibiotics (see section on antibiotic prophylaxis), antihypertensives, IV fluids, anticoagulants, Vitamin K, etc. where relevant.

Non drug treatment, e.g., rectal washouts, vaginal douches, stomach wash, etc. where relevant.
Handling of medicolegal cases

First aid has to be provided in all cases who report in an emergency state. After stabilizing the patient, patient should be properly guided and helped in shifting to the appropriate centre.

In case that we decide to treat, we must:
- Send an information, in duplicate, to the police. Prepare a medico legal report. Preserve and seal clothes etc; preserve fluid and stains samples where indicated. Respond to information sought by the police.
- Arrange to take dying declaration, where indicated.
- Preserve all X-rays and patient records.
- Respond to court summons.
- In case of death, hand over the body to the police.
- In case of discharge/referral, police needs to be informed.

Care during transfer

This would depend on a number of factors like nature, patient's condition, and reasons for referral, readiness of the referral centre to accept the patient and whether the transfer is an emergency or elective.

Emergency transfer

- Identify the degree of emergency.
- Resuscitative measures to be adopted in serious patients with management of shock, oxygen etc.
- Transfer in a well-equipped ambulance etc (see relevant section for specific care).
- Transfer to a referral centre with prior intimation and confirmation of the readiness at the referral centre.
- Doctor or paramedical staff to accompany the sick patient.

Referral slip

Should contain information on:
- Condition of the patient when first seen.
- Diagnosis and resuscitative measures taken.
- Reasons for referral.
- Where referred.
- Precautions advised during transportation.
- Any other information (e.g. any staff or equipment sent along with, any communication given to referral centre or specialist concerned).

Reference


POSTOPERATIVE CARE

Postoperative pain relief

Postoperative pain is associated with all surgical procedures. This varies according to the surgical procedure. Severe pain can prolong gastrointestinal ileus,
urinary retention, impair respiratory movements producing atelectasis and predisposes to deep vein thrombosis due to immobilization.

Various methods to alleviate postoperative pain are NSAIDs, opioids (intramuscular, transdermal or transmucosal), patient controlled analgesia, local infiltration of anaesthetic drugs, epidural analgesia and intrapleural analgesia. The method used depends upon the site and the magnitude of surgery done, severity of pain, whether the patient is allowed orally, facilities and expertise available. It is necessary to give analgesics by intramuscular or intravenous route in the immediate postoperative period and till the patient is able to accept orally.

Commonly used agents are:
- **Inj. Diclofenac sodium 75 mg** 6-8 hourly.
- **Or**
  - **Inj. Pentazocine (30 mg/ml) 30-60 mg** 1M/IV repeated 3-4 hourly.
  - **Or**
  - **Inj. Tramadol (50 mg/ml) 1M/IV 4-6 hourly,**
  - **Or**
  - **Inj. Morphine (15 mg/ml) 10-15 mg,** can be repeated 4-6 times.

In tertiary care centers, epidural analgesia, intravenous patient controlled analgesia, intrapleural analgesia can be used under expert care.

When patient is able to accept orally
- **Tab. Paracetamol 500 mg** 3-4 times a day.
- **Or**
  - **Tab. Ibuprofen 400-600 mg** 8 hourly.
  - **Or**
  - **Tab. Nimesulide 100 mg** twice daily.

**Postoperative nausea and vomiting**

Postoperative nausea and vomiting lead to significant morbidity and prolonged hospitalization. It has an incidence of 20-30% after abdominal surgery. Predisposing factors are diabetes mellitus, pregnancy, dehydration, electrolyte imbalance, gastroesophageal reflux, emergency surgery, use of certain anaesthetic drugs and opioids.

**Treatment**

Bowel obstruction (mechanical or paralytic ileus) should be ruled out as a cause of vomiting by proper examination and investigations if it is associated with abdominal distension, fever and occurs beyond 3rd postoperative day.

Nausea and vomiting are managed with bed rest, intravenous fluids, analgesics to relieve postoperative pain, nasogastric decompression.

**Pharmacological**

- **Inj. Metoclopramide (5 mg/ml) 10 mg** 1M/IV 1-3 times daily or SOS.
  - **Or**
  - **Inj. Ondansetron (2 mg/ml) 4 mg** slow IV or 1M.
    - **In children:** 100 mcg/kg (max 4mg/day) by slow IV or 1M.
  - **Or**
  - **Inj. Promethazine (25 mg/ml) 2 ml** IV SOS.
Postoperative pneumonia

Pulmonary disorders remain the most frequent post operative problem and 10-15% of patients are considered to have clinically significant chest complication after surgery under general anaesthesia.

Factors predisposing to increased chest complications are smoking, obesity, chronic restrictive and obstructive lung disease, prolonged general anaesthesia and presence of nasogastric tube.

Postoperative pneumonia is caused by pathogens such as Pseudomonas, Serratia, Klebsiella, Proteus and Streptococcus.

SALIENT FEATURES

- Fever, productive cough, dyspnoea, chest pain.
- Bronchial breathing and presence of rales.
- Chest X-ray shows areas of consolidation.

Treatment

1. Antibiotics: depending upon sputum culture and sensitivity. Initial treatment can be started with aminoglycoside and antipseudomonas Cephalosporins.
2. Inj. Ketorolac 30 mg every 6-8 hours IV or IM
   Or
   Inj. Diclofenac 75 mg IM every 6-8 hours.
3. Chest physiotherapy
4. Nebulized bronchodilators may be used if bronchospasm is present.

Reference


ANTIBIOTIC PROPHYLAXIS IN SURGERY

The goals of prophylactic administration of antibiotics to surgical patients are to: reduce the incidence of surgical site infection; use antibiotics in a manner that is supported by evidence of effectiveness; minimize the effect of antibiotics on the patient's normal bacterial flora; minimize adverse effects; cause minimal change to the patient's host defenses.

Prophylaxis is uniformly recommended for all clean-contaminated contaminated and dirty procedures. It is considered optional for most clean procedures, although it may be indicated for certain patients and clean procedures that fulfill specific risk criteria.

It is important to emphasize that surgical antibiotic prophylaxis is an adjunct to, not a substitute for, good surgical technique. Antibiotic prophylaxis should be regarded as one component of an effective policy for the control of hospital-acquired infection.

In procedures that require the insertion of implants or prosthetic devices, the term surgical site infection is used to encompass the surgical wound and the implant.
Surgical site infection also encompasses infections involving the body cavity (e.g. a subphrenic abscess), bones, joints, meninges and other tissues involved in the operation. Throughout this guideline the term surgical site infection (SSI) is used, unless the evidence relates specifically to surgical wound infection.

Criteria for defining a surgical site infection

**Superficial incisional SSI**

Infection occurs within 30 days after the operation and infection involves only skin of subcutaneous tissue of the incision and at least one of the following:

1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs or symptoms of infection:
   - pain or tenderness,
   - localized swelling,
   - redness, heat and superficial incision is deliberately opened by a surgeon, unless, incision is culture-negative
4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

**Deep incisional SSI**

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g. fascial and muscle layers) of the incision and at least one of the following:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
2. A deep incision spontaneously dehisces or deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms:
   - fever (>38°C)
   - localized pain tenderness
   - unless site is culture-negative
3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during re-operation, or by histopathologic or radiologic examination.
4. Diagnosis of deep incisional SSI by a surgeon or attending physician.

**Organ/space SSI**

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g. organs or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following:
I. Purulent discharge from a drain that is placed through a stab wound into the organ/space

2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space

3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during re-operation, or by histopathologic or radiologic examination

4. Diagnosis of an organ/space SSI by a surgeon or attending physician.

**Choice of antibiotic**

The antibiotics selected for prophylaxis must cover the common pathogens. Antibiotic selection is influenced by the organism most commonly causing wound infection in the specific procedure and by the relative costs of available agents. In certain gastrointestinal procedures, oral and intravenous administration of agents with activity against gram-negative and anaerobic bacteria is warranted, as well as mechanical preparation of the bowel. Cefazolin provides adequate coverage for most other types of procedures.

The antibiotics chosen for prophylaxis can be those used for active treatment of infection. However, the chosen antibiotics must reflect local, disease-specific information about the common pathogens and their antimicrobial susceptibility. A past history of a serious adverse event should preclude administration of a particular antibiotic like penicillin.

**Penicillin allergy**

In patients allergic to penicillins, challenge tests can be used to demonstrate cross-reactions with cephalosporins and carbapenems. However, the frequency of these relationships and their clinical significance is uncertain.

**Timing and duration of prophylaxis**

The first dose should always be given before the procedure, preferably within 30 minutes before incision. Re-administration at one to two half-lives of the antibiotic is recommended for the duration of the procedure. In general, postoperative administration is not recommended.

There may be situations where overriding factors alter the normal timing of administration. For example, during a cesarean section prophylaxis should be delayed until the cord is clamped in order to prevent the drug reaching the neonate. When a tourniquet is to be applied the necessary tissue concentration must be achieved prior to its application rather than the time of incision. This probably occurs within 10 minutes of administration of an IV antibiotic injection.

Antibiotics should also be administered immediately after unexpected contamination of the tissues.
**Additional doses during the operation**

The individual surgeon should be free to give an extra dose for prolonged operations or operations with major blood loss if they wish. However, there is insufficient evidence to make a general recommendation.

Antibiotic prophylaxis should be confined to the perioperative period.

**Route of administration**

Intravenous administration of antibiotic prophylaxis immediately before or after induction of anaesthesia is the most reliable method for ensuring effective serum antibiotic concentrations at the time of surgery.

**Dose selection**

A single dose of antibiotic at the therapeutic concentration is sufficient for prophylaxis under most circumstances.

In adults, blood loss of up to 1500 ml during surgery or haemodilution up to 15 ml/kg does not require an additional dose of prophylactic agent.

In the event of major intraoperative blood loss (>1500 ml), additional doses of prophylactic antibiotic should be given after fluid replacement.

Antibiotic prophylaxis in all cardiac surgeries and interventions is recommended.

If antibiotic prophylaxis is necessary, the recommended medications and dosages are summarised in Table 18.1. Classification of operative wounds and risks of infection are given in Table 18.2.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Medication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard prophylaxis</td>
<td>Amoxicillin</td>
<td>Adults: 2.0 g; children: 50 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td>Unable to take oral medication</td>
<td>Ampicillin</td>
<td>Adults: 2.0 g IM or IV; children: 50 mg/kg IM or IV within 30 min before procedure</td>
</tr>
<tr>
<td>Allergic to Penicillin</td>
<td>Clindamycin or</td>
<td>Adults: 600 mg; children: 20 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td></td>
<td>Cephalexin or</td>
<td>Adults: 2.0 g; children: 50 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td></td>
<td>Cefadroxil or</td>
<td>Adults: 2.0 g; children: 50 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td></td>
<td>Azithromycin or</td>
<td>Adults: 500 mg; children: 15 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td></td>
<td>Clarithromycin</td>
<td>Adults: 500 mg; children: 15 mg/kg orally lh before procedure</td>
</tr>
<tr>
<td>Allergic to penicillin and</td>
<td>Clindamycin or</td>
<td>Adults: 600 mg; children: 20 mg/kg IV within 30 min before procedure</td>
</tr>
<tr>
<td>unable to take oral medications</td>
<td>Cefazolin</td>
<td>Adults: 1.0 g; children: 25 mg/kg IM or IV within 30 min before procedure</td>
</tr>
</tbody>
</table>
Table 18.2: Classification of operative wounds and risk of infection

<table>
<thead>
<tr>
<th>Classification</th>
<th>Criteria</th>
<th>Risk (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
<td>Elective, not emergency, nontraumatic, primarily closed; no acute inflammation; no break in technique; respiratory, gastrointestinal, biliary and genitourinary tracts not entered</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Clean-contaminated</td>
<td>Urgent or emergency case that is otherwise clean; elective opening of respiratory, gastrointestinal, biliary or genitourinary tract with minimal spillage (e.g., appendectomy) not encountering infected urine or bile; minor technique break</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Contaminated</td>
<td>Nonpurulent inflammation; gross spillage from gastrointestinal tract; entry into biliary or genitourinary tract in the presence of infected bile or urine; major break in technique; penetrating trauma &lt;4 hours old; chronic open wounds to be grafted or covered</td>
<td>~20</td>
</tr>
<tr>
<td>Dirty</td>
<td>Purulent inflammation (e.g., abscess); preoperative perforation of respiratory, gastrointestinal, biliary or genitourinary tract; penetrating trauma &gt;4 hours old</td>
<td>~40</td>
</tr>
</tbody>
</table>

Infection risk factors

Factors associated with increased risk of infection are:

- **Systemic factors.** Diabetes, corticosteroid use, obesity, extremes of age, malnutrition, recent surgery, massive transfusion, multiple (3 or more) preoperative comorbid medical diagnoses American Society of Anesthesiologists class 3, 4 or 5.

- **Local factors.** Foreign body, electrocautery; injection with epinephrine; wound drains; hair removal with razor; previous irradiation of site.

Development of local guidelines

It is expected that these guidelines will act as a framework for local development or modification after discussion with clinicians and management. These guidelines should be developed in conjunction with the Drugs and Therapeutics, Antibiotic and Protocol Development Committees. Responsibility for prophylaxis in each unit should be clearly assigned. This guideline should ideally be used in conjunction with local guidelines for the management of postoperative pyrexia. Guideline implementation should be supported by a programme of continuing education.

References


Postoperative wound management

Most postoperative wounds are covered with occlusive dressings.
The occlusive dressing (semi permeable to water vapours and oxygen but impermeable to liquids) consists of a hydrating layer (antibiotic ointments or petroleum jelly), a non-adherent contact layer, an absorbent and cushioning layer (gauze), and a securing layer like hypo allergic tape.

Oclusive dressings should be applied within 2 hours of wounding and left on for at least 24 hours for optimal healing to occur for acute wounds. These should never be used on infected wounds. Dressing changes can be performed once or twice daily. If other types of occlusive are used, the timing of the dressing changes will vary between 1 to 7 days, depending on the wound characteristics.

**Postoperative wound infection**

Wound infections are classified as:
- Minor: e.g. stitch abscess, cellulitis.
- Major: e.g. presence of discrete collection of pus in wound.

Superficial infections are limited to skin and subcutaneous tissue. Deep infections involve the areas of wound below the fascia.

**Postoperative - cross infection in wards.** *Staphylococcus aureus* is the most frequently involved organism. Other less common organisms are *Enterococci, Pseudomonas, Proteus, E. Coli* and *Klebsiella*.

---

**SALIENT FEATURES**

- Pain is unusually severe for the magnitude of procedure and last long.
- Fever: 101 to 102°F with tachycardia is usually present.
- Local examination: Wound is warm to touch and may be swollen and oedematous. Redness of the surrounding area and cellulites is often present.
- Wound infections are generally evident between 3rd to 6th postoperatedays.

**Treatment**

- **Superficial Infections:**
  1. Drainage: Wounds are managed by opening up the incision to provide adequate drainage.
  2. Dressing: Daily dressing with Povidone iodine 5% and a wick is placed to prevent premature closure of the wound.
  3. Analgesics: Tab. Ibuprofen 400 mg 3 times a day till pain is there.

- **Deep Infections:** Antibiotics are given on the basis of pus culture and sensitivity in addition to drainage of wound.

**Prevention**

Postoperative wound infection rate can be minimized by adequate skin preparation, bowel preparation, prophylactic antibiotics, and meticulous surgical technique.

---

**WOUND CARE**

Wounds can be classified as acute or chronic and further as arterial, venous trophic, malignant, etc. (Table 18.3). Acute wounds heal uneventfully within an expected time frame e.g. burns. For the purpose of guidelines, chronic wounds can be defined as an ulcer present at least for 6 weeks.
Treatment

Meticulous wound care includes adequate cleansing, debridement, oedema control, and prevention of ischemia, in addition to maintaining a moist wound environment and keeping the bacteria count as low as possible.

Acute wounds

The overall objectives in caring for wounds that are incompletely clotted are to minimize unnecessary blood loss and to avoid the formation of a haematoma.

1. Irrigate gently with copious quantities of water or normal saline. Debris and necrotic tissue should be removed without damaging healthy tissue. Sharp mechanical debridement may be necessary to expose viable tissue for large areas of fibrinous exudates or eschar. Chemical debridement is useful for those areas that are difficult to access by sharp debridement. Chemical debridement of the wounds may be done using topical agents - antiseptics (chlorhexidine, povidone iodine, alcohol, hydrogen peroxide, triclosan) and antibacterials (silver sulfadiazine, neomycin, polymyxin, bacitracin, mupirocin). When debridement is complete, dressings can be applied.

2. Healing of acute wound is further facilitated by closure. Alternatively, closure can be delayed for several days to allow infection to clear.

Wound healing is impaired by malnutrition, oedema, bacterial contamination, ischemia, smoking and immunosuppressant.

Chronic wounds

Identify and treat the predisposing factors, e.g. diabetes mellitus, peripheral arterial or venous disease, severe anaemia, protein deficiency, rheumatoid arthritis, systemic vasculitis, Cushing’s syndrome and conditions requiring systemic steroid therapy.

Table 18.3. Classification and clinical assessment of wounds

<table>
<thead>
<tr>
<th>Type of ulcer</th>
<th>Clinical assessment</th>
<th>Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>Involves deep fascia or deeper structure, Decreased or absent distal pulses</td>
<td>Doppler US(ABPI&lt;0.8)</td>
</tr>
<tr>
<td>Venous</td>
<td>Involves skin, subcutaneous fat, Tortuous long/short saphenous veins, Perforators' incompetence</td>
<td>Doppler US/Venography</td>
</tr>
<tr>
<td>Tubercular</td>
<td>Undermined edge</td>
<td>Edge biopsy</td>
</tr>
<tr>
<td>Trophic</td>
<td>Punched out/undermined</td>
<td>Edge biopsy</td>
</tr>
<tr>
<td>Malignant</td>
<td>Raised/erverted margin</td>
<td>Edge biopsy</td>
</tr>
</tbody>
</table>

No evidence of granulation tissue
Nonpharmacological

Encourage daily or twice a day bath, to avoid walking bare foot or with slippers and patient should be encouraged to wear shoes and socks. Patients with leg ulcer to reduce standing or excessive walking. In leg ulcer due to chronic venous insufficiency or oedema, patients should be advised to wear elastic stockings, elevation of leg and foot end of the bed while asleep along with some leg exercises to activate the calf muscle pump.

Pharmacological

Identify the microorganism and treat accordingly. Tubercular ulcer is treated with antitubercular drug (2HRZE+7HR) for at least 9 months (for details see section on tuberculosis in chapter 1).

Surgical treatment

Surgical debridement in ulcers associated with necrotic tissue or slough. Clean the wound with physiological normal saline or tap water only (antiseptics delay wound healing).

Daily dressing: Gauze adheres to the wound bed and it may remove viable tissue from the wound surface on removal, resulting in delayed wound healing. Some of the commonly used dressings are:

Occlusive (moisture retentive) dressings (Hydrocolloid gel) in case of clean and shallow ulcers without any pus discharge or other features of infection. Occlusive dressings have barrier properties that enable to prolong the presence of moisture and wound fluid in the wound bed.

Calcium alginate dressing: For bleeding wounds and wounds with a cavity.

Refer patients with chronic leg ulcer to a vascular surgeons or general surgeons with some experience in peripheral vascular problems for surgical treatment.

Patient education

To prevent ulcers in future, explain about the care of leg ulcers, wearing socks, shoes and compression stocking. Good personal hygiene (daily bath) and after bath the healed scar area should be massaged with an emollient cream such as lanolin or some other oil to keep the scar tissue soft and supple and prevent further breakdown. Regular use of calf muscle activating exercises and leg elevation and to avoid prolonged period of standing or sitting with legs down.

In case of diabetic patients, control of diabetes is necessary.

Reference


VARICOSE VEINS

Chronic venous disease of the lower limb is one of the most common conditions affecting the adults. Varicose veins the most common complaint, represent one end
of the spectrum of venous disease which extends through increasing degrees of venous insufficiency and may result in leg ulceration in the most severe cases.

**Basle Study Venous Classification**

No venous disease.

Varicosities:
(i) Telangiectasia (spider veins): intradermal varicose veins those are small and rarely symptomatic.
(ii) Reticular veins: subcutaneous veins that begin at the tributaries of the trunk veins.
(iii) Trunk veins: varicose veins of the greater/lesser saphenous system and its named tributaries.

Chronic venous insufficiency:
(i) Dilated subcutaneous veins.
(ii) Hyperpigmented/depigmented areas.
(iii) Open healed ulcer.

**SALIENT FEATURES**

- **Varicose veins** refer to any dilated, tortuous, elongated vein, regardless of size.
- Duplex ultrasonography is confirmatory and also helps in localization of perforators and at times saphenopopliteal opening which is of immense help in the performance of operation.
- Evaluation of the deep venous system is a must in a patient with a history or clinical examination suggestive of deep venous thrombosis (leg oedema, present or past ulcer).

**Treatment**

Carefully examine the lower limb for sapheno-femoral reflux, varices and perforators in thigh and manifestations of venous insufficiency in calf and foot.
Reassurance and use of elastic compression stockings,
Definitive treatment includes injection sclerotherapy or surgical treatment.

**Surgical**

A recent episode of deep venous thrombosis is a contraindication for operation in the superficial venous system. However, in patients with old deep vein thrombosis (DVT), perforator or obviously varicose long or short saphenous system should be ligated or treated by sclerotherapy. The most definitive approach in the thigh perforator is flush ligation and thigh stripping, with careful attention to groin tributaries. Saphenofemoral ligation alone can be performed under local anaesthesia but the addition of stripping or operation of the sapheno-popliteal system warrants spinal/general anaesthesia.

In case of small varices and those where the main long and short saphenous veins and their major tributaries, are competent, injection sclerotherapy with STD (sodium tetradecyl sulphate) is best used in the management of large varicose veins and perforators in the calf. Treatment can be repeated when necessary.
Technique: Place 25G needle into the varices or perforators. Empty the vein and inject 0.5 ml of sclerosant i.e. STD. Compression is applied immediately with compression bandage or stocking.

Or

Ambulatory phlebectomy (avulsion of veins) prevents venous recanalization and recurrence.

Postoperative management
1. Compression bandaging immediately following stripping or avulsion of veins. Replace bandages by compression stocking after 2 days.
2. Limb elevation and encourage the patient to walk with compression stockings after first change of dressing 48 hours after operation.
3. Postoperative pain is controlled with dextropropoxyphene or NSAIDs.

Patient education
Certain do's are leg exercise, leg elevation, wear stockings and drinking 4-5 L of fluids in a day.
Certain don'ts are hot bath, exposure to extremes of temperature, pregnancy, contraceptive pills and oestrogens, long journeys (flight).
Teach the patient leg exercises - frequent movements of toes and heels, Sarvangasan or Shirshasan, and elevation of foot end of the bed about 6 inches by putting a block of wood or 2 bricks under foot end of bed. To avoid prolonged standing or dangling legs down.

Reference

CERVICAL LYMPHADENOPATHY
An enlarged cervical lymph node is the commonest cause of lump in the neck. Cervical lymph nodes may become enlarged as a result of inflammation or neoplastic process (Table 18.4). Tuberculosis is one of the commonest cause of cervical lymphadenopathy.

Table 18.4. Causes of lymphadenopathy and clinical features

<table>
<thead>
<tr>
<th>Condition</th>
<th>Causes</th>
<th>Clinical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute inflammation</td>
<td>Infection of the aerodigestive tract, head and neck or other infections</td>
<td>Fever, sore throat, firm, tender nodes 1-2 cm in diameter</td>
</tr>
<tr>
<td>Chronic inflammation</td>
<td>Tuberculosis, sarcoidosis, Histiocytosis X</td>
<td>Swelling in the neck and fever, cough, may or may not be present</td>
</tr>
<tr>
<td>Lymphomas</td>
<td>HodgkinsINon Hodgkins lymphoma</td>
<td>Large painful rubbery lymph nodes.</td>
</tr>
<tr>
<td>Metastatic</td>
<td>Carcinomas of the upper aerodigestive</td>
<td>Symptoms related to primary disease,</td>
</tr>
</tbody>
</table>
Treatment

Detailed history and examination are essential to pinpoint specific aetiology. Majority of the lymph nodes are reactive to viral infections of upper respiratory tract, therefore, do not require any treatment.

A. In case of acute suppurative lymphadenopathy secondary to any focus of bacterial infection in the drainage area:
   Cap. Cephalexin 250-500 mg every 6 hours for 7 days.
   Or
   Cap. Amoxicillin 250-500 mg every 8 hours for 7 days.
   If lymph nodes persist, perform fine needle aspiration cytology (FNAC) and treat accordingly. If FNAC is nonconclusive take a biopsy from the enlarged lymph node and treat accordingly.

B. In case of chronic lymphadenopathy perform FNAC and treat accordingly.
   If FNAC is nonconclusive, perform biopsy and treat accordingly.

Treatment (tubercular lymphadenopathy)

Start antitubercular therapy (see section on tuberculosis in chapter 1).
Reassess the patient after 6 months. If lymph nodes are either not present or less than 1 cm size keep the patient under follow-up and continue treatment. However, if lymph nodes are palpable and more than 1 cm take a biopsy of the node and treat accordingly and consider second line antitubercular drugs.

Reference

THYROID SWELLING

Thyroid swelling forms one of the most important differentials for swelling in front of the neck. The differential diagnoses of thyroid swelling are benign goiter, intrathyroid cysts, thyroiditis, benign and malignant tumours. Simple goitre is enlarged thyroid gland and occurs commonly around puberty in girls due to iodine deficiency. Malignancy should be suspected in case of extremes of age, male sex, rapidly growing swelling, persisting pain, dysphagia, recurrent laryngeal nerve palsy, hardness and fixity of the thyroid gland and presence of one or more palpable neck nodes. Fine needle aspiration cytology, isotope scan and ultrasonography are helpful in differentiating the causes of thyroid swelling.

Treatment

Simple diffuse hyperplastic goitre is preventable by using iodized salt.
Treatment with L-thyroxine can reverse the swelling at the stage. Simple nodular goitre is treated by subtotal thyroidectomy (Fig. 18.1).
Clinical examination + Thyroid function test + Autoantibody titles + Scan

**Multinodular**
- Large/complicated
  - Thyroidectomy
- Small/ uncomplicated
  - Watch

**Solitary**
- Hot
  - FNAB
  - Benign
    - Watch
  - Partial thyroidectomy or radio-iodine
- Cold
  - FNAB
  - Benign
  - Watch

**Autoimmune thyroiditis**
- Biopsy and watch

- Hemithyroidectomy + frozen section histology
  - Benign
    - Aspirate and watch
  - Follicular
  - Papillary
  - Lymphoma
  - Medullary
  - Anaplastic
    - Resect if possible + radiotherapy
    - Total Tx + modified blocks
    - Total Tx + modified blocks + radio-iodine therapy
    - Total Tx + modified blocks + radio-iodine therapy + chemotherapy

(Tx—thyroidectomy, $T_4$—Suppressive thyroxine therapy, FNAB—Fine needle aspiration biopsy)

**Fig. 18.1.** Management plan for thyroid nodule.
**Thyroidectomy**

Preoperative care. Preoperative antibiotic prophylaxis (Inj. Ampicillin 1 g IV 30 min before operation) is given to the patient. Prior to thyroidectomy, indirect laryngoscopy (ILD) is performed to identify compensated or unsuspected recurrent laryngeal nerve palsy. Before operation, thyrotoxic patients should be made euthyroid with antithyroid drugs (carbimazole 10-15 mg 4 times a day and propranolol 20 mg 3 times a day). Fully discuss the potential complications with the patients - mentioning the risk to parathyroid gland and recurrent laryngeal nerve.

Postoperative care. Place patient in a slightly propped up position. Carefully observe for respiratory insufficiency, haemorrhage from the wound, irritability to the facial nerve and carpopedal spasm (parathyroid injury). Monitor drain output daily and remove if 24 hours output becomes lesser than 10ml. Check wound site for infection and suture removed on the 5th day.

Complications. The most immediate life threatening complication is haemorrhage under deep cervical fascia, which can lead to acute asphyxia. Management include reopening of the suture line, to drainage of the haematoma and re-exploration for control of bleeders. Damage to recurrent laryngeal nerve can lead to respiratory distress (bilateral recurrent laryngeal nerve) and hoarseness of voice. Parathyroid damage leads to hypocalcaemia.

Symptomatic hypocalcaemia (positive Chovstek's or Trousseau's signs or corrected serum calcium level < 8 g/dl) is treated with 10% calcium gluconate intravenously. If hypocalcaemia persist, oral calcium supplement and synthetic Vitamin D is necessary.

Late complications include recurrent thyrotoxicosis (Grave’s disease), hypothyroidism, and recurrence of malignancy at the local site or in the lymph nodes in the neck.

**Radio-iodine therapy**

Radio-iodine therapy is indicated in follicular, papillary and mixed carcinoma. Following total thyroidectomy; a total body radioactive isotope scan should be arranged four weeks after the operation. During this period L-thyroxine therapy should be withheld. If radioactive scan shows residual thyroid tissue or metastatic deposit then further dose of radioiodine should be given to ablate these. Following isotope scan, high dose L-thyroxin (0.2-0.3 mg) should be started and continued for life. Radioactive iodine has no role in residual/metastatic medullary carcinoma. Treatment approach to Hurthle cell neoplasm is similar to follicular neoplasm.

**Follow up**

Patients should be followed at three monthly intervals for the initial 2 years and 6 monthly for next three years and then at yearly interval for life. On each follow up visit patient should be examined for any local or nodal recurrence in the neck, a chest X-ray should be done to exclude pulmonary deposit and clinical features of thyroid toxicity noted and dose of L-thyroxine regulated.

**Reference**

**BREAST ABSCESS**

Breast abscesses can be classified into mastitis neonatorum, lactating epidemic or sporadic mastitis, and non-lactating breast abscesses.

Usually caused by highly virulent strains of penicillin resistant *Staphylococcus aureus* and anaerobic *Streptococci*.

**Treatment**

*Nonpharmacological*

Rest and support to the breast and to continue breast feeding from both the breasts, however, in case of larger abscess shift to bottle feeding.

*Pharmacological*

In early stage (induration only):

1. Tab. Erythromycin 500 mg 3 times a day for 7 days.  
   Or  
   Tab Roxithromycin 150 mg twice a day.
2. Tab. Metronidazole 400 mg 3 times a day for 7 days.
3. Tab. Ibuprofen 400 mg as and when required.

In case of no improvement or large abscess:

1. Antibiotics as above.
2. Incision and drainage of pus through thinned skin over the abscess (Large abscesses require operation under intercostal block or general anaesthesia).
3. Daily dressing.

In some cases suppress lactation with hormones if the mother finds breast feeding too painful.

**Patient education**

To maintain good hygiene and to continue breast feeding from both the sides unless it is a large abscess and very painful.

Advise on timely weaning of the infant.

**Reference**


**DYSPHAGIA**

Dysphagia is the sensation of difficulty in swallowing. It may be due to general causes e.g. myasthenia gravis, bulbar palsy, hysteria etc. or due to the local causes. The latter may be

a. Intraluminal (e.g. foreign body)
b. Intramural (e.g. achalasia, oesophagitis, oesophageal strictures, Plummer-Vinson syndrome, pharyngeal pouch, benign neoplasm, malignant neoplasm)
c. Extra luminal (e.g. retrosternal goitre, mediastinal tumor, mediastinal lymphadenopathy, aortic aneurysm, hiatus hernia).
SALIENT FEATURES

- Difficulty in swallowing (solids and/or liquids), oesophageal pain, regurgitation and aspiration.

Investigations

Barium swallow to evaluate cause, site and extent of the lesion and the state of the oesophagus above and below the lesion; upper GI endoscopy for direct vision evaluation and for taking tissue for histopathological examination wherever indicated.

Abdominal ultrasound, chest X-ray and other routine investigations.

CT scan and endoscopy ultrasound to be considered in tertiary care centers, wherever indicated; and oesophageal manometry, pH studies and evaluation for H pylori to be considered in tertiary care centers, wherever indicated.

Treatment

Definitive treatment depends on the cause and its extent.

Nonpharmacological

Diet restricted to liquids or semi solids depending upon extent of dysphagia.

Psychotherapy if the patient is depressed or demoralized.

Pharmacological

Gel Magnesium hydroxide + Aluminium hydroxide + Activated Dimethicone (250 mg + 250 mg + 50 mg/ml) 20 ml 6 hourly,

Or

Tab. Ranitidine 150 mg 2 times a day.

Reference


ACUTE ABDOMEN

Abdominal pain can occur due to variety of medical and surgical causes. It is important to elicit a detailed clinical history and perform abdominal examination to determine the cause of pain. In very severe cases, it may be necessary to give treatment before proper history can be obtained or examination is allowed by the patient.

Causes of acute abdomen

Abdominal causes

1. Inflammation of peritoneum due to bacterial or chemical contamination.
   Perforation of appendix or bowel, ulcer, pancreatitis or pelvic inflammatory disease.
2. Mechanical obstruction of hollow viscera-intestinal obstruction, ureteric obstruction due to stone or other causes, and obstruction of the biliary tree.
3. Vascular disturbances - vascular rupture, embolism or thrombosis, torsion of pedicle.
Treatment

Low fat diet with no spices.

Definitive treatment is cholecystectomy in symptomatic and asymptomatic patients with diabetes or a solitary large stone or multiple small stones with wide cystic duct or porcelain gall bladder or anxious patients. If the patient comes after 48 hours manage conservatively and cholecystectomy after 6-8 weeks.

Expectant management - In case of acute cholecystitis, empyema gall bladder, and stones in the CBD.

Maintenance IV fluids (for details see section on fluid and electrolyte imbalance in adults in chapter 1 and children in Chapter 19).

1. a. Inj. Ciprofloxacin (infusion 100 mg/50 ml) 100 ml IV twice a day.
   b. Inj. Gentamicin (40 mg/ml) 2 ml IV 8 hourly.
   Or
   a. Inj. Ampicillin (500 mg/ml) 1 ml IV 6 hourly.
   b. Inj. Cloxacillin (500 mg/ml) 1 ml IV 6 hourly.
   Or
   a. Inj. Ciprofloxacin (infusion 100 mg/50 ml) 100 ml IV twice a day.
   b. Inj. Amikacin (500 mg/2 ml) 2 ml twice a day.
2. In case anaerobic bacterial infection is suspected or anticipated, give Inj. Metronidazole (500 mg/100 ml) 100 ml IV 8 hourly.
3. Inj. Diclofenac sodium (25 mg/ml) 2 - 3 ml 1M SOS or 6 hourly.
   Or
   Inj. Pentazocine lactate (30 mg/ml) 1 ml 1M SOS.
4. Inj. Hyoscine butylbromide (20 mg/ml) 1 ml IV SOS.
5. In patients having obstructive jaundice, add Inj. Vitamin K (10 mg/ml) 1 ml 1M once or twice a day till prothrombin time reaches to a satisfactory level. Antibiotics are usually stopped after 5-7 days unless the patient has evidence of persistent infection or has indwelling tube (e.g., T-tube).

Patient education

To avoid fatty and fried meals for 3 months.

Although ambulation is encouraged as early as possible, heavy physical exertion should be avoided for 2 weeks (after laparoscopic cholecystectomy) and for 3 months after conventional cholecystectomy.

If T-tube has been placed, it should be removed after 2-3 weeks, after ensuring that the CBD is patent, non dilated and there is free flow of contrast into the duodenum during T-tube cholangiography.

Reference


APPENDICITIS

Appendicitis is the commonest cause of acute abdomen and may appear as catarrhal appendicitis or as obstructive appendicitis and sometimes it may present as an appendicular lump or appendicular abscess or as burst appendix with peritonitis.
• Acute central abdominal pain, followed by nausea, vomiting and fever, with the pain after a variable period, shifting to right lower abdomen localized tenderness maximum at the Mc Burney's point, rebound tenderness and guarding in the right iliac fossa,

• An inflammatory lump in the right lower abdomen or signs of peritonitis.

• A polymorphonuclear leucocytosis and ultrasonographic appearances may help to corroborate the clinical diagnosis.

• Investigations are primarily undertaken to exclude other conditions like ectopic gestation or ureteric calculus.

Treatment

The definitive treatment is appendicectomy and the sooner it is done, the better. Surgery should be delayed if the patient is moribund with advance peritonitis where the conservative measures will need to be supplemented by measures to make him fit for operation. An interval appendicectomy should be performed where a lump has formed or when attack has already resolved or circumstances make surgery not feasible.

Nonpharmacological

Stop oral feeding.

Pharmacological (expectant management)

1. Intravenous fluids to maintain hydration. Requirement of fluids would be more if the patient has peritonitis and septicaemia.

2. Inj. Ciprofloxacin infusion (100 mg/50 ml) 100 ml twice a day for 5 days.

3. Inj. Gentamicin (40 mg/ml), 80 mg IV 8 hourly.
   Or
   Inj. Amikacin (500 mg/2 ml), 2 ml IV twice a day.

4. Inj. Metronidazole infusion (500 mg/100 ml) 100 ml IV 8 hourly.

5. Inj. Diclofenac sodium (25 mg/ml) 50 ml 1M SOS.
   (Caution: Purgation and enema are contraindicated)

Pain subsides first, followed by relaxation of the abdomen and control of fever. Tenderness disappears later. Polymorphonuclear leucocytosis tends to settle down. Failure of signs and symptoms to subside or the appearance of new signs and symptoms during expectant treatment, calls for surgical intervention.

Postoperative management

Oral feeding is started when abdomen is soft, the patient has passed flatus/stools and bowel sounds have appeared. Start with liquids, gradually permitting semi solid and solid diet over a period of 2-3 days. Antibiotics should continue for 5 days or more if the condition demands. Initially antibiotics are given by parenteral route and later switched to oral route when the patient starts tolerating semi solid diet.
Patient is discharged usually between 3rd and 5th postoperative day, if comfortable, ambulatory, tolerating semi solid or solid food, afebrile and has a healthy wound. Sutures are removed around 7th postoperative day.

**Patient education**

Normal routine physical work can be permitted in 10-15 days (5-7 days after laparoscopic appendicectomy).

Moderate physical work is permitted after 4-6 weeks (2 weeks after laparoscopic appendicectomy).

Heavy physical work is permitted after 2-3 months (4-6 weeks after laparoscopic appendicectomy).

Reference


**RETENTION OF URINE**

Retention of urine is inability to pass urine. It can be either acute or chronic. *Mechanical* causes of retention are: posterior urethral valves, foreign bodies, tumours, blood clot and stones, phimosis, paraphimosis, trauma (rupture of urethra or bladder), urethral stricture, urethritis, meatal ulcer, tumours, prostatic enlargement-benign or malignant, retroverted gravid uterus, fibroid, ovarian cyst, faecal impaction. *Neurogenic*—postoperative retention, neurogenic bladder, spinal cord injuries, hysteria, drugs—anticholinergics, antihistaminics, smooth muscle relaxants.

**SALIENT FEATURES**

- Acute retention of urine is characterized by inability to pass urine despite urge, suprapublic discomfort or severe agonizing pain. There may be previous such episodes or history of trauma, instrumentation or surgery.
- Chronic retention is an enlarged painless bladder whether or not the patient is having difficulty with micturition. Some times acute episode can be precipitated in cases of chronic retention of urine.
- There may be symptoms suggestive of prostatic enlargement in elderly male.
- On examination, there is suprapubic swelling arising out of pelvis in the midline in the hypogastric region that is dull to percussion and cystic in nature. This helps to differentiate from anuria where urinary bladder is not palpable.
- Rectal examination will help to confirm the prostatic pathology in elderly patients.
- Spinal defects or neurological findings suggest presence of neurogenic bladder.

**Treatment**

1. General measures include sedation, adequate hydration and antibiotics if sepsis is present.
2. If there is history of trauma, urethral injury should be ruled out before attempting catheterization.
3. If urethra is patent, a catheter is passed in to the bladder under strict aseptic precautions and is connected to a sterile closed collecting system. The catheter
is chosen according to the size of the external meatus. In cases of acute retention, single catheterization is adequate or an indwelling self-retaining catheter is inserted if deemed necessary.

4. If urethral pathology is present or there is inability to pass the catheter, a suprapubic puncture or cystostomy is performed to relieve the retention.

5. In case of chronic retention, decompression should be performed intermittently (300-400 ml volume) to avoid haematuria that can occur after sudden decompression.

6. The patient should be kept under observation after admission for investigation to elucidate the cause of retention. The investigations include urine examination, renal functions, plain and contrast radiological studies; ultrasound, CT scan or MRI. Urodynamical studies are required to diagnose neurogenic bladder. Cystoscopy can help to diagnose and treat many conditions of the urethra and urinary bladder.

7. Definitive treatment of the aetiology is done after proper investigations.

Pharmacological
1. Tab. Cotrimoxazole (960 mg) 2 times a day
   Or
   Tab. Norfloxacin 400 mg 2 times a day for 5-7 days. This may be changed according to urine culture and sensitivity reports.

Patient education
- Explain catheter care-measures - tip of the urethra should be cleaned with antiseptic solution regularly.
- Watch for blood in urine.

Reference

INGUINAL HERNIA

Hernia occurs due to raised intra-abdominal pressure due to various causes or weakness of the body wall due to any disease. A hernia consists of the sac, the coverings and the contents of the sac that could be omentum, intestine, circumference of intestine, ovary or Meckel's diverticulum. Most common type of the external hernia is the inguinal hernia, less common being femoral and umbilical. Therefore, management of inguinal hernia is discussed.

SALIENT FEATURES
- Pain and swelling in the groin. The swelling increases as the duration of hernia increases.
- Complications of hernia include irreducibility, incarceration and obstruction, strangulation and inflammation due to inflammation of the contents.
Treatment

Surgical treatment
The treatment of choice for hernia is surgical repair. The surgery is advocated as soon as the diagnosis is made since the complications are common. Even in children, hernia repair is done at the earliest after diagnosis. Any predisposing factors need to be treated first before hernia repair else recurrence is possible. The hernia with complications needs to be operated in emergency.

Treatment in children entails herniotomy while in adults repair of the posterior wall of the inguinal canal without (herniorrhaphy) or with prosthesis (hernioplasty) after high ligation and division of the sac is done. This can be done by open repair or laparoscopic repair by the experts. Day care surgery under local anaesthesia is practiced at many centers.

Complications of herniorrhaphy include infection, haematoma formation, injury to viscera like urinary bladder, injury to vas and recurrence.

Nonsurgical treatment
This is not advocated for the treatment of hernia except in the extremely frail patients unfit for surgery or where surgery is refused by the patient. Application of external pressure causes trauma to skin and may cause injury to the contents.

Patient education
Reduce weight and quit smoking before surgery.
Treatment of any predisposing factors like chronic cough, prostatic enlargement and constipation is necessary.
The surgery should not be delayed since complications of hernia are frequent and can be serious.
After surgery, avoid lifting heavy weights, cycling etc. for three months.

Reference

SCROTAL SWELLINGS
Scrotal swellings can be either congenital or acquired. The acquired scrotal swellings could be further classified as inflammatory, traumatic or malignant. Important diagnoses include hydrocoele, epididymo-orchitis, torsion of testis and tumours.

A. Hydrocoele
This is a collection of fluid in some part of processus vaginalis usually tunica. It can occur in children and adults. Hydrocoele could be primary or secondary to testicular diseases like inflammation, infections or malignancy. It can be unilateral or bilateral.

SALIENT FEATURES
- Cystic swelling usually translucent, it is possible to reach above the swelling and it is not possible to feel the testis distinct from the swelling. Although there is history of reduction of size in children, it is not reducible.
• Complications include rupture, haematocoele formation, infection (pyocoele), calcification and testicular atrophy and herniation through the dartos muscle in long standing cases.

Treatment

In infants, it is advised to wait till the age of two years to allow spontaneous resolution. Beyond the age of two years, the surgical treatment entails herniotomy by the inguinal approach.

In adults, definitive treatment requires drainage of the fluid along with eversion of the sac with or without excision of the same. This can be done under local or regional anaesthesia.

B. Epididymo-Orchitis

Epididymo-orchitis is inflammation of the epididymis and the testis due to various causes. It can be acute or chronic. Infection reaches the epididymis via the vas deferens from the lower urinary tract. A history of urinary tract infection is usually available. The condition has to be differentiated from torsion of testis (as given below).

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The epididymis and the testis show swelling with shiny oedematous skin and tenderness. It may be possible to feel the epididymis and testis separately. The pain is relieved by rest and elevation of testis.</td>
</tr>
<tr>
<td>• Urine examination shows pus cells. Complications include secondary hydrocoele with clear fluid, abscess formation and pus discharge from sinus formation.</td>
</tr>
</tbody>
</table>

Treatment

Bed rest and scrotal support.

Pharmacological

1. Cap. Doxycycline 100 mg once daily for 8-10 days. It may be changed according to urine culture and sensitivity.
2. Analgesic and antipyretics may be required.

C. Torsion of Testis

Torsion of testis is most common between ages of 10-25 years though it may occur at any age.

<table>
<thead>
<tr>
<th>SALIENT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• There is sudden onset of pain in the affected testis and lower abdomen.</td>
</tr>
<tr>
<td>• The testis is tender; lies higher as compared to its counterpart; the opposite testis lies horizontally; it isn't possible to palpate testis and epididymis</td>
</tr>
</tbody>
</table>
separately; pain increases on elevation of testis and secondary haemorrhagic hydrocele.

- Ultrasound examination and colour Doppler examination demonstrate torsion of testis and resultant obstruction of the blood supply.

**Treatment (Immediately refer to a higher centre)**

Treatment of torsion of testis requires immediate correction by surgical exploration through scrotal incision, untwisting of the cord and orchiopexy.

It is important to fix the opposite testis at the same time. It is of paramount importance NOT to delay the exploration even if diagnosis is doubtful or for the want of special investigations. Any undue delay can lead to gangrene of the testis.

**Patient education**

Any scrotal swelling should be brought to notice of your doctor. Any sudden onset swelling of the testis merits immediate attention of the surgeon and delay in diagnosis or treatment even for few hours can be harmful.

**Reference**


**FISSURE-IN-ANO**

An anal fissure is an elongated ulcer in relation to anal canal. It most commonly occurs in the midline posteriorly. Most cases are idiopathic and may be due to trauma and ischaemia. Specific causes of fissure are incorrect operation for haemorrhoids, inflammatory bowel disease and sexually transmitted diseases. These can be acute and chronic.

**SALIENT FEATURES**

- The severe pain on defaecation that promotes constipation.
- Bleeding is usually small and occurs as a streak by the side of stools.
- A foul smelling discharge is present in chronic cases.
- On examination, a longitudinal ulcer is seen in the midline posteriorly that may be covered by a skin tag. There is local inflammation and induration.

**Treatment**

The aim of the treatment is to obtain complete relaxation of the sphincter and provide relief from pain.

*Nonpharmacological*

- Sitz bath- sitting in a tub containing luke warm water with potassium permanganate to provide relief from spasm and pain.
- Local hygiene.
High fiber diet to prevent constipation.

**Nonsurgical**

- 2% Glycerine trinitrate as an ointment for local application.
- Manual dilatation of the anal sphincters-Lord's procedure.

**Surgical**

- Lateral anal sphincterotomy.
- Dorsal fissurectomy and sphincterotomy.

Complication of surgical treatment could include mild incontinence and prolonged healing time.

**Patient education**

- Local care of the region and Sitz bath should be regularly taken.
- Avoid constipation by the use of high fiber diet and use of purgatives.

### FISTULA-IN-ANO

Fistula-in-ano is a tract lined by granulation that connects superficially the skin around the anus and deeply the anal canal or the rectum. Low level fistula opens into the anal canal below the anorectal ring. The high level fistula opens into the canal at or above the anorectal ring. It is important to know the level of fistula since a low level fistula can be laid open without fear of incontinence.

#### SALIENT FEATURES

- Persistent seropurulent discharge that may be blood stained.
- Pain and sometimes a history of a perianal abscess that has been drained.
- Fistula-in-ano may be associated with tuberculosis, Crohn's disease, carcinoma, bilharziasis.
- There is usually an opening within 3-4 cm of the anal orifice with granulation tissue. The fistula heals only to recur later on. Digital examination may reveal the internal opening.

### Treatment

**Nonpharmacological**

- Local hygiene and Sitz bath. Diet modification to avoid constipation.

**Pharmacological**

1. Cap. Ampicillin 500 mg every 6 hours.
2. Tab. Metronidazole 400 mg every 8 hours.
3. Bulk laxative to relieve and avoid constipation.

Definitive treatment is fistulotomy (laying open of the fistula tract), fistulectomy (excision of the fistula tract) and use of Seton. Secondary fistula needs treatment of primary disease. High level fistula may need proximal colostomy for treatment.
**Patient education**

- Do not take treatment for anal disorders like abscess and fistula from unqualified persons.
- Avoid constipation and take bulk laxatives.
- Maintain local hygiene.

**Reference**


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**HAEMORRHOIDS**

Haemorrhoids (commonly called piles) are the dilated tortuous veins occurring in relation to the anus. These can be primary or secondary to some other disease like carcinoma of rectum, pregnancy, straining at micturition, or constipation due to any cause. These can be classified into external, internal or mixed (externo-internal) depending on their position in relation to anal orifice.

**SALIENT FEATURES**

| • Many small sized haemorrhoids are asymptomatic. They present with bright red painless bleeding that can be mild or severe. |
| • Mucous discharge, prolapse of piles and occasionally pain can also occur, if associated with proctitis |
| • Chronic cases develop anaemia due to continuous blood loss. |
| • On the basis of clinical features, haemorrhoids can be graded: |
  |  - First degree—bleed only, do not prolapsed |
  |  - Second degree—bleeding occurs, descend down on straining but reduce spontaneously |
  |  - Third degree—piles prolapse during defaecation, but stay prolapsed and have to reposed manually |
  |  - Fourth degree—piles are large and remain permanently prolapsed |
| • On examination, there is no external evidence of haemorrhoids in early cases. |
| • In advanced cases, haemorrhoids can be seen on straining or are constantly prolapsed. |
| • Complications of haemorrhoids include strangulation, thrombosis, ulceration, gangrene, fibrosis, suppuration and pylophlebitis. |

**Treatment**

Asymptomatic haemorrhoids do not need any treatment. Secondary haemorrhoids due to concomitant disease also tend to resolve once the underlying disease is cured.

**In asymptomatic or mild degree haemorrhoids**

Bowel regulation by the use of laxatives, use of high fiber diet, Sitz bath and application of topical ointment containing Xylocaine (2%) to relieve pain, if any.
**In case bleeding persists despite these measures, second and early third degree piles**

Injection treatment using 5% phenol in almond oil (3-5 ml for each pile)/rubber band ligation/photocoagulation/cryosurgery/infrared or laser coagulation.

**Late third and fourth degree piles**

Haemorrhoidectomy or excision of the piles. The complications of surgery include pain, acute retention of urine, reactive bleeding and later on secondary haemorrhage and anal stricture.

**Patient education**

Avoid constipation and use laxative, if required.

Use high fiber diet that produces high roughage.

Sitz bath to reduce pain and spasm.

Haemorrhoids that prolapse should be reposed gently and not forced back.

Take treatment for any disease that promotes straining at micturition like benign hypertrophy of prostate.

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**Reference**


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**PAEDIATRIC SURGICAL CONDITIONS**

**Spina Bifida**

Spina bifida is a congenital malformation in which there is incomplete closure of the spinal arch at one or more levels. The disorder can be diagnosed in the antenatal period with ultrasound and a decision regarding continuation of pregnancy can be taken in consultation with paediatric surgeon, obstetrician, neurosurgeon and other specialties.

**SALIENT FEATURES**

- Spina bifida occulta—defect is seen only on the radiographs. Some sort of cutaneous manifestation may point towards the underlying defect.
- Spina bifida aperta—meningocoele, meningomyelocele and syringomyelocele. This category requires immediate decision about the course of treatment after parent counseling.
- The lesions have varying degree of associated neurological defect, musculoskeletal defects. Almost 90% cases have associated hydrocephalus.

**Treatment**

If the lesion is detected on antenatal ultrasound, parent counselling should be done after investigations for other associated congenital malformations. If the parents opt for continuation of pregnancy, they should be referred to a center where facilities of paediatric surgeon or neurosurgeon are available. If a newborn baby is seen with a defect on the back, baby should be taken
for immediate surgery after relevant investigation at a center where expert surgical expertise and operating facilities for neonatal surgery are available.

At the peripheral center management would include:
- Isolation of the newborn and prevention of hypothermia.
- Care of the lesion and back to prevent desiccation and trauma.
- Nursing in a prone position.
- Intravenous fluids - 10% Dextrose 60 ml/kg/day for the first 48 hours of life.
- Inj. Ampicillin (500 mg/vial) 100 mg/kg in 4 divided doses.
- Transfer the baby to a tertiary care center.

Parent education

If diagnosed in antenatal period, parents are counselled and investigated for severity of lesion and possible outcome.

Abortion may be advised if associated anomalies are noted in the foetus.

Reference

UNDESCENDED TESTIS

Undescended testis is defined as the testis, which cannot be brought to the base of the scrotum without undue tension on the spermatic cord. This anomaly is often diagnosed early but the treatment is delayed due to misconceptions leading to various complications.

**SALIENT FEATURES**
- The testis can be located in the superficial inguinal pouch, inguinal canal or intra-abdominal site. Truly ectopic testis can be present in perineum, femoral region, pubopenile site or contralateral hemiscrotum.
- Differentiate from retractile testis which is occasionally pulled up due to reflex contraction of cremasteric muscle. The retractile testis is normal in size, can be brought down into scrotum where it stays for some time and the scrotum is normally developed.
- Complications of undescended testis include temperature effects on testis, endocrine effects, germ cell alteration, lower fertility, higher incidence of malignancy, increased incidence of torsion, increased chances of trauma and psychological trauma.

Treatment
1. If the newborn child is seen with unilateral undescended testis, follow up the patient at intervals to see the descent. If testis fails to descend by the age of 12 months, orchiopexy is advised. If seen after first birthday the operation of orchiopexy should be done before the age of two years. The operation entails mobilizing the testis and cord structures and fixing it in
the subdartos pouch in the scrotum with absorbable sutures.

2. If the newborn child has bilateral undescended testes with hypospadias, it should be investigated for intersex disorder.

3. If a child has undescended testis with clinically visible hernia, orchiopexy can be done at an earlier age along with herniotomy.

**Patient education**

The parents should be informed about the anomaly if detected at birth and advised to monitor the descent of testis and to get it operated by the age of 1 year.

**Reference**


**ANORECTAL MALFORMATIONS**

These are characterized by the absence of the anal opening or an abnormally located anal or rectal opening. These are evident at birth and need urgent attention on behalf of the attending physician. These can be associated with other congenital malformations like cardiac anomalies, gastrointestinal anomalies, vertebral anomalies, genitourinary system anomalies and limb anomalies.

**Treatment**

Isolate the baby,
Maintain temperature,
Insert nasogastric tube to rule out oesophageal atresia and decompress stomach,
Reassure and counsel parents,
Explain prognosis.

**Pharmacological**

It is required in all the cases that are to be undertaken for surgery in the form of definitive procedure or preliminary colostomy.

1. Intravenous fluids 10% Dextrose 60 ml/kg per day (first 48 hours) and Isolyte P 100 ml/kg body weight thereafter till required.
2. Inj. Vitamin K 1 mg 1Mstat
3. Inj. Ampicillin 50-100 mg/kg in 4 divided doses for 7 days.
4. Inj. Metronidazole 7.5 mg/kg per day in 3 divided doses for 3 days.

**Surgical treatment**

Best carried out by a qualified paediatric surgeon.

Figure 18.2 and 18.3 depict examination and management of anorectal anomalies in male and female newborns. Transfer newborns to such centers for performing the definitive surgery. However, colostomy can be performed at places where expertise for doing definitive procedure is not available.

Anovestibular fistula can be managed by cut back procedure at a peripheral center as initial procedure. Anal stenosis can be managed by anal dilatation.

If unsure, it is safe to perform a sigmoid colostomy before referring the patient to a tertiary care center.

**Parent education**

Reassure the parents and explain the nature of anomaly and also explain that the child would require multiple surgical procedures to correct the malformation.
Teach the parents the care of the colostomy - not leaving it open, cleaning around it with soft cotton cloth soaked in water, not rubbing over the colostomy to prevent bleeding, management of prolapsed colostomy and follow-up schedule.

**Fig. 18.2.** Examination and management of anorectal anomalies in male.
Newborn with anorectal malformation

Observation 16-24 hours
Abdominal ultrasound

Perineal inspection

Fistula (90-95% of patients)

No fistula (5% of cases)

Single opening
Cloaca

Vestibular
(or vaginal)

Perineal
(Cutaneous)

Cross table lateral film with
patient in prone position

Emergency
GU
Evaluation

Colostomy
and if needed
vaginostomy
urinary
diversion

Colostomy

< 1 cm bowel
skin distance
(usual)

4-8 weeks-rule out
associated
malformations verify
normal growth

1 cm bowel
skin distance

Colostomy

4-8 weeks-rule out
associated
malformations

PSARVUP—posterior sagittal non-recto-vaginourethroplasty; PSAR—posterior anoplasty; PSARP—posterior sagittal anorectoplasty.

Fig. 18.3. Examination and management of anorectal malformations in female.
CARCINOMA BREAST

Breast cancers are potentially life-threatening malignancies that develop in one or both breasts. Breast cancer is either noninvasive or invasive.

**SALIENT FEATURES**

- Breast cancers in their early stages usually are painless or could present as a hard lump, the affected breast appear elevated or asymmetric, the nipple may be retracted or scaly, or breast is dimpled like the skin of an orange, bloody or clear discharge from the nipple. Many cancers, however, produce no symptoms and cannot be felt on examination; they can be detected only with the use of a mammogram.

- The causes of breast cancer are not yet completely understood but certain women do seem to be at a higher risk of developing the disease - women over the age of 65, inherited faulty gene (BRCA1 and BRCA2).

- The following factors might indicate the possible presence of an inherited faulty gene within a family: breast cancer in several close members of the same family; other cancers, especially cancer of the ovary and colon; women who either have no children or had children late in life, and women whose periods started at a very young or menopause occurred late; hormone replacement therapy (HRT) slightly increases the risk of developing breast cancer. Women taking combinations of oestrogen and progesterone seem to have a greater increase in risk than women taking oestrogen alone.

**Screening**

1. **Breast examination**
   
   Early detection of breast cancer significantly reduces the risk of death. Every woman between the ages of 20 and 49 should have a physical examination by a health professional every one to two years. Those over 50 should be examined annually.

2. **Monthly self-examination**
   
   1. Pick a time of the month that is easy to remember and perform self-examination at that time each month. The breast has normal patterns of thickness and lumpiness that change within a monthly period, and a consistently scheduled examination will help differentiate between what is normal from abnormal.
   
   2. Stand in front of a mirror. Breasts should be basically the same size (one may be slightly larger than the other). Check for changes or redness in the nipple area. Look for changes in the appearance of the skin. With hands on the hips, push the pelvis forward and pull the shoulders back and observe the breasts for irregularities. Repeat the observation with hands behind the head. Move each arm and shoulder forward.
   
   3. Lie down on the back with a rolled towel under one shoulder. Apply lotion or bath oil over the breast area. The finger action should be as follows:
Use the 2nd, 3rd, and 4th finger pads (not tips) held together and make dime-sized circles. Press lightly first to feel the breast area, and then press harder using a circular motion.

Using this motion, start from the collar bone and move downward to underneath the breast. Shift the fingers slightly over, slightly overlapping the previously checked region, and work upward back to the collar bone. Repeat this up-and-down examination until the entire breast area has been examined. Be sure to cover the entire area from the collar bone to the bottom of the breast area and from the middle of the chest to the armpits. Move the towel under the other shoulder and repeat the procedure.

4. Examine the nipple area, by gently lifting and squeezing it and checking for discharge.

5. Repeat step 3 in an upright position. (The shower is the best place for this, using plenty of soap.)

Note: A lump can be any size or shape and can move around or remain fixed. Of special concern are specific or unusual lumps that appear to be different from the normal varying thicknesses in the breast.

2. Mammography screening

Women with risk factors for breast cancer, including a close family member with the disease, should consider having annual mammograms starting 10 years earlier than the age at which the relative was diagnosed.

Women over 40 years old with no special risk factors to have a baseline mammogram at age 40 and then be tested every one to two years until age 50.

After age 50 screening should be annual (women over 65 account for most new cases of breast cancer).

3. Biopsy

A definitive diagnosis of breast cancer made only by an excisional biopsy under general anaesthesia.

Treatment

The three major treatments of breast cancer are surgery, radiation, and combination drug therapy. No one treatment fits every patient, and some combination therapy is virtually always required. The choice is determined by many factors, including the age of the patient and (among women) menopausal status, the kind of cancer (e.g., ductal vs. lobular), its stage, and whether the tumor contains hormone-receptors or not.

Stage 0

This stage is also called noninvasive carcinoma or carcinoma in situ.

Lobular carcinoma in situ. (1) Careful monitoring with or without preventive use of tamoxifen or other selective oestrogen-receptor modulators (SERMs). (2) In selected cases, consideration of removal of both breasts, since if the cancer does develop, it tends to do so in both breasts or to be invasive.
Ductal carcinoma in situ. Use of tamoxifen or other SERMs after surgery and radiation to prevent recurrence in selected patients.

**Stage I and Stage II**

Stage I. Cancer cells have not spread beyond the breast and the tumor is no more than 2 cm (about 3/4 of an inch) across.

Stage II. One of the following conditions apply: the tumor is less than 2 cm across (lumpectomy followed by radiation), and the cancer has spread to the lymph nodes under the arm; the tumor is between 2 and 5 cm (about 3/4 inch to 2 inches) with or without spreading to the lymph nodes under the arm (lumpectomy followed by radiation); the tumor is larger than 5 cm but has not spread to the lymph nodes under the arm (mastectomy).

**Primary treatment options for Stage I and II breast cancers**

- Choice of (1) Breast-sparing surgery (typically lumpectomy, usually with lymph node sampling) followed by external beam radiation therapy, or (2) modified or radical mastectomy with or without breast reconstruction, (3) Removal or radiation of lymph nodes.

- Adjuvant and neoadjuvant treatment options. Adjuvant therapy is administered in addition to surgery or radiation therapy to prevent recurrence. (1) Combination chemotherapy can be considered for hormone receptor-negative cancers. (2) Hormonal therapy with or without chemotherapy for hormone receptor-positive cancers. Tamoxifen is the standard agent and is administered for about five years. Aromatase inhibitors (letrozole, anastrozole, and exemestane) are proving to be at least as effective as tamoxifen, although the results of these agents in the adjuvant setting are still preliminary.

**Stage III (locally advanced)**

In this stage, the tumor in the breast is more than 5 cm across, and it has spread (sometimes extensively) to the underarm lymph nodes, or it has spread to other lymph nodes or tissues near the breast. Inflammatory breast cancer is also treated as a Stage III cancer.

**Treatment options for Stage III**

- (1) Standard therapy is mastectomy usually with radiation therapy and systemic treatment (combination chemotherapy, hormonal therapy, or both). (2) Radiation after surgery is recommended for women with four or more involved lymph nodes or an extensive primary tumor. It is not yet clear if radiation would benefit women with one to three involved lymph nodes.

**Stage IV (metastasized cancer)**

In stage IV the cancer has spread from the breast to other parts of the body. In about 75% of cases, the cancer has spread to the bone. The cancer at this stage is considered to be chronic and incurable and the usefulness of treatments available is limited. The goals of treatment for Stage IV can be a complete or partial response, stabilization of the disease, or slowing of its progression. Unlike many other cancers,
stage IV breast cancer patients have responded to as many as five rounds of intervention drug treatments.

Treatment options for Stage IV

(1) Surgery or radiation for any localized tumors in the breast. (2) Chemotherapy, hormonal agents, or both are appropriate for most patients (durable and complete remission possible in 10% to 20% of cases but cure is very rare). Chemotherapy in patients with hormone receptor-negative disease or who have extensive metastasis which requires rapid tumor shrinkage. Ovarian ablation (in premenopausal women) or other hormonal therapies in patients with hormone receptor-positive cancer and no or minimal organ involvement (Aromatase inhibitors, taxanes, and other agents used in combination or in innovative schedules are improving results). (3) Metastasis to the brain may require radiation and high-dose steroids. (4) Metastasis to the bone (which occurs in 75% of cases) may be helped with radiation and bisphosphonates (clodronate and pamidronate) by reducing pain and preventing fractures. Such treatments relieve pain and help prevent bone fractures.

Recurrent breast cancer

Recurrent breast cancer is considered to be an advanced cancer. Most recurrences appear within the first two or three years after treatment, but breast cancer can recur many years later. Treatment options are based on the stage at which the cancer reappears, whether the tumor is hormone responsive or not, and the age of the patient. Of 10% to 20% of recurring cancers are local; most are metastatic at presentation. All patients with recurring cancer are candidates for clinical trials.

Psychological support at any stage. Studies have suggested that psychotherapy, group support, or both can relieve pain and reduce stress. There is no evidence that facing the realities of the condition causes any physical deterioration.

Radiation

Radiation is generally in the following ways:

External Beam Radiation. It is usually administered four to six weeks after surgery and delivered externally by an X-ray machine that targets radiation to the whole breast. It may be delivered to the chest wall in high-risk patients (e.g. large tumors, close surgical margins, or lymph node involvement). The treatment is generally given daily for about six weeks. A follow-up boost of radiation therapy in patients with lumpectomies appears to reduce the risk for recurrence.

Brachytherapy (radiation delivered in implants). Implants are most often used as a radiation boost rather than as primary radiation therapy. Nevertheless, some evidence suggests that implants alone can reduce treatment time and may be as effective as external beam radiation in early stage breast cancer.

Patient education

All breast surgery, however, will leave some type of scar, and the appearance
of the breast afterwards depends on the technique used.
Side effects of radiation include: fatigue, nausea and lack of appetite, skin changes and burns can occur on the breast skin. After repeated sessions, the skin may become moist and "weepy." Exposing the treated skin to air as much as possible helps healing.
Chemotherapy is given as a course of treatment, which may last for less than one day or for a few days. This is followed by a rest period of a few weeks. The number of courses depends on the type of cancer and how well it is responding to the drugs.
Chemotherapy can sometimes cause unpleasant side effects, but for women whose cancer has spread it can also make them feel better by relieving the symptoms of the cancer. The main side effects are: lowered resistance to infections, anaemia, feelings of sickness, nausea, vomiting, sore mouth, hair loss (if patient loses hair, it will grow back over a period of 3-6 months). Adjuvant chemotherapy is given in addition to surgery to reduce the chances of a cancer coming back. It works by killing off any tiny traces of cancer that might have been left behind after an operation and that were too small to be seen or to be picked up on scans or other tests.

Reference
ESSENTIAL NEWBORN CARE

SALIENT FEATURES

The components of essential newborn care include

- Establishment of breathing at birth and neonatal resuscitation.
- Prevention of hypothermia.
- Prevention of infection.
- Early and exclusive breast feeding.
- Early identification and appropriate referral of high-risk newborns.

Treatment

1. Establishment of breathing at birth

90% of newborns cry immediately at birth and therefore need no assistance to establish breathing.

2. Hypothermia

(a) Identification of hypothermia. An axillary (or rectal) temperature <36.0°C is hypothermia. Such a baby would feel cold to touch on the abdomen and periphery.

(b) Identification of cold stress: Baby’s peripheries are cold but abdomen is warm. This usually corresponds to axillary temperature of 36-36.4°C.

(c) Prevention of hypothermia.

(i) Dry the baby with warm dry linen at birth. Discard wet linen and wrap in dry linen.

(ii) Place baby after birth under a radiant warmer or 200 Watt bulb (placed at a distance of 45 ern above the baby). If neither is available, place the newborn infant on the mother’s chest and wrap baby and mother together to prevent heat loss from the exposed skin surfaces of the baby.

(iii) Ensure that there are no open windows or fans turning in the delivery area where baby is being delivered or being observed.

   Place under radiant warmer
   Dry thoroughly
   Remove wet linen

   Suction mouth and then nose with mucous sucker

   Provide tactile stimulus and check for breathing effort. Check breathing and heart rate after 30 seconds. No breathing, heart rate <60 beats per minute (bpm) continue positive pressure ventilation (Ppv); Start chest compression and continue ppv; if Heart rate <60 bpm then give adrenaline 0.1-0.3 ml/kg of 1:10,000 solution preferably by IV route, if not available give intratracheally 0.5-1 ml of 1:10000 solution. (Fig. 19.1).
Flow Diagram for Basic Neonatal Resuscitation

**BIRTH**
- **No Meconium**
  - Dry the baby
- **Meconium present**
  - Suction the mouth, then the nose (If baby is not crying)
  - Dry the baby

**ASSESS BREATHING**
- Breathing well or crying: Routine Care
- Not breathing well: Initial Steps
  1. Cut the cord
  2. Place on firm, flat surface
  3. Provide warmth
  4. Position baby with neck slight extended
  5. Suction the mouth, then nose
  6. Stimulate, reposition

**ASSESS BREATHING**
- Breathing well: Observational Care
- Not breathing well: Provide bag and mask ventilation for 30 sec
  - Ensure chestrise

**ASSESS BREATHING**
- Breathing well: ASSESS HEART RATE
- Not breathing well
  1. Call for help
  2. Continue bag and mask ventilation
  3. Add oxygen, if available

**ASSESS HEART RATE**
- Heart rate 100 or more: Continue ventilation
- Heart rate <100
  1. Continue ventilation with oxygen
  2. Provide advanced care (Chest compression, medication, intubation)
  3. Organize referral

**ASSESS BREATHING**
- Not breathing well: Post Resuscitation Care

Fig. 19.1. Algorithm for neonatal resuscitation.
(iv) Delay bathing of newborn for the first few days; this will prevent hypothermia. However, baby may be wiped with warm clean water to remove dried blood, vernix or secretions. Care must be taken to ensure that the room is warm and draught free when the baby is being cleaned or bathed. The baby should immediately be wrapped in dry linen after being wiped dry.

(v) After birth and for the first few days thereafter keep mother and baby in close proximity with baby being adequately clothed. In cold weather, the baby must have 2 layers of cotton vest with a woolen sweater, cap, socks and legs should be covered and baby should be wrapped in a blanket. In summer, cotton dress with a cotton diaper wrapped in a cotton cloth.

3. Prevention of infection
   (a) Always clean hands with soap and water and wear sterile gloves if available before conducting the birth of the baby and while examining babies during the first few days of life.
   (b) A sterilized blade (if that is not available a new razor blade) must be used for cutting the cord at delivery.
   (c) The cord tie used must be sterile or boiled for 20 minutes before used for tying the cord after birth.
   (d) The surface for conducting delivery and placing the baby after birth must be clean.
   (e) Do not apply anything to the cord or eyes after birth.
   (f) Do not give prelacteal feeds.
   (g) Give exclusive breast-feeding from birth.

4. Exclusive breastfeeding
   Advise mothers to
   (a) Start breast feeding within one hour of birth.
   (b) Not to give any prelacteal feeds such as honey, water, etc.
   (c) Give breast feeds to baby on demand.
   (d) Give the baby exclusive breast feeding for at least first 6 months of life. However, there may be situations where it may not be possible to provide human milk i.e., maternal death, severe maternal illness, HIV positive mothers and documented lactational inadequacy.
   (e) Not to give water to the baby during period of exclusive breast feeding.

5. Early identification of high-risk newborns

   Babies born to mothers with eclampsia, antepartum haemorrhage, diabetes etc. are considered as high-risk newborns and delivery should be conducted at a centre where all facilities for the care of the newborn are available. The following examination at birth or during the first few days would help detect high risk babies who are in need of immediate referral to an appropriate health facility which has adequate newborn care.

   (a) Weigh baby. Babies with birth weights < 2000 g are at increased risk of morbidity and mortality and need careful assessment by a physician trained in child health.
   (b) Examine for major malformations. Most major and life threatening malformations such as neural tube defects, oesophageal and anal atresias,
diaphragmatic hernia, etc. can be detected at birth by careful examination. Some important clues to an underlying malformation are non-passage of meconium at 24 h of age or non-passage of urine at 48 h after birth.

(c) Sucking, activity and cry. Newborn infants who have poor sucking, are less active than normal and have a weak cry are very ill and need immediate referral.

(d) Respiratory distress. Babies who have a respiratory rate of >60 bpm (counted for at least 1 minute and persisting on repeat count) or have severe subcostal retractions have respiratory distress and need immediate referral.

(e) Identification of severe jaundice. Yellow staining of the skin within 24 h of age or when yellow staining of the skin includes the palms and soles at any age, this is severe jaundice and needs immediate referral.

6. Immunization

All newborns delivered at a health facility should be given BCG and one dose of oral polio vaccine within 24 hours of birth (for details see section on immunization).

LOW BIRTH WEIGHT BABIES

SALIENT FEATURES

- Low birth weight (LBW) baby is the one who weighs less than 2500 g at birth.
- Low birth weight may result from either prematurity (gestational age <37 weeks) or intrauterine growth retardation (IUGR), which is also called small-for-date baby.

Treatment

Indications for hospitalization are:

Birth weight of less than 1800 g; Gestation age of less than 34 weeks; Neonate who is not able to take feeds from the breast or by cup (katori) and spoon (irrespective of birth weight and gestation); and a sick neonate (irrespective of birth weight and gestation).

1. Keep the LBW babies warm:

   Room temperature should be kept between 28-30°C. Following methods may be used:

   Maternal-baby skin to skin contact (Kangaroo mother care). Place the naked baby between the mother's breasts. Wrap baby and mother with a shawl. Cover the baby's head with a cap.

   Proper clothing - cap, woolen sweaters, socks and mittens.

   Blankets.
Overhead radiant warmer.
Incubator.

Nutrition-guidelines to provide fluids and nutrients to low birth weight babies are given in Table 19.1.

<table>
<thead>
<tr>
<th>Age</th>
<th>Category of neonates</th>
<th>Birth weight gestation</th>
<th>1200-1800g 30-34 weeks</th>
<th>&gt;1800g &gt;34 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>Intravenous fluids</td>
<td>Gavage (60 ml/kg/day)</td>
<td>Breast feeding if unsatisfactory, give katori/spoon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(80 ml/kg/day) Try gavage feeds if not sick.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After 1-3 days</td>
<td>Gavage (15-30 ml/kg/d), increase by 15-30 ml/kg/day to a maximum of 180 ml/kg/day</td>
<td>Katori/spoon (maximum of 150-180)</td>
<td>Breast</td>
<td></td>
</tr>
<tr>
<td>Later (1-3 weeks)</td>
<td>Katori/spoon (150-180 ml/kg/day)</td>
<td>Breast</td>
<td>Breast</td>
<td></td>
</tr>
<tr>
<td>After some more time (4-6 weeks)</td>
<td>Breast</td>
<td>Breast</td>
<td>Breast</td>
<td></td>
</tr>
</tbody>
</table>

2. Vitamin K 1.0 mg IM at birth. (if <1000gm give 0.5ml Vitamin K)
3. Vitamin D 400 IU orally daily - from 2 week age onwards, once on full feeds continue till 6 months of age.
4. Iron 2-4 mg/kg/day orally daily - from 4 weeks age onwards, till one year of age.
5. Vitamin E, calcium and phosphorus supplementation in very LBW <1500 g, <32 week gestation).

Early detection of sickness by periodic evaluation. Referral to higher centre in the presence of anyone or more of the following signs: Lethargy, refusal to feed, hypothermia, respiratory distress, grunt, apnoea, abnormal weight gain pattern, jaundice over soles and palms, abdominal distension, feed intolerance, cyanosis, pallor, sclerema, seizures and bleeding.

**NEONATAL JAUNDICE**

**SALIENT FEATURES**

- Jaundice is a common physical finding (manifesting as yellowness of the skin of the face when the serum bilirubin level exceeds 5 mg/dl) during first week of life.
- As the degree of jaundice increases, there is a cephalopedal progression of jaundice. Yellow colouration of trunk indicates the serum bilirubin to range
between 10 to 12 mg/dl, whereas staining of palms and soles is ominous as it indicates a serum bilirubin of more than 15 mg/dl.

• More than 90% of all neonatal jaundice is physiological and does not need any specific therapy. It is recognized by its characteristic timetable: jaundice appears between 24 and 72 hours of age, its maximum intensity (peak serum bilirubin always below 15 mg/dl) is seen on the 4th to 5th day of life and usually disappears before 14 days of life.

• About 5% of newborn babies develop pathological jaundice or hyperbilirubinaemia. It should be considered a medical emergency as it may cause bilirubin encephalopathy or kernicterus when unconjugated bilirubin exceeds 20 mg/dl (term baby) or lower levels (preterm babies). Pathological jaundice is recognized by any of these features: jaundice appearing within 24 hours, serum bilirubin levels exceeding 15 mg/dl (term babies) or lower levels (preterm babies) and persistence of jaundice beyond two weeks of age.

• If jaundice persists beyond 2 weeks, the baby should be investigated for cholestatic (obstructive) jaundice.

Treatment

There are two important modalities of treatment:

1. **Phototherapy.** Most preterm babies are placed under phototherapy, when their serum bilirubin approaches 10-12 mg/dl, and term babies are given phototherapy when their serum bilirubin approaches 15 mg/dl. During phototherapy, the naked infant (with eyes and genitalia covered) is kept about 45 cm below the phototherapy unit comprising of blue and white tubes or halogen lamps. Non-breastfed babies should be provided additional fluids at the rate of 20 ml/kg/day. Many babies while undergoing phototherapy may pass greenish-yellow stools which by themselves are not harmful as long as baby is active. Assessment of severity of jaundice by looking at the skin is unreliable. Estimation of serum bilirubin is necessary to monitor response to therapy.

2. Exchange transfusion should be promptly performed, if any of the following exist:

   (i) **In babies with rhesus haemolytic disease of the newborn:**
      a. Cord haemoglobin of 10 g/dl or less.
      b. Cord bilirubin of 5 mg/dl or more.
      c. Unconjugated serum bilirubin of more than 10 mg/dl within 24 hours or rate of rise of more than 0.5 mg/dl/hour.

   (ii) **In babies with jaundice due to other causes:**
      a. Unconjugated serum bilirubin of 20 mg/dl or more in term baby.
      b. In preterm babies, serum bilirubin of more than 1.0 mg/100g weight of the infant (i.e. 10 mg/dl for 1000 g and 15 mg/dl for 1500 g and so on).
      c. In the presence of asphyxia, respiratory distress, sepsis, hypothermia, exchange is performed at about 2 mg/dl lower serum bilirubin level than is otherwise indicated.
MANAGEMENT OF COMMON CLINICAL PROBLEMS IN NEWBORNS

Regurgitation of feeds and vomiting. Unlike vomiting, non-projectile expulsion of stomach contents without force (regurgitation) is normal and simply needs advice regarding feeding technique.

Bowel disorders. No medication should be prescribed for passage of stools after each feed (exaggerated gastrocolic reflex) as this is normal in some babies. From 3rd to 14 days many exclusively breast-fed babies pass loose stools (10-15 times! day) without illness/dehydration. These are transitional stools and require no medication.

Delayed passage of urine. Non-passage of urine by 48 hours after birth may suggest urinary tract anomalies. Such babies need to be investigated. Crying before passing urine is normal.

Jitteriness is abnormal only when it is excessive or persists even during feeding and then it may suggest hypoglycaemia or hypocalcaemia.

Dehydration fever. Transitory moderate fever (up to 38.5°C) usually during the second or third day of life in summer months in an active baby, who sucks well, is normal and responds to lowering the environmental temperature.

Excessive crying. Most baby cry when either they are hungry or are having discomfort such as due to full bladder before passing urine, wet napkin, nose block etc. Excessive inconsolable crying or high-pitched crying is indicative of meningitis or any other painful inflammatory conditions.

Umbilical sepsis. If there is pus discharge not extending to periumbilical skin, apply 10% Gentian violet or Povidone Iodine locally twice a day. However, if there is periumbilical erythema or induration administer syrup erythromycin 40 mg/kg/day in 3-4 divided doses. If the newborn has any other high risk factor, refer to a higher centre.

Umbilical granuloma. A red flesh-like nodule at the base of umbilical cord can be managed by cautery with Silver Nitrate or application of common salt for 3 to 4 days.

Engorgement of breasts in both sexes and vaginal bleeding after 4 days of birth is normal.

Tongue-tie. Rarely requires surgical intervention.

IMMUNIZATION SCHEDULE

There are now a number of vaccines available for childhood immunization. However, there are those which are considered essential for all children because the infections which they protect against are important national causes of childhood morbidity and mortality (Tables 19.2, 19.3 and 19.4).

General comments on vaccines

(a) Simultaneous administration of multiple vaccines. Both killed and live vaccines can be administered simultaneously without decreasing the efficacy of the individual vaccine. However, vaccines be administered at different sites using separate needles for each component.

A gap of 1 month is recommended between 2 live vaccines if not given together.
(b) Injection safety issues. Avoid giving injections if skin is infected or compromised by a local reaction (skin lesion or weeping dermatitis). Prepare skin with a disinfectant. Always use a sterile syringe and needle for each injection and to reconstitute each unit of medication. After use syringes and needles should be disposed off carefully as per guidelines together.

Table 19.2. National immunization schedule (Universal Immunization Programme)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCG</td>
<td>Birth or 6 weeks.</td>
</tr>
<tr>
<td>OPV</td>
<td>Birth, 6, 10, 14 weeks, 15-18 months.</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Birth, 6, 10, 14 weeks</td>
</tr>
<tr>
<td>DPT</td>
<td>6, 10, 14 weeks, 15-18 months.</td>
</tr>
<tr>
<td>Measles</td>
<td>9 months.</td>
</tr>
<tr>
<td>MMR</td>
<td>15-18 months.</td>
</tr>
<tr>
<td>DT</td>
<td>5 years.</td>
</tr>
<tr>
<td>TT</td>
<td>10 and 16 years (if given for first time at this age, give 2 doses at 4 weeks Interval).</td>
</tr>
</tbody>
</table>
### I. IAP recommended vaccines for routine use

<table>
<thead>
<tr>
<th>Age (completedwks/mo/y)</th>
<th>Vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG, OPV 0, Hep-B 1</td>
</tr>
<tr>
<td>6 weeks</td>
<td>DTwP 1, IPV 1, Hep-B 2, Hib 1, Rotavirus 1, PCV 1</td>
</tr>
<tr>
<td>10 weeks</td>
<td>DTwP 2, IPV 2, Hib 2, Rotavirus 2, PCV 2</td>
</tr>
<tr>
<td>14 weeks</td>
<td>DTwP 3, IPV 3, Hib 3, Rotavirus 3, PCV 3</td>
</tr>
<tr>
<td>6 months</td>
<td>OPV 1, Hep-B 3</td>
</tr>
<tr>
<td>9 months</td>
<td>OPV 2, MMR-1</td>
</tr>
<tr>
<td>9-12 months</td>
<td>Typhoid, Conjugate Vaccine</td>
</tr>
<tr>
<td>12 months</td>
<td>Hep-A 1</td>
</tr>
<tr>
<td>15 months</td>
<td>MMR 2, Varicella 1, PCV booster</td>
</tr>
<tr>
<td>16 to 18 months</td>
<td>DTwP B1/DTaP B1, IPV B1, Hib B1</td>
</tr>
<tr>
<td>18 months</td>
<td>Hep-A 2</td>
</tr>
<tr>
<td>2 years</td>
<td>Typhoid booster</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>DTwP B2/DTaP B2, OPV 3 Varicella 2, Typhoid booster</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>Tdap/Td, HPV</td>
</tr>
</tbody>
</table>

### II. IAP recommended vaccines for High-risk* children (Vaccines under special circumstances)

1. Influenza Vaccine
2. Meningococcal Vaccine
3. Japanese Encephalitis Vaccine
4. Cholera Vaccine
5. Rabies Vaccine
6. Yellow Fever Vaccine
7. Pneumococcal Polysaccharide vaccine (PPSV 23)

*High-risk category of children: Congenital or acquired immunodeficiency (including HIV infection); Chronic cardiac, pulmonary (including asthma if treated with prolonged high-dose oral corticosteroids), hematologic, renal (including nephrotic syndrome) and liver disease; Children on long term steroids, salicylates, immunosuppressive or radiation therapy; Diabetes mellitus, Cerebrospinal fluid leak, Cochlear implant, Malignancies; Children with functional/anatomic asplenia/hyposplenia; During disease outbreaks; Laboratory personnel and healthcare workers; Travelers; Children having pets in home; Children perceived with higher threat of being bitten by dogs such as hostellers, risk of stray dog menace while going outdoor.
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Diluent</th>
<th>Schedule</th>
<th>Dose, route &amp; site</th>
<th>Contraindication</th>
<th>Adverse effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCG (freeze-dried)</td>
<td>Normal Saline</td>
<td>Single dose at birth or at first encounter</td>
<td>0.1ml intradermal left deltoid</td>
<td>Immuno-deficiency</td>
<td>Axillary lymphnode adenitis</td>
</tr>
<tr>
<td>DPTwcv(whole cell vaccine)</td>
<td>None(liquid form)</td>
<td>3 primary doses at 6, 10, 14 weeks; booster at 18 month and 5 years</td>
<td>0.5ml IM anterolateral aspect of thigh</td>
<td>Progressive neurological disease, Severe reaction to first dose</td>
<td>Fever, local pain &amp; induration, incessant crying, rarely encephalopathy VAPP rarely</td>
</tr>
<tr>
<td>DPT(acellular vaccine)</td>
<td>None(liquid form)</td>
<td>2 drops orally</td>
<td></td>
<td>Immunodeficiency</td>
<td></td>
</tr>
<tr>
<td>OPV</td>
<td>None (liquid form)</td>
<td>3 primary doses at 6, 10, 14 weeks; booster at 18 month and 5 years</td>
<td>0.5 ml IM anterolateral aspect of thigh</td>
<td>None</td>
<td>Local pain, erythema</td>
</tr>
<tr>
<td>Hepatitis B10 mcg of purified HBsAg</td>
<td>None (liquid form)</td>
<td>Birth, 6, 14 wks; or 6, 10, 14 wks or 0, 1, 6 month</td>
<td>0.5 ml IM anterolateral aspect of thigh</td>
<td>None</td>
<td>Local pain, erythema</td>
</tr>
<tr>
<td>H. infu B10 mcg of capsular</td>
<td>None (liquid form)</td>
<td>3 primary doses at 6, 10, 14 weeks; booster at 18 months</td>
<td>0.5 ml IM Anterolateral aspect of thigh</td>
<td>None</td>
<td>Local pain, erythema, mild fever</td>
</tr>
<tr>
<td>Measles (lyophilized)</td>
<td>Sterile water</td>
<td>Single dose at 9 months</td>
<td>0.5 ml SC deltoid/thigh</td>
<td>None</td>
<td>Mild fever, mild rash after 7 days</td>
</tr>
<tr>
<td>MMR (Lyophilized)</td>
<td>Sterile water</td>
<td>2 doses at 15 months and 4-5 years</td>
<td>0.5 ml SC deltoid/thigh</td>
<td>None</td>
<td>Mild fever, mild rash after 7 days</td>
</tr>
<tr>
<td>Varicella (Lyophilized)</td>
<td>Sterile water</td>
<td>2 doses at 15 months and 4-5 years</td>
<td>0.5 ml SC Deltoid</td>
<td>None</td>
<td>Milder varicella type rash</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>None (Liquid form)</td>
<td>After one year two doses at 0, 6 months</td>
<td>0.5 ml IM Thigh</td>
<td>None</td>
<td>Local pain, erythema</td>
</tr>
<tr>
<td>Typhoid Vi antigen vaccine 30 mcg of inactive Vi capsular polysaccharide</td>
<td>None (Liquid form)</td>
<td>First dose after two years, booster every 3 year</td>
<td>0.5 ml IM Deltoid</td>
<td>None</td>
<td>Mild local reaction</td>
</tr>
<tr>
<td>Meningococcal (A+C) (Lyophilized) 50 mcg each serotype of Inactivated capsular polysaccharide</td>
<td>Sterile water</td>
<td>2 years and above during epidemics</td>
<td>0.5 ml IM or SC deltoid/thigh</td>
<td>None</td>
<td>Mild fever; local reaction</td>
</tr>
</tbody>
</table>
Immunization in special circumstances

1. Immunization in preterm infants: In general, all vaccines may be administered as per schedule according to the chronological age irrespective of birth weight or period of gestation. Very low birth weight/preterm babies can be given immunization, if they are stable otherwise.

2. Children receiving corticosteroids: Children receiving oral corticosteroids in high doses (Prednisolone 1-2 mg/kg/day) for more than 14 days should not receive live virus vaccines until the steroid has been discontinued for at least one month. Killed vaccines are safe but may not be completely effective in such situations. Patients on topical or inhaled steroids should not be denied their age appropriate vaccine.

3. Children awaiting splenectomy: Immunization with pneumococcal, Hib, and meningococcal vaccine should be initiated a few weeks prior to splenectomy.

4. Vaccination in children with HIV infection: Immune response may be suboptimal as it depends on the degree of immunodeficiency at that point of time. Readministration of childhood immunization may be considered when their immune status has improved following anti-retroviral therapy.

5. Lapsed immunization: There is no need to restart a vaccine series regardless of the time that has elapsed between individuals doses. In case of unknown or uncertain immunization status, however, it is appropriate to start the schedule as for an unimmunized child.

6. Minor illnesses, e.g. fever, diarrhoea, respiratory infections and malnutrition should not be construed as contraindications to immunization.

Newer vaccines in childhood (Table 19.3)

These are optional vaccines which can be offered on parental request or under special circumstances.

References

2. Indian Academy of Pediatrics (IAP) Recommended Immunization Schedule for Children Aged 0 through 18 years – India, 2014 and Updates on Immunization. Indian Pediatrics October 15, 2014;15:785-800.

FLUID AND ELECTROLYTES

Fluid and electrolyte therapy is divided into three phases:

1. Correction of preexisting deficits. The losses, via renal or extra-renal route, should be estimated and corrected as soon as possible; for example, rehydration therapy for diarrhoeal dehydration.
2. Provision of maintenance requirements for normal metabolism.
3. Correction of ongoing losses. These may occur via the gastrointestinal tract through losses (as in diarrhoea, vomiting etc.) or removal (suction, aspiration
etc.). Replacement of such losses should be similar in type and amount to the fluid being lost.

Out of these three phases, we shall discuss the maintenance requirements here. Correction of preexisting deficits and correction of ongoing losses shall be discussed, wherever relevant (see section on Diarrhoea).

Maintenance requirements in children

A guideline for estimating daily fluid and electrolytes requirement in a normal child under normal conditions is: Water-100ml/100Kcal/day; sodium-1-3 mEq/100 Kcal/day; potassium-1-2 mEq/100Kcal/day. Hence the fluid requirement based on caloric requirement for different weight groups can be calculated as follows:

<table>
<thead>
<tr>
<th>Weight</th>
<th>Fluid requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-10 kg</td>
<td>100ml/kg/day</td>
</tr>
<tr>
<td>10-20 kg</td>
<td>1000 + 50 ml/kg/day for each kg &gt; 10.</td>
</tr>
<tr>
<td>&gt; 20 kg</td>
<td>1500 + 20 ml/kg/day for each kg &gt; 20.</td>
</tr>
</tbody>
</table>
Maintenance fluid requirement replaces water loss through skin (2/3 of losses), GIT, respiration, and urine. These losses are affected by ambient humidity, clothing, body temperature, respiratory rate, and age of the child. Situation specific adjustments are necessary when calculating maintenance fluids.

Refer to the section on newborn care for guidelines on fluid therapy in neonates and those weighing <3.0 kg.

The most commonly employed intravenous maintenance fluid employed in children is N/5 (0.18%) sodium chloride in 5% glucose + potassium chloride 20 mEq/Liter. Commercially it is available as Isolyte P, Kidral etc.

### Maintenance requirements in newborns

Table 19.5 provides the normal fluid electrolyte requirements in newborn babies.

<table>
<thead>
<tr>
<th>Age (days)</th>
<th>Total fluids</th>
<th>Glucose/Dextrose (mllkg/day)</th>
<th>Electrolyte</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>10% Dextrose in water</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>70-80</td>
<td>-do-</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>80-90</td>
<td>-do-</td>
<td>Sodium 2-3 mmol/kg/day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Potassium 2 mmol/kg/day</td>
</tr>
<tr>
<td>4</td>
<td>90-100</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>5</td>
<td>100-110</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>6</td>
<td>110-120</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

- From day 3 onwards, fluid containing glucose-electrolyte mixture can be provided using commercially available paediatric maintenance intravenous solutions provided 5% weight loss has been documented.
- The fluid and electrolyte requirement from day 7-28 remains the same. However, in babies <1500 g the fluid requirement after day 7 need to be increased by 10-20 ml/kg/day till a maximum of 150 ml/kg/day.

**Conditions that increase fluid requirement**

- Fever: for every 1°C increase over 37.5°C, the fluid requirement increases by 10 ml/kg/day.
- Phototherapy: this increases fluid requirement by 10-20 ml/kg/day.

**Conditions that decrease fluid requirement**

- Congestive cardiac failure: Fluid requirements are reduced to 2/3rd of the normal need for that age.
- Renal failure: In cases of decreased urinary output, the fluid regimen is 400 mil ml/day ifFinsensible water losses plus urinary output over the day. Potassium should be added with caution or omitted in suspected cases of acute renal failure. (see also Fluid and electrolyte imbalance in Chapter 2).

### HYponatraemia

It is defined as serum sodium <135 mEq/L. This may be associated with increased or decreased extracellular water (ECF), evidenced by an acute increase or decrease in body weight respectively. Clinical symptoms appear when levels fall below 120
These include drowsiness, seizures and coma. Acute hyponatraemia is associated with hypotension, and circulatory failure.

Treatment

1. If fluid overload, renal failure, or SIADH is present, restrict fluid intake to 2/3 of the normal maintenance. If dehydration is present, expand ECF volume by giving isonatraemic fluids intravenously depending on the degree of dehydration.

2. Sodium. Acute symptomatic hyponatraemia is treated with administration of 3% sodium chloride 1-2 ml/kg/h till symptoms resolve. Chronic hyponatraemia should be corrected over a period of 48 hours.

The deficit is calculated as follows:

\[
\text{Sodium deficit} = (\text{desired Na}^+ - \text{present Na}^+) \times \text{weight} \times 0.6
\]

**HYPERNATRAEMIA**

It is defined as serum sodium > 150 mEq/L, consequent to

1. Excessive administration of sodium (accidental salt administration in ORS),

2. Inadequate water intake or

3. Excessive water losses. Symptoms are non specific or relate to CNS such as altered sensorium or convulsions.

Treatment

Identify and treat the underlying cause.

Replace water deficit as assessed by degree of dehydration over a period of 48 hours with a solution containing 40 mEq/L of sodium. Over rapid correction may lead to cerebral oedema. (Caution: Sodium free solutions are never used except when hyponatraemia is acute i.e. onset within few hours). Serum sodium > 180 mEq/L may require urgent dialysis. (see also Fluid and electrolyte imbalance in Chapter 2).

**HYPOKALAEMIA**

It is defined as serum potassium < 3.5 mEq/L. Clinical symptoms include muscle weakness, hypotonia, and paralytic ileus. ECG changes include ST depression, T wave flattening/inversion, U waves and arrhythmias.

Treatment

Identify and treat the underlying cause.

Correct the deficit with potassium supplements @ 40 mEq/L of fluids. The amount of fluid is dictated by the hydration status of the child. Potassium chloride may be given orally (15 ml – 20 mEq). Intravenous correction with KCl (1 ml = 2 mEq) is required when patient is unable to take orally, serum potassium is < 2.5 mEq/L, has respiratory paralysis, or in presence of arrhythmia.
Correct the potassium deficit over a period of 24 hours. Potassium rich foods such as banana or fruit juice may be advised on long term basis, especially in undernourished children.

HYPERKALAEMIA

It is defined as serum potassium >5.5 mEq/L. Symptoms include weakness, paraesthesias, and tetany. ECG changes are characteristic including high peaked T waves, prolonged PR interval, widened QRS complex, heart blocks, and arrhythmias in that order.

Treatment

1. Mild hyperkalaemia: Serum K+ 5.5 to 6.0 mEq/L is managed by stopping the potassium intake and offending drugs such as potassium sparing diuretics, correction of acidosis and intravascular volume.

2. Moderate hyperkalaemia (serum K+ 6 to 8 mEq/L or peaked T waves) is managed by administering a glucose insulin infusion (0.5 g/kg glucose with 0.3 U regular insulin/kg glucose, over 2 hours) and/or a sodium bicarbonate infusion (2 mEq/kg over 5-10 min), in addition to the measures already mentioned. Can be repeated 4-6 hourly.

3. Patients with severe hyperkalaemia (serum K+ >8 mEq/L or ECG changes apart from tall T waves) should be urgently administered intravenous 10% calcium gluconate 0.5 ml/kg over 5-10 minutes. This immediately reverses the cardiac effects of hyperkalaemia. This should be followed up with the measures as for moderate hyperkalaemia. Intravenous Salbutamol (4 mg/kg in 5 ml water) or nebulised salbutamol (2.5-5.0 mg) given over 15-20 minutes also acts rapidly to lower serum K+. Dialysis has to be done in case the hyperkalaemia is refractory to therapy as in renal failure.

4. Monitoring of the therapy should be done with ECG and serum potassium levels.

References


ANAEMIA

A haemoglobin (Hb) level below 11 g/dl for children 6 months to 6 years old, and <12 mg/dl for children 6-14 years is considered as anaemia. Anaemia can result either from decreased RBC production, increased RBC destruction, or excessive blood loss. In some patients more than one mechanism may be operative.
1. Anaemia due to decreased RBC production may. It may be due to:
   (a) Deficiency of one or more of haematopoietic nutrients i.e. iron, folic acid, and vitamin B12. Deficiency of other nutrients such as copper, protein etc. is uncommon.
   (b) Bone marrow infiltration due to abnormal cells as in acute and chronic leukaemia, disseminated malignant diseases, myelofibrosis etc.
   (c) Bone marrow aplasia - congenital and acquired aplastic anaemia (severe and moderately severe) and pure red cells aplasia such as Diamond - Blackfan syndrome, transient erythroblastopenia of childhood.

2. Anaemia due to increased RBC destruction i.e., haemolytic anaemia. Commonest haemolytic anaemia seen in this part of the country is thalassaemia major. Others include sickle cell disease, hereditary spherocytosis, G6PD deficiency, haemolytic anaemia, malaria etc.

3. Anaemia due to excessive blood loss. Usually in such cases, the site of bleeding is obvious, e.g. massive oesophageal variceal bleeding, rectal polyps etc. In cases like ankylostomiasis, Meckel diverticulum, etc. there may be only occult bleed.

Clinical approach in a child with anaemia

Careful history and physical examination provide useful clues towards the likely cause of anaemia, thereby guiding the most appropriate laboratory tests required to avoid unnecessary expenses in diagnosis, e.g.
   (a) Nutritional iron deficiency anaemia (IDA) is uncommon below 6 months of age in term born child with normal birth weight.
   (b) Most thalassaemics are normal at birth and usually start becoming anaemic between 6 -18 months of age.
   (c) Constitutional aplastic anaemia (Fanconi cytopenia) presents between 5-10 years, whereas congenital pure red cell aplasia manifests in first few months.
   (d) Megaloblastic anaemia occurs in infants and toddlers preschool children with prolonged exclusive breast feeding by undernourished mothers.
   (e) Presence of splenomegaly and hepatomegaly suggests the diagnosis of either haemolytic anaemia or leukaemia (usually there is associated lymphadenopathy) or anaemia of chronic infection/inflammation.
   (f) Presence of petechial and/or purpuric spots is suggestive of concomitant thrombocytopenia and points towards the diagnosis of acute leukaemia, aplastic anaemia or megaloblastic anaemia.

Investigations

Initial investigations to be carried out in cases of anaemia - estimation of Hb%, TLC, DLC and platelet count, examination of peripheral blood smear for RBC size and shapes, anisopoikilocytosis, presence of immature cells and haemoparasites, reticulocyte count. Currently, most of the laboratories use electronic cell counters for
haematological investigations which give additional useful information such as MCV, MCH, MCHC etc.

The following important information can be gathered from the above investigations:

(a) Type of anaemia on the basis of cell size, such as microcytic (MCV <80fl), normocytic and macrocytic (MCV >90fl), and on the basis of Hb content, i.e. hypochromic or normochromic.

(b) Associated thrombocytopenia and/or neutropenia (bicytopenia or pancytopenia) is suggestive of aplastic anaemia, megaloblastic anaemia, or bone marrow infiltration due to leukaemia, etc.

(c) Increased, normal or decreased reticulocyte count is suggestive whether anaemia is due to decreased production or increased destruction of RBCs.

The following section describes the differential diagnosis of cases of anaemia according to preliminary investigations results:

1. Microcytic hypochromic anaemia
   Two important causes are:
   1. IDA - reticulocyte count is normal or mildly elevated.
   2. Thalassaemia major - reticulocyte count is usually 4-6%. Peripheral smear also shows target cells and numerous nucleated RBCs. Elevated foetal haemoglobin (HbF) on blood electrophoresis confirms the diagnosis. Lead poisoning and pyridoxine responsive anaemia, sideroblastic anaemia and copper deficiency are rare.

2. Macrocytic normochromic anaemia
   i. Megaloblastic anaemia of B12 and folate deficiency is common and may have associated neutropenia and/or thrombocytopenia, Reticulocyte count is usually low. Bone marrow examination reveals megaloblastic changes.
   ii. Other causes of macrocytic anaemia are liver diseases, hypothyroidism, thiamine deficiency and some inborn errors of metabolism.

3. Normocytic normochromic anaemia
   This group comprises a large number of causes:
   i. Congenital or acquired aplastic anaemia - usually have bicytopenia or pancytopenia and decreased reticulocyte count. Bone marrow aspiration or biopsy is confirmatory.
   ii. Bone marrow infiltration such as leukaemia and other neoplasms, storage disorders, myelofibrosis etc. Diagnosis is confirmed by bone marrow examination.
   iii. Haemolytic anaemia - such as immune haemolysis, hereditary spherocytosis, G6PD deficiency etc. Reticulocyte count is increased.
   iv. Anaemia resulting from acute blood loss.
   (see also Anaemia in Chapter 1 and Anaemia in Pregnancy in Chapter 15).
IRON DEFICIENCY ANAEMIA (IDA)

SALIENT FEATURES

Iron deficiency anaemia commonly occurs in children due to nutritional deficiency. However, IDA is uncommon in term breast fed children but prematurity, perinatal blood loss or cow milk feeding may lead to IDA in infancy. It is characterized by pallor, irritability, pica and absence of organomagaly and lymphadenopathy (10-15% may have mild splenomegaly).

Treatment

Nonpharmacological

After the period of exclusive breast feeding (6 months), cereal based diet should be added. Encourage green leafy vegetables and fruits.

Pharmacological Severe anaemia (Hb < 6 g/dl)

Blood transfusion.
1. Give packed cell transfusion, usually 2-3 ml/kg at one time under close monitoring to severely anaemic children (Hb < 4-5 g/dl).
2. Inj. Frusemide (1 mg/kg/dose) may be administered if there is evidence of cardiovascular overload.

Mild to moderate anaemia

Initiation of therapy. Oral ferrous salts (sulfate, gluconate, etc.) are the preferred therapeutic iron preparation.

Syr./Drops/Tab. Ferrous Sulfate/Ferrous gluconate/Ferrous fumarate 3-6 mg/kg/day of elemental iron in 2-3 divided doses to be given between meals for 4-6 weeks after normal Hb concentration for age is achieved.

Usual iron preparations have 35-50 mg elemental iron per 5 ml of syrup or per ml of drops. Elemental content of various ferrous salts is - Ferrous sulfate 20%, Ferrous gluconate 12%, Ferrous fumarate 33%, Colloidal iron 50%.

(Caution: Milk/tea should particularly be avoided one hour before or after the drug. Not to be given along with calcium preparations).

Response to therapy. Decreased irritability and improved appetite is seen in 12-24 hours. Reticulocytosis is seen within 2-3 days and rise in Hb is noticeable by 5th-7th day. Rate of rise of Hb is 0.25-0.4 g/dl/day (daily or even weekly estimation of Hb% is not required). Usually normal Hb levels are obtained by about 8-12 weeks.

If the response is inadequate, check for the prescribed dose, compliance, presence of diarrhoea and/or malabsorption, infections (particularly urinary tract infection and tuberculosis), occult blood loss or ~ thalassaemia trait which may have been misdiagnosed as IDA.

Modification or step up therapy. Parenteral iron therapy is very rarely required, however, it is necessary if there is interference to absorption of oral iron, chronic diarrhoea or malabsorption, occult bleeding from GIT when oral iron therapy may not maintain desired Hb. Parenteral iron therapy may also be used in severely anaemic child not likely to take oral therapy because of socioeconomic reasons.
When parental iron is required, the total dose may be calculated:

Dose of iron required (mg) = wt (kg) x 2.5 x Hb deficit

Hb deficit is the difference of desired normal Hb and present Hb. To this dose, 10 mg/kg should be added for replenishing the stores. Inj. Iron Dextran or Iron Sorbitol Citric acid complex (50 mg/ml) deep gluteal IM injection (preferred) or infusion after a test dose. The total dose of iron may be given as a single dose IV or as multiple daily doses IM not exceeding 5 mg/kg/dose spread over several days if the volume is too large.

Patient/parent education

IDA occurs generally due to dietary deficiency of iron. Once the diet is modified, the patient should stick to that diet.

Iron medicine should be taken between meals and never along with milk or tea.

Intake of iron medicine usually causes harmless black discolouration of the teeth and stools. The teeth discolouration can be prevented by rinsing the mouth with water after doses.

Increase in Hb levels with iron therapy will take approximately 5-7 days and about 12 weeks for desired normal Hb level to be achieved.

Reference


PROTEIN ENERGY MALNUTRITION (PEM)

Undernutrition is a condition in which there is inadequate consumption, poor absorption or excessive loss of nutrients. However sometimes the term malnutrition or severe acute malnutrition is used interchangeably.

SALIENT FEATURES

- Milder forms may just present with failure to thrive i.e. decreased rate of weight gain.
- Marasmus is characterized by gross wasting of muscle and subcutaneous tissues resulting in emaciation, marked stunting, and no oedema.
- Markedly retarded growth, psychomotor changes, and oedema of dependent parts are three essential clinical features of kwashiorkor.
- PEM is usually associated with
  (i) anaemia due to iron, protein, vitamin B12 or folic acid deficiency,
  (ii) xerophthalmia due to vitamin A deficiency, and
  (iii) other micronutrient deficiencies including magnesium, copper, zinc, vitamins B, C, D and K.

Assessment of nutritional status

Undernutrition is classified by WHO into moderate and severe forms as shown in Table 19.6. Reference values for weight for height are provided in Table 19.7.

Severe Acute Malnutrition(SAM)

SAM among children of 6-59 months of age is defined by UNICEF as any of the following:
1. Weight for height below -3 SD of median WHO growth reference
2. Visible severe wasting
3. Presence of bilateral pedal oedema
4. Mild upper arm circumference <11.5cm.

These children are at high risk of death and they require urgent attention and management in the hospital. In children of <6 month of age MUAC cannot be used, and SAM should be diagnosed in the presence of 1, 2, and 3.

Table 19.6. WHO Classification for severity of undernutrition

<table>
<thead>
<tr>
<th>Symmetrical oedema</th>
<th>Moderate undernutrition</th>
<th>Severe undernutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight for height</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>(measure of wasting)</td>
<td>SD score -2 to -3</td>
<td>SD score &lt; -3</td>
</tr>
<tr>
<td>(70-79% of expected')</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height for age</td>
<td>SD score -2 to -3</td>
<td>SD score &lt; -3</td>
</tr>
<tr>
<td>(measure of stunting)</td>
<td>(85-89% of expected')</td>
<td></td>
</tr>
<tr>
<td>a. This includes kwashiorkar and marasmic kwashiorkar.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. SD score= Observed value - expected value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard deviation of reference population</td>
<td></td>
</tr>
</tbody>
</table>
c. Median (50th percentile of NCHS standards).

Table 19.7. NCHS/WHO Normalized reference values for weight-for-height/length

<table>
<thead>
<tr>
<th>Boys’ weight (kg)</th>
<th>Length(cm)</th>
<th>Girls’ weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3 SD</td>
<td>-2 SD</td>
<td>Median</td>
</tr>
<tr>
<td>2.6</td>
<td>2.8</td>
<td>3.3</td>
</tr>
<tr>
<td>3.6</td>
<td>3.8</td>
<td>4.5</td>
</tr>
<tr>
<td>4.7</td>
<td>5.1</td>
<td>6.0</td>
</tr>
<tr>
<td>5.7</td>
<td>6.2</td>
<td>6.3</td>
</tr>
<tr>
<td>6.6</td>
<td>7.2</td>
<td>8.4</td>
</tr>
<tr>
<td>7.5</td>
<td>8.1</td>
<td>9.5</td>
</tr>
<tr>
<td>8.2</td>
<td>8.9</td>
<td>10.4</td>
</tr>
<tr>
<td>9.1</td>
<td>9.8</td>
<td>11.5</td>
</tr>
<tr>
<td>10.1</td>
<td>10.9</td>
<td>12.7</td>
</tr>
<tr>
<td>11.0</td>
<td>11.9</td>
<td>13.9</td>
</tr>
<tr>
<td>12.0</td>
<td>12.9</td>
<td>15.2</td>
</tr>
<tr>
<td>13.0</td>
<td>14.1</td>
<td>16.6</td>
</tr>
<tr>
<td>14.2</td>
<td>15.4</td>
<td>18.3</td>
</tr>
</tbody>
</table>

SD - standard deviation score (or z score).

Indian Academy of Paediatrics (JAP) takes a weight of more than 80% of expected for age as normal. Grades of malnutrition are: Grade I (71-80%), Grade II (61-70%, Grade III (51-60%) and Grade IV < 50%) weight of expected value for that age. Alphabet k is post fixed in the presence of oedema.

Treatment

1. Mild to moderate undernutrition. Mild and moderately under-nourished children are best treated in their own home surroundings. Domiciliary treatment of malnourished children by their mother is economical, offers in-built advantage of practical health education, and is associated with minimal recurrence risk.

2. The parents are advised to increase the food intake of the child by all available means. The child should receive adequate amount of calories and protein (150 Kcal/kg/d) in the diet, which should be prepared from the locally available, inexpensive foods. Frequent feeding up to 7 times required. Oil can be used to increase the energy of diet.

3. The child should be kept under surveillance by using a growth chart and effort should be made that he does not slip down to severe malnutrition.

Hospital management of severe malnutrition (Table 19.8).

Initial treatment involves managing complications. The aim is to treat complications and stabilize the child.

Severe malnutrition

Severely wasted children and those with oedema need hospitalization. Other indications for admission in an undernourished child are severe dehydration, severe diarrhoea, hypothermia, shock, systemic infection, jaundice, bleeding, age less than one year, or persistent loss of appetite.

Those with severe stunting alone may be managed in the community. Hospital
management of severe malnutrition is summarized in Table 19.8.

Refer, when child fails to (i) regain appetite by day 4, (ii) loose oedema by day 5, or (iii) gain weight by day 10 of therapy. Children who fail to respond to treatment should be screened for faulty feeding, inadequate feeding, persistent diarrhoea, malabsorption, giardiasis, shigellosis, amoebiasis, otitis media, pneumonia, UTI, fungal infections, scabies, tuberculosis, helminthiasis, malaria, and HIV/AIDS. If the search proves futile, one should also look for any underlying immunological disease, inborn errors of metabolism and malignancies.

Table 19.8. Hospital management of severe malnutrition

<table>
<thead>
<tr>
<th>Problem</th>
<th>Management</th>
</tr>
</thead>
</table>
| Hypothermia (rectal temperature <35.5°C) | • Keep under a heat source, such as radiant warmer, room heater, hot air blower or 200 W bulb, and warm up to rectal temp. 37.0°C within 2-3 hours.  
• If electric gadgets are not available, cover the child well. Warm up with Kangaroo technique (placing the naked child on mothers’ bare chest and covering them both together with cloth and blanket).  
• Monitor rectal temperature half hourly. Investigate and treat for infection and hypoglycaemia. |
| Hypoglycaemia (blood sugar <54 mg/dl) | • 10% glucose, 5-10 ml/kg IV immediately followed by IV infusion of a dextrose containing solution.  
• Stop IV fluids as soon as blood glucose stabilizes and switch to oral feeds.  
• Some dehydration is to be corrected with 2/3 diluted ORS over 12 hours.  
• Severe dehydration: Administer Ringer's lactate or N/2 5% saline 30 ml/kg 2 hours. If still pulse is not palpable, consider septic shock and manage accordingly.  
• If pulse improves after 2 hours, give N/6 5% saline @ 10 ml/kg/h in next 10 hours followed by 5 ml/kg/h in next 12 hours. |
| Dehydration (as assessed by WHO classification) | |
| Severe dehydration: weak pulse, oliguria | |
| | |
Septic shock
(clinical features similar to severe dehydration)

- After dehydration is corrected, start on maintenance fluids @ 75-100 ml/kg/day till feeding is established.
- Add potassium to IV fluids @ 30 mEq/L after the child passes urine.
- Give blood/plasma transfusion 10 ml/kg over 3 hours.
- Start antibiotics; as given in Infections.
- Fluid management is similar to that of severe dehydration.
- There is a risk of hypernatraemia and hypokalaemia.
- Potassium supplements should be given @ 30-40 mEq/L per day of fluids provided if the child is passing urine freely.
- Restrict sodium intake and do not give hypertonic saline even in face of hyponatraemia.
- Presence of septic shock, hypoglycaemia, hypothermia, skin, respiratory, urinary infection or sick looking: Inj Ampicillin 50-100 mg/kg 1M/IV 6 hourly + Gentamicin 7.5 mg/kg 1M/IV once a day for seven days.
- If no response to above antibiotics in 48 h; add Chloramphenicol 25 mg/kg 1M/IV 8 hourly. Give every 6 hourly, if meningitis is suspected.
- If specific infections are detected such as dysentery, malaria, pneumonia, worm infestations, tuberculosis, treat as per STG of that particular condition.

Infections

- No apparent signs of infection and no complications: Cotrimoxazole (5 mg/kg of trimethoprim) twice daily for 5 days.
- If NP is elevated, give a single dose of Inj Digoxin 5 meg/kg.
- Give packed red cells 10 ml/kg in 4-6 h, carefully monitoring cardiac status.
- Give a single dose of vitamin A orally to all children: <6 months: 50,000 IU; 6 months - 1 year: 100,000 IU; >1 year: 200,000 IU. If signs of vitamin A deficiency are present, repeat the above dose twice; the next day and then after 2 weeks.
- Inj Vitamin K 2.5 mg 1M single dose.
- Give 0.2 ml/kg of 50% solution of magnesium sulphate IV single dose.
- Give folic acid 5 mg on day 1 followed by 1 mg/day.

Congestive heart failure (tachycardia, cardiomegaly)

- Restrict fluid intake.
- Give Inj Frusemidie 1 mg/kg stat.

Severe anaemia (haemoglobin<4 g/dl)

- If NP is elevated, give a single dose of Inj Digoxin 5 meg/kg.
- Give packed red cells 10 ml/kg in 4-6 h, carefully monitoring cardiac status.
- Give a single dose of vitamin A orally to all children: <6 months: 50,000 IU; 6 months - 1 year: 100,000 IU; >1 year: 200,000 IU. If signs of vitamin A deficiency are present, repeat the above dose twice; the next day and then after 2 weeks.
- Inj Vitamin K 2.5 mg 1M single dose.

Vitamin K deficiency or bleeding tendency

- Give 0.2 ml/kg of 50% solution of magnesium sulphate IV single dose.

Magnesium deficiency

- Give folic acid 5 mg on day 1 followed by 1 mg/day.

Folic acid deficiency

Initiation of cure. First seven days aim: start nutrition

Starting point. Once complications are taken care of and child is ready to tolerate feeds (Table 19.9).

Table 19.9. Initiation of cure

Start feeding

- Initiate feeds as early as possible.
- If oral feeding is not possible, give nasogastric feeding.
- Start with a lower volume of feed at frequent intervals; no. of feeds varying from 12 feeds on first and second day and 6 to 8 feeds on days 3-7.
If tolerated, milk based diets are most suitable (80 kcal/kg/d) and protein (0.7 g/kg/d). The caloric intake should not exceed 100 kcal/kg/d on the first day. Increased gradually over one week to 150 kcal/kg/day of energy and 2-3 g/kg/d of proteins. Total amount of fluids should be kept within 100-125 ml/kg/d.

Sugar and oil can be added to provide extra calories.

Lactose intolerance

- Reduce the total lactose load in the diet by diluting the milk for 3 or 4 days or substituting a part of milk feeds by formulae based on lactose free milk protein (calcium caseinate), sugar and oil, soyabean, meat or vegetable protein mixtures.

Other nutrients

- Supplement the diet with minerals and trace elements as follows:
  - Potassium chloride (1.2-2.4 g/L of feed), magnesium chloride (300-600 mg/L of feed), zinc acetate (20 mg per day), copper acetate (2 mg/L of feed), selenium (6-10 mcg/kg/day) and folic acid (1 mg per day).
  - Do not give iron at this stage. Add iron only after a week of therapy.
  - Vitamins of B complex group are not useful in initial therapy.

Signs of improvement

During these seven days, a child with kwashiorkor will lose weight and a marasmic child gains little or nothing because the tissue gains are masked by excess body water loss.

Rehabilitative phase (2-6 weeks) Aim:

Restore normal weight for height.

Starting point: Child has started showing signs of recovery of appetite and change of expressions.

Intensive feeding (to recover lost weight)

- Replace the initial milk diet with home diet as soon as possible.
- Provide therapeutic diet as follows: fluids 150 ml/kg/day, energy 175-200 kcal/kg/day, protein 2-4 g/kg/day.
- The diet prescribed for the child should be such, which the family can afford to provide for the baby within its limited income, can be easily cooked at home, does not perish easily, is culturally acceptable and easily available in the local market.

Treat concurrent nutritional deficiencies

- Start oral Iron 3mg/kgid elemental iron once a day. Start other vitamins including vitamins B, C, D, E at double the RDA.
- Continue potassium, magnesium, zinc, copper, selenium and folic and supplementation.
- Provide vitamin D 400 IU oral once daily for 4 weeks.

References

NUTRITIONAL RICKETS

Rickets is defective mineralization of growing skeleton caused by deficiency of vitamin D characterized by skeletal deformities like genu valgum/genu varum, broadening of wrists, susceptibility to fractures, weakness, hypotonia and disturbances in growth. Most often it is nutritional (lack of exposure to sunlight and inadequate dietary intake) and occurs between 2 months to 2 years of age. Radiological picture shows that epiphyseal growth plate is increased in thickness, cupped with hazy metaphyseal borders. Serum calcium is generally normal or low, phosphate is low or normal and alkaline phosphatase is raised in nutritional rickets.

Treatment

Nonpharmacological
Encourage the child to play outdoors/increase exposure to sunlight. Enhance dietary sources of vitamin D - dairy products, egg and fish liver oil.

Pharmacological
1. Vitamin D 600,000 IV Stat oral or 1M (if patient is sick due to intercurrent infection) Repeat X-ray wrist after 4 weeks. If the response is positive, i.e. healing line of rickets is seen on X-ray, continue oral vitamin D 400 IU/day. If no response to therapy after 4 weeks refer to a higher centre for evaluation of non-nutritional rickets.

Patient education
Exposure to sunlight is beneficial for a child with rickets.
No special type of oil is required for massage.
Consumption of dairy products which are rich in vitamin D should be emphasized.
Most of the deformities improve in the due course of time.

Reference

PICA

Pica involves repeated and chronic ingestion of non-nutrientsubstances including mud, plaster, paint, earth, clay, etc. Most of the time, it is self-limiting and represents manifestations of family disorganization, poor supervision, and affectional neglect.

Treatment
Pica below two years does not need any intervention.
Children with pica are at increased risk of lead poisoning, iron deficiency, bezoars, and parasitic infections. They should be investigated for these problems and if present, treated suitably.
Education, guidance and counselling of the family.
The child has to be kept occupied in other tasks and provided with the environmental stimulation.

Reference


**BREATH HOLDING SPELLS**

Paroxysmal self-limiting event occurring in up to 5% of healthy children and are rare prior to 6 months of age, peak at about 2 years of age and abate by 5 years of age.

**SALIENT FEATURES**

- Child starts crying (precipitated by an upsetting event, such as anger, fear, or injury) and then holds breath in expiration followed by a color change (blue or pale).
- Spell may resolve spontaneously or the child may lose consciousness and may have convulsions. Normal breathing and alertness is resumed with in a minute.

Treatment

Reassurance. Explain that attacks are harmless and always abort by itself.

*Immediate measures*

Prevent injury during the episode. Help the child to floor and have him lie flat. If loss of consciousness occurs, place on the side to protect against aspiration. Maintain patent oral airway but do not start CPR.

Do not shake the baby, splash water or put anything in the mouth.

*Long term measures*

There are NO prophylactic medications. Treat iron deficiency, if associated.

*Refer to a higher centre*

If the child is less than 3 months or unconsciousness lasts for more than 1 minute.

If attacks are too frequent or seizure disorder or cyanotic spell is suspected.

Parent education

Avoid precipitating factors such as exhaustion, hunger, or injury. Do not give toys or tasks beyond the child's abilities and try to distract.

Avoid excessive rules and restrictions. Try to remove unnecessary frustrations.

References

PRIMARY NOCTURNAL ENURESIS

Most common cause in primary enuresis is inappropriate toilet training. Other causes could be genetic, sleep disorder, reduced ADH at night. Psychological causes may be found in secondary. 3% children have organic pathology, such as obstructive uropathy or UTI.

SALIENT FEATURES

- Involuntary discharge of urine after the age at which bladder control should have been established (5 years).
- In primary nocturnal enuresis, child has never been dry at night while in secondary, child has been continent for at least 6 months before the child begins to wet again;

Treatment

Nonpharmacological (effective in 30% cases)

Rule out organic causes. Restrict fluid intake in the evening.

Bladder exercises:
(i) hold urine as long as possible during the day.
(ii) practice repeated starting and stopping the stream at the toilet bowl.
Practice getting up from bed and going to the bathroom at bedtime before sleep.

Pharmacological

Indicated only in children > 6 years where sufficient trial of nonpharmacological management has failed with following:

Tab. Imipramine: 6-8 year (25 mg), 9-12 year (50 mg), >12 year (75 mg)
once a day at bedtime. Success rate 30-60%, relapse rate 90%.
Or
Desmopressin acetate (nasal spray, 10 mcg per spray): Start with 10 mcg given at bedtime daily and increase gradually by 10 mcg/per week to a maximum of 40 mcg per day. If effective, it should be used or 3-6 months. Success rate is 40-60%, relapse rate 90%.
Or
Tab. Desmopressin 0.1-0.5 mg at bed time.

Refer the patient to a higher centre if organic cause is suspected or when diagnosis is in doubt.

Parent education

Reassure the parents that condition is self-limiting.
Ask the parents to maintain a diary record of dry nights; reward the child for such nights. Avoid punitive measures.
References

WHEEZY CHILD

Wheezing is a clinical symptom present in asthma and other illnesses including bronchiolitis and other viral infection, foreign body inhalation, tuberculosis, pneumonia, cystic fibrosis, immune deficiency, bronchomalacia, hypersensitivity pneumonia and conditions compressing airways. Wheezing during infancy could be due to viral infections. Absence of family history and personal history of atopy with gradual decrease in frequency of episodes is seen in many transient wheezers who grow out of their wheezing episodes. Wheezing in asthma is recurrent, gets worse in night and after exercise, seasonal and may be associated with other allergic illnesses like atopic dermatitis, allergic rhinitis etc (for details see section on bronchial asthma in chapter I). Clinical features suggestive of other cause of wheezing are: neonatal onset, associated with difficulty in feeding, choking or vomiting, localized findings in chest or abnormality in cardiovascular system.

ACUTE BRONCmOLITIS

Acute bronchiolitis is an acute respiratory tract infection caused commonly by viral pathogens. The commonest aetiological agent being Respiratory syncytial virus. Bronchiolitis commonly occurs in infants below 6 months of age. Peak occurrence during winter and early spring.

SALIENT FEATURES

- Cold for 2-4 days followed by cough, wheeze and rapid respiration. With increasing severity of illness there may be lower chest indrawing, difficulty in feeding, excessive crying due to hypoxaemia, cyanosis and respiratory failure. There may be history of viral upper respiratory infections in other family members in the recent past.
- Mild disease is characterized by rapid respiration, no chest indrawing, no problem in feeding, no clinical evidence of hypoxaemia and oxygen saturation is more than 95% (optional).
- Severe disease is characterized by chest indrawing, difficulty in feeding, clinical evidence of hypoxaemia, lethargy, convulsion, oxygen saturation <95% (optional).
- Normal or minimal increase in total leucocyte counts with relative lymphocytosis. X-ray chest may show hyperinflation and small atelectasis.
Treatment

Nonpharmacological
For associated nasal block normal saline drops in both nostrils as and when required, especially before feeds, and use of home remedies (ginger, honey, tulsi) for control of cough and plenty of liquids orally.
For hospitalizedpatientselevation at 30-40 degree and neck slightly extended.
To be nursed in comfortable environment.

Pharmacological

Treatment of mild disease (ambulatory treatment at home)
No antibiotics.
Syr. Paracetamol 10-15 mg/kg 4-6 hourly for fever (for details see section on fever in chapter I).
If patient shows overall improvement with no evidence of chest indrawing, cyanosis, difficulty in feeding continue treatment as above. If there is partial improvement patient should be called again after 2 days or earlier if patient deteriorates for reassessment.
Hospitalize immediately if any of the following develop:
Chest indrawing, poor feeding, cyanosis, altered sensorium and convulsions and managed as severe disease.
If there is no improvement or deterioration at any time during the illness, the patient should be managed as severe disease.

Treatment of the severe disease (needs hospitalization for management)
1. Oxygen administration by oxygen hood or nasal catheter and intravenous fluids if child is not able to feed.
2. Adrenaline inhalation (Injectable form) 0.3 mg/kg by nebulizer after dissolving the solution in 3 ml saline; can be repeated every 4-6 hourly as required. (No role of antibiotics, steroids, ribavirine inhalation in uncomplicated patients).
3. If adrenaline not available Salbutamol inhalation (0.15 mg/kg dissolved in 3 ml soln) may be tried and continued if response observed.
4. Syr. Paracetamol 10-15 mg/kg/dose may be given 4-6 hourly.
5. Do not use sedatives.
Monitor improvement in respiratory rate, lower chest indrawing, difficulty in feeding, excessive crying, cyanosis and oxygen saturation, if available, every 4-6 hours till there is significant improvement. If child does not improve/deteriorate look for underlying heart disease i.e., myocarditis/congenital heart disease and get an X-ray chest and look for massive collapse of lung/infection/pneumothorax etc. and manage accordingly.

Patient education
Mother should be educated about the signs of pneumonia i.e., rapid respiratory rate, chest indrawing, difficulty in feeding.
Mother should be educated about identification of danger signals in a child suffering from pneumonia and report immediately to the health care facility.

References

PNEUMONIA

Pneumonia is commonly caused by infectious agents e.g. viruses, bacteria and mycoplasma. Viruses alone or combined with bacteria are responsible for majority of the cases. In developing countries bacterial pneumonia (Streptococcus pneumoniae, H. influenzae) may be more common.

SALIENT FEATURES

- Fever, cough with rapid breathing, lower chest indrawing, crepitations/wheezing, difficulty in feeding and cyanosis..
- On the basis of clinical features pneumonia can be classified as mild to very severe disease.
  
  No pneumonia - no fast breathing and no indicators of severe or very severe pneumonia.
  Pneumonia - fast breathing e.g. age below 2 months> 60 RR/min; 2 months-<2 months> 50 RR/min; 12 months -60 months> 40 RR/min and no indicators of severe or very severe pneumonia.
  Severe pneumonia - lower chest indrawing or nasal flaring and no signs of very severe pneumonia.
  Very severe pneumonia - central cyanosis or not able to breastfeed or drink or convulsions or lethargy or unconsciousness or severe respiratory distress (e.g. head nodding).

Treatment

Nonpharmacological

Nasal block to be treated with saline nasal drops as and when required, especially before feeds.
Ginger, honey, tulsi with warm beverages can be used as home remedies for cough.
Patients with respiratory distress to be nursed in semi reclined posture at angle of about 30°.
Young infants should be nursed in comfortable position preferably in mother's lap.
Breast feeding and small frequent feeds to be continued in children who do not have severe or very severe pneumonia.

Pharmacological
Fever to be treated as in section on fever. Treatment is initiated according to the severity.

1. Pneumonia
Patients with age more than 2 months and with absence of features of severe/very severe pneumonia can be treated at home.
- Tab./Syr. Amoxycillin 20-40 mg/kg/day in 3 divided doses for 5-7 days.
- Or Tab./Syr. Cephalexin 20-40 mg/kg/day in 3 divided doses for 5-7 days.
- Or Tab./Syr. Cotrimoxazole (TMP) 6-8 mg/kg/day in 2 divided doses for 5-7 days.

2. Severe pneumonia and very severe pneumonia or age <2 months treated as inpatients
1. Oxygen inhalation to maintain SaO\(_2\) ≥ 92%. Continue with oxygen until the signs of hypoxia (such as severe lower chest wall in-drawing or breathing rate of ≥ 70/min) are no longer present.
2. Give supportive care:
   - Ensure that the child receives daily maintenance fluids appropriate to child’s age. Encourage breastfeeding and oral fluids, once the distress settles and the child is able to feed.
   - If the child has fever (≥38.5°C) which appears to be causing distress, give oral Paracetamol (15 mg/kg/dose).
   - If wheeze is present, give a rapid-acting bronchodilator (as described in the next section).
   - Remove any thick secretions in the nose/throat, which the child cannot clear, by gentle suction.
3. Inj. Cefotaxime 100 mg/kg/day in 4 divided doses for 7-10 days.
   - Or Inj. Cefuroxime 100 mg/kg/day in 3 divided dose for 7-10 days.
   - Or Inj. Ampicillin 100 mg/kg/day in 4 divided doses Plus Inj. Gentamicin 7.5 mg/kg/day in 3 divided doses for 7-10 days.

3. Severe pneumonia and very severe pneumonia with age >2 months treated as inpatients
- Obtain a radiograph of the chest, if facilities are available for the same at admission to assess the extent of disease and to rule out presence of pneumothorax or effusion. In case of severe distress, stabilize and oxygenate the child before sending for radiograph.
- 1 and 2 as above
- 3. Inj. Ampicillin 50 mg/kg IM/IV every 6 hours plus Inj. Gentamicin 7.5 mg/kg IM/IV once a day. If the child responds well, discharge after 5 days to continue treatment at home with oral Amoxicillin 15 mg/kg per dose 3 times a day plus IM Gentamicin once daily for a further 5 days.
   - Or Inj. Chloramphenicol 25 mg/kg IM or IV every 8 hours until the child improves.
   - Then continue the same drug orally in the same dose for 3 times a day for a total course of 10 days.
If the child does not improve by 48 hours to any one of above treatment, reassess for complications and switch to Inj. Ceftriaxone 80 mg/kg IM or IV once daily for 10 days.

High risk patients in category (c) i.e. post measles, with congenital heart disease and severe malnutrition etc. may be given Amoxycillin + Clavulanic acid, or Cefotaxime/Cefuroxime as initial therapy.

Children who deteriorate rapidly, develop empyema/pneumothorax or have skin lesions suggestive of Staphylococcal infection - should be treated with Inj. Cloxacillin 200 mg/kg/day in 3-4 divided doses + Inj. Gentamicin 7.5 mg/kg/day in 2-3 divided doses.

Follow up and monitoring

Children with mild pneumonia are reassessed at 48 hours or earlier if child deteriorates. If child shows improvement same treatment is continued for 5-7 days. If deteriorates, patient is hospitalized and treated as severe/very severe pneumonia. Children who are hospitalized (severe and very severe pneumonia) are monitored more frequently. Children with severe/very severe pneumonia (age >2 month) on deterioration can be treated with cefotaxime/cefuroxime in the doses given in (2).

Patient Parent education

Explain the signs of pneumonia i.e., rapid respiratory rate, chest indrawing, difficulty in feeding etc.

Explain the danger signals in a child suffering from pneumonia.

References

2. The WHO Young Infant Study Group, Bacterial Etiology of Serious Infections in Young Infants in Developing Countries: Results of Multicentre Study, Paediatric Inf. Dis. J. 1999, 18 (suppl): S17-S22.

THRUSH (ORAL CANDIDIASIS)

Oral candidiasis may be seen as early as 7-10 days of age (peak 4th week of life) uncommon after 12 months of age, when it is secondary to broad-spectrum antibiotic treatment. Chronic Recurrent oral candidiasis is seen in hypoparathyroidism, Addison’s disease, autoimmune disorders, immuno deficiency, AIDS, myelosuppressive therapy and severe malnutrition.

SALIENT FEATURES

Thick white patches on an erythematous base in the oral mucosa may spread to involve the lips, buccal mucosa, tongue and palate.

- Asymptomatic or may cause pain in the mouth, discomfort, anorexia and decreased feeding. Rarely may cause aspiration pneumonia.
- Diagnosis is confirmed by the fact that on removing the plaques, punctate areas of bleeding are seen on the undersurface.

Treatment

Nonpharmacological

Correction of faulty sterilization technique of bottle; best to avoid bottle feeding.
Pharmacological

Nystatin (100,000 units/ml) oral suspension 1 ml applied to each side of mouth every 6 hours.
Or
Clotrimazole 1% cream, gel or lotion, oral application 3-4 times/day after feeding for 5-7 days (or 1-2 days beyond recovery).
Or
Miconazole gel 25 mg 4 times a day for 5-7 days.
Or
Gentian violet 1% aqueous solution 1-2 times a day, for 5-7 days (can stain tissues and clothes).

In resistant/chronic cases (patients with major underlying disease)
Tab. Fluconazole 3-6 mg/kg once daily for 5-7 days.
Or
Tab. Ketoconazole 3-6 mg/kg once daily for 5-7 days.

Warning

Resistant/recurrent/chronic thrush in a child with no obvious predisposing factor/source of infection look for underlying endocrinopathy/immune disorder, AIDS and malnutrition.

Patient/Parent education

Emphasize on bottle hygiene, care/hygiene of the nipple and treatment of vaginal candidiasis in expectant mother.

References


CONSTIPATION

Constipation is defined as the passage of hard stools that are difficult to pass irrespective of frequency. However, passage of stool less than twice a week is considered as constipation. Genuine hard stools may result from an excess milk intake, hunger stools, use of over-strength artificial feeds and low roughage diet. True constipation may be due to anorectal malformation, low intestinal obstruction, neonatal small colon syndrome, Hirschsprung disease, cystic fibrosis or hypothyroidism but most of the time it is idiopathic.

SALIENT FEATURES

- Fretfulness, poor appetite, intermittent abdominal pain, distension. Retentive posturing occurs with urge to defaecate, relieved after going to the toilet, overflow soilage may appear.(Encoprosis)
- There may be history of recurrent UTI. Weight gain may be impaired.
- On examination there is faecal soiling of under wear and persistent faecal odour. Abdomen is often distended and tympanic to percussion. Faecal masses palpable above pubis and in left colon, rarely entire colon is filled with firm mass on rectal examination, hard stool are palpable in ampulla.
Treatment

If a surgical cause is suspected patient should be investigated and treated accordingly. The main objective of medical management is to dislodge faecal mass, overcome withholding behaviour and promote regular bowel habits.

Nonpharmacological

Dietary modification: Ensure adequate fluid intake in diet. In infants, breast milk should continue as it is less likely to be constipating than cow's milk, can add extra sugar in cow's milk if child is not breast-fed.
Add fiber by cereals (wheat bran, oat, com), pulses, vegetables, salads and fruits and isabgol.
Behavioral modification.
Toilet training to achieve regular evacuation. Child is instructed to use bathroom after break fast or dinner, to take advantage of meal stimulated increase in colonic motility.
Maintain calendar to record stooling.
Positive reinforcement (reward/appreciation) for successful toileting (no punishment for failure).
Follow up with regular contact with child and parent for 2-3 years.

Pharmacological

1. Rapid Rectal Decompression:
   a. Glycerine suppository for infant and toddlers.
   b. Phosphate enema 60ml for <1 year and 6ml/kg up to 135 ml for >1 year child.

2. Slow oral disimpaction:
   a. Over 2-3 days-
      Polyethylene Glycol with electrolytes, 25ml/kg up to 1000ml/hr until clear fluid comes out from anus.
   b. Over 5-7 days-
      i. Polyethylene glycol without electrolytes 1.5gm/kg per day for 3 days
      ii. Milk of Magnisia 2ml/kg twice daily for seven days
      iii. Mineral oil 3ml/kg twice daily for 7 days
      iv. Lectulose/Sorbitol 2ml/kg twice daily for 7 days

3. Maintenance therapy:
   a. Long term(for years)-
      i. Milk of Magnisia 1-2ml/kg divided into 1-2 dose for >1 month age
      ii. Mineral oil 1-3ml/kg divided into 1-2 dose for >12 month age
      iii. Lectulose/Sorbitol 1-3ml/kg divided into 1-2 dose for >1 month age
      iv. Polyethylene glycol 0.7gm/kg divided into 1-2 dose for >1 month age
   b. Short term(for months)-
      i. Senna 1tab.(1-5 years) or 2 tab.(5-15 years) With breakfast maximum 3 tab. Daily.
ii. Glycerine enema 20-30ml/day for >10 years of age.

iii. Bisacodyl suppositories 10mg daily for age >10 years.

In very severe cases with multiple faecoliths, failed medical treatment, mental retardation etc., surgical disimpaction may be done.

Patient/Parent education

The parents should be empowered to titrate the medication against the child's stools.
Importance of dietary modifications should be explained.
Treatment should not be abandoned early after recovery.
Bowel training should have only positive reinforcements. Negative reinforcement should be avoided at all costs.

References.
(See also Constipation in Chapter 6)

RECURRENT ABDOMINAL PAIN OF CHILDHOOD (RAP)

Three or more bouts of abdominal pain occurring over a period of not less than three month and severe enough to interfere with child's normal activities. It is most common in the age group of 5-15 years and in 90% cases it is functional.

SALIENT FEATURES

- Paroxysmal - Child appears well in between the episodes or sometimes dull continuous ache may be present.
- Mostly periumbilical, epigastric or suprapubic.
- Episodes last for generally less than one hour.
- Not related temporally to activity, meals, and stress or bowel habits.
- Rarely awakened from sleep.
- Normal physical examination and growth.

Warning signs pointing towards organic pain

Well localized pain away from midline (Apleys law - farther the pain from midline, more likely to be organic).
Repeated vomiting.
Pain awakening the patient from sleep.
Radiation to shoulder, back, scapula, lower extremities.  
Age less than 6 years.

Associated fever, arthralgias, rash, rectal bleeding. Consistent sleepiness following pain attacks. Intermittent faecal incontinence.

Weight loss or growth deceleration.

Recurrent isolated episodes of pain that come suddenly and last for several minutes to few days.

In case of any warning sign, patients should be investigated accordingly, otherwise treat as functional. However, basic investigations e.g. urine, stool, Mantoux and ultrasound examination might be done.

Upper gastrointestinal endoscopy is generally not required.

**Treatment**

**Nonpharmacological**

Treat organic cause if found.

Environmental intervention to avoid painful stress; change in parent reaction to avoid secondary gain. Common psychogenic factors responsible for RAP are complaint modeling (parents with abdominal pain), school phobia, learning problems, anxious overachiever, ridicule by peers, teacher incompatibility, attention seeking (attention withdrawal after an illness, over busy parents, single child, sibling rivalry, eating time conflict, forceful toilet training), family psychopathology (parental conflict, single parent).

Visit to doctor and placebos often help.

Child is asked to maintain pain chart (help in assessment of improvement as well as aetiology).

If required, help from a psychologist may be taken.

**Pharmacological**

Nothing more than placebo is required.

Constipation, if present may be treated.

**Patient/parent education**

Explain the outline of the work up and treatment for the child before starting treatment. Doing so after negative work up makes family feel that the physician is making excuses. Explain that cause of RAP in most children is nonorganic.

Discovery of cause may lessen the family's concern but may not alleviate the symptoms. There is no way to be certain that abdominal pain is because of identified disease entity. Pain may continue and its persistence does not mean serious organic disease.

**References**

ACUTE DIARRHOEA

Acute diarrhoea is defined as passage of 3 loose stools per day for a duration of less than 7 days, and increased fluidity or volume of stools. It is caused commonly by Rotavirus, E. coli, V. cholerae, Giardia or parenteral infections and invasive diarrhoea by Shigella, Salmonella and E. histolytica.

SALIENT FEATURES

- Clinical features of diarrhoea are frequent stools, vomiting, fever and dehydration.
- Dehydration is categorized into some dehydration and severe dehydration.
  In some dehydration child is thirsty and drinks voraciously, active and alert but irritable, with sunken eyes, depressed fontanelle, absent tears, loss of skin turgor and some decrease in urine output.
  In severe dehydration all these are more severe except that child is lethargic and does not want to drink water.

Table 19.10 lists the investigations that may be done if indication exists.

Table 19.10. Investigations in acute diarrhoea

<table>
<thead>
<tr>
<th>Investigations</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stool microscopy</td>
<td>Dehydration or high fever, Diarrhoea persisting beyond 7 days, Blood persisting in stool after 48 hour, of treatment</td>
</tr>
<tr>
<td>Blood urea.</td>
<td>All 3 investigations in moderate to severe dehydration, SE in persistent vomiting or signs of dyselectrolytaemia, ABO in respiratory distress and no chest signs and sepsis (correct it only if pH &lt;7.25).</td>
</tr>
<tr>
<td>S. electrolytes (SE) and arterial blood gas (ABO)</td>
<td>Fever persisting &gt;72 hours, PEM &gt; grade III or age &lt;3 months.</td>
</tr>
<tr>
<td>Infection screening by TLC, DLC, band cell count, ESRandCRP</td>
<td>Suspected sepsis, Before starting antibiotics. As and when required</td>
</tr>
<tr>
<td>Blood culture</td>
<td>No role</td>
</tr>
<tr>
<td>Chest X-ray, CSF and others</td>
<td></td>
</tr>
<tr>
<td>Stool culture</td>
<td></td>
</tr>
</tbody>
</table>

Nonpharmacological

Maintain hydration by home available fluids (HAF) in place of or along with ORS. These are rice, kanji, butter milk, dal soup, coconut water or weak tea etc. Soft drinks, sweetened fruit drinks and tea are unsuitable and could be potentially dangerous.

Maintain nutrition: continue breast feeding. Continue normal light diet e.g. khichri, dalia, banana or mashed dal etc. Do not dilute or stop milk as there is not much role of lactose intolerance or milk protein allergy. Give extra food during recovery.
Pharmacological

I. Low osmolarity oral rehydration solution (ORS) is used in some dehydration

75 ml/kg in 4 hours under observation.

After 4 hours if dehydration is corrected, or if child was not dehydrated at presentation, send home with instructions to give ORS in 2:1 dilution as accepted by the child. Asked to report back if vomiting persists or urine is not passed for >8 hours. As a rough guideline 10 ml/kg of ORS may be added for each large stool.

If dehydration is not corrected after 4 hours, same amount of ORS may be repeated in next 4 hours and if dehydration is corrected send home.

If dehydration does not improve in 8 hours or if it worsens abandon oral rehydration therapy (ORT) and give IV fluids.

Zinc ORS is not superior to supplementation of zinc separately, III malnourished children with diarrhoea.

Principles of Oral Rehydration Therapy (ORT)

Give in small sips.

Vomiting is not a contraindication unless persistent.

Contraindicated in altered sensorium or paralytic ileus.

Stop as soon as diarrhoea stops.

2. IV fluid therapy in case of severe dehydration or shock or contraindications or failure of ORT. N/2 saline is given over 8 hours (1:100 ml KCl after child passes urine), as follows:

Some dehydration- 75 ml/kg.
Severe dehydration- 100 ml/kg (half in first 2-3 hours)
Shock- push 20 ml/kg of Ringer’s lactate or normal saline over 15 minutes and can repeat twice more if shock persists use central venous pressure monitoring for further management if shock present after pushing 60 ml/kg.
(For details see section on shock in Chapter 2).

Specific therapy, if indicated

Frank blood and mucus in the stool or >10 pus cells/HPF

Syr. Nalidixic acid 55 mg/kg/day in 3 divided doses for 5 days
Or
Syr. Ciprofloxacin 15-20 mg/kg/day in 2 divided doses (Shigella strains are largely resistant to ampicillin and cotrimoxazole) for 5 days.

Giardiasis (only if trophozoites are seen on stool microscopy) Syr.
Metronidazole 15 mg/kg/day in 3 divided doses for 5 days Or
Syr. Tinidazole 50 mg/kg/day single dose (max. 2 g)

Cholera (suspect in any child with severe watery diarrhoea)

Mainstay of treatment is fluid therapy and following antibiotic may be used to prevent spread:

Syr. Doxycycline 5 mg/kg (max 200 mg) in single dose.
Or
Syr. Furazolidone 5 mg/kg/day in 4 divided doses for 3 days.
Or
Syr. Cotrimoxazole (TMP) 8 mg/kg/day in 2 divided doses for 5 days.
Or
Syr. Erythromycin 30 mg/kg/day for 3 days.

Parenteral infections to be treated by appropriate antibiotics. There is not much role of antiemetics in a child with vomiting. Rule out meningitis, URI and dyselectrolytaemia and give ORS in sips. If vomiting persists give intravenous fluids. However, occasionally 1 or 2 doses of Metoclopramide (0.5 mg/kg) or Domperidone (0.5 mg/kg) may be tried before giving intravenous fluids. Binding agents e.g., Kaolin pectin etc. are not useful.

Following drugs are contraindicated
1. Antimotility agents e.g. diphenoxylate, atropine etc.
2. Antisecretory agents e.g., loperamide, salicylates etc.

Keep record of vitals e.g. pulse, BP, capillary filling time (CFT), respiratory rate (1 hourly) and temperature (6 hourly). Monitor for improvement or worsening of signs of dehydration. Record urine output and stool frequency and consistency.

Modifications or step up treatment
Admit if PEM grade III or age <3 months (as higher chances of complications e.g. shock, hypoglycaemia etc.), anxious mother, associated severe systemic infections e.g. septicaemia, meningitis or pneumonia. Investigate for lactose intolerance, incipient infections e.g., Urinary tract infection (UTI) or rare gut organisms, if diarrhoea persists for >7 days. Exclude parenchymal renal failure, if child has not passed urine after hydration. Give a fluid challenge (20 ml/kg of normal saline) followed by frusemide injection 0-2 mg/kg). If urine is still not passed then parenchymal renal failure considered and managed accordingly.

Patient/Parent education
Information on natural course of diarrhoea to avoid dissatisfaction and that ORS only prevents dehydration i.e. purge rate and consistency usually improves by 3-7 days

Explain that most of the complications in diarrhoea are because of dehydration and thus ORS is the mainstay of therapy.

Explain preparation of ORS and method of administration.

Nutritional advice as mentioned earlier in nonpharmacological section.

Education about food and water hygiene.

References

ACUTE VIRAL HEPATITIS

Acute viral hepatitis is a systemic infection affecting liver and is caused by a number of viruses like Hepatitis A, B, C, D, E viruses etc. Commonest causes for infective hepatitis among children are Hepatitis A and Hepatitis E. Both of these are spread by faeco-oral route. Hepatitis Band C are more common in children requiring blood product for certain chronic illnesses.

SALIENT FEATURES

- The illness may vary from asymptomatic infection, anicteric hepatitis to icterus, and even hepatic coma.
- Prodrome constituted by fever, malaise, nausea, emesis, anorexia and abdominal discomfort may precede the appearance of jaundice. It may go unnoticed or may be severe mimicking malaria or typhoid fever.
- LFTs may be done only if the course of disease is unusual or when obstructive jaundice is suspected.

Treatment

Nonpharmacological

Rest if the patient feels exhausted or fatigued (forced rest does not help and does not shorten the time to recovery).

Regular small frequent meals with high caloric content. High carbohydrate diets are acceptable but should be hygienic. Traditionally sugarcane juice is used as home therapy though it has no established benefit. Maintain adequate hydration in case of vomiting and avoid fatty meals.

Pharmacological

There is no specific treatment for simple acute viral hepatitis. Uncomplicated cases can be treated at home.

If patient has frequent vomiting Syr/Tab, Metoclopramide 0.1 mg/kg/dose or Ondensetron 0.15-0.45mg/kg/dose IV for >3 years of age, can be given as and when required but not to be repeated before 6 hours. Zink and Vit E can also be added. Usually fever abates after jaundice appears. Occasionally if the situation requires, paracetamol may be used sparingly (see section on fever in chapter I).

Persistent high grade fever suggests alternative diagnosis. Hospitalization required only in clinically severe illness e.g. alteration in sleep pattern, altered behavior, abnormal movements, persistent vomiting, dehydration, decreased urinary output, bleeding from any site or any other complication.

Patient education

Continue breast feeding or other regular feeding.

Observe carefully for any danger signs listed above.

Usually a self limiting disease and fever subsides after the jaundice is evident.
clinically. Most patients start recovering in 7-14 days time. Total duration of
illness is 3 weeks.
Hepatitis A and B are two different diseases. Getting your child vaccinated
with hepatitis B vaccine will not protect you against Hepatitis A (see section on
immunization for details).
Hepatitis A spreads through contaminated food and water and close person to
person contact.
Raw or insufficiently cooked food (fruits, vegetables, salads) or cooked
food handled by an infected individual can be the source of hepatitis A
infection.

Reference
   also Jaundice and Acute viral hepatitis in adults in Chapter 1).

CHICKEN POX OR VARICELLA

Varicella is the primary infection caused by Varicella-zoster virus. It is highly infectious
and is transmitted by droplet infection. The incubation period is about 14 days.

SALIENT FEATURES

- Begins as crops of small red papules over the trunk appearing within 1 day of
  fever and systemic symptoms which quickly develop into clear, often oval
  vesicles on an erythematous base. Contents become cloudy in about 24 hours
  and then scab. Many such crops may appear for 3=4 days.
- Bacterial superinfection, thrombocytopenia, arthritis, hepatitis, encephalitis or
  meningitis can complicate the disease.
- The disease is severe in adolescents and adults as well as immune
  compromised individual. Reactivation disease results in herpes zoster or
  shingles for details see skin section in chapter 14).

Treatment

Nonpharmacological

Itching is bothersome and scratching effect may be minimized by making the
patient wear mittens, daily change of clothes and good personal hygiene may
decrease the risk of secondary infection.

Pharmacological symptomatic therapy

1. For management of fever (see section on fever). Aspirin and other salicylates are
   contraindicated due to risk of Reye’s syndrome and should not be used.
2. Local anti-pruritic agents like Calamine lotion may alleviate itching. If itching

...
is not relieved with above. Tab. Pheniramine 25 mg 2 times a day
In children Syr. 0.5 mg/kg/day every 8 hours
Or
Tab. Cetirizine 10 mg once a day
In children (2-6 years) 5 mg; (>6 years) 10 mg once a day.
Or
Levocetirizine 0.125mg/kg(2-6 years), 2.5mg(>6 years) as simple
dose (avoid below 2 years of age)

3. In case of immune-compromised children on long term treatment with
steroids, those on anti-cancer drugs or other immunosuppressive therapy, HIV
positive patients, children older than 12 years of age, those with chronic
cutaneous or pulmonary disorders who are at increased risk of severe
disease, oral acyclovir if started within few hours (<24 h) of the onset of
rash may decrease the duration, magnitude of fever as well as the number of
skin lesions.

To be started routinely for a healthy child.
Tab. Acyclovir 20 mg/kg/ day is given 6 hourly for 5 days.
In case the patient is severely immuno-compromised, viral encephalitis or
severe disease in adults, Inj. Acyclovir should be started as soon as possible in
all cases at the dose of 10 mg/kg 8 hourly IV for 7 days.

Assessment of response to therapy
Most cases will stop having fever after the initial 3-4 days when new crops of
vesicle stop appearing. The vesicles normally heal by scabbing in about a week's
time. Persistence of fever may suggest secondary infection.

The disease can be complicated by: secondary bacterial infection of skin lesion,
thrombocytopenia, pneumonia - particularly in adolescents and adults, Reye's Syndrome,
post infectious encephalitis and if any of these develop, should be treated appropriately.

Patient/Parent education
The disease commonly is self limiting in healthy children. Child should be
excluded from day care or school till after 6th day of the rash or till scabs are formed.
Do not use over the counter fever medicines as they may contain aspirin
or other salicylates.
An expensive but potent vaccine is available for protection against the disease
and can be recommended only for those at risk of severe form of the disease
but is immunocompetent.
Post exposure prophylaxis with VZIG (specific immunoglobulins) is
recommended for the contacts that are severely immunocompromised or
pregnant (particularly in the first trimester).

References
   713-737.
MEASLES

Measles is an acute viral disease of childhood, associated with high rates of morbidity and mortality. It directly or indirectly contributes to 7% of the under five deaths in the developing world.

SALIENT FEATURES

- Fever, cough, coryza, conjunctivitis, an erythematous maculopapular rash appearing on the 4th day of the illness, and a pathognomonic enanthem (Koplik spots) characterize it.
- Rash starts from behind the ears, along the hairline, involve the face and then the trunk and the limbs.
- Fever usually subsides after the appearance of the rash unless there is some complications such as otitis media, bronchopneumonia, laryngotracheobronchitis (croup), and diarrhoea. Acute encephalitis, which frequently results in permanent brain damage, occurs in approximately 1 in every 1000 cases.
- Another cause of persistence of fever could be flaring up of Koch's.

Treatment

Nonpharmacological

- The patient should be isolated from other susceptible individuals particularly unimmunized children for at least four days after the appearance of the rash.
- Bed rest is usually required and cold sponging may be required for febrile patients.
- Small frequent feeds and plenty of oral fluids should be continued.

Pharmacological

- No specific antiviral treatment is available.
- 1. Fever is managed with oral Paracetamol (see the section on fever in chapter 1).
- 2. If there is persistent coryza or nasal itching which is disturbing the child, oral Syr. Promethazine 1 mg/kg/day in 3-4 divided doses can be used.

Treatment of other co-existing problems

- 1. Vitamin A 200,000 IU is given orally for children of age >2 years, 100,000 IU for 6-month-1 years age group and 50,000 IU for below 6 months of age. The is to be repeated on next day.
2. Treat appropriately secondary bacterial infection like bronchopneumonia and/or gastrointestinal infection.

**Patient/parent education**

The disease leads to marked anorexia and also often precipitates protein energy malnutrition (PEM) and other deficiencies. Regular frequent feeds must continue. Extra meal should be added to provide for increased requirement during convalescence.

The disease usually lasts 10-12 days and the maximum risk of infectivity is 5 days prior to and 4 days after the appearance of rash. The rash usually heals by desquamation and often leaves some hyperpigmented stains on the body which disappears over weeks subsequently.

The parents must report to the hospital in case the child develops any of the following warning signs:
- Stiff neck, facial twitching or convulsions (seizures), extreme drowsiness, loss of consciousness or altered behaviour.
- Rapid and or laboured breathing, difficulty in feeding, cyanosis.
- Significant dehydration as evident by sunken eyes or fontanelles, loss of skin turgor, dryness of tongue or lack of tears etc.
- Blood in stools.

Vaccination against measles is recommended at 7-9 months of life and a subsequent booster with measles or MMR is mandated at 15 months of age particularly if the primary immunization was done at less than 9 months of age. There is no role of giving measles vaccination to a child who has already suffered from the disease.

In case any other susceptible (unimmunized child below 5 year) has been in contact with the patient of measles then it may be worthwhile to immunize this individual. Measles vaccine is useful if used early as it can prevent or decrease the severity of the disease in the secondary contacts (see section on immunization for details).

**References**

4. IMNCI Guidelines

**MUMPS**

Mumps is a disease caused by a virus that can infect many parts of the body, especially the parotid salivary glands.
SALIENT FEATURES

- The parotid glands become increasingly swollen and painful over a period of one to three days. There is often a fever of up to 103°F (39.4°C), with headache and loss of appetite.
- **Mumps** can also involve the brain, pancreas and other organs. The involvement of these organs signifies a severe disease and there is usually a recrudescence of high fever in such situations in addition to organ specific symptoms.
- Meningoencephalitis is the commonest complication (2501 to 10000 cases). Other complications are orchitis, epididymitis, oophoritis, pancreatitis, thyroiditis, myocarditis, deafness, optic neuritis and arthrits.

Treatment

**Nonpharmacological**

Child should be encouraged to drink plenty of fluids. Water, decaffeinated soft drinks and tea are better tolerated than acidic fruit juices (like orange juice, grapefruit juice or lemonade) that make parotid pain worse.

Either warm or cold packs - whichever feels better - may be used to sooth the swollen parotid glands.

**Pharmacological**

Most cases are treated symptomatically on OPD basis.

Fever when troublesome may be brought down using non aspirin fever medications such as Paracetamol (10-15 mg/kg/day SOS or every 4-6 hours). These medicines will also help relieve pain in the swollen parotid glands.

(Caution: Aspirin is contraindicated in children with viral illnesses due to risk of Reye's syndrome).

Being a viral illness antibiotics have no role. There is no specific therapy available.

Patients with abdominal pain, testicular swellings or signs of raised intracranial tension need to be admitted in the hospital.

**Patient/parent education**

Parents should be explained warning signs e.g.

- **In boys**, parents are told to watch for high fever, with pain and swelling of the testicles.

  Watch for abdominal pain that can mean involvement of the pancreas in either sex, or involvement of the ovaries in girls. Severe headache, stiff neck, convulsions (seizures), extreme drowsiness etc suggest CNS involvement and need for admission to a tertiary level center.

  Recurrence of high grade fever (above 101°F/38.3°C) often heralds onset of the above complication and can be used as an early referral sign.
<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Polio</th>
<th>GBS</th>
<th>Transverse myelitis</th>
<th>Traumatic or injection neuritis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Most cases occur under 3 years of age</td>
<td>Usually above 2 years of age</td>
<td>Mostly above 4 years of age</td>
<td>No age limit</td>
</tr>
<tr>
<td>Progression of paralysis</td>
<td>24-48 h onset to full paralysis</td>
<td>Hours to days</td>
<td>Hours to 4 days</td>
<td>Hours to 4 days</td>
</tr>
<tr>
<td>Fever onset</td>
<td>High always present at onset of flaccid paralysis disappears the following day</td>
<td>Not common</td>
<td>Rare</td>
<td>Commonly present before, during and after paralysis</td>
</tr>
<tr>
<td>Flaccidity</td>
<td>Acute, asymmetrical, proximal</td>
<td>Acute, asymmetrical, distal</td>
<td>Acute lower limbs symmetrical</td>
<td>Acute, asymmetrical limb</td>
</tr>
<tr>
<td>Muscle tone</td>
<td>Diminished</td>
<td>Diminished</td>
<td>Diminished in lower limbs</td>
<td>Diminished in affected limb</td>
</tr>
<tr>
<td>Deep Tendon Reflexes</td>
<td>Decreased or absent</td>
<td>Absent</td>
<td>Absent in lower extremities, later hyper-reflexia</td>
<td>Decreased or absent</td>
</tr>
<tr>
<td>Sensation</td>
<td>Severe myalgia but no sensory deficit</td>
<td>Cramps, tingling hypoanaesthesia of palms and soles</td>
<td>Anaesthesia of the lower limbs with sensory loss</td>
<td>Pain in gluteal region</td>
</tr>
<tr>
<td>Cranial nerve</td>
<td>Only in bulbar or bulbospinal cases. Loss of gag reflex most common</td>
<td>Often present affecting VII, IX, X, XI, XII</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>Only when bulbar and bulbospinal involving respiratory muscles</td>
<td>In severe cases</td>
<td>Sometimes</td>
<td>Absent</td>
</tr>
<tr>
<td>CSF WBCs Proteins</td>
<td>High WBCs. Normal or slightly increased</td>
<td>&lt;10</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Bladder dysfunction</td>
<td>Absent</td>
<td>Transient</td>
<td>Present</td>
<td>Never</td>
</tr>
<tr>
<td>Nerve conduction velocity in 3rd week</td>
<td>Abnormal, anterior horn cell disease</td>
<td>Abnormal, demyelination</td>
<td>Normal of abnormal has no diagnostic value</td>
<td>Abnormal in sciatic nerve</td>
</tr>
<tr>
<td>EMG 3rd week</td>
<td>Abnormal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Sequelae at 3 months and up to a develop later</td>
<td>Severe asymmetrical atrophy, skeletal deformities may atrophy after years</td>
<td>Symmetrical atrophy of distal muscles, diplegia, lower limb</td>
<td>Flaccid</td>
<td>Moderate atrophy only in affected year</td>
</tr>
</tbody>
</table>
Children usually recover from mumps in about 10-12 days. First attack of mumps almost always gives lifelong protection against another, therefore, such children do not benefit from any immunization later. Mumps can be prevented by a vaccine which can be given alone, or as part of the mumps-measles-rubella (MMR) vaccine given at the age of 15 months. Mumps vaccine is effective in 75 to 95% of immunized persons (for details see section on immunization).

References

ACUTE FLACCID PARALYSIS (AFP)
A case of AFP is defined as any child aged <15 years, with acute onset of flaccid paralysis without any obvious cause (e.g. severe trauma or electrolyte imbalance like hypokalaemia). AFP is a notifiable disease and all cases must be reported to Nodal Officer and District Surveillance Officer, NPSP Unit, Directorate of Family Welfare.

SALIENT FEATURES
- The paralysis is of acute onset &frac14 weeks) and the affected limb(s) are flaccid (floppy or limp). If the AFP is due to polio, then sensation is never affected. Other important differentials to be considered in cases with AFP are detailed in Table 19.11.
- Pseudoparalysis due to pain in congenital syphilis, osteomyelitis, abscess, scurvy, unrecognized trauma leading to contusions, slipped epiphysis or fractures etc can also mimic AFP

Treatment for acute POLIO cases
All cases should be treated as below except patients with isolated single lower limb involvement and reporting after 4 days of onset of paralysis and currently not progressing for more than 48 hours.

Nonpharmacological
Complete bed rest and correct positioning of the affected limbs in the optimal position as follows:
- Hip - slight flexion, knee - 5 degrees flexion, foot - 90 degrees with support against the soles. Both legs should be supported from the lateral sides with pillows or rolled towels or salt/sand packs to prevent rotation. When pain subsides, passive movements of the joints for about 10 minutes, 2-3 times a day.
Warm water fomentation using hot packs with soaked towels wrapped around the affected parts for about 10 minutes, 2-3 times a day help in relieving pain.
If transient urinary retention occurs, alternate hot and cold compresses over the suprapubic region.
**Caution:** No massage or intramuscular injections as it may further precipitate paralysis. Watch for progression, particularly for the involvement of the respiratory muscles.

**Pharmacological**

There is no specific drug therapy for polio. For fever and pain use paracetamol or ibuprofen (see section on Fever in Chapter 1). Referral to a tertiary care level center with a ventilatory support facility if there is progression of paralysis, respiratory distress, bulbar involvement, paralysis of upper limbs which is <3 days old (there is higher risk of diaphragmatic involvement in such cases), marked drowsiness or any other complication.

**Patient/Parent education**

No dietary restrictions, however, continue breast feeding or other regular feeding.
Paralysis progresses usually for about 4-7 days after onset. Recovery may start thereafter over days to weeks with little recovery of strength after 6 months of illness. A regular physiotherapy facilitates recovery of muscles.
**Note:** Post polio residual paralysis should be referred for rehabilitative services to an appropriate centre.

References


**PERTUSSIS (WHOOPING COUGH)**

This results from *Bordetella pertussis* infection leads to this respiratory disorder which can have long term poor effects on health.

**SALIENT FEATURES**

- Beginning as a mild upper respiratory tract infection (catarrhal stage), can progress to severe paroxysms of cough, often with a characteristic whoop, followed by vomiting.
- The child runs out of breath with bulging eyes, flushed face, lacrimation, salivation, protrusion of tongue and distension of the neck veins etc. Such episodes are exhausting and precipitated by yawning, sneezing, eating or even suggestion.
Treatment

Pharmacological

1. Syr. Tab. Erythromycin, 40–50 mg/kg/day in 4 divided doses orally for 14 days initiated early in the coryzal phase of the disease i.e. first 14 days of the illness may shorten the course of whooping cough, which otherwise may last for weeks or months. Later once the paroxysms start, no antimicrobial have any benefit except for eradication of any secondary pulmonary infection.

2. In patients with severe coughing paroxysms salbutamol 1-2 mg/kg/day in 3-4 divided doses for a week or so may be tried.

3. Severe cases particularly those <6 months of age and those with respiratory distress need to be admitted for intravenous fluids and oxygen therapy.

Supportive therapy

Oxygen therapy is required in severe cases with respiratory distress. Hydration should be maintained with intravenous or oral fluids in adequate amounts (cough suppressants are usually not helpful).

Patient/parent education

Explain the need to continue feeding during the prolonged period of cough, adequate hydration and nutrition to prevent onset of malnutrition. Antibiotic therapy must be continued for at least 14 days to prevent relapse of the disease, even if they may not be providing any relief in the symptoms. All contacts below 7 years of age must be given erythromycin for 14 days. Contact the doctor immediately if the patient develops listlessness, apnoea or seizures. This is particularly more common in infants below 6 months. Immunization against pertussis is available in our country as triple antigen (DPT) and 3 primary doses are routinely advised for all infants followed by a booster after 1.5 years and 4.5 years after the primary immunization. The primary immunization is expected to reduce the disease burden by two third.

References


CARDIAC FAILURE

Cardiac failure is defined as a state in which the heart cannot deliver an adequate cardiac output to meet the metabolic needs of the body. Clinical presentation is dependent on age and degree of cardiac reserve. Common causes according to age of presentation are:

Neonate - Severe anaemia, heart block, congenital heart disease e.g. hypoplastic left heart, coarctation, left to right shunt and large mixing cardiac defects
Fig. 19.4. Algorithm for treatment of congestive heart failure
Infant - Left to right shunt, supraventricular tachycardia.
Children - Rheumatic fever, myocarditis, cardiomyopathy, acute hypertension e.g., acute glomerulonephritis.

**SALIENT FEATURES**

- Exertional dyspnoea, poor weight gain, feeding difficulties, breathes too fast and better when upright, persistent cough and wheezing, excessive perspiration and irritability, puffiness of face and pedal oedema.
- Tachypnoea, tachycardia, small volume pulse, peripheral cyanosis, pedal/facial/sacral oedema, hepatomegaly, raised JVP (appreciated well in older children), gallop rhythm, cardiomegaly and failure to thrive.

**Treatment**

Identify and treat the underlying cause.

*Nonpharmacological*

- Restricted activity and bed rest with upright posture depending on cardiac reserve. In severe CHF, dietary modifications in infants by increasing calories per feed.
- Breast-feed supplementation, naso gastric feed to avoid the exertion of active feeding.
- No added salt in diet and fluid restriction.
- Cold sponging in case of fever.

*Pharmacological*

- Algorithm for treatment is shown in Fig. 19.2.
- **1. Elixir/Tab. Digoxin** (Elixir 0.25 mg/5 mL, Tab. 0.25 mg)
  - Method of digitalization. 0.5 x digitalization dose initially, 0.25 x digitalizing dose 8 and 16 hours later.
  - Digitalizing dose. Newborn = IV, IM: 0.010 - 0.030 mg/kg divided or orally: 0.040 mg/kg divided in fractions.
  - Infants = IV, IM 0.030 - 0.040 mg/kg or orally 0.050 mg/kg in fractions.
  - Children = IV, IM, PO: 0.010 - 0.015 mg/kg in fractions.
  - For maintenance. Begin maintenance dosage 24 hours after 1st fraction of digitalizing dose. Newborn = PO: 0.005 - 0.010 mg/kg/24 hours, divided every 12 hours. In infants and children orally 0.002 - 0.005 mg/kg/24 hours divided every 12 hours.
  - (Caution: Avoid hypokalaemia during therapy with digoxin)
- **2. Tab. Frusenide** 1-2 mg/kg every 12 hourly (may need K supplement).
  - Or
  - Tab. Chlorothiazide 20-50 mg/kg/day in 2 divided doses.
  - Or
  - Tab. Spironolactone 1-3 mg/kg/day in 2 divided doses.
- **3. In cases with regurgitant cardiac lesions like severe MR where reduction in after load is required**
  - Tab. Captopril 0.1-0.2 mg/kg/dose 8-12 hourly (maximum 4 mg/kg/day).
  - Or
Tab. Enalapril 0.08-0.5 mg/kg/dose 12-24 hourly (maximum 1 mg/kg/day).

4. Patients with hypotension and low cardiac output should be referred to a higher center for

Inj. Dopamine infusion (40 mg/ml) 2-20 mg/kg/min prepared in normal saline or 5% dextrose. Hypovolaemia should be corrected before infusion is started and BP is monitored during the infusion.

Or

Inj. Dobutamine infusion (250 mg/5 ml) 2-20 mg/kg/min. Both the drugs can be used simultaneously to have added response because of different mechanism of actions.

Parent education

Decreased salt intake should be emphasized.
Sufficient rest and adequate sleep must be emphasized. Strict bed rest is necessary only in severe cases.
Semi-upright position during sleep may make the patient more comfortable.

References
(See also Congestive Heart Failure in Chapter 3).

DIABETES MELLITUS (DM)

DM in children is of insulin dependent diabetes mellitus (IDDM) has hyperglycaemia with glucosuria and related metabolic changes.

SALIENT FEATURES

- While some cases present with classical symptoms of polyphagia, polydipsia, polyuria and weight loss, many children at the onset present in the state of diabetic ketoacidosis (DKA).
- A minority of cases, while asymptomatic are detected to have glucosuria and hyperglycaemia.
- Diagnosis of DM is made by demonstration of hyperglycaemia (random plasma glucose more than 200 mg/dl). Table 19.12 shows the cut off levels of plasma glucose used for diagnosis of DM, while doing oral glucose tolerance test (GTT after glucose dose of 1.75 g/kg of ideal body weight (maximum 75 g).
- Patients during DKA have moderate to severe dehydration with plasma glucose levels usually more than 300 mg/dl, metabolic acidosis, ketonuria and various electrolyte disturbances.
Table 19.12: Diagnostic criteria for impaired glucose tolerance and diabetes mellitus

<table>
<thead>
<tr>
<th>Impaired glucose tolerance (IGT)</th>
<th>Diabetes mellitus (DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting glucose 110-125 mg/dl</td>
<td>Symptoms of DM plus random plasma glucose ≥200 mg/dl</td>
</tr>
<tr>
<td>2 h plasma glucose during the OGGT &lt;200 mg/dl but ≤140 mg/dl</td>
<td>Or Fasting plasma glucose ≥126 mg/dl</td>
</tr>
<tr>
<td></td>
<td>Or 2 h plasma glucose during the OGGT# ≥200 mg/dl</td>
</tr>
</tbody>
</table>

* Symptoms include polyuria, polydipsia & unexplained weight loss with glycosuria and ketonuria

* OOTT Oral glucose tolerance test

**Treatment**

**Nonpharmacological**

**Diet.** Regularity of eating pattern is very important so that diet and insulin dosing is synchronized.

- General nutritional guidelines are followed.
- Calorie mixture should have 55% carbohydrates, 30% fat and 15% proteins.
- Avoid carbohydrate with refined sugars to prevent metabolic swings. Carbonated drinks should be of sugar free variety and should have low Glycemic Index.
- Fats derived from animal sources to be reduced and should be replaced by fats of vegetable origin.
- Calorie intake should be split as 20% breakfast, 20% lunch, 30% dinner and 10% each for 3 snacks at mid morning, mid afternoon and evening.

**Physical activity and fitness.** Usual exercises advised to diabetic children and adolescents include vigorous walking, jogging, swimming, tennis etc. Though, diabetics can undertake any exercise, but unusual exercise may require modification in insulin dosing. For the schedule day of unusual exercise, insulin dose may be reduced by 10-15%.

**Pharmacological**

**Initial therapy.** Treatment is initiated in the hospital with fastacting (regular) insulin. At the onset of DM (or after recovery from DKA) the dose of insulin is 0.5-1.0 unit/kg/day. Inj. Regular insulin 0.1-0.25 units/kg subcutaneous injections are given 6-8 hourly before meals.

Simultaneous blood glucose level monitoring is done. One to two days therapy is required to find out total daily insulin requirement. Once the patient stabilizes on 6 hourly insulin injections, the patient is switched over to "2 daily injections" schedule.
In "2 daily injections" schedule, the insulin is administered as follows: Combinations of intermediate acting (usually lente) insulin and fast acting (regular) insulin in the ratio of 2:3:1. Two third of total daily dose is injected before breakfast and one third before dinner. Each injection has combination of both types of insulin e.g., total dose of insulin is 30 units -20 units (14 units lente and 6 units regular) are injected before breakfast and 10 units (6 units lente and 4 units regular) are injected before dinner.

Blood glucose levels are monitored before each meal and the dose of insulin adjusted accordingly. Blood glucose levels should ideally be 80 mg/dl fasting and 140 mg/dl after meals (acceptable range between 80 -240 mg/dl). Early morning 3 AM blood glucose level should be more than 70 mg/dl.

**Modification in the insulin doses.**

Modification in the insulin doses will be required depending upon the blood glucose levels (Table 19.13).

<table>
<thead>
<tr>
<th>Time and blood glucose</th>
<th>Type and time of insulin modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High fasting blood glucose</td>
<td>Evening lente insulin is increased by 10%</td>
</tr>
<tr>
<td>2. High noon blood glucose</td>
<td>Morning regular insulin is increased by 10%</td>
</tr>
<tr>
<td>3. High pre dinner blood glucose</td>
<td>Morning lente insulin is increased by 10%</td>
</tr>
<tr>
<td>4. High pre bed time blood glucose</td>
<td>Evening regular insulin is increased by 10%</td>
</tr>
<tr>
<td>5. Low fasting blood glucose</td>
<td>Evening lente insulin is decreased by 10%</td>
</tr>
<tr>
<td>6. Low noon blood glucose</td>
<td>Morning regular insulin is decreased by 10%</td>
</tr>
<tr>
<td>7. Low pre dinner blood glucose</td>
<td>Morning lente insulin is decreased by 10%</td>
</tr>
<tr>
<td>8. Low pre bed time blood glucose</td>
<td>Evening regular insulin is decreased by 10%</td>
</tr>
</tbody>
</table>

Any increase or decrease in insulin dose is by 10-15%. Generally not more than 6 units.

After initial stabilization, newly diagnosed cases may have gradual decline in insulin requirement even up to 0.5 units/kg/day. This may persist for several weeks to several months.

Decrease total dose of insulin by 10% at the time of discharge from hospital as the increased activity at home will decrease the insulin requirement.

**Assessment of diabetic control or response to therapy**

Blood glucose estimation should be done before each meal and at bed time in the first few weeks after diagnosis. After stabilization, it can be reduced to twice a week.

Periodically blood glucose estimation at 3-4 AM is required to detect early morning hypo glycæmia.

Urine for sugar is also monitored initially 3-4 times daily before meals.

This can be done less frequently after initial few weeks, preferably on the days when blood sugar is not done.

Urine for ketones once daily should be done.

Glycosylated haemoglobin (HbA1c) estimation - once every 3 months. - HbA1c levels of 6-9% represent very good control of diabetes, 9 -12% show fair control and above 12% represent poor control.

Serum lipids - cholesterol, HDL, LDL, VLDL, triglycerides and urine for protein should be done once every year. Serum cholesterol should be less than 200 mg/dl, LDL less than 130 mg/dl and triglycerides less than 140 mg/dl.

Thyroid function tests should be done once every year to detect concomitant hypothyroidism.
(For management of Hypoglycaemia and Diabetic ketoacidosis see also Chapter on hormonal disorders).

**Patient/parent education**

- Patient/parents should be taught self diabetic care which should include:
- Patient should have a ID card with diagnosis, name of patient, and whom should be contacted.
- Technique of measuring insulin in the syringe.
- Importance of drawing insulin always in the same sequence (usually regular insulin first) so that same type of insulin is left over in the dead space of the syringe.
- Explain technique of subcutaneous injections and importance of rotating the injection sites - arms, thighs (upper and lower), buttocks and abdomen.
- Monitoring urinary sugar - by the double void method (void 30 minutes before the test void).
- Blood sugar monitoring, maintaining the records of treatment and sugar levels.
- Adherence to diet.
- Regular exercise.
- Recognizing the symptoms of hypoglycaemia and its home management.

**Reference**


(See also Diabetes Mellitus in Chapter 11).

**HYPOTHYROIDISM**

Hypothyroidism is characterized by decrease in the function of the thyroid glands. Most cases in children are due to congenital hypothyroidism causes such as aplasia, hypoplasia or ectopia of thyroid gland. Common causes of acquired hypothyroidism are iodine deficiency, lymphocytic thyroiditis and following irradiation of cervical region for malignant disorder's. Diagnostic studies and treatment are same as that for congenital hypothyroidism.

**SALIENT FEATURES**

- Congenital hypothyroidism is difficult to diagnose in neonatal period as the symptoms and signs may not be fully developed. However, prolongation of physiological jaundice and feeding difficulty in the form of sluggishness and choking during feeding occur. Infants cry less, sleep more and have constipation, abdominal
protuberance and umbilical hernia. Infants with these features should be screened by thyroid function tests to avoid delay in diagnosis. Gradually the features of physical and mental retardation become more obvious which can be severe.

- The diagnosis is based on demonstration of low serum T4. Serum T3 levels may be normal and are not useful for diagnosis. In primary hypothyroidism, TSH is elevated. Radionuclide scans are not essential for diagnosis but help to delineate the exact aetiology.
Pharmacological

Initiation of therapy. L-thyroxine (Tab. 50 and 100 meg).

Initial dose in neonatal period is 10-15 meg/kg/day (usually 37.5-50 meg per day), given as a single daily dose half an hour before food. The tablet can be crushed and mixed in expressed breast milk or any other liquid for small infants.

Treatment is required life long and the requirement keeps changing with increasing age. In later part of infancy dose decreases to 5-6 meg/kg/day then to 3-4 meg/kg/day in children and the adult dose is 2 meg/kg/day.

Assessment of response. Early response is evident in initial few weeks and consists of symptomatic improvement in alertness, relief of constipation, improvement in appetite and feeding. Increased linear growth and osseous maturation is seen over next few months.

The child should be followed clinically every month for 6 months, 3 monthly till 2 years and thereafter once to twice every year. Recurrence of symptoms such as lethargy, constipation and weight gain suggest under treatment and diarrhoea, palpitations, increased appetite and weight loss suggest overdosing.

Periodic check on thyroid function tests is needed (6 monthly or so). Serum T4 level should be maintained in upper normal range and TSH levels suppressed to normal.

After few months of starting therapy, sometimes features suggestive of raised intracranial tension such as headache and vomiting may appear. The patient should be immediately admitted and treated.

Patient/parent education

1. Patient should be told about the need for life long administration of the drug.
2. Regular follow up at the interval described above is important for proper monitoring and dose titration.
3. Clinical symptoms of under or overdosage, including the danger signs of pseudo tumour cerebri should be explained.
   (See also Hypothyroidism in Chapter 11).

Reference


URINARY TRACT INFECTION (UTI)

Urinary tract infection (UTI) is a common bacterial infection in infants and children. One percent boys and 3-5% girls below 14 years develop UTI. Risk of UTI is higher in children with congenital urinary tract anomalies, chronic diarrhoea and malnutrition.
SALIENT FEATURES

- Symptoms are nonspecific. In neonates, it presents as a part of sepsicaemia, in infants and young children with fever, diarrhoea; vomiting, pain and poor weight gain.
- Older children may have burning, urgency, frequency, flank pain, turbid urine and recent onset enuresis. Diagnosis is confirmed by growth of significant number of organisms of a single species in the urine (Table 19.14).

Table 19.14. Interpretation of urine culture

<table>
<thead>
<tr>
<th>Method of collection</th>
<th>Colony count</th>
<th>Probability of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suprapubic aspiration</td>
<td>Urinary pathogen in any number</td>
<td>99%</td>
</tr>
<tr>
<td>Urethral catheterization</td>
<td>&gt;50 x 10^5 CFU/ml</td>
<td>95%</td>
</tr>
<tr>
<td>Midstream clean catch</td>
<td>&gt;10^5 CFU/ml</td>
<td>90-95%</td>
</tr>
</tbody>
</table>

CFU: colony forming units.

Definitions

Significant bacteriuria: Colony count of >10^5/ml of a single species in a midstream clean catch sample.
Asymptomatic bacteriuria: Presence of significant bacteriuria on two or more specimens in a child with no symptoms.
Recurrent UTI: Second attack of UTI.
Complicated UTI: Presence of fever >38.5°C, toxicity, persistent vomiting, dehydration and renal angle tenderness.
Simple UTI: UTI with low grade fever, dysuria, frequency, urgency but none of the above symptoms.

Treatment

Nonpharmacological

Maintain adequate hydration and encourage liberal fluid intake to alleviate dysuria (Note: Alkalization of urine is not necessary).

Pharmacological

Therapy should be started after obtaining urine culture. Patient's age, degree of toxicity, state of hydration, ability to retain oral intake and the likelihood of compliance with medication help in deciding therapy.

Complicated UTI and/or age less than 3 months

1. Inj. Ampicillin 100 mg/kg/day IV in 3 divided doses for 10 to 14 days. And
2. Inj. Gentamicin 5-6 mg/kg/day in 2 divided doses for 10 to 14 days. Or
   Inj. Cefotaxime 100-150 mg/kg/day IV in 3 divided doses for 10 to 14 days. Or
   Inj. Ceftriaxone 75-100 mg/kg/day IV in 1-2 divided doses for 10 to 14 days.
If age more than 3 months only Inj. Gentamicin can be given

Uncomplicated UTI and age >3 months

- Syr. Amoxycillin 30-50 mg/kg/day in 3 divided doses for 7 to 10 days.
  - Or
  - Syr. Cotrimoxazole (Trimethoprim) 6-10 mg/kg/day in 2 divided doses for 7-10 days.
  - Or
  - Syr. Cephalexin 50-70 mg/kg/day in 3 divided doses for 7-10 days.

(Caution: Quinolones should be avoided as first line medication; their use should be guided by results of culture and sensitivity test)

Nalidixic acid or Nitrofurantoin should NOT be used to treat UTI in young infants since they do not achieve therapeutic concentration in renal parenchyma and blood stream.

Monitoring

An abdominal ultrasound examination and repeat urine culture are necessary in patients who fail to show clinical response (reduction of fever and toxicity) within 48 hours of initial treatment.

First UTI

Ultrasound examination

Normal

Abnormal

MCU and DMSA scan

<2 years MCU and DMSA scan

2–5 years DMSA scan

=4 xd’ q Mn d agdqdu’ k’d m

MCU - Micturating cystourethrogram
DMSA - Dimercaptosuccinic acid radionuclide scan.

Fig. 19.3. Workup of cases of first UTI.
Workup of a case of first UTI is shown in Fig. 19.3. Child with more than one episode should be worked up for cause of recurrent UTI. Each episode is treated as mentioned above but child should be investigated in detail with ultrasound, MCU and DMSA scan and prophylaxis for recurrence as in Tables 19.15 and 19.16.

Table 19.15. Antimicrobials for prophylaxis of UTI

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose (mg/kg/day)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotrimoxazole</td>
<td>1-2 (trimethoprim)</td>
<td>Avoid in infants &lt;3 months age and G-6PD deficiency</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>1-2</td>
<td>Gastrointestinal upset; avoid in infants &lt;3 months age, G-6PD deficiency and renal insufficiency</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>10</td>
<td>Drug of choice in first 3-6 months of life</td>
</tr>
</tbody>
</table>

Antibiotic prophylaxis in recurrent UTI

Long term, low dose antibacterial prophylaxis is used to prevent recurrent febrile UTI.

Table 19.16. Indications and duration for antimicrobial prophylaxis

<table>
<thead>
<tr>
<th>Findings</th>
<th>Age</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>First UTI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflux and renal scar present</td>
<td>All</td>
<td>Till 5 years of age*</td>
</tr>
<tr>
<td>No reflux but renal scar</td>
<td>All</td>
<td>Six months and re-evaluate**</td>
</tr>
<tr>
<td>No reflux, no renal scar</td>
<td>&lt; 2 years</td>
<td>Six months and re-evaluate**</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 years</td>
<td>No prophylaxis</td>
</tr>
<tr>
<td>Recurrent UTI (without reflux or scar)</td>
<td>All</td>
<td>Six months</td>
</tr>
</tbody>
</table>

* Child >5 years of age at initial evaluation prophylaxis for 12-18 months, reevaluate
**DRCG/MCU to look for vesico urethral reflux (VUR), which might have been missed on initial evaluation. Prophylaxis is stopped if VUR is not detected.

Note: Grade IV (bilateral) and Grade V - prophylaxis given up to 1 year, then surgery is indicated.

Reference


ACUTE GLOMERULONEPHRITIS (POST-STREPTOCOCCAL)

It follows streptococcal infection of throat or skin by 1-2 weeks. Complications like congestive heart failure or encephalopathy may occur in a few patients. Diagnosis is clinical with urine showing RBCs, WBCs and mild proteinuria. Serum C3 levels may be low. Disease is self limiting and generally resolves in one month, however, microscopic urinary changes may persist up to one year.
SALIENT FEATURES

- Sudden onset of gross haematuria, proteinuria, oedema, hypertension, oliguria and other features of renal insufficiency.

Treatment

Child should be admitted for monitoring and treatment, if complications occur.

Nonpharmacological

Routine activity need not be restricted unless features of acute renal failure or severe hypertension occur.

Diet is restricted if there is acute renal failure or hypertension.

Pharmacological

Treatment of hypertension

Inj. Frusemide (40 mg) 1-2 mg/kg/day in 2 divided doses till oliguria lasts

Cap. Nifedipine 0.25 mg/kg SOS.

Inj. Procaine penicillin 4 lac units once daily if evidence of sore throat or skin infection

Monitoring and follow up with

Regular weight record, strict intake-output chart, blood pressure recording should be done regularly.

Refer to a higher centre if hypertension, haematuria or renal failure is not manageable.

Patient/parent education

Parents should be explained the natural course. More than 95% recover within 2-4 weeks. Only a few patients may end up with chronic renal insufficiency.

Reference


NEPHROTIC SYNDROME (NS)

Nephrotic syndrome is an important chronic disorder in children. It can be primary (idiopathic) or secondary (SLE, Henoch Schonlein purpura, amyloidosis etc). About 90% children with idiopathic nephrotic syndrome have ‘minimal lesion’ on renal histology and respond promptly to corticosteroids. Approximately three fourth patients have one or more relapses. Steroid toxicity and frequent serious infection complicate such cases.
SALIENT FEATURES

- **Heavy** proteinuria, hypoalbuminaemia (S. Albumin <2.5 g/dl), hyperlipidaemia (S. cholesterol > 200 mg/dl) and oedema. Dipstick or heat coagulation of urine shows 3+/4+ proteinuria.
- Investigations which help in diagnosis and management are urine analysis, blood counts, S. cholesterol, S. proteins, blood urea, S. creatinine, urine culture, X-ray chest, Mantoux, HBsAg.

Treatment

Treatment of nephrotic syndrome without hypertension, haematuria and azotaemia is shown in Figure 19.4.
Definitions useful for guiding treatment are as follows:

Remission: Urine albumin nil or trace (or proteinuria <4 mg/mv) for 3 consecutive days.

Relapse: Urine albumin 3+ or 4+ (or proteinuria >40 mg/mv) for 3 consecutive days having been in remission previously.

Frequent relapses: Two or more relapses in six months of initial response, or more than three relapses in any twelve months.

Steroid dependence: Two consecutive relapses when on alternate day steroids or within 14 days of its discontinuation.

Steroid resistance: Absence of remission despite therapy with 4 weeks of daily prednisolone in a dose of 2 mg/kg per day.

Nonpharmacological

Avoid saturated fats.

Adequate proteins, and salt restriction only during oedema, avoid extra salt

Good physical activity.

Pharmacological

Investigations to rule out infection should be done before starting treatment with steroids i.e. urine culture & sensitivity, Mantoux, X-ray chest, Hb, HBsAg.

Treatment of oedema. In case of moderate to severe oedema

Tab Frusemide 1-3 mg/kg/day in 1-2 doses given preferably in the morning.

Treatment of nephrotic syndrome without hypertension, haematuria and azotaemia is given in Figure 19.4. Presence of these features points towards nonminimal change.

If oedema does not respond, Tab Spironolactone 2-4 mg/kg/day as single dose preferably in the morning. A gradual reduction of oedema is better.

Patient with refractory severe oedema should be referred to a higher centre.

Monitoring

1. Urine output, weight record
2. Blood pressure
3. Urine albumin daily till remission

Infection in nephrotic syndrome

1. Patients of nephrotic syndrome with positive Mantoux test but no evidence of disease should be put on fNH prophylaxis for 6 months.
2. Absence of florid symptoms and signs may delay the diagnosis of serious infections like peritonitis and cellulitis in nephrotics. Systemic antibiotics should be used aggressively if infection is suspected.

Indications for kidney biopsy (to be carried out at tertiary care level)

At onset

<1 year or >15 years persistent microscopic or gross haematuria, low serum C3; sustained hypertension; renal failure not attributable to hypovolaemia; or suspected secondary causes of nephrotic syndrome.
**After initial treatment**

Proteinuria persisting despite 4 weeks of daily corticosteroid therapy.
Before starting treatment with cyclosporine-A.
Frequently relapsing or steroid dependent nephrotic syndrome.

**Indications for referral to a higher centre**

Onset <1 year of age.
Nephrotic syndrome presenting with hypertension, persistent microscopic or gross haematuria, or impaired renal function.
Complications like refractory oedema, thrombosis, severe infections and steroid toxicity.
Resistance to steroids: initial or late.
Frequently relapsing or steroid dependent nephrotic syndrome.

**Patient/parent education**

Reassurance that despite a relapsing course progression to end stage renal disease is rare.
Urine examination by sulfosalicylic acid (SSA), dipstick or boiling should be taught.
Maintain a diary showing proteinuria and medication received.
Ensure normal activity.
Protection against infection.

**Reference**

   (See also Nephrotic syndrome in Chapter 10).

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**NEUROCYSTICERCOSIS**

Neurocysticercosis is the disease produced by invasion of the CNS by the cystic stage (cysticercus) of pork-tapeworm (*Taenia solium*). It is the most common parasitic cause of CNS disease and is prevalent in every continent except Antarctica. In humans the disease is acquired by ingestion of contaminated food or water with the eggs of *Taenia solium*.

**SALIENT FEATURES**

- The clinical features depend upon site and number of cysts in the eNS, and the inflammatory response of the CNS. It can present as a ‘silent’ case on one hand to encephalitis like symptoms. On the other hand any neurologic, cognitive or personality disorder in an individual from an endemic area may represent neurocysticercosis. However, seizures, either focal or generalized, remain the most common form of presentation.

- **Less common** is the featureof meningeal irritation, hydrocephalus or increased intra-cranial tension. Decreased visual acuity may be seen in ocular
cysticercosis. In spinal neurocysticercosis, patients present with evidence of cord compression, nerve root pain, transverse myelitis, or meningitis.

- Imaging studies (CT & MRI) and serologic tests (ELISA or immunoblot) are the only way to confirm the diagnosis. Cystic lesions with or without enhancement and calcifications are the commonest findings.

**Treatment**

Issues concerning when and how to treat are not completely resolved. Parenchymal lesions resolve even without treatment. Anticonvulsant drugs may be the only symptomatic therapy required. However, some workers suggest cysticidal therapy because it leads to rapid resolution.

**Pharmacological**

1. Tab. Albendazole 15 mg/kg/day in 2-3 doses per day for 15 days, taken with fatty meals. Patients should be monitored carefully for development of raised ICP. Tab. Prednisolone 1-2 mg/kg/day started 2-3 days prior to cysticidal drugs and continued for 5-7 days may prevent these effects.
2. Anti-convulsants, such as carbamazepine or phenytoin should be used in appropriate doses to control the seizures. An optimum duration of therapy has not been settled. However, a seizure free interval for even one year may be taken as indication to taper off the therapy (for details see section on epilepsy and status epilepticus).
3. Corticosteroid currently use of corticosteroids limited to following category of patients only:
   i. Patients who develop signs of increased intra-cranial tension during treatment.
   ii. Large sub-arachnoid cysts (these cases have risk of developing cerebral infarcts due to occlusive endarteritis).
   iii. Encephalitis like features.
   iv. Cysticercal angitis.

**Surgical treatment**

1. A ventricular shunt must be placed if there is evidence of hydrocephalus. This should precede the medical treatment.
2. Surgical intervention is also required for removal of large solitary cyst for decompression, removal of mobile cysts causing ventricular obstruction, and some cases that fail to respond to medical therapy (spillage of cyst contents is not seen in these cases as is seen in cases of echinococcosis).
3. Ocular cysticercosis should be treated surgically only; enucleation is frequently required.
Patient/parent education

Minimizing the opportunities for ingestion of faecally derived eggs by means of good personal hygiene, effective faecal disposal and treatment and prevention of human intestinal infections.
All members of a family of an index case of cysticercosis should be examined for the presence of eggs or signs of disease.
Prolonged freezing or thorough cooking of food items will kill the parasite.

References
(See also Neurocysticercosis in Chapter 9).

FEBRILE SEIZURES

Febrile Seizures are brief (2-5 min), generalized tonic-clonic and selflimited seizures followed by a brief post-ictal period of drowsiness, in an otherwise healthy, febrile child of 6 months to 5 years of age, without any evidence of underlying neurological disease. They are the most common seizure disorder during childhood, with a uniformly excellent prognosis.

They occur rarely before 6 months and after 5 year of age. The peak age of onset is approximately 14-18 months of age, found in 3-4% of young children. There is a strong family history of febrile convulsions in siblings and parents, suggesting a genetic predisposition. Except for the cases at high risk, simple febrile seizures rarely develop into epilepsy.

**SALIENT FEATURES**

- Febrile seizures usually occur when the temperature is rising rapidly, to generally 39°C (102°F) or more of core temperature.

  They are of two types:

  (i) Typical (Simple) febrile seizure occurs on day 1 of fever, does not last for more than 10 minutes; generalized tonic-clonic; generally not more than one episode within 24 hours.

  (ii) Atypical or complex febrile seizure may persist for more than 15 minutes; it could be focal in nature; more than one episode of seizure in 24 hours.

- Lumbar puncture: A lumbar puncture with examination of CSF is essential to rule out possibility of meningitis in cases with first episode of febrile seizures.
• EEG is not required in case of simple febrile seizures. However, in cases with atypical febrile seizure or in a child with high risk for developing epilepsy, it may be helpful.

• **High** risk for developing epilepsy, include a positive family history of epilepsy, initial febrile convolution prior to 9 months of age, a prolonged or atypical febrile seizure, delayed developmental milestones and an abnormal neurological examination.

**Treatment**

Most febrile seizures are brief and would be over by the time a child is brought to the doctor or health facility.

Careful search for the cause of fever and treat fever (see section on fever in Chapter 1).

**Nonpharmacological**

Clear the airway, semi-prone lateral position and oxygen therapy.

**Pharmacological**

In cases presenting with seizures, the mainstay of management is prompt administration of anticonvulsants.

The best drug is Diazepam in a dose of 0.3 mg/kg by slow intravenous or rectal route. It can be repeated if seizures do not subside (per rectal dose may be given up to 0.5 mg/kg/dose).

Or

Inj. Midazolam 0.05mg/kg IV bolus to control seizure.

**Intermittent prophylaxis (during febrile illness)**

It is a safe and effective method of prophylaxis.

Clobazam0.3-1mg/kg/day at bed time for 2-3 days of febrile illness, started on the day of onset of fever. Dose can be adjusted if over sedation or ataxia noted.

**Patient/parent education**

• The parents and caretaker should be assured of the benign nature of the disease and should be told that no neurological deficit or mental retardation occurs as a result of simple febrile seizure.

• They should be taught about control of fever at home. They can be taught to give diazepam per rectally at home or midazolam nasal spray.

• Routine immunization as per schedule should be followed. After OPT vaccination, oral paracetamol 15 mg/kg/dose every 6 h for 2 or 3 days and similarly, after measles vaccination, oral paracetamol in the same dose started on the 4th day from the day of vaccination and given for 3 to 4 days to avoid precipitation of febrile seizures.
ACUTE MENINGOECEPHALITIS

Acute meningoencephalitis is an acute inflammatory process involving meninges and brain tissue, due to infectious causes. The common aetiological agents are viruses and bacteria. Children of any age may be affected.

**SALIENT FEATURES**

- Fever, headache, vomiting, irritability altered state of consciousness, signs of meningeal irritation and seizures.
- CSF examination differentiates the viral from bacterial cause of acute meningoencephalitis (Table 19.17).

**Treatment**

Supportive treatment is the mainstay of therapy and is started immediately.

1. Maintain airway, breathing and circulation.
2. Control of seizures with IV injection of Diazepam 0.2 to 0.4 mg/kg stat followed by Inj. Phenytoin 10-20 mg/kg stat followed by 5 mg/kg/day in divided doses.
3. Increased intracranial tension is treated by proper positioning of patient with head elevated at 15-30° position, fluid restriction to 2/3rd of maintenance, 20% Mannitol 5 ml/kg over 10-15 min followed by 3 ml/kg every 6 hourly for 48 hours and then SOS.
   - Or
   - Acetazolamide 50-75 mg/kg/day in 3 divided doses through feeding tube
   - Or
   - Glycerine 1 ml/kg/day through feeding tube may be added if increased intracranial tension persists.
4. Fever is controlled as given in section on fever.
   (Caution: Never give aspirin).
5. The intravenous fluid at 2/3rd of the maintenance requirement initially. The electrolyte concentration of the blood is monitored very closely. Any imbalance is treated promptly. Fluid restriction is not done if patient is dehydrated or is in shock.
6. Feeding: Initially the patient is kept nil orally for first 24-48 hours. Later on the feeding is guided by the level of sensorium. A tube feeding is helpful for feeding as well as for giving medicines.

**References**

Table 19.17. CSF findings in meningoencephalitis

<table>
<thead>
<tr>
<th></th>
<th>Pressure (mmHg)</th>
<th>Leucocytosis (mm')</th>
<th>Protein (mg/dl)</th>
<th>Glucose (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>50-80</td>
<td>&lt;5, &gt;75% Lymphos</td>
<td>20-45</td>
<td>&gt;50 or 75% serum glucose</td>
</tr>
<tr>
<td>Acute bacterial meningitis</td>
<td>Usually elevated (100-300)</td>
<td>100-10,000 PMN's* predominates</td>
<td>100-500</td>
<td>Decreased &lt;40</td>
</tr>
<tr>
<td>Acute viral meningococcalitis</td>
<td>Normal or elevated</td>
<td>Rarely &gt; 1000 PMN's early but Lymphos predominate in the most of the course</td>
<td>50-200</td>
<td>Normal rarely decreased</td>
</tr>
<tr>
<td>Tubercular meningococcalitis</td>
<td>Usually elevated</td>
<td>100-500 PMN's early but later lymphocytes predominate</td>
<td>100-300</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

*PMN's = Polymorphonuclear leucocytes

Specific treatment

Until a bacterial cause is excluded, parenteral antibiotic therapy should be administered. The choice of antibiotics depends upon age of the patient and prevalence of organism in the area.

Age 0-3 months
1. Inj Cefotaxime 200 mg/kg/day IV in 4 divided doses for 14 days.
2. Inj Ampicillin 300 mg/kg/day IV in 4 divided doses for 14 days.

Age 3 months - 12 years
1. Inj Ceftriaxone 100 mg/kg/day IV in 2 divided doses for 10 days
   Or
   Inj Cefotaxime 200 mg/kg/day IV in 3 divided doses for 10 days
   Or
   Inj Ampicillin 300 mg/kg/day IV in 4 divided doses for 10 days
2. Inj Chloramphenicol 100 mg/kg/day in 4 divided doses for 10 days
   If Meningococci is suspected/isolated Inj Penicillin G 300,000 - 400,000 IV/kg/day in 4 divided doses for 7-10 days.

Viral meningoencephalitis

Herpes simplex virus (generally diagnosed by focal encephalitis or CT scan):
Inj Acyclovir 30 mg/kg/day in 3 divided doses for 14-21 days. Non HSV viral encephalitis is treated by supportive therapy only.

Lumbar puncture is repeated at 48 hours to see the response. However, if the patient is improving well, a repeat lumbar puncture may not be necessary.

Advice at discharge

Regular follow up for neurological assessment including deafness is advised.
Anticonvulsant therapy to be continued if seizures are recurrent during course of meningitis.

Children with sequelae would require assessment of handicap and multidisciplinary management. Occupational/physiotherapy may be taught during hospital stay itself.

References
   (See also Encephalitis in Chapter 9).

TUBERCULOUS MENINGITIS

Tuberculous meningitis is the inflammation of meninges due to lympho-haematogenous spread of the primary infection of tuberculosis to the meninges, found in about 0.3% of untreated primary infection in children. It is the most dangerous form of extra-pulmonary tuberculosis. 70% of the cases are found in children less than 5 years of age.

SALIENT FEATURES

- The clinical progression of tubercular meningitis (TBM) may be rapid or gradual. The signs and symptoms progress slowly over several weeks and can be divided into three stages.
  
  - The 1st stage, which typically lasts 1-2 weeks, is characterized by non-specific symptoms, such as fever, headache, irritability, drowsiness and malaise. Focal neurologic signs are absent.
  - The 2nd stage usually begins more abruptly. The most common features are lethargy, neck-rigidity, seizures, positive Kernig or Brudzinski signs, hypertonia, vomiting, cranial nerve palsies and other focal neurologic signs.
  - The 3rd stage is marked by coma, hemiplegia or paraplegia, hypertonia, decerebrate posturing, deterioration of vital signs, and eventually, death.

- Complications: Survivors may have motor deficits; cranial nerve deficits, mental retardation, learning disabilities, seizures, hydrocephalus, blindness, deafness and diabetes insipidus;

- The diagnosis is made by analysis of CSF on lumbar puncture, which shows lymphocytic leucocytosis with elevated protein and a low sugar (for details see Table 19.17 in section on meningoencephalitis).

- Demonstration of AFB in CSF confirms the diagnosis, but the yield is very poor. Culture of CSF shows growth of *M. tuberculosis*, takes too much time. Positive tuberculin skin test corroborates the diagnosis but may be negative in severely malnourished/disseminated disease. 20-50% of children have a normal chest radiograph others may show primary disease. CT scan or MRI of brain may be normal during early stages of the disease. Later, it can show exudates in the basal cisterns of brain, periventricular oozes and hydrocephalus. Some may show tuberculomas even.
Treatment

Treatment consists of proper supportive care, including nonpharmacological treatment, specific antitubercular therapy, treatment of increased intracranial tension and, if required, surgical treatment.

Nonpharmacological

- Nutrition: after initial stabilization, nutritional rehabilitation should be done as given in section on protein energy malnutrition.
- Skin care and prevention of bedsores.
- Care of bowel and bladder.
- Physiotherapy and occupational therapy should be instituted early to prevent deformities and contractures.

Pharmacological

1. Appropriate fluid therapy to correct dehydration due to frequent vomiting and decreased oral intake.
2. Treatment of SIADH. Fluid restriction to 3/4th or 2/3rd of maintenance. Treatment of raised intracranial tension
3. Inj. Dexamethasone: 0.15 mg/kg IV 6 hourly for 2 weeks followed by Tab. Prednisolone 1.5 mg/kg/day orally through feeding tube for 4 weeks. This should be tapered over another 2 weeks. A total of 6-8 weeks therapy with steroid is recommended.
4. Mannitol (20% solution) 1.5 to 2 g/kg or 8-10 ml/kg over 30-60 minutes. Repeated every 6-8 hours for 7 days. Lower doses (0.25 g/kg/dose) can also be tried.
   - Or
   - Glycerol 1 ml/kg/dose every 6-8 hours, diluted in orange juice or water, given through feeding tube.
   - Or
   - Tab. Acetazolamide 50 mg/kg/day, in 3 divided doses for 2-3 weeks.
5. Presence of seizures necessitates treatment with phenytoin or carbamazepine in appropriate doses (for details see section on epilepsy in chapter 1).
6. Specific antitubercular therapy - as given in management of tuberculosis (see section on tuberculosis in chapter 1).
7. Surgical Treatment - Ventriculoperitoneal Shunt (VP Shunt): TBM shows some degree of hydrocephalus by 4 weeks. Obstructive hydrocephalus should be shunted immediately. Non obstructive hydrocephalus with increased intracranial pressure as shown by ventricular tap or CT scan will also be benefited by VP shunt. An early shunt is preferable.

Follow-up

1. Patient should be kept under follow up after discharge from the hospital and assessed for neurological deficit and features of increased intracranial pressure (rCP). One of the common causes of increased rCP is untreated hydrocephalus or blocked shunt.
2. Check compliance to drugs and ensure that occupational therapy/physiotherapy is being continued.
3. Assess physical, mental, visual and auditory handicap and take expert opinion for rehabilitation from other specialists.

**Patient/parent education**

Seriousness of disease must be explained. Context survey should be done and any other member in the family found to have active TB should be counselled to attend TB clinic for therapy. Need for compliance should be emphasized. Drug toxicity and side effects must be explained. Neurological deficits may appear even in a patient on therapy.

**References**


(see also Tuberculous Meningitis in Chapter 9).
TOOTH AVULSION

One of the commonest sequelae of facial trauma is tooth avulsion, exfoliation or exarticulation.

**SALIENT FEATURES**

- History of fall, sports injury, assault or accident. Central incisors and developing teeth are more frequently avulsed,
- Patient presents with a bleeding socket, clot in the socket and a raw wound.

**Treatment**

Immediately refer to a dentist.

Best result is observed if tooth is reimplanted within 5-10 minutes.

Fixation of implanted tooth with periodontal wiring, arch bar wiring or composite resin; fixation period 6 to 8 weeks; root canal treatment done after replantation only (to avoid desiccation of periodontal ligament).

**Interim storage**

Best method is to place back the tooth in the socket immediately.

Other storage media are saliva, milk (placed in ice since this minimizes the adverse effects on the periodontal ligament) and saline.

**Pharmacological**

1. Cap. Amoxycillin 250-500 mg 3 times a day for 5 days.
   Or
   Tab. Ciprofloxacin 250-500 mg twice a day for 5 days.
2. Tab. Ibuprofen 400 mg 3 times a day for 3-5 days.
   Or
   Tab. Nimesulide 100 mg 2 times a day for relief of pain.
3. Inj. Tetanus toxoid (see section on tetanus).

**References**

TOOTHACHE
The causes of toothache directly associated with tooth are caries, periodontal socket, abrasion, attrition, erosion and periodontitis. The indirect causes of toothache are maxillary sinusitis (recent bout of common cold), trigeminal neuralgia where pain is sudden, sharp, severe or short duration, like electric shock. Trigger zone mayor may not be present.

Treatment

Pharmacological
1. Cap. Amoxycillin 250 - 500 mg 3 times a day for 5 days.
   Or
   Tab. Ciprofloxacin 250 - 500 mg 2 times a day for 5 days.
2. Tab. Ibuprofen 400 mg 3 times a day for 3-5 days.
   Or
   Tab. Nimesulide 100 mg two times a day for 3-5 days.
   For specific treatment refer to a dentist.

Surgical
Removal of irritantlike high filling and high spot on crown or bridge. Excavation of caries and sedative dressing with clove oil. Anaesthetize the tooth and extirpate the pulp (if pulp is exposed). Assess the response by getting immediate radiographs, radiograph after 6 weeks to assess bone loss and root resorption, and clinical assessment of mobility of tooth after 6 weeks

Patient education
Maintenance of oral hygiene.
Importance of tooth preservation should be explained.
Pit and fissure sealing in paediatric patient.
Not to bite anything hard from anterior teeth during fixation period.

References

DENTAL ABSCESS
Patient presents with pain and swelling. The most common types of dental abscesses are periapical abscess and lateral periodontal abscess.

Periapical Abscess

SALIENT FEATURES
- Severe throbbing pain, disturbed sleep, tooth is tender to touch, is extruded, mobile and may be associated with localized or diffuse swelling.
Immediate treatment

To give antibiotics as given below and refer to a dentist.

Pharmacological

Cap. Amoxycillin 250-500 Q1g 3 times a day for 5 days.
Or
Tab. Ciprofloxacin 250-500 mg two times a day for 5 days.

Surgical

Drainage of pus to relieve occlusion by entering the pulp chamber. If fluctuant swelling of soft tissue is present drain by incision. Extraction or root canal treatment should be done when acute symptoms subside. Spread of infection should be closely observed to prevent complications like Ludwig's angina.

Patient education

Maintenance of oral hygiene (see details in section on oral hygiene).
Control of diabetes mellitus, if present.
No hot fomentation over the skin.

References


LATERAL PERIDONTAL ABSCESS

SALIENT FEATURES

- Same as in acute periapical abscess often associated with bad taste. Tooth is usually mobile and tender on tooth percussion, with associated localized or diffuse swelling of the adjacent periodontium.
- Vitality test usually positive if no associated pulpal problem.
- Radiograph shows vertical or horizontal bone loss in relation to the tooth.

Treatment

Pharmacological

1. Cap. Amoxycillin 250-500 mg 3 times a day for 5 days.
2. Tab. Metronidazole 400 mg 3 times a day for 5 days.

For surgical treatment refer to a dentist for debridement of pocket and drainage of pus and irrigation with chlorhexidine. Spread of infection to be closely observed to prevent complications like Ludwig's angina.

Patient education

Maintenance of oral hygiene (see section on oral hygiene).
No hot fomentation over the skin.
Control of diabetes mellitus if present.

References

DENTAL CARIES
This is a multifactorial infectious disease of hard tissues of teeth characterized by demineralization of inorganic and destruction of organic part of the tooth.

SALIENT FEATURES
• Usually asymptomatic in early stages. Patient presents with tooth sensitivity and tooth ache.

Treatment
Examine for stage of caries and treat accordingly.

Nonpharmacological
In non-cavitated lesion and low risk patient with good oral hygiene practices, no treatment is given. In cavitated lesion, restoration is done.

Pharmacological
Where caries is likely to progress (in high risk patient) pit and fissure sealout.
1. Topical 2% Sodium fluoride.
2. 0.2% Chlorhexidine mouth wash twice a day.

Assessment of response to therapy
For caries active patient - follow up visit every 3 months and to check the progression of white spot on the teeth.
For normal patients - follow up every 6 months to 1 year to check the development of the white spot/cavitation.

Patient education/prevention
For caries active/high risk patient preferably
Diet control and avoidance of sugar containing food.
Frequent ingestion of food containing sucrose should be substituted by sugar free foods.
Oral hygiene: (a) brushing of teeth twice a day (b) flossing (c) thorough rinsing after every meal.
Fluoride application using Topical 2% Sodium fluoride (by dentist) 4 applications at weekly intervals at the age of 3, 7, 11 and 13 years.
0.05% Sodium fluoride daily rinse (should not be swallowed).
0.2% Sodium fluoride supervised weekly rinse in school (age of children >7 years) only if these children have been identified as caries active patients.

References

ADULT TYPE PERIODONTITIS
Most common dental disease includes diseases of the gum.

SALIENT FEATURES
- Swollen gums, bleeding from gums either spontaneously or on eating something hard, difficulty in chewing food, dull pain in the gums, pus discharge from gum on pressing, loosening of teeth, recession of gums.
- There is slowly progressive destruction of periodontium, loss of periodontal attachment and presence of periodontal pocket.

Treatment
Nonpharmacological
Advisе brushing twice daily once after breakfast and once after dinner with super soft tooth brush for at least 3 minutes and refer to a dentist for oral prophylaxis by thorough scaling and root planing.

Pharmacological
Local therapy. 1. Rinsing with 0.2% Chlorhexidine twice daily.
2. Gel Metronidazole to be massaged on the gums twice daily.
3. Gel Chlorohexidine to be massaged on the gums twice daily.
Systemic therapy. In adults, Cap. Tetracycline 250 mg 4 times a day for 5-7 days. In children very deep pockets: Combination of drugs i.e.,
1. Tab. Ciprofloxacin 500 mg twice daily for 5-7 days.
2. Tab. Tinidazole 600 mg twice daily for 5-7 days.
Recheck the depth of periodontal pockets, if it persist, refer to a periodontist for further management.

References

JUVENILE PERIODONTITIS
Common in the age group of 13-25 years characterized by rapid destruction of periodontal tissues.
SALIENT FEATURES

- Mobility in incisors and molars, spacing in upper incisors, distolabial migration of upper incisors, arc shaped bone loss extending from distal surface of second premolar to medial surface of second molar.

Treatment

**Pharmacological**
- Cap. Tetracycline 250 mg 4 times a day for 14 days.

**Surgical**
- Extraction of badly involved teeth. Refer the patient to periodontist for further periodontal management at the earliest.

**Patient education**
- Proper brushing twice daily with super soft tooth brush.

References

INFLAMMATORY GINGIVAL ENLARGEMENTS

The gingival enlargement can be acute which is very painful or they can be chronic which may be painless.

SALIENT FEATURES

- Acute enlargements maybe localized or generalized, very painful; deep red in colour, soft friable with shiny surface.
- Chronic enlargements may be localized or generalized, often painless and slowly progressive.

Treatment

**Pharmacological**
1. Tab. Ciprofloxacin 500 mg 2 times a day for 3-5 days.
2. Tab. Nimesulide 100 mg 2 times a day for 3-5 days.
3. Rinsing with 0.2% Chlorhexidine twice daily.
   Refer to a periodontist for surgical management and drainage of pus.

**Patient education**
- Proper brushing twice daily with super soft tooth brush.

References
GENERAL MEASURES FOR GOOD ORAL HYGIENE

1. Select the right quality of tooth brush which should be short, soft and have uniformly trimmed bristles.
2. Brush teeth at least twice a day for 2-3 minutes particularly at night before going to sleep.
3. Use right technique of teeth brushing.
4. Never use force while brushing.
5. Avoid too much sugar and aerated drinks.
6. Avoid eating in between meals, if can not be avoided rinse your mouth or preferably brush your teeth.
7. Ensure regular dental checkup at 6 monthly interval.

Tooth brushing is extremely important for cleaning teeth, for massage of the surrounding gums and maintaining oral hygiene. Regular brushing keeps the tooth surface free of plaque, which is soft material that gets deposited on the tooth surface and is the cause of dental caries and periodontal problems.

ANTIBIOTIC PROPHYLAXIS IN DENTAL PROCEDURE

If patient is in the high or moderate risk groups, then antibiotic prophylaxis is recommended for the following dental procedures:

- Dental extractions.
- Periodontal procedures including surgery, scaling and root planing, probing, and recall maintenance.
- Dental implant placement and reimplantation of avulsed teeth.
- Endodontic (root canal) instrumentation or surgery only beyond the apex. Subgingival placement of antibiotic fibers or strips.
- Initial placement of orthodontic bands but not brackets. Intraligamentary local anaesthetic injections.
- Prophylactic cleaning of teeth or implants where bleeding is anticipated. Antibiotic prophylaxis is not recommended for the following dental procedures:
  - Restorative dentistry (operative and prosthodontic) with or without retraction cord.
  - Local anaesthetic injections (nonintraligamentary).
  - Intracanal endodontic treatment; post placement and buildup.
  - Placement of rubber dams, postoperative suture removal, taking of oral impressions, and fluoride treatments.
  - Placement of removable prosthodontic or orthodontic appliances and orthodontic appliance adjustment.
    - Taking of oral radiographs.
    - Shedding of primary teeth.

For details, see section on Antibiotic Prophylaxis in Chapter 18.

Reference

APPENDIX I

LOCAL ANAESTHETICS

Bupivacaine

Used for local and regional anaesthesia (infiltration anaesthesia, peripheral and sympathetic nerve blocks, dental anaesthesia, spinal, epidural and caudal anaesthesia).

**Bupivacaine**

Inj 0.25%, 0.5% in vial

for spinal anaesthesia, Inj. 0.5% in 4 ml

ampoule mixed with 7.5% or 8.25%

glucose (hyperbaric solution).

The maximum cumulative safe dose for adults

and children of a 0.25% solution of

bupivacaine is 2 mg/kg

**Unsuitable for intravenous regional

anaesthesia**

<table>
<thead>
<tr>
<th>Anaesthetic procedure</th>
<th>Concentration</th>
<th>Average dose in ml</th>
<th>Average dose in mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local infiltration</td>
<td>0.25%</td>
<td>Up to 60 ml</td>
<td>Up to 150 mg (not to exceed 2 mg/kg)</td>
</tr>
<tr>
<td>Peripheral nerve block</td>
<td>0.25-0.5%</td>
<td>Up to 30 ml</td>
<td>Up to 150 mg (not to exceed 2 mg/kg)</td>
</tr>
<tr>
<td>Dental anaesthesia</td>
<td>0.5%</td>
<td>1.8-3.6 ml</td>
<td>9.0-18.0 mg</td>
</tr>
<tr>
<td>Spinal anaesthesia</td>
<td>0.5% (with 7.5% or 8.25% glucose; preservative free)</td>
<td>1.5-3 ml</td>
<td>7.5-15 mg</td>
</tr>
<tr>
<td>Epidural anaesthesia</td>
<td>0.5%</td>
<td>Bolus 10-20 ml</td>
<td>50-100 mg</td>
</tr>
<tr>
<td>Epidural analgesia (labour and postoperative pain)</td>
<td>0.0625-0.25%</td>
<td>As per requirement</td>
<td>As per requirement</td>
</tr>
<tr>
<td>Caudal anaesthesia</td>
<td>0.25-0.5%</td>
<td>15-30 ml (adults) 0.5-1 ml/kg (children)</td>
<td>37.5-150 mg (adults) up to 2 mg/kg (children)</td>
</tr>
</tbody>
</table>

**Precautions**

The smallest effective dose should be administered.

Not recommended for obstetrical paracervical block and intravenous regional anaesthesia.

Concentrations above 0.5% are associated with toxic reactions and refractory cardiac arrest.

Intravenous access is essential during major regional block.

Use with caution in patients with hypovolaemia, shock, severe congestive heart failure, and all forms of heart block.
Toxic plasma levels (from accidental intravascular injection) may cause cardiopulmonary collapse and seizures.

Epidural, caudal, or intrathecal injection should be avoided in patients with hypovolaemic shock, septicaemia, and infection at the injection site or coagulopathy.

Principal adverse effects

- **Cardiovascular**: Hypotension, arrhythmias, cardiac arrest
- **Pulmonary**: Respiratory impairment and arrest
- **CNS**: Seizures, tinnitus, blurred vision
- **Allergic**: Urticaria, angioneurotic oedema, anaphylactoid reaction

Epidural/caudal/spinal anaesthesia: Hypotension, urinary retention, lower extremity weakness and paralysis, loss of sphincter control, headache, backache, cranial nerve palsies, slowing of labour.

Lidocaine (Lignocaine)

Used for surface anaesthesia of mucous membranes, infiltration anaesthesia, peripheral and sympathetic nerve blocks, intravenous regional anaesthesia, dental anaesthesia, spinal epidural and caudal anaesthesia, attenuation of pressor response to intubation and treatment of ventricular arrhythmias.

<table>
<thead>
<tr>
<th>Anaesthetic procedure</th>
<th>Concentration</th>
<th>Adrenaline</th>
<th>Dose</th>
<th>Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local infiltration and peripheral nerve block</td>
<td>0.5%</td>
<td>Not for ring block</td>
<td>&lt;50 ml</td>
<td>&lt;250 mg</td>
</tr>
<tr>
<td>Pharynx, larynx, Trachea</td>
<td>1%</td>
<td>Yes</td>
<td>&lt;40 ml</td>
<td>&lt;400 mg</td>
</tr>
<tr>
<td>Urethra</td>
<td>2% jelly</td>
<td>No</td>
<td>Up to 10 ml</td>
<td>Up to 200 mg</td>
</tr>
<tr>
<td>Dental anaesthesia</td>
<td>2%</td>
<td>Yes</td>
<td>1-5 ml</td>
<td>20-100 mg</td>
</tr>
<tr>
<td>Epidural anaesthesia</td>
<td>1% - 2%</td>
<td>Yes</td>
<td>Bolus 10-20 ml</td>
<td>Up to 7 mg/kg</td>
</tr>
</tbody>
</table>

**Attenuation of pressor response**: Lidocaine 2% (preservative free) 1-1.5 mg/kg intravenous

**Treatment of ventricular arrhythmias**: Lidocaine 2% (preservative free) 1-1.5 mg/kg intravenous followed by infusion @ 1-4 mg/min.

**Intravenous regional anaesthesia**

- Upper extremities 200-250 mg (40-50 ml of 0.5% solution)
- Lower extremities 250-300 mg (100-120 ml of 0.25% solution)
**Tetracaine**

A short acting local anaesthetic for the cornea and conjunctiva. It is effective after topical application to the eye and anaesthesia persists for at least 15 minutes. Solution (eyedrops), 0.5% one or 2 drops of 0.5% solution should be instilled into the conjunctiva sac.

**Adrenaline (Epinephrine)**

Used with local anaesthetics to retard absorption of infiltrated local anaesthetics. Inj 1mg/ml in 1 ml ampoule (1:1000).

- **Local surgery** 5 mcg/ml (1:200,000) as a vasoconstrictor with local anaesthetic solutions.
- **Dental surgery** 12.5 mcg/ml (1:80,000) are commonly used.

**Note:** Adrenaline should not be used in ring block of digits or the penis or other situations where there is a danger of local ischaemia.

**Reference**

Prevention of exposure is the primary strategy to reduce the risk of occupational blood-borne pathogen infections.

**Standard work precautions**

6. Proper application or protective measures.
8. Careful handling of sharp instruments.
9. Safe techniques.
10. Sterilization and disinfection.
12. Use of personal barrier (gloves, masks, gowns/aprons/protective eye care, foot cover).
13. Immunization against HBV.

Immediately after an exposure injury, the wound should be washed thoroughly under running water and squeezed (not sucked) to encourage bleeding. The site of injury should then be wiped with an alcohol impregnated swab and covered with a waterproof dressing.

Comprehensive education should be provided to all healthcare workers regarding the possible risks and prevention of blood-borne infections after an occupational exposure, as well as the principles of post-exposure management and the importance of seeking urgent advice following any occupational exposure immediately after it occurs.

**Pre-exposure prophylaxis with hepatitis B vaccine**

<table>
<thead>
<tr>
<th>Dose</th>
<th>Dosage</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>20 mcg</td>
<td>at elected date</td>
</tr>
<tr>
<td>2nd</td>
<td>20 mcg</td>
<td>1 month later</td>
</tr>
<tr>
<td>3rd</td>
<td>20 mcg</td>
<td>6 months after 1st dose</td>
</tr>
</tbody>
</table>

Children under 10 years of age should be given half of the above dosage at the same time intervals.
Post-exposure prophylaxis

At risk workers must report all needle stick injuries. Post-exposure prophylaxis will depend on identification of the source of exposure, determination of the carrier status of the source if possible and the antibody status of the worker.

Guidelines for post-exposure hepatitis B immunoprophylaxis of unvaccinated persons who have a discrete identifiable exposure to blood or body fluids that contain blood

<table>
<thead>
<tr>
<th>Cause of exposure</th>
<th>Suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous (e.g. bite or needlestick) or mucosal exposure to HBsAg-positive blood or body fluids contain blood</td>
<td>Administer hepatitis B vaccine and hepatitis B immune globulin (HBIG)*</td>
</tr>
<tr>
<td>Sexual or needle-sharing contact of an HBsAg-positive person</td>
<td>Administer hepatitis B vaccine and HBIG*</td>
</tr>
<tr>
<td>Victim of sexual assault/abuse by a perpetrator who is HBsAg-positive</td>
<td>Administer hepatitis B vaccine</td>
</tr>
<tr>
<td>Victim of sexual assault/abuse by a perpetrator with unknown HBsAg status</td>
<td>Administer hepatitis B vaccine</td>
</tr>
<tr>
<td>Percutaneous (e.g. bite or needlestick) or mucosal exposure to blood or body fluids that contain blood from a source with unknown HBsAg status</td>
<td>Administer hepatitis B vaccine</td>
</tr>
</tbody>
</table>

* Immunoprophylaxis should be administered as soon as possible, preferably within ≤ 24 hours. Studies are limited on the maximum interval after exposure during which postexposure prophylaxis is effective, but the interval is unlikely to exceed 7 days for percutaneous exposures and 14 days for sexual exposures. Dose of HBIG is 0.05-0.07 ml/kg. The hepatitis B vaccine series should be completed.

Hepatitis B surface antigen (HBsAg).

The following recommendations are made regarding HBV:

- All healthcare workers should be vaccinated against HBV, and the combined hepatitis A/ HBV vaccine is recommended for healthcare workers with chronic HCV infection, or other liver problems.
- When necessary, post-exposure prophylaxis with HBV vaccine, hepatitis B immunoglobulin (HBIG) or both should be started within 24 hours and no later than one week after exposure.
- HBsAg-positive healthcare workers should receive clinical evaluation and their serostatus, as well as risk for hepatitis D, should be assessed.
- Serological follow-up is not recommended when post-exposure management is managed according to these recommendations.
The following recommendations are made regarding HCV:

Currently, there is no available vaccine for HCV.

It is unclear whether treating acute HCV infection (with pegylated or unpegylated interferon with or without ribavirin) is more effective than treating early chronic HCV infection.

HCV antibody and liver function tests should be done at exposure, and either 3 or 6 months later.

Follow-up with HCV viral load testing, if liver function tests are abnormal.

Reference

Special dosage forms and the methods for their administration
Step by step guidance for administering different dosage forms is given herewith. This may be used to explain to the patient on how to administer a treatment correctly. It may also be useful to teach health workers.

Eye ointment
4 Wash your hands.
4 Do not touch anything with the tip of the tube.
4 Tilt the head backwards a little.
4 Take the tube in one hand, and pull down the lower eyelid with the other hand, to make a ‘gutter’.
4 Bring the tip of the tube as close to the ‘gutter’ as possible.
4 Apply the amount of ointment prescribed.
4 Close the eye for two minutes.
4 Remove excess ointment with a tissue.
4 Clean the tip of the tube with another tissue.

Eardrops
• Warm the eardrops by keeping them in the hand or the armpit for several minutes. Do not use hot water tap.
• Tilt head sideways or lie on one side with the ear upward.
• Gently pull the lobe to expose the ear canal.
• Apply the amount of drops prescribed.
• Wait five minutes before turning to the other ear.
• Use cotton wool to close the ear canal after applying the drops ONLY if
the manufacturer explicitly recommends this.

• Eardrops should not burn or sting longer than a few minutes.

Eyedrops
• Wash your hands.
• Do not touch the dropper opening.
• Look upward.
• Pull the lower eyelid down to make a ‘gutter’.
• Bring the dropper as close to the ‘gutter’ as possible without touching it or the eye.
• Apply the prescribed amount of drops in the ‘gutter’.
• Close the eye for 2 minutes. Do not shut the eye too tight.
• Excess fluid can be removed with a tissue.
• If more than one kind of eyedrop is used, wait for at least five minutes before applying the next drops.
• Eyedrops may cause a burning feeling but this should not last for more than a few minutes. If it does last longer, consult a doctor or a pharmacist.
**When giving eyedrops to children**

- Let the child lie back with head straight.
- The child’s eyes should be closed.
- Drip the amount of drops prescribed into the corner of the eye.
- Keep the head straight.
- Remove the excess fluid.

**Nasal drops**

4. Blow the nose.

5. Sit down and tilt head backward strongly or lie down with a pillow under the shoulders; keep head straight.

6. Insert the dropper one centimetre into the nostril.

7. Instill the amount of drops prescribed.

8. Immediately afterwards tilt head forward strongly (head between the knees).

9. Sit up after a few seconds; the drops will then drip into the pharynx.

10. Repeat the procedure for the other nostril, if necessary.

11. Rinse the dropper with boiled water.

**Nasal spray**

10. Blow the nose.

11. Sit with the head slightly tilted forward.

12. Shake the spray.

13. Insert the tip in one nostril.

14. Close the other nostril and mouth.

15. Spray by squeezing the vial (flask, container) and sniff slowly.

16. Remove the tip from the nose and bend the head forward strongly (head between the knees).

17. Sit up after a few seconds; the spray will drip down the pharynx.

18. Breathe through the mouth.

19. Repeat the procedure for the other nostril, if necessary.

20. Rinse the tip with boiled water.
Inhaler with capsules

9. Cough out as much sputum as possible.
10. Place the capsule(s) in the inhaler according to the manufacturer’s instructions.
11. Breathe out slowly and empty lungs of as much air as possible.
12. Place lips tightly around the mouthpiece.
14. Take a deep breath through the inhaler.
15. Hold the breath for 10 to 15 seconds.
16. Breathe out through the nose.
17. Rinse the mouth with warm water.

Aerosol

7. Cough out as much sputum as possible.
8. Shake the aerosol before use.
9. Hold the aerosol as indicated in the manufacturer’s instructions (This is usually upside down).
10. Place the lips tightly around the mouthpiece.
11. Tilt the head backward slightly.
12. Breathe out slowly, emptying the lungs of as much air as possible.
13. Breathe in deeply and activate the aerosol, keeping the tongue down.
14. Hold breath for 10 to 15 seconds.
15. Breathe out through the nose.
16. Rinse the mouth with warm water.
Steps 4 and 5

Transdermal patch

8 For patch site, see instructions included with the drug or check with your pharmacist.
8 Do not apply over bruised or damaged skin.
8 Do not wear over skin folds or under tight clothing and change spots regularly.
8 Apply with clean, dry hands.
8 Clean and dry the area of application completely.
8 Remove patch from package, do not touch ‘drug’ side.
8 Place on skin and press firmly. Rub the edges to seal.
8 Remove and replace according to instructions.

Applying vaginal creams, ointments and gels

(Most of these drugs come with an applicator)
3. Wash your hands.
4. Remove the cap from the tube containing the drug.
5. Screw the applicator to the tube.
6. Squeeze the tube until the required amount is in the applicator.
7. Remove the applicator from the tube (hold the cylinder).
8. Apply a small amount of cream to the outside of the applicator.
9. Lie on your back, draw your knees up and spread them apart.
3 Gently insert the applicator into the vagina as far as possible, do not use force.
3 Hold the cylinder and with the other hand push the plunger down thus inserting the drug into the vagina.
3 Withdraw the applicator from the vagina.
3 Discard the applicator, if disposable or clean thoroughly (boiled water) if not.
3 Wash your hands.

Vaginal tablet without applicator
G. Wash your hands.
H. Remove the wrapper from the tablet.
I. Dip the tablet in lukewarm water just to moisten it.
J. Lie on your back, draw your knees up and spread them apart.
K. Gently insert the tablet into the vagina as high as possible, do not use force.
L. Wash your hands.

Vaginal tablet with applicator
3. Wash your hands.
4. Remove the wrapper from the tablet.
5. Dip the tablet into the open end of the applicator.
6. Lie on your back, draw your knees up and spread them apart.
7. Gently insert the applicator with the tablet in front into the vagina as far as possible, do not use force.
8. Depress the plunger so that the tablet is released.
9. Withdraw the applicator.
6. Discard the applicator (if disposable).
7. Clean both parts of the applicator thoroughly with soap and boiled lukewarm water (if not disposable).
8. Wash your hands.

General practical aspects of injecting
Apart from the specific technique of injecting, there are a few general rules that you should keep in mind.

3. Expiry dates. Check the expiry dates of each item including the drug. Check the drugs in your medical store regularly to make sure that they have not passed the expiry date.

4. Drugs. Make sure that the vial or ampoule contains the right drug in the right strength.

5. Sterility. During the whole preparation procedure, material should be kept sterile. Wash your hands before starting to prepare the injection. Disinfect the skin over the injection site.

6. No bubbles. Make sure that there are no air bubbles left in the syringe. This is more important in intravenous injections.

7. Prudence. Once the protective cover of the needle is removed, extra care is needed. Do not touch anything with the unprotected needle. Once the injection has been given, take care not to prick yourself or somebody else.

8. Waste. Make sure that contaminated waste is disposed of safely.
Subcutaneous injection

Materials needed: Syringe with the drug to be administered (without air), needle (Gauge 25, short and thin; on syringe), liquid disinfectant, cotton wool, adhesive tape.

Technique
B Wash hands.
C Reassure the patient and explain the procedure.
D Uncover the area to be injected (upper arm, upper leg, and abdomen).
E Disinfect skin.
F ‘Pinch’ fold of the skin.
G Insert needle in the base of the skin-fold at an angle of 20 to 30 degrees.
H Release skin.
I Aspirate briefly; if blood appears: withdraw needle, replace it with a new one, if possible, and start again from point 4.
J Inject slowly (0.5-2 minutes).
K Withdraw needle quickly.
L Press sterile cotton wool on to the opening. Fix with adhesive tape.
M Check the patient’s reaction and give additional reassurance, if necessary.
N Clean up; dispose of waste safely; wash hands.

Intramuscular injection

Materials needed. Syringe with the drug to be administered (without air), needle (Gauge 22, long and medium thickness), liquid disinfectant, cotton wool, adhesive tape.

Technique
3. Wash hands.
4. Reassure the patient and explain the procedure.
5. Uncover the area to be injected (lateral upper quadrant major gluteal muscle, lateral side of upper leg, deltoid muscle).
6. Disinfect skin.
7. Tell the patient to relax the muscle.
8. Insert the needle swiftly at an angle of 90 degrees (watch depth).
9. Aspirate briefly; if blood appears: withdraw needle, replace it with a new one, if possible, and start again from point 4.
B Inject slowly (less painful).
C Withdraw needle swiftly.
D Press sterile cotton wool on to the opening.
E Check the patient’s reaction and give additional reassurance, if necessary.
F Clean up; dispose of waste safely; wash your hands.

**Intravenous injection**

**Materials needed.** Syringe with the drug to be administered (without air), needle (Gauge 20, long and medium thickness; on syringe), liquid disinfectant, cotton wool, adhesive tape, tourniquet.

**Technique**
1. Wash hands.
2. Reassure the patient and explain the procedure.
3. Uncover arm completely.
4. Have the patient relax and support his arm below the vein to be used.
5. Apply tourniquet and look for a suitable vein.
6. Wait for the vein to swell.
7. Disinfect skin.
8. Stabilize the vein by pulling the skin taut in the longitudinal direction of the vein. Do this with the hand you are not going to use for inserting the needle.
9. Insert the needle at an angle of around 35 degrees.
10. Hold the syringe and needle steady.
11. Aspirate. If blood appears hold the syringe steady, you are in the vein. If it does not come, try again.
12. Loosen tourniquet.
13. Inject (very) slowly. Check for pain, swelling, haematoma; if in doubt whether you are still in the vein aspirate again!
15. Check the patient’s reaction and give additional reassurance, if necessary.
16. Clean up; dispose of waste safely; wash your hands.

**Reference**
1. Model Guide to Good Prescribing, Published by Action Programme on Essential Drugs, WHO.
Drugs can have harmful effects on mother and foetus at any time during pregnancy. Use of medications during pregnancy requires a careful assessment of risks and benefits for them. During the first trimester, teratogenic effects are frequent. There is higher risk from third to eleventh weeks of gestation. During the second and third trimester, drugs may affect the growth and functional development of foetus or have toxic effect on the foetal tissues. Drugs administered shortly before term or during labour may have adverse effect on mother or on neonate. The FDA has established five categories (A, B, C, D, X) which indicate the potential of a systemically absorbed drugs causing birth defects. These categories are indicative of the level of risk to the foetus. The category X includes the drugs for which there are enough data to implicate their teratogenicity and the risk vs. benefit ratio does not support the use of the drug and hence these are contraindicated during pregnancy. A few drugs present variable risk to the foetus depending on the time and duration of their use. These drugs have been assigned double categories. The categories of risk involved are as under:

**A:** Adequate studies in pregnant women have not demonstrated a risk to the foetus in the first trimester of pregnancy and there is no evidence of risk in later trimesters.

**B:** Animal studies have not demonstrated a risk to the foetus but there are no adequate studies in pregnant women or, animal studies have shown an adverse effect, but adequate studies in pregnant women have not demonstrated a risk to the foetus during the first trimester of pregnancy and there is no evidence of risk in later trimesters.

**C:** Animal studies have shown an adverse effect on the foetus but, there are no adequate studies in humans or there are no animal reproduction studies and no adequate studies in humans; the benefits from the use of the drug in pregnant women may be acceptable despite its potential risks.

**D:** There is evidence of human foetal risk, but the potential benefits from the use of the drug in pregnant women may be acceptable despite its potential risks.

**X:** Studies in animals or humans demonstrate foetal abnormalities or adverse reaction reports indicate evidence of foetal risk; the risk of use in a pregnant woman clearly outweighs any possible benefits.
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<th>Drugs</th>
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<td>General anaesthetics</td>
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<td>Ether</td>
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<td>Isoniazid</td>
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<td><strong>7. Antiparkinsonism drugs</strong></td>
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<td>Bromocriptine</td>
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<td>Levodopa + Carbidopa</td>
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<td>Selegiline</td>
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<td>Trihexyphenidyl</td>
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<td><strong>8. Drugs affecting blood</strong></td>
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<td><strong>Anti-anaemic drugs</strong></td>
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<td>Ferrous fumarate</td>
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<td>Folic acid</td>
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<td><strong>Drugs affecting coagulation</strong></td>
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<td>Vitamin K</td>
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<td>Warfarin</td>
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9. Blood products and substitutes
Dextran-40 | C |
Dextrose 5%+Sodium chloride | C |
Polymer from degraded gelatin | C |
+ electrolytes made isotonic solution

10. Cardiovascular drugs
**Antianginal drugs**
Atenolol | C |
Glyceryl trinitrate | C |
Isosorbide dinitrate | C |
Isosorbide mononitrate | C |
Metoprolol | B |
Propranolol | C |

**Antidysrhythmic drugs**
Adenosine | C |
Amiodarone | C |
Diltiazem | C |
Disopyramide | C |
Lignocaine | A/C |
Mexiletine | C |
Procanamide | C |
Verapamil | C |

**Antihypertensive drugs**
Amlodipine | C |
Enalapril | C/D |
Felodipine | C |
Hydralazine | C |
Indapamide | D |
Methyldopa | C |
Nifedipine | C |
Sodium nitroprusside | C |

**Cardiac glycosides**
Digoxin | C |

**Hypolipidaemic drugs**
Fenofibrate | C |

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<tr>
<td>Simvastatin</td>
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**Drugs used in vascular shock and peripheral vascular diseases**
Dobutamine | C |
Dopamine | C |
Mephentermine | C |

11. Dermatological drugs
**Antifungal drugs**
Benzoic acid + Salicylic acid | C |
Clotrimazole | B/C |
Miconazole | C |
Nystatin | B/C |

**Anti-infective drugs**
Framycetin | C |
Povidone iodine | D |
Silver nitrate | C |
Silver sulfadiazine | C |

**Scabicides and pediculocides**
Benzyl benzoate | B |
Gamma benzene hexachloride | B |
Permethrin | B |

**Anti-inflammatory and antipruritic drugs**
Betamethasone | C |
Clobetasol | C |

**Keratoplastic and keratolytic agents**
Benzyol peroxide | C |
Coal tar | C |
Podophyllin | X |
Salicylic acid | C |

**Ultraviolet blocking agents**
5-Methoxy psoralen | C |
Para-amino benzoic acid | C |
Trimethyl psoralen | C |

**Others**
Tretinoin | C |
Triamcinolone | C |
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<td>Meglumine iothalamate</td>
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<td>Acriflavin + Glycerine</td>
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<td>Cetrimide + Chlorhexidine</td>
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<td>Betamethasone valerate + Lignocaine + Phenylephrine</td>
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<td>Ethinyl oestradiol + Norethisterone</td>
<td>X</td>
</tr>
<tr>
<td>Oestrogens</td>
<td></td>
</tr>
<tr>
<td>Conjugated equine oestrogen</td>
<td>X</td>
</tr>
<tr>
<td>Ethinyl oestradiol</td>
<td>X</td>
</tr>
<tr>
<td>Progestogens</td>
<td></td>
</tr>
<tr>
<td>Danazol</td>
<td>X</td>
</tr>
<tr>
<td>Medroxy progesterone acetate</td>
<td>D</td>
</tr>
<tr>
<td>Norethisterone</td>
<td>X</td>
</tr>
<tr>
<td>Insulin and other antidiabetic drugs</td>
<td></td>
</tr>
<tr>
<td>Insulin lente</td>
<td>B</td>
</tr>
<tr>
<td>Insulin semilente</td>
<td>B</td>
</tr>
<tr>
<td>Metformin</td>
<td>C</td>
</tr>
<tr>
<td>Tolbutamide</td>
<td>D</td>
</tr>
<tr>
<td>Drugs</td>
<td>Categories</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Glibenclamide</td>
<td>D</td>
</tr>
<tr>
<td>Insulin</td>
<td>B</td>
</tr>
<tr>
<td><strong>Drugs affecting calcification and bone turnover</strong></td>
<td></td>
</tr>
<tr>
<td>Alendronate</td>
<td>C</td>
</tr>
<tr>
<td><strong>Thyroid hormones and antithyroid drugs</strong></td>
<td></td>
</tr>
<tr>
<td>Carbimazole</td>
<td>D</td>
</tr>
<tr>
<td>Iodine</td>
<td>D</td>
</tr>
<tr>
<td>Thyroxine sodium</td>
<td>A</td>
</tr>
<tr>
<td><strong>17. Immunological agents</strong></td>
<td></td>
</tr>
<tr>
<td>Anti-rabies (vero cells)</td>
<td>C</td>
</tr>
<tr>
<td>Hepatitis</td>
<td>B</td>
</tr>
<tr>
<td>MMR (live vaccine) USP</td>
<td>X</td>
</tr>
<tr>
<td>Measles IP</td>
<td>X</td>
</tr>
<tr>
<td>Meningococcal polysaccharide vaccine</td>
<td>C</td>
</tr>
<tr>
<td>Monoclonal anti-Rh (D)-immunoglobulin</td>
<td>A</td>
</tr>
<tr>
<td>Rubella (live vaccine) BP</td>
<td>X</td>
</tr>
<tr>
<td>Typhoid IP</td>
<td>C</td>
</tr>
<tr>
<td>BCG (freeze dried) IP</td>
<td>C</td>
</tr>
<tr>
<td>DT (adsorbed) IP</td>
<td>C</td>
</tr>
<tr>
<td>Poliomyelitis IP</td>
<td>C</td>
</tr>
<tr>
<td>Tetanus toxoid</td>
<td>A</td>
</tr>
<tr>
<td><strong>18. Muscle relaxant and anticholinesterase</strong></td>
<td></td>
</tr>
<tr>
<td>Atracurium</td>
<td>C</td>
</tr>
<tr>
<td>Methocarbamol</td>
<td>X</td>
</tr>
<tr>
<td>Neostigmine</td>
<td>C</td>
</tr>
<tr>
<td>Pancuronium</td>
<td>C</td>
</tr>
<tr>
<td>Suxamethonium</td>
<td>C</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>C</td>
</tr>
<tr>
<td><strong>19. Oxytocics and antioxytocics</strong></td>
<td></td>
</tr>
<tr>
<td>Dinoprostone</td>
<td>C</td>
</tr>
<tr>
<td>Isoxsuprine</td>
<td>C</td>
</tr>
<tr>
<td>Magnesium sulphate</td>
<td>B</td>
</tr>
<tr>
<td><strong>21. Psycotherentapeutic drugs</strong></td>
<td></td>
</tr>
<tr>
<td>Alprazolam</td>
<td>D</td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>D</td>
</tr>
<tr>
<td>Chlorpromazine</td>
<td>C</td>
</tr>
<tr>
<td>Clozapine</td>
<td>B</td>
</tr>
<tr>
<td>Diazepam</td>
<td>D</td>
</tr>
<tr>
<td>Fluoxetine</td>
<td>B</td>
</tr>
<tr>
<td>Fluphenazine</td>
<td>C</td>
</tr>
<tr>
<td>Haloperidol</td>
<td>C</td>
</tr>
<tr>
<td>Imipramine hydrochloride</td>
<td>D</td>
</tr>
<tr>
<td>Lithium carbonate</td>
<td>D</td>
</tr>
<tr>
<td>Lorazepam</td>
<td>D</td>
</tr>
<tr>
<td>Nitrazepam</td>
<td>D</td>
</tr>
<tr>
<td>Risperdone</td>
<td>C</td>
</tr>
<tr>
<td>Thioridazine</td>
<td>C</td>
</tr>
<tr>
<td>Trazodone</td>
<td>C</td>
</tr>
<tr>
<td>Trifluoperazine</td>
<td>C</td>
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<tr>
<td><strong>22. Drugs acting on respiratory system</strong></td>
<td></td>
</tr>
<tr>
<td>Aminophylline</td>
<td>C</td>
</tr>
<tr>
<td>Beclomethasone</td>
<td>C</td>
</tr>
<tr>
<td>Budesonide</td>
<td>C</td>
</tr>
<tr>
<td>Etiophylline + theophylline</td>
<td>C</td>
</tr>
<tr>
<td>Ipratropium bromide</td>
<td>B</td>
</tr>
<tr>
<td>Salbutamol</td>
<td>C</td>
</tr>
<tr>
<td>Terbutaline</td>
<td>B</td>
</tr>
<tr>
<td><strong>Antitussives</strong></td>
<td></td>
</tr>
<tr>
<td>Bromhexine hydrochloride</td>
<td>A</td>
</tr>
<tr>
<td>Codeine phosphate</td>
<td>C/D</td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>B</td>
</tr>
<tr>
<td><strong>23. Solution correcting water electrolyte</strong></td>
<td></td>
</tr>
<tr>
<td>Calcium chloride, USP</td>
<td>C</td>
</tr>
<tr>
<td>Calcium gluconate</td>
<td>C</td>
</tr>
<tr>
<td>Dextran</td>
<td>C</td>
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<tr>
<td>Drugs</td>
<td>Categories</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Dextrose</td>
<td>C</td>
</tr>
<tr>
<td>Isolyte</td>
<td>C</td>
</tr>
<tr>
<td>N/2 &amp; N/4 dextrose with normal saline</td>
<td>C</td>
</tr>
<tr>
<td>N/6 Normal saline</td>
<td>C</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>C</td>
</tr>
<tr>
<td>Ringer lactate</td>
<td>C</td>
</tr>
<tr>
<td>Sodium bicarbonate</td>
<td>C</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>C</td>
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<tr>
<td>Sodium chloride, USP</td>
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**24. Vitamins and minerals**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
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</thead>
<tbody>
<tr>
<td>Calcium carbonate</td>
<td>A/C</td>
</tr>
<tr>
<td>Calcium gluconate</td>
<td>C</td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>A/C</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>A/X</td>
</tr>
<tr>
<td>Vitamin B Complex NFI</td>
<td>A/C</td>
</tr>
<tr>
<td>Vitamin B&lt;sub&gt;1&lt;/sub&gt;</td>
<td>A/C</td>
</tr>
<tr>
<td>Vitamin B&lt;sub&gt;12&lt;/sub&gt;</td>
<td>A/C</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>A/C</td>
</tr>
<tr>
<td>Vitamin D&lt;sub&gt;3&lt;/sub&gt;</td>
<td>A/D</td>
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**25. Dental preparations**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Povidone iodine</td>
<td>D</td>
</tr>
<tr>
<td>Salicylate, Gel</td>
<td>C</td>
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</table>

**26. Ophthalmological preparations**

**Anti-infective agents**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclovir</td>
<td>C</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>C</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>C</td>
</tr>
<tr>
<td>Framycetin</td>
<td>C</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>C</td>
</tr>
<tr>
<td>Miconazole</td>
<td>C</td>
</tr>
<tr>
<td>Natamycin</td>
<td>C</td>
</tr>
<tr>
<td>Oxytetracycline</td>
<td>D</td>
</tr>
<tr>
<td>Sulfacetamide</td>
<td>B/D</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>B</td>
</tr>
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</table>

**Anti-inflammatory agents**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone</td>
<td>C</td>
</tr>
<tr>
<td>Dexamethasone + Gentamicin</td>
<td>C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone + Neomycin</td>
<td>C</td>
</tr>
<tr>
<td>Ketorolac</td>
<td>C</td>
</tr>
</tbody>
</table>

**Miotics and antiglaucoma drugs**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilocarpine</td>
<td>C</td>
</tr>
<tr>
<td>Timolol</td>
<td>C</td>
</tr>
</tbody>
</table>

**Mydriatics**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>C</td>
</tr>
<tr>
<td>Cyclopentolate</td>
<td>C</td>
</tr>
<tr>
<td>Homatropine</td>
<td>C</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>C</td>
</tr>
<tr>
<td>Tropicamide</td>
<td>C</td>
</tr>
</tbody>
</table>

**Others**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetazolamide</td>
<td>C</td>
</tr>
<tr>
<td>Fluorescein</td>
<td>C</td>
</tr>
<tr>
<td>Hyaluronidase</td>
<td>C</td>
</tr>
<tr>
<td>Hydroxypropyl methylcellulose</td>
<td>C</td>
</tr>
<tr>
<td>Proparacain</td>
<td>C</td>
</tr>
</tbody>
</table>

**27. Anticancer drugs**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparaginase</td>
<td>C</td>
</tr>
<tr>
<td>Bleomycin</td>
<td>D</td>
</tr>
<tr>
<td>Busulfan</td>
<td>D</td>
</tr>
<tr>
<td>Calcium Folinic acid</td>
<td>C</td>
</tr>
<tr>
<td>Cisplatin</td>
<td>D</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>D</td>
</tr>
<tr>
<td>Cyclosporine A</td>
<td>D</td>
</tr>
<tr>
<td>Cytosine arabinoside</td>
<td>D</td>
</tr>
<tr>
<td>Daunomycin</td>
<td>D</td>
</tr>
<tr>
<td>Doxorubicin</td>
<td>D</td>
</tr>
<tr>
<td>Etoposide</td>
<td>D</td>
</tr>
<tr>
<td>5-fluorouracil</td>
<td>D</td>
</tr>
<tr>
<td>GMCSF</td>
<td>C</td>
</tr>
<tr>
<td>Melphalan</td>
<td>D</td>
</tr>
<tr>
<td>Mercaptopurine</td>
<td>D</td>
</tr>
<tr>
<td>Methotrexate</td>
<td>D</td>
</tr>
<tr>
<td>Paclitaxel</td>
<td>D</td>
</tr>
<tr>
<td>Procarbazine</td>
<td>D</td>
</tr>
<tr>
<td>Tamoxifen</td>
<td>D</td>
</tr>
<tr>
<td>Vincristine</td>
<td>D</td>
</tr>
</tbody>
</table>
### 28. Solutions for parenteral nutrition

- Amino acid solution for parenteral B nutrition
- Fat emulsion for parenteral nutrition
- Human normal serum albumin B

### 29. ENT drugs

- Gentamicin + betamethasone C
- Chloramphenicol C
- Clotrimazole, Eardrops B
- Gentamicin, Eardrops C
- Glucose in glycerine C
- Sodabicarb glycerine C
- Xylometazoline nasal drops C

**Note:** The table should be used as a guide; absence from the table does not imply safety.

**References**

Disinfection is defined as a process that destroys most but not all pathogenic microorganisms on inanimate objects. Most common disinfection process uses a liquid disinfectant. Activity of a disinfectant depends upon concentration of solution, load of pathogens, water hardness, pH and temperature of solution and presence of organic matter. Many disinfectants are unsafe for use on human tissue including skin.

Sterilization is a process by which all types of organisms including spores are destroyed. It can be achieved by autoclaves, hot air oven, ethylene oxide, low-temperature steam, formaldehyde, sporicidal chemicals and irradiation.

1. **Autoclaves** use steam under pressure has a higher temperature than 100°C. To be effective against viruses and spore forming bacteria need to have steam in direct contact with material. Vacuum has to be created. It is required to autoclave for 3 min at 134°C or 15 min at 121°C. The performance is checked by colour changes on indicator tape. Autoclave is highly effective and inexpensive but unsuitable for heat-sensitive objects.

2. **Hot ovens** are inefficient compared to autoclaves and require temperatures of 160°C for 2 hours or 180°C for 30 min.

3. **Ethylene oxide** is highly-penetrative and active against bacteria, spores and viruses but is also flammable, toxic and expensive. It leaves toxic residue on sterilized items and instruments, therefore, need to be stored for prolonged period before use. It is suitable for heat-sensitive items.

4. **Sporicidal chemicals** often used as disinfectants but can also sterilize instruments, if used for prolonged period. Most bacteria and viruses are killed within 10 minutes but spores can survive several hours. These are inexpensive and suitable for heat-sensitive items. They are toxic and irritants.
   i) **Alcohol** (70% ethyl alcohol and isopropyl alcohol). It is bactericidal, virucidal, tuberculocidal but not sporicidal. It is also effective against cytomegalovirus and human immunodeficiency virus. It should not be used on surgical instruments as it is not sporicidal and is corrosive to stainless steel. It can be used for thermometers, medication vial stoppers, injection sites, hand rub. Due to flammable quality, it should not be used in presence of electrocautery and lasers.
   ii) **Sodium hypochlorite** (household bleach). A fast acting broad-spectrum disinfectant and commonly used for blood spills. It is deactivated in presence
of organic matter so the areas should be cleaned before use. It is very corrosive to steel.

A. **Formaldehyde** (37% solution of formaldehyde in water). It is bactericidal, fungicidal, tuberculocidal, virucidal and sporicidal. It is used in tissue preservation and disinfection of some equipment. It is also used in tablet form for disinfection of instruments, rubber instruments in some situations. The fumes emitted are very toxic.

B. **Glutaraldehyde** (2% solution). A widely used high level disinfectant that is sporicidal, bactericidal and virucidal. It is completely safe when used on instruments, endoscopes, anaesthesia equipment. It requires a longer period of exposure for sterilization. It is tuberculocidal in 20 minutes. It gets weakened by repeated dilution and should be replaced after 14 days. It is “activated” by alkali for use as a broad-spectrum disinfectant.

C. **Phenol** (carbolic acid). It is commonly used in detergent form for routine hospital cleaning. It is not sporicidal but is tuberculocidal, virucidal, fungicidal and bactericidal. Its use is restricted for disinfection of non-critical items. It has a noxious odour and can cause skin lesions and respiratory irritation.
Drug Therapy During Breastfeeding

Prescribing in lactation

1. Review the nursing patient and ascertain that the drug is really needed by the mother.
2. If the drug is needed, seek information on how to minimize risks. Start with the minimal possible dose.
3. Question whether the drug would be absorbed by the baby, if it is present in the breast milk and, if so, whether it would harm the baby.
4. Question whether the drug would affect lactation.
5. Use only those drugs for which there is evidence regarding safety in preference to the latest drugs.

List of drugs to be used according to criteria

To be avoided

<table>
<thead>
<tr>
<th>Alcohol</th>
<th>Dihydroergotamine</th>
<th>Phenindione</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alendronate</td>
<td>Diloxanide</td>
<td>Phenobarbiturate</td>
</tr>
<tr>
<td>Amiloride</td>
<td>Diphenhydramine</td>
<td>Potassium iodide</td>
</tr>
<tr>
<td>Aminophylline</td>
<td>Doxepin</td>
<td>Povidone iodine (used</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>Efornithine</td>
<td>locally in vagina)</td>
</tr>
<tr>
<td>Androgen</td>
<td>Ergotamine</td>
<td>Praziquantel</td>
</tr>
<tr>
<td>Artemether +</td>
<td>Flucytosine</td>
<td>Pyrimethamine</td>
</tr>
<tr>
<td>Lumefantrine</td>
<td>Fluorouracil</td>
<td>Radioactive iodine</td>
</tr>
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<td>Aspirin</td>
<td>Fluroxetine</td>
<td>Senna</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Imipenem + Cilastin</td>
<td>Streptomycin</td>
</tr>
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<td>Bromocriptine</td>
<td>Indomethacin</td>
<td>Sulpiride</td>
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<td>L-Dopa</td>
<td>Testosterone</td>
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<td>Tetracycline</td>
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<td>Theophylline</td>
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<tr>
<td>(Combined)</td>
<td>Nalidixic acid</td>
<td>Thyroxine (modified</td>
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<tr>
<td>Cotrimoxazole</td>
<td>Penicillin</td>
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<td>Vitamin A</td>
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<td>Dapsone</td>
<td>Pentavalent antimony compounds</td>
<td>Vitamin D</td>
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<tr>
<td>Cautious use</td>
<td>Contraindicated</td>
<td>Toxicity in high doses</td>
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<td>----------------------</td>
<td>----------------------</td>
<td>------------------------</td>
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<tr>
<td>Allopurinol</td>
<td>Asparaginase</td>
<td>Corticosteroids</td>
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<td>Carbamazepine</td>
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<tr>
<td>Opioids (other than</td>
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<td>morphine)</td>
<td>Mercaptopurine</td>
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<tr>
<td>Sulphonylureas</td>
<td>Methotrexate</td>
<td></td>
</tr>
<tr>
<td>Warfarin</td>
<td>Paclitaxel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Procarbazine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radioactive iodine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vinblastine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vincristine</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** There is inadequacy of currently available information on drugs in breast milk. Using a drug with caution means to avoid use, if possible. The table should be used only as a guide; absence from the table does not imply safety.
Prescribing in liver disease
1. Prescribe drugs to a minimum.
2. Prefer drugs that do not need hepatic metabolism for elimination.
3. Give the lowest effective dose of a drug.
4. Avoid prodrugs that need hepatic metabolism for activation.
5. Avoid hepatotoxic drugs.

Drugs to be avoided in liver diseases

<table>
<thead>
<tr>
<th>ACE inhibitors</th>
<th>Diuretics</th>
<th>Methylldopa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiodarone</td>
<td>Doxycycline</td>
<td>Minocycline</td>
</tr>
<tr>
<td>Anticoagulants</td>
<td>Erythromycin</td>
<td>Oestrogens</td>
</tr>
<tr>
<td>Antihistaminics</td>
<td>Ether</td>
<td>Oral contraceptives</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Fluphenazine</td>
<td>Prednisolone</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Halothane</td>
<td>Progesterones</td>
</tr>
<tr>
<td>Chlorpheniramine</td>
<td>Isoflurane</td>
<td>Pyrazinamide</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>Isoniazid</td>
<td>Quinolones</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>Lignocaine</td>
<td>Rifampicin</td>
</tr>
<tr>
<td>Contraceptives</td>
<td>MAO inhibitors</td>
<td>Sodium valproate</td>
</tr>
<tr>
<td>Dextromethorphan</td>
<td>Metformin</td>
<td>Sulphonylureas</td>
</tr>
</tbody>
</table>

Drugs to be avoided in severe liver disease

<table>
<thead>
<tr>
<th>Abacavir</th>
<th>Efavirenz</th>
<th>Mefloquine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antipsychotics</td>
<td>Ergometrine</td>
<td>Nitroprusside</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>Ergotamine</td>
<td>Ofloxacin</td>
</tr>
<tr>
<td>Clomiphene</td>
<td>Iopanoic acid</td>
<td>Sodium nitroprusside</td>
</tr>
<tr>
<td>Clomipramine</td>
<td>Ketoconazole</td>
<td>Tricyclic antidepressants</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>Lopinavir with ritonavir</td>
<td>Warfarin</td>
</tr>
</tbody>
</table>
### Drugs which require a decrease in dose

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allopurinol</td>
<td>Diphenhydramine</td>
<td>Pancuronium</td>
</tr>
<tr>
<td>Alprazolam</td>
<td>Doxorubicin</td>
<td>Paracetamol</td>
</tr>
<tr>
<td>Amiloride</td>
<td>Famotidine</td>
<td>Pefloxacin</td>
</tr>
<tr>
<td>Aminophyline</td>
<td>Fentanyl</td>
<td>Pethidine</td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>Frusemide</td>
<td>Phenindione</td>
</tr>
<tr>
<td>Amphotericin-B</td>
<td>Glibenclamide</td>
<td>Phenytoin</td>
</tr>
<tr>
<td>Atenolol</td>
<td>Heparin</td>
<td>Propranolol</td>
</tr>
<tr>
<td>Azathioprine</td>
<td>Hydralazine</td>
<td>Propyl thiouracil</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>Indinavir</td>
<td>Quinidine</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Lincomycin</td>
<td>Ranitidine</td>
</tr>
<tr>
<td>Codeine</td>
<td>Lorazepam</td>
<td>Rifampicin</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>Metoclopramide</td>
<td>Sulphonylureas</td>
</tr>
<tr>
<td>Cyclosporin</td>
<td>Metoprolol</td>
<td>Theophylline</td>
</tr>
<tr>
<td>Cytarabine</td>
<td>Metronidazole</td>
<td>Valproic acid</td>
</tr>
<tr>
<td>Daocarbazine</td>
<td>Mexiletine</td>
<td>Vancomycin</td>
</tr>
<tr>
<td>Daunorubicin</td>
<td>Nifedipine</td>
<td>Verapamil</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Ofloxacin</td>
<td>Vinblastine</td>
</tr>
<tr>
<td>Didanosine</td>
<td>Omeprazole</td>
<td>Vincristine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warfarin</td>
</tr>
</tbody>
</table>

### Drugs that can precipitate hepatic coma

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiolytics</td>
<td>Hypnotics</td>
<td>Frusemide</td>
</tr>
<tr>
<td>Phenobarbitone</td>
<td>Promethazine</td>
<td>Opioids</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Prescribing in renal impairment
1. Drug prescribing should be kept to a minimum.
2. The extent to which the dose of a drug is reduced depends on the pharmacokinetics of the drug. The total daily dose of a drug can be adjusted by increasing the interval between doses. If the maintenance dose is reduced, a loading dose for immediate effect is required.
3. Nephrotoxic drugs should be avoided in patients with renal disease.
4. The serum creatinine concentration can usually be used as a measure of renal function

\[
\text{Creatinine clearance} = \frac{(140 \text{ Age}) \times \text{Weight in kilograms}}{72 \times \text{Serum Creatinine in mg/dl}}
\]

For prescribing purpose renal impairment is divided into 3 grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>GFR</th>
<th>Serum creatinine (approx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>20-50 ml/min</td>
<td>200-300 µmol/L</td>
</tr>
<tr>
<td>Moderate</td>
<td>10-20 ml/min</td>
<td>300-700 µmol/L</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;10 ml/min</td>
<td>&gt; 700 µmol/L</td>
</tr>
</tbody>
</table>

5. It is wise to assume at least mild impairment of renal function when prescribing for the elderly.

**Drugs that can cause renal damage**

- ACE inhibitors
- Acetaminophen
- Acyclovir
- Allopurinol
- Aminoglycosides
- Ampicillin
- Aspirin
- Carb Anh inhibitors
- Cisplatin
- Cyclosporin
- Diatrizoate
- Diuretics
- Interleukin-2
- Iohexol
- Lithium
- Meglumine iotrexate
- Methionine
- Methotrexate
- Methoxyflurane
- Methyl CCNU
- Mithramycin
- Nimesulide
- Penicillamine
- Phenytoin
- Rifampicin
- Tetracycline
- Triamterine
### Doses of drugs that required to be reduced in case of impaired renal function

<table>
<thead>
<tr>
<th>Drug A</th>
<th>Drug B</th>
<th>Drug C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxycillin</td>
<td>Dacarbazine</td>
<td>Nalidixic acid</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Daunorubicin</td>
<td>Pentamidine isetionate</td>
</tr>
<tr>
<td>Atenolol</td>
<td>Dextromethorphan</td>
<td>Pethidine</td>
</tr>
<tr>
<td>Azathioprine</td>
<td>Diazepam</td>
<td>Phenytoin</td>
</tr>
<tr>
<td>Benzyl penicillin</td>
<td>Dicloxacillin</td>
<td>Piperacillin</td>
</tr>
<tr>
<td>Bleomycin</td>
<td>Diethylcarbamazine</td>
<td>Prazosin</td>
</tr>
<tr>
<td>Capreomycin</td>
<td>Digoxin</td>
<td>Procainamide</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>Efornithine</td>
<td>Propranolol</td>
</tr>
<tr>
<td>Ceftadizime</td>
<td>Ethambutol</td>
<td>Propylthiouracil</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>Flucytosine</td>
<td>Pyrazinamide</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>Frusemide</td>
<td>Pyridostigmine</td>
</tr>
<tr>
<td>Chlorquine</td>
<td>Gentamicin</td>
<td>Salicylates</td>
</tr>
<tr>
<td>Chlorpheniramine</td>
<td>Hydralazine</td>
<td>Streptomycin</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>Imipenem + Cilastin</td>
<td>Theophylline</td>
</tr>
<tr>
<td>Clavulanic acid</td>
<td>Lamivudine</td>
<td>Trimethoprim</td>
</tr>
<tr>
<td>Clofibrate</td>
<td>Magnesium hydroxide</td>
<td>Valproic acid</td>
</tr>
<tr>
<td>Cloxacillin</td>
<td>Magnesium sulphate</td>
<td>Vancomycin</td>
</tr>
<tr>
<td>Codeine</td>
<td>Mercaptopurine</td>
<td>Vecuronium</td>
</tr>
<tr>
<td>Colchicine</td>
<td>Methotrexate</td>
<td>Warfarin</td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>Morphine</td>
<td>Zidovudine</td>
</tr>
</tbody>
</table>
APPENDIX VIII

DRUGS IN GLUCOSE 6 PHOSPHATE DEHYROGENASE (G6PD) DEFICIENCY

G6PD deficiency a genetically heterogenous disease predominantly seen in males. WHO classification of different G6PD variants, on the magnitude of enzyme deficiency and severity of haemolysis.

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Very severe enzyme deficiency (&lt;10% of normal) associated with chronic haemolytic anaemia</td>
</tr>
<tr>
<td>Class II</td>
<td>Severe enzyme deficiency associated with intermittent haemolysis</td>
</tr>
<tr>
<td>Class III</td>
<td>Moderate enzyme deficiency (20-60% of normal) with intermittent haemolysis with drugs or infection.</td>
</tr>
<tr>
<td>Class IV</td>
<td>No enzyme deficiency or haemolysis</td>
</tr>
<tr>
<td>Class V</td>
<td>Increased enzyme activity</td>
</tr>
</tbody>
</table>

Infection and disease-induced haemolytic anaemia

Salmonella, Beta haemolytic Streptococci, E. coli, Rickettsiae, viral hepatitis, diabetic ketoacidosis.

Drugs causing haemolysis in G6PD-deficient individuals

<table>
<thead>
<tr>
<th>Antimalarials</th>
<th>Sulphones</th>
<th>Other drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroquine</td>
<td>Dapsone</td>
<td>Ascorbic acid</td>
</tr>
<tr>
<td>Primaquine</td>
<td>Sulphonamides</td>
<td>Aminosalicylic acid</td>
</tr>
<tr>
<td>Pentaquine</td>
<td>Salicylazosulphapyridine</td>
<td>Doxorubicin</td>
</tr>
<tr>
<td>Primaquine</td>
<td>Sulphacetamide</td>
<td>Methylene blue</td>
</tr>
<tr>
<td>Pyrimethamine</td>
<td>Sulphadiazine</td>
<td>Nalidixic acid</td>
</tr>
<tr>
<td>Quinine</td>
<td>Sulphamerazine</td>
<td>Niriadazole</td>
</tr>
<tr>
<td>Quinacrine</td>
<td>Sulphamethoxazole</td>
<td>Phenacetin</td>
</tr>
<tr>
<td><strong>Nitrofurans</strong></td>
<td>Sulphamethoxypridazine</td>
<td>Phenazopyridine</td>
</tr>
<tr>
<td>Furazolidone</td>
<td>Sulphapyridine</td>
<td>Probenecid</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>Sulphaguanidine</td>
<td>Quinidine</td>
</tr>
<tr>
<td><strong>Antipyretics and Analgesics</strong></td>
<td><strong>Other antibiotics</strong></td>
<td><strong>Vitamin K</strong></td>
</tr>
<tr>
<td>Acetysalicylic acid</td>
<td>Chloramphenicol</td>
<td>Procinamid</td>
</tr>
<tr>
<td>Acetanilide</td>
<td>Cotrimoxazole</td>
<td></td>
</tr>
</tbody>
</table>
Contrast media commonly used in conventional radiology are:

1. **Barium sulphate.** Available as paste, suspensions (of varying densities), powder (for making paste and dilute suspension).
   Used in various forms and amounts depending upon the study in investigating various conditions of the gastrointestinal tract.
   Various investigations include Barium swallow, upper GI studies, follow-through, enteroclysis, enema and oral contrast in CT scans.
   Used in single and double contrast studies. Double contrast studies also use other agents such as water, air and methylcellulose.

**Contraindications, side effects and special precautions:**
Contraindicated in perforation of GI tract—can cause severe peritonitis.
Constipation may occur after oral or rectal barium sulphate. Adequate hydration should be maintained.
Rarely impaction, obstruction, appendicitis, cramping or diarrhoea.
Accidental venous intravasation can lead to the formation of emboli.
May be retained for years in closed cavities.
ECG abnormalities during barium sulphate enemas.
Accidental aspiration into the lungs can lead to pneumonitis or granuloma formation.
Hypersensitivity reactions can occur due to the additives used in the formulation.

2. **Intravascular Iodine-based contrast media (water-soluble)**
   **Ionic contrast media** – Sodium and Meglumine Diatrizoate and Iothalamate. **Non-ionic contrast media** – Monomeric: Iohexol, Ioversol, Iopamidol; Dimeric: Iotrolan, Iodixanol. They are available in various iodine concentrations from 240 to 370 mg/ml, in 10, 20, 40, 50 and 100 ml.

   Broad range of indications in the form of intravascular and intracavitatory routes. Intravascular includes intravenous pyelogram (IVP), venography, angiography contrast enhanced CT scans, etc.

   Intracavitatory includes HSG, micturating cystourethrogram, fistulogram, etc. Dose varies from each investigation and case-to-case basis. In general, non-ionic media are better tolerated than ionic media and more non-ionic contrast can be used.

   Non-ionic media should be preferred for intravascular use whenever possible.
Contraindications, side effects and special precautions

Contraindicated in patients with known hypersensitivity to a particular contrast agent. Special precautions to be taken in patients with history of allergy, asthma, previous generalized contrast medium reaction, etc. Premedication to avoid or minimize possible allergic reactions may be considered.

Antihistamines should be given by a separate injection to avoid precipitation. Test dose before injection of the full dose has been employed but is not completely reliable. The patient should be kept under observation for 30 to 60 minutes following injection.

Patients on adrenergic β blockers are more prone to severe adverse effects to contrast media.

An interval of at least 48 hours should be allowed before studies are repeated especially in patients with reduced renal function.

Preparatory dehydration is not necessary and may be dangerous in infants, young children, the elderly, presence of multiple myeloma and azotemic patients (especially those with polyuria, oliguria, diabetes, advanced vascular disease or pre-existing dehydration).

Use with caution in patients with congestive heart failure.

Special precaution to be taken in patients with cerebral thrombosis or embolism, primary or metastatic cerebral lesions, subarachnoid haemorrhage, increased intracranial pressure, arterial spasm, transient ischaemic attacks and in any condition when the blood-brain barrier is breached or the transit time of the contrast material is prolonged.

The results of protein bound iodine and radioactive iodine uptake studies will not reflect thyroid functions for at least 16 days following administration of iodinated contrast media.

Avoid in patients known or suspected to have pheochromocytoma.

Contrast media by IV route can promote the phenomenon of sickling in individuals homozygous for sickle cell disease.

Other risk factors include raised serum creatinine levels, particularly secondary to diabetic nephropathy, dehydration, congestive heart failure, age over 70 years, concurrent administration of nephrotoxic drugs, e.g. non-steroid anti-inflammatory drugs, hyperthyroidism, concomitant severe renal and hepatic disease, gout.

Safety of contrast media for use in pregnancy has not been determined; the benefit to the patient should be carefully weighed against the possible risk to the fetus. Since contrast media are known to be excreted in breast milk, nursing should be stopped and alternate feeding substituted for 24 to 48 hours following administration.

Reactions to contrast media

Reactions occur at random and are generally unpredictable. Most of them recover when properly treated. The reactions are described as mild, moderate and severe.
**Mild reactions**: Flushing, nausea, arm pain, vomiting, headache, mild urticaria. They are mild in severity, of short duration, self-limiting, and require no specific treatment. Occasionally, Tab Chlorpheniramine 25 mg, Tab Diazepam 5 mg, or Tab Paracetamol 500 mg may be given.

Incidence of mild reactions is 5-15%. It is lower with non-ionic contrast media.

**Moderate reactions**: More serious degree of the mild symptoms, hypotension and bronchospasm. They disturb both the patient and the doctor but are not alarming. The incidence of these reactions is 0.5-2%. In case of non-ionic contrast, it is reduced to 1/4th.

**Severe reactions**: They include convulsions, unconsciousness, laryngeal oedema, severe bronchospasm, pulmonary oedema, severe cardiac arrhythmias and arrest, cardiopulmonary collapse. Treatment is urgent, since death can eventually occur. The incidence of deaths in ionic contrast media is 1 in 40,000 patients. It is absolutely essential to take informed consent of the patient before giving intravascular contrast agents. The patient should be shifted to ICU immediately.

Anaesthetist should be available. Trolley with oxygen, oral airways, nasal tubes, endotracheal tubes, facemask, ambu bag, sphygmomanometer and stethoscope, syringes, needles and tracheostomy set should be readily available.

Artificial respiration and cardiac massage by a DC defibrillator should be given. The incidence of severe reactions is 0.1% in ionic and 0.02% in non-ionic media.

(For details of management see Chapter 2 on Anaphylaxis and CPR)
## Normal Haematological Values

(Expressed as Mean ± 2 SD (95% Range))

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Adults</th>
<th>Men</th>
<th>5.5 ± 1.0 × 10^{12}/l</th>
<th>5.5 ± 1.0 millions/mm^3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red-cell count</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>4.8 ± 1.0 × 10^{12}/l</td>
<td>4.8 ± 1.0 millions/mm^3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants (full-term, cord blood)</td>
<td>4.0 ± 0.8 × 10^{12}/l</td>
<td>4.0 ± 0.8 millions/mm^3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 1 y</td>
<td>4.4 ± 0.8 × 10^{12}/l</td>
<td>4.4 ± 0.8 millions/mm^3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3-6 y</td>
<td>4.8 ± 0.7 × 10^{12}/l</td>
<td>4.8 ± 0.7 millions/mm^3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 10-12 y</td>
<td>4.7 ± 0.7 × 10^{12}/l</td>
<td>4.7 ± 0.7 millions/mm^3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemoglobin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>155 ± 25 g/l</td>
<td>15.5 ± 2.5 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>140 ± 25 g/l</td>
<td>14.0 ± 2.5 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants (full-term, cord blood)</td>
<td>165 ± 30 g/l</td>
<td>16.5 ± 3.0 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3 months</td>
<td>115 ± 20 g/l</td>
<td>11.5 ± 2.0 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 1 y</td>
<td>120 ± 15 g/l</td>
<td>12.0 ± 1.5 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3-6 y</td>
<td>130 ± 10 g/l</td>
<td>13.0 ± 1.0 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 10-12 y</td>
<td>130 ± 15 g/l</td>
<td>13.0 ± 1.5 g/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packed cell volume (PCV; haematocrit value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.47 ± 0.07 (1/1)</td>
<td>47 ± 07 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>0.42 ± 0.05 (1/1)</td>
<td>42 ± 05 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants (full-term, cord blood)</td>
<td>0.54 ± 0.10 (1/1)</td>
<td>54 ± 10 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3 months</td>
<td>0.38 ± 0.06 (1/1)</td>
<td>38 ± 06 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3-6 y</td>
<td>0.40 ± 0.04 (1/1)</td>
<td>40 ± 04 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 10-12 y</td>
<td>0.41 ± 0.04 (1/1)</td>
<td>41 ± 04 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean cell volume (MCV)</td>
<td>Adults</td>
<td>86 ± 10 fl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants (full-term, cord blood)</td>
<td>106 fl (mean)</td>
<td>106 fl (mean)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3 months</td>
<td>95 fl (mean)</td>
<td>95 fl (mean)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 1 y</td>
<td>78 ± 8fl</td>
<td>78 ± 8fl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3-6 y</td>
<td>81 ± 8fl</td>
<td>81 ± 8fl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 10-12 y</td>
<td>84 ± 7fl</td>
<td>84 ± 7fl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean cell haemoglobin (MCH)</td>
<td>Adults</td>
<td>29.5 ± 2.5 pg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3 months</td>
<td>29 ± 5 pg</td>
<td>29 ± 5 pg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 1 y</td>
<td>27 ± 4 pg</td>
<td>27 ± 4 pg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 3-6 y</td>
<td>27 ± 3 pg</td>
<td>27 ± 3 pg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children, 10-12 y</td>
<td>27 ± 3 pg</td>
<td>27 ± 3 pg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean cell haemoglobin concentration (MCHC)</td>
<td>Adults and children</td>
<td>325 ± 25 g/l</td>
<td>32.5 ± 2.5 g/dl</td>
<td></td>
</tr>
</tbody>
</table>

Red-cell diameter (mean values)

- Adults (dry films) 6.7-7.7μm
<table>
<thead>
<tr>
<th><strong>Red-cell density</strong></th>
<th>1092 ± 1100 g/l</th>
<th>109.2 ± 110.0 g/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reticulocytes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults and children</td>
<td>0.2–2.0%</td>
<td>0.2–2.0%</td>
</tr>
<tr>
<td></td>
<td>(25-85 × 10⁹/l)</td>
<td>(25-85 × 10⁹/mm³)</td>
</tr>
<tr>
<td>Infants (full-term, cord blood)</td>
<td>2– 6% (mean 150 × 10⁹/l)</td>
<td>2– 6% (15000/mm³)</td>
</tr>
<tr>
<td><strong>Blood volume</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red-cell volume, men</td>
<td>30 ± 5 ml/kg</td>
<td></td>
</tr>
<tr>
<td>women</td>
<td>25 ± 5 ml/kg</td>
<td></td>
</tr>
<tr>
<td>Plasma volume</td>
<td>45 ± 5 ml/kg</td>
<td></td>
</tr>
<tr>
<td><strong>Red-cell lifespan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>120 ± 30 days</td>
<td></td>
</tr>
<tr>
<td><strong>Leucocyte count</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils</td>
<td>2.0-7.5 × 10⁹/l (40-75%)</td>
<td>2000-7500/mm³</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>1.5-4.0 × 10⁹/l (20-45%)</td>
<td>1500-4000/mm³</td>
</tr>
<tr>
<td>Monocytes</td>
<td>0.2-0.8 × 10⁹/l (2-10%)</td>
<td>200-800/mm³</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>0.04-0.4 × 10⁹/l (1-6%)</td>
<td>40-400/mm³</td>
</tr>
<tr>
<td>Basophils</td>
<td>&lt;0.01-0.1 × 10⁹/l (&lt;1%)</td>
<td>10-100/mm³</td>
</tr>
<tr>
<td>Infants (1st day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils</td>
<td>5.0 ± 13.0 × 10⁹/l</td>
<td>500-1300/mm³</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>3.5 ± 8.5 × 10⁹/l</td>
<td>3500-8500/mm³</td>
</tr>
<tr>
<td>Monocytes</td>
<td>0.5 ± 1.5 × 10⁹/l</td>
<td>500-1500/mm³</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>0.1 ± 2.5 × 10⁹/l</td>
<td>100-250/mm³</td>
</tr>
<tr>
<td>Basophils</td>
<td>&lt;0.01 ± 0.1 × 10⁹/l</td>
<td>10-100/mm³</td>
</tr>
<tr>
<td>Infants (3 y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils</td>
<td>1.5 ± 7.0 × 10⁹/l</td>
<td>1500-700/mm³</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>2.0 ± 5.0 × 10⁹/l</td>
<td>2000-500/mm³</td>
</tr>
<tr>
<td>Monocytes</td>
<td>0.3 ± 1.1 × 10⁹/l</td>
<td>300-1100/mm³</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>0.2 ± 2.0 × 10⁹/l</td>
<td>20-200/mm³</td>
</tr>
<tr>
<td>Basophils</td>
<td>&lt;0.01 ± 0.1 × 10⁹/l</td>
<td>10-100/mm³</td>
</tr>
<tr>
<td>Children (6 y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils</td>
<td>2.0 ± 6.0 × 10⁹/l</td>
<td>200-600/mm³</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>5.5 ± 8.5 × 10⁹/l</td>
<td>5500-8500/mm³</td>
</tr>
<tr>
<td>Monocytes</td>
<td>0.7 ± 1.5 × 10⁹/l</td>
<td>700-1500/mm³</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>0.3 ± 0.8 × 10⁹/l</td>
<td>300-800/mm³</td>
</tr>
<tr>
<td>Basophils</td>
<td>&lt;0.01 ± 0.1 × 10⁹/l</td>
<td>10-100/mm³</td>
</tr>
<tr>
<td><strong>Platelet count</strong></td>
<td>150-400 × 10⁹/l</td>
<td>1.5-4.0 lakh/mm³</td>
</tr>
<tr>
<td><strong>Bleeding time (Ivy’s method)</strong></td>
<td>2-7 min</td>
<td></td>
</tr>
<tr>
<td>(Template method)</td>
<td>2.5-9.5 min</td>
<td></td>
</tr>
</tbody>
</table>
Coagulation time (Lee and White’s method, 37°C) 5-11 min
Prothrombin time (brain-thromboplastin time)
  I-stage (Quick) 10-14 s
Partial thromboplastin time (PTTK) 35-43 s
Prothrombin-consumption index 0-30%
Plasma fibrinogen 2.0-4.0 g/l

Osmotic fragility (at 20°C and pH 7.4)

<table>
<thead>
<tr>
<th>NaCl (g/l)</th>
<th>Before incubation % lysis</th>
<th>After incubation for 24 h at 37°C % lysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>100</td>
<td>95-100</td>
</tr>
<tr>
<td>3.0</td>
<td>97-100</td>
<td>85-100</td>
</tr>
<tr>
<td>3.5</td>
<td>90-99</td>
<td>75-100</td>
</tr>
<tr>
<td>4.0</td>
<td>50-95</td>
<td>65-100</td>
</tr>
<tr>
<td>4.5</td>
<td>5-45</td>
<td>55-95</td>
</tr>
<tr>
<td>5.0</td>
<td>0-6</td>
<td>40-85</td>
</tr>
<tr>
<td>5.5</td>
<td>0</td>
<td>15-70</td>
</tr>
<tr>
<td>6.0</td>
<td>0</td>
<td>0-40</td>
</tr>
<tr>
<td>6.5</td>
<td>0</td>
<td>0-10</td>
</tr>
<tr>
<td>7.0</td>
<td>0</td>
<td>0-5</td>
</tr>
<tr>
<td>7.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Median corpuscular fragility (MCF) (g/l NaCl)

<table>
<thead>
<tr>
<th>NaCl (g/l)</th>
<th>MCF</th>
<th>Median corpuscular fragility (MCF) (g/l NaCl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0-4.45</td>
<td></td>
<td>4.65-5.9</td>
</tr>
</tbody>
</table>

Autohaemolysis (37°C)

- 48 h, without added glucose 0.2-4.0%
- 48 h, with added glucose 0-0.5%

Cold-agglutinin titre (4°C) <64

Serum iron 13-32 μmol/l (0.7-1.8 mg/l)
Total iron-binding capacity 45-70 μmol/l (2.5-4.0 mg/l)
Transferrin 1.2-2.0 g/l
Serum vitamin B₁₂ (as cyanocobalamin) 160-925 ng/l
Serum folate 3-20 mcg/l
Red-cell folate 160-640 mcg/l
Plasma haemoglobin 10-40 mg/l
Serum haptoglobin (Hb-binding) 0.3-2.0 g/l

Sedimentation rate (Westergren, 1 h) (at 20±3°C)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age Group</th>
<th>Sedimentation Rate (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>17-50 y</td>
<td>1-7 mm</td>
</tr>
<tr>
<td></td>
<td>&gt; 50 y</td>
<td>2-10 mm</td>
</tr>
<tr>
<td>Women</td>
<td>17-50 y</td>
<td>3-9 mm</td>
</tr>
<tr>
<td></td>
<td>&gt; 50 y</td>
<td>5-15 mm</td>
</tr>
</tbody>
</table>

Plasma viscosity (at 25°C) 1.61 ± 0.05 cP

Heterophile (anti-sheep red-cell) agglutinin titre <80
  After absorption with guinea-pig kidney <10
OXYGEN THERAPY

Oxygen is used as a medical treatment in both chronic and acute cases, and can be used in hospital, pre-hospital or entirely out of hospital, dependant on the needs of the patient and the advice of the medical professional.

Use in chronic conditions
Commonly used in patients with chronic obstructive pulmonary disease (COPD) with \( \text{PaO}_2 \leq 55 \text{ mmHg} \) or \( \text{SaO}_2 \leq 88\% \), and in case of chronic bronchitis or emphysema, who may require additional oxygen to breathe either during a temporary worsening of their condition, or throughout the day and night.

Use in acute conditions
In the pre-hospital environment, high flow oxygen is definitively indicated for use in resuscitation, major trauma, anaphylaxis, major haemorrhage, shock, active convulsions and hypothermia or for any other injury or illness causing hypoxemia. The oxygen flow should be moderated to achieve target oxygen saturation levels, based on pulse oximetry (with a target level of 94-98\% in most patients, or 88-92\% in COPD patients).

Storage and sources
Gas cylinders containing oxygen
A home oxygen concentrator \textit{in situ} in an emphysema patient’s house are in widespread usage for home oxygen therapy as portable personal oxygen, with the advantage of having continuous supply without the need for additional deliveries of bulky cylinders.

Fire risk
Highly concentrated sources of oxygen promote rapid combustion. Oxygen itself is not flammable, but the addition of concentrated oxygen to a fire greatly increases its
intensity, and can aid the combustion of materials (such as metals) which are relatively inert under normal conditions.

**Delivery**

A pressure regulator is used to control the high pressure of oxygen delivered from a cylinder (or other source) to a lower pressure which is controlled by a flow meter. The typical flow meter range for medical oxygen is between 0 and 15 litres per minute (lpm) up to 25 liters per minute.

**Supplemental oxygen**

Many patients require only a supplementary level of oxygen in the room air they are breathing, which can be delivered through a number of devices dependant on the situation, flow required and in some instances patient preference. O₂ is preferably administered by non-rebreathing systems outside the operating room. There are mainly 2 types of non-rebreathing oxygen delivery systems:

1. **Fixed performance high-flow system**: It predetermines room air entrainment to achieve the desired flow and FiO₂. Venturi devices are the most commonly used high flow oxygen devices for un-intubated patients. Variation in orifice or entrainment port size will change FiO₂, whereas variation of oxygen flow rate will determine the total volume of gas provided by the device. FiO₂ values of 0.24 to 0.40 are readily provided by these masks.

2. **Variable performance low-flow system**: Air entrainment varies to meet the patients’ inspiratory flow requirements.

**Devices for delivery of oxygen**

1. A nasal cannula (NC), comfortably provide oxygen at low flow rates, 2–6 litres per minute (lpm), delivering a concentration of 24–40%.

2. Simple face mask: It covers the nose and mouth and is often used at between 5-8 lpm providing a concentration of O₂ to the patient up to 40 to 60%.

3. Mask with reservoir bag: A partial rebreathing mask is a simple facemask with an attached reservoir bag, provides oxygen at 40 to 80% or even higher at 5-10 lpm.

4. Non-rebreather masks draw oxygen from an attached reservoir bag, with one-way valves that direct exhaled air out of the mask. When properly fitted and used at flow rates of 10-15 lpm or higher, they deliver close to 100% oxygen. The delivered FiO₂ of this system is 60-80%, depending on the oxygen flow and breathing. This type of mask is indicated for acute medical emergencies.

5. Demand valves or oxygen resuscitators deliver oxygen only when the patient inhales, or, in the case of an apnoic (non-breathing) victim, the caregiver presses a button on the mask and are useful in emergency situations when a limited supply of oxygen is available and there is a delay in transporting the patient to higher care. Care must be taken not to over-inflate the patient’s lungs, and some systems employ safety valves to help prevent this. These systems may not be appropriate for unconscious patients or those in respiratory distress.
Negative effects

Never give oxygen in paraquat poisoning unless they are suffering from severe respiratory distress or respiratory arrest, as this can increase the toxicity. Oxygen therapy is not recommended for patients who have suffered pulmonary fibrosis or other lung damage resulting from bleomycin treatment. High levels of oxygen given to infants causes blindness (retinopathy of prematurity).

Chronic obstructive pulmonary disease

Supplemental high levels of oxygen, causes ventilation–perfusion imbalance reducing respiratory drive to the point of precipitating respiratory failure, and eventual death, therefore, care needs to be exercised in patients with COPD, such as emphysema, especially in those known to retain carbon dioxide (type II respiratory failure). However, the risk of the loss of respiratory drive is far outweighed by the risks of withholding emergency oxygen, and therefore, emergency administration of oxygen is never contraindicated. Transfer from field care to definitive care, where oxygen use can be carefully calibrated, should occur long before significant reductions to the respiratory drive.
A clinically relevant drug–drug interaction (DDI) occurs when the effectiveness or toxicity of one medication is altered by prior administration or co-administration of another medicine. The potential for clinically important DDIs can often be predicted based on the drug properties, method of drug administration, and patient-specific parameters.

Consequences of drug–drug interactions

There are 3 possible outcomes when drug-drug interactions occur and they are the following:

1. One drug may intensify the effects of the other: Aspirin (anti-platelet) given together with warfarin /coumarin (anticoagulant) increases chances of bleeding; Antihistamines increase the sedative effects of barbiturates, tranquilizers, alcohol and pain relievers.

2. One drug may reduce the effects of the other: Beta blockers used with terbutaline.

3. The combination may produce a new response not seen when either drug is given alone: Alcohol and disulfiram (Antabuse) when taken to either many unpleasant and dangerous responses.

Mechanism of drug interactions

Interactions can be pharmacodynamic or pharmacokinetic. Some drug interactions are due to a combination of mechanisms.

1. Pharmacodynamic drug interactions: Pharmacodynamic interactions are relatively straightforward and are relatively predictable, if the actions of the medicine are known. These interactions are due to competition at receptor sites or activity of the interacting drugs on the same physiological system. There is no change in the plasma concentrations of interacting drugs. These involve the additive effect of similar medicines, or a cancelling effect, for example:
   - Increasing risk of hypotension with two antihypertensives
   - Antagonism–beta blockers used with terbutaline
   - Cephalosporin when taken with aminoglycoside (gentamicin) renal toxicity is increased.
   - Corticosteroid, decreases hypoglycaemic action of glipizide, glimepride.
Opposing pharmacodynamic interactions are: NSAIDs/antihypertensives or diuretics Diuretics/hypoglycaemics Steroids/hypoglycaemics β-blockers/β-agonists CNS depressants/sympathomimetics/caffeine Warfarin/vitamin K Lithium/NSAIDs

2. Pharmacokinetic drug interactions: Pharmacokinetic interactions are more complex and usually involve interference with

Absorption: Drugs, food and drinks can alter the absorption of drugs. This is one important site of drug interaction, e.g.
- Antacids, and oral iron preparations block absorption of quinolones, tetracycline, and azithromycin.
- Iron supplements and the antibiotic or calcium bind together in the stomach, instead of being absorbed into the bloodstream.
- Ampicillin when taken with food absorption is reduced.
- Omeprazole when taken with food absorption is reduced.
- Ampicillin or amoxycillin taken with allopurinol, skin rashes increase.
- Omeprazole, lansoprazole, H2-antagonists decrease the absorption of ketoconazole, delavirdine.

Distribution: The drug moves from bloodstream into various fluids and tissues or drug may get bound to plasma proteins. One drug may displace another drug from these sites.

Metabolism: Most drugs are metabolized in the liver. The liver has many enzymes that metabolize the drugs and these enzymes can be induced or inhibited by drugs thus causing increase or decrease in metabolism of other drugs:
- INH inhibits metabolism of carbamazepine.
- INH induces the metabolism of oral contraceptive resulting in contraception failure.

Excretion: Drugs are excreted primarily by kidneys. One drug may decrease or increase the excretion of drugs. A change in blood concentration causes a change in the drug’s effect. If the concentration increases, there may be more adverse effects or if the concentration decreases, there may be lack of therapeutic response.
- INH inhibits diazepam excretion leading to enhanced diazepam response. Furosemide enhances lithium toxicity.

4. Pharmaceutical interactions: These can be classified as those interactions that occur prior to systemic administration. For example incompatibility between two drugs mixed in an IV fluid. These interactions can be physical (e.g. with a visible precipitate) or chemical with no visible sign of a problem.

Ketamine is incompatible with barbiturate and diazepam.
Do not combine thiopentone and suxamethonium.
Do not combine protamine zinc sulphate and soluble insulin.
Phenytoin precipitates in dextrose solutions, e.g. D5W.
Amphotericin precipitates in saline
Gentamicin is physically/chemically incompatible with most beta-lactams, resulting in loss of antibiotic effect.

4. Drug-food interactions: They are both important and poorly understood. They are important because they can result in toxicity or therapeutic failure.

**Decreased absorption:** Food frequently decreases the rate of drug absorption and can decrease the extent of absorption. The reduction of rate will simply delay the onset of the effects. But reducing the extent of the absorption reduces the intensity of peak responses.

High-fibre foods can reduce absorption of some drugs. Digoxin, a drug used for cardiac disorders, is reduced significantly by wheat bran, rolled oats, and sunflower seed. Since digoxin has a narrow therapeutic range, reduced absorption can result in therapeutic failure.

**Increased absorption:** Some drug-food increases the extent of absorption. A high-calorie meal more than doubles the absorption of saquinavir. If saquinavir is taken without food, absorption may be insufficient for antiviral activity.

**Impact of food-drug interactions:**
- Monoamine oxidase (MAO) inhibitors and foods rich in tyramine (aged cheeses, yeast extracts, Chianti wine), if MAO is combined with these foods can result in life-threatening hypertension.
- Theophylline (an asthma medication) plus caffeine, can result in excessive CNS excitation.
- Potassium-sparing diuretics (spironolactone) plus salt substitutes can result in dangerously high potassium levels.
- Aluminum-containing antacids (Maalox) plus citrus beverages (e.g. orange juice) can result in excessive absorption of aluminum.

5. **Unknown mechanisms:** Not all interactions can be predicted based upon readily recognizable mechanism. Be wary of new combinations where literature is sparse or non-existent.

**Risk factors for drug interactions**

There are some patient categories that are at greater risk of experiencing a drug interaction. There are also some drugs, which tend to be involved in the more important clinically significant drug interactions.

**High-risk patients**

Patients on multiple drugs. Higher the number of drugs greater is the risk of drug interactions.

The elderly are more prone to drug interactions, as they are more sensitive to some pharmacodynamic effects and also tend to be on multiple drugs.

Patients with co-morbidities
High-risk drugs

These include drugs with a narrow therapeutic index, e.g. warfarin, carbamazepine, phenytoin, theophylline and digoxin.

Minimization of drug-drug interactions

Drug-drug interactions are a common problem during drug treatment and give rise to a large number of hospital admissions as a result of medically important, sometimes serious or even fatal adverse events. Drug-drug interactions can also cause partial or complete abolishment of treatment efficacy. Among the various types of medical errors, the occurrence of adverse DDIs is one that is usually preventable. It is, therefore, essential that health professionals be able to evaluate the potential for DDIs and, when detected, to determine appropriate prevention or management strategies.

**How to minimize adverse interactions:**

Minimize the number of drugs a patient receives.

Complete a thorough drug history, including illicit drugs and over-the-counter drugs.

Risk assessment—as to how common is the interaction? How severe will the interaction be, if it occurs? Is it a dose-related interaction?

Use alternative drug or adjusting the dosage when an inducer of metabolism is added to or deleted from the patients regimen.

Adjusting the timing of administration to minimize interference with absorption.

Monitor for early signs of toxicity when combinations of toxic agents cannot be avoided.

Be very cautious patient in taking a drug with a narrow therapeutic range.

Monitor with investigations like INR, blood pressure, liver function tests or clinically for dizziness, muscle aches, etc.

Effect and mechanism of the potential DDIs and options for clinical management

<table>
<thead>
<tr>
<th>Object drug</th>
<th>Precipitant drug</th>
<th>Effect</th>
<th>Mechanism</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamazepine</td>
<td><strong>Macrolides</strong> (Erythromycin, clarithromycin)</td>
<td>Increased carbamazepine concentrations and risk of carbamazepine toxicity</td>
<td>Inhibition of carbamazepine metabolism by CYP3A4</td>
<td>Consider alternative antimicrobials (e.g. azithromycin, quinolones, 2nd/3rd generation cephalosporins, penicillin) If alternatives are not appropriate, monitor carbamazepine concentrations and consider dose adjustment</td>
</tr>
<tr>
<td>Object drug</td>
<td>Precipitant drug</td>
<td>Effect</td>
<td>Mechanism</td>
<td>Options</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Warfarin</td>
<td>NSAIDs, Statins (Simvastatin, Lovastatin), Antibiotics (Sulfamethoxazole/trimethoprim, Metronidazole, Fluconazole)</td>
<td>Additive risk of bleeding</td>
<td>Antiplatelet effects and GI erosion associated with NSAIDs and the anticoagulant effect of warfarin. Some individual NSAIDs may also alter the pharmacokinetics of warfarin. Statins, antibiotics and fluconazole cause inhibition of warfarin metabolism by CYP2C9.</td>
<td>A non-NSAID alternative such as acetaminophen or opioid analgesics is preferred. If any NSAID is used with warfarin, monitor carefully for evidence of bleeding, especially from the GI tract. Atorvastatin and pravastatin appear to be safer alternatives. Likewise oral penicillins, cephalosporins, quinolones and macrolides are preferred alternatives. If alternatives are not appropriate, carefully monitor the INR, if these agents are started, stopped, or change in dosage then adjust the warfarin dose accordingly.</td>
</tr>
<tr>
<td>Tetracyclines (doxycycline, minocycline, tetracycline)</td>
<td>Antacids containing Al, calcium, magnesium</td>
<td>Reduced serum concentrations of tetracyclines</td>
<td>Reduced absorption of all tetracyclines</td>
<td>Space administration by 1-2 hours</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>Antacids, sucrafate, and products containing calcium, iron, or zinc</td>
<td>Reduced serum concentrations of ciprofloxacin leading to its therapeutic failure</td>
<td>Interference with the oral absorption of ciprofloxacin</td>
<td>Should be taken either 6 hours before or two hours after the dose of ciprofloxacin</td>
</tr>
<tr>
<td>Theophylline</td>
<td>Ciprofloxacin and erythromycin</td>
<td>Theophylline accumulation leading to excessive blockade of adenosine receptors and phosphodiesterase resulting in tachycardia and other dysrhythmias, tremors, and seizures</td>
<td>Inhibition of CYP1A2 mediated metabolism of theophylline and thus its increased blood levels.</td>
<td>The dose of the theophylline should be reduced, and theophylline plasma concentrations monitored when a patient begins taking ciprofloxacin or erythromycin.</td>
</tr>
<tr>
<td>Imipramine, Clozapine</td>
<td>Fluoroquinolones, Fluvoxamine &amp; Ketoconazole</td>
<td>Increased level of object drugs (may lead to toxicity)</td>
<td>Inhibition of enzyme CYP1A2 which is responsible for the metabolism of object drugs. Hence their metabolism is decreased.</td>
<td>Monitor concentrations of object drugs or use alternative concomitant drugs which do not interfere with CYP1A2 mediated metabolism</td>
</tr>
<tr>
<td>Object drug</td>
<td>Precipitant drug</td>
<td>Effect</td>
<td>Mechanism</td>
<td>Options</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Atorvastatin, Cerivastatin, Lovastatin, Simvastatin</td>
<td>Erythromycin, Clarithromycin, Ketoconazole, Itraconazole, HIV Protease inhibitors (nelfinavir), fusidic acid</td>
<td>Accumulation of statins leading to diffuse myalgias, rhabdomyolysis and renal failure</td>
<td>Inhibition of CYP3A4 mediated metabolism of statins</td>
<td>Use alternative statins such as Rosuvastatin and fluvastatin which are not metabolized by CYP3A4. Alternatively use other class of antibiotics. However, if use of these antibiotics is unavoidable, start with lowest dose of statins. Monitor for symptoms and signs of myalgia. If myopathy does occur, the statin should be stopped immediately.</td>
</tr>
<tr>
<td>Antihypertensives (ACEI, β-blockers, diuretics except CCBs and centrally acting agents)</td>
<td>NSAIDs (Indomethacin, naproxen, piroxicam)</td>
<td>Decreased antihypertensive effect</td>
<td>NSAIDs inhibit prostaglandin-mediated vasodilatation and promote salt and water retention</td>
<td>Consider alternative analgesics, such as acetaminophen, sulindac, tramadol, or narcotic analgesics or switch to an antihypertensive drug (CCBs) not as susceptible to the blunting effects of NSAIDs. If NSAIDs have to be continued, monitor blood pressure and adjust dose of antihypertensive accordingly.</td>
</tr>
<tr>
<td>Oral contraceptive pills (OCP)</td>
<td>Rifampin, griseofulvin</td>
<td>Decreased effectiveness of oral contraception</td>
<td>Increased hepatic metabolism of Ethinyl oestradiol in OCP</td>
<td>Avoid rifampin, if possible. If combination therapy is necessary, have the patient take an oral contraceptive pill with a higher oestrogen content (&gt;35 μg of ethinyl oestradiol) or recommend alternative method of contraception.</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>Carbamazepine, Phenytoin</td>
<td>Hepatotoxicity of acetaminophen may be increased by high dose or long-term administration of these drugs.</td>
<td>Accelerated CYP450 metabolism of acetaminophen with elevated production of its hepatoxic oxidative metabolite.</td>
<td>Avoid prolonged coadministration of these drugs. Monitor patient for reduced acetaminophen effects and for signs of hepatotoxicity.</td>
</tr>
<tr>
<td>Direct acting Sympathomimetic agents (Epinephrine, Norepinephrine)</td>
<td>Tricyclic antidepressants (TCAs)-high dose (amitriptyline, desipramine, imipramine, nortriptyline, etc.)</td>
<td>Increased sympathomimetic effects possible.</td>
<td>Inhibition of norepinephrine reuptake in adrenergic neurons, resulting in increased stimulation of adrenergic receptors.</td>
<td>Limit epinephrine to 0.04 mg with high dose TCAs. Parenteral administration of direct-acting sympathomimetic agents should preferably be avoided. If concomitant use is necessary, initial dose and rate of administration of the sympathomimetic should be reduced, and cardiovascular status including blood pressure should be monitored closely.</td>
</tr>
<tr>
<td>Object drug</td>
<td>Precipitant drug</td>
<td>Effect</td>
<td>Mechanism</td>
<td>Options</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Clopidogrel</td>
<td>Proton Pump inhibitors (PPI) (Omeprazole, Lansoprazole, rabeprazole and esomeprazole except Pantoprazole)</td>
<td>Reduced effectiveness of clopidogrel leading to reduced platelet inhibition</td>
<td>PPIs competitively inhibit one of the principal enzymes, CYP2C19, important in the activation of clopidogrel</td>
<td>Concomitant therapy with PPI and clopidogrel should be avoided. Use of drugs not dependent on the CYP2C19 isoenzyme, such as pantoprazole and H2-receptor antagonists should be preferred.</td>
</tr>
<tr>
<td>Diazepam &amp; Phenytoin</td>
<td>Isoniazid &amp; Ketoconazole</td>
<td>Increased level of object drugs (may lead to toxicity)</td>
<td>Inhibition of enzyme CYP2C19 by the precipitant drugs. Hence the metabolism of object drugs is decreased.</td>
<td>Monitor concentrations of Phenytoin or use alternative antibiotics which do not interfere with CYP2C19 mediated metabolism.</td>
</tr>
<tr>
<td>Codeine, β blockers (Propranolol, Atenolol, Metoprolol), Tricyclic Antidepressants (Imipramine, Amitriptyline)</td>
<td>Fluoxetine, Haloperidol, Paroxetine &amp; Quinidine</td>
<td>Increased level of object drugs (may lead to toxicity)</td>
<td>Inhibition of enzyme CYP2D6 responsible for the metabolism of object drugs. Hence their metabolism is decreased.</td>
<td>Consider use of alternative concomitant drugs which do not interfere with CYP2D6 mediated metabolism of object drugs.</td>
</tr>
<tr>
<td>Sulfonylurea hypoglycemics</td>
<td>Rifampin</td>
<td>Risk of hyperglycemia</td>
<td>Induces hepatic CYP2C9 mediated metabolism of sulfonylurea and therefore, causes increased clearance</td>
<td>Monitor blood sugar and adjust the dose of antidiabetic drug.</td>
</tr>
</tbody>
</table>
The key points of rational use of blood

Judicious use of blood and blood components. *The motto is never to transfuse unless it is worth the risk.*

**Whole blood has a very limited use in clinical practice.** The decision to transfuse red cells should be based on clinical assessment of the patient along with laboratory parameters.

Preference for ‘Fresh blood’ is another totally misguided practice. Avoid use of fresh blood because of increased risk of transfusion associated Graft versus host disease (GVHD) and transfusion transmitted infections.

**Single unit whole blood transfusion has no significant therapeutic benefit.** Discourage single unit/ fresh blood use.

Component preparation and use is the need of the hour. One unit of blood can be separated into 1 unit of fresh frozen plasma, 1 unit of packed red blood cells and 1 unit of random donor unit of platelets. The advantages of separation of whole blood into components are: helps in targeted approach and rational use, different components can be used for 3-4 different patients; circulatory overload avoided and reactions minimized with concentrated dose of required component.

Use of autologus blood is safest and pre-surgical haemodilution in elective surgery helps in conserving blood.

Advantages of single donor platelets over random donor platelets are:

- There is reduced number of donor exposure which further reduces the risk of alloimmunization and incidence of transfusion transmitted diseases. It yields a leucocyte reduced product, thus reduces non-febrile haemolytic transfusion reactions in recipients.
- It provides full effective dose.
- Platelet donor can donate every 72 hours.
### Indications for blood and blood components, storage requirements and shelf life of blood/components

<table>
<thead>
<tr>
<th>Blood/blood components</th>
<th>Indication</th>
<th>Volume/unit</th>
<th>Hb/ haematocrit /platelet count/ rise</th>
<th>Storage temperature</th>
<th>Average shelf life</th>
<th>Administration time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Blood*</td>
<td>Acute blood loss (&gt;30% of total blood volume); Exchange transfusion (reconstituted whole blood preferred) if PRBC not available.</td>
<td>350-450 ml</td>
<td>Hb rise 1g/dl Haematocrit rise 3%; the increase may not be apparent until when patient blood volume adjusts to normal</td>
<td>2-6°C</td>
<td>35 days</td>
<td>Administer within 30 minutes of issue and complete within 4 hours</td>
</tr>
<tr>
<td>Packed red blood cells (PRBC)</td>
<td>Chronic anaemia &lt;6 g/dl; Preoperative Hb &lt;7 g/dl; in patients with cardiac disease the Hb trigger is around 10 g/dl</td>
<td>250-300 ml</td>
<td>as above</td>
<td>2-6°C</td>
<td>35 days</td>
<td>Administer within 30 minutes of issue and complete within 4 hours</td>
</tr>
<tr>
<td>Random donor platelets (RDP)**</td>
<td>Thrombocytopenia</td>
<td>50-60 ml</td>
<td>Platelet count rise 5,000-10,000 / microlitre</td>
<td>22-24°C with agitation</td>
<td>5 days</td>
<td>Immediately administer after issue and complete within 30 minutes</td>
</tr>
<tr>
<td>Single donor platelet (SDP)**</td>
<td>Thrombocytopenia</td>
<td>250-300 ml</td>
<td>Platelet count rise 30,000-40,000 / microlitre</td>
<td>20-24°C with agitation</td>
<td>3-5 days</td>
<td>As above</td>
</tr>
<tr>
<td>Fresh frozen plasma (FFP)</td>
<td>Clotting factor deficiency</td>
<td>200-220 ml</td>
<td>20% increase in coagulation factors</td>
<td>-40°C</td>
<td>1 year</td>
<td>Administer within 30 minutes of issue and complete within 6 hours</td>
</tr>
<tr>
<td>Cryoprecipitate (CP)</td>
<td>Haemophilia A when there is non-availability of FVIII</td>
<td>One Cryo unit/10 kg</td>
<td>Rise of FVIII</td>
<td>-40°C</td>
<td>1 year</td>
<td>Immediately administer after issue and complete within 30 minutes</td>
</tr>
<tr>
<td>Cryo poor plasma (CPP)</td>
<td>Plasma exchange, in burns</td>
<td>200 ml</td>
<td>-</td>
<td>-40°C or below</td>
<td>1 year</td>
<td>Administer within 30 minutes of issue and complete within 4 hours</td>
</tr>
</tbody>
</table>

- Unrefrigerated whole blood, less than 24 hours old is labelled as fresh whole blood (FWB). Intracellular pathogens (CMV, HTLV), Treponema and malarial parasite survive in fresh blood leucocytes, thus increased the risk of transfusion transmitted infections. Due to presence of viable lymphocytes, there are more chances of transfusion reaction (TA GVHD).

** In stable non-bleeding patients, platelets are withheld till counts of 10,000/micro liter. Do not use platelets in patients with autoimmune thrombocytopenia, thrombotic thrombocytopenic purpura except for life-threatening bleeding.

### Dose

**PRBC:** The decision to transfuse should be based on clinical assessment of the patient and not on the laboratory parameters. The physiological adaptation to acute or chronic anaemia should be considered. The decision for dosage depends upon the baseline hematocrit, the desired rise and the cardiorespiratory status of the patient. In neonates, dose is 10-15 ml/kg.
Platelets:
Adults: One single aphaeresis derived product (SDP) or 4-5 whole blood derived platelets (random donor platelets)
In neonate: 10 ml/kg
Fresh frozen plasma (FFP) – 10-20 ml/kg
Cryoprecipitate – one unit/10 kg body weight

Compatible blood groups for blood components
Red cell transfusion should always be ABO and Rh D compatible with recipient and cross matched to confirm compatibility before transfusion.
Whole blood transfusion should always be group specific.
ABO identical platelets are the components of choice, except in emergency. FFP must be ABO compatible.
Cryoprecipitate can be given across ABO barrier.

Safe administration of blood or blood components
Errors in requesting, supply and administration of blood/components can lead to serious adverse reactions. Follow all steps precisely.
1. Pretransfusion blood sample collection (3-5 ml in PLAIN vial) and labelling at bed side is the responsibility of the medical officer in-charge of the ward, and must NEVER be delegated to nurses or medical students. Check and confirm patient’s identity.
2. Request be sent on Blood Requisition Form only properly filled with details of clinical diagnosis, indication for transfusion, time and date of submission and history of transfusion and reactions, if any, obstetric history in females.
3. Obtain informed consent for transfusion.
4. Maintain cold chain during transport of blood to ward/another hospital in thermocol boxes.
5. Bed side checks for identification of the recipient before transfusion by checking name and registration number, compatibility report and label on the blood pack. Blood unit should be visually inspected and checked for expiry date.
6. Transfusion of blood/components and concurrent fluids and medications: Blood should only be transfused by a separate IV line using blood transfusion set with appropriate filter. Only normal saline, 4% albumin, ABO- compatible plasma can be given concurrently through the same IV device as red cell transfusion. (Caution: NEVER give electrolyte and colloid solutions containing calcium with blood cell components collected in anticoagulant containing citrate as they may cause clotting of the infusion line; Do NOT use 5% dextrose and Do NOT add medication to blood bag or the transfusion line).
7. Monitor vitals pulse, BP, temperature, respiration rate and signs of the potential complications of transfusion: every 5 minutes for 15 minutes; every 15 minutes for 30 minutes; every 30 minutes for 1 hour; every hour till the end of transfusion; 30 minutes post-transfusion and maintain all records.

Do’s and Don’ts for achieving blood safety

<table>
<thead>
<tr>
<th>Don’ts</th>
<th>Do’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask for fresh whole blood</td>
<td>× Always give specific component therapy, if blood components are available following appropriate guidelines</td>
</tr>
<tr>
<td>Delay transfusion after issue of blood component from blood bank</td>
<td>× PRBC – start within 30 minutes and complete within 4 hours</td>
</tr>
<tr>
<td></td>
<td>× Platelets – start immediately and complete within 30 minutes</td>
</tr>
<tr>
<td></td>
<td>× FFP – start within 30 minutes and complete within 6 hours</td>
</tr>
<tr>
<td>Warm blood before transfusion</td>
<td>× Warm blood during rapid/massive transfusion</td>
</tr>
<tr>
<td>Thaw FFP in hot running water</td>
<td>× FFP may be thawed in water bath with monitored temperature (30-37°C). The unit should be placed in plastic over wrap before insertion into water bath</td>
</tr>
<tr>
<td>Store blood unit in domestic refrigerator in wards</td>
<td>× Start transfusion immediately after issue. Return the blood unit to blood bank within 30 minutes, if not required.</td>
</tr>
<tr>
<td>Refrigerate platelet—they become nonviable</td>
<td>×</td>
</tr>
<tr>
<td>Label the blood sample away from the patient</td>
<td>× Always label the blood sample at bed side of the patient using gum pasted labels</td>
</tr>
<tr>
<td>Use IV set for transfusion</td>
<td>× Always use BT set with appropriate filter for transfusion. It must be changed at prescribed interval</td>
</tr>
<tr>
<td>Leave patient unattended after staring transfusion</td>
<td>× Patient must be appropriately monitored to detect transfusion reactions as soon as possible. Never ignore mild transfusion reaction. It may be a start of severe transfusion reaction</td>
</tr>
</tbody>
</table>

Transfusion reaction

Transfusion reaction can occur in spite of all relevant laboratory tests. The severity of the reaction varies from being relatively mild to more severe, and at times can be fatal. Acute reaction present with fever/chills, hypotension/tachycardia, cola-coloured urine, nausea, vomiting, pain in flanks/back/abdomen/chest, etc. Delayed reaction may present 5-10 days post-transfusion with fever, anaemia, jaundice, increased bleeding tendency, thrombocytopenia. Graft-vs-host disease and transfusion transmitted diseases can present late.
Treatment of transfusion reaction

1. Stop transfusion immediately
2. Maintain venous access using normal saline
3. Inform doctor on duty and seek help immediately from skilled anaesthetist or emergency team, if required. For reactions like itching, urticaria, rashes administer medications as per hospital protocol.
4. Inform Blood Bank. Send the following to the blood bank the implicated unit along with transfusion set, blood samples (post-transfusion sample in 2 ml EDTA vial and 5 ml PLAIN vial), along with completed Adverse Transfusion Reaction Report Form.
5. Send first void urine sample.
6. Repeat all clerical and identity checks.
7. Request for another unit after sending fresh sample from the patient to the blood bank.
8. Documentation: Complete documentation of transfusion in the case file is essential and should include recipient consent for transfusion, name and type of blood/ components, unit number, the blood transfusion compatibility report, date and time of transfusion, pre- and post-transfusion vital signs, volume transfused, any adverse event, identification of bedside transfusion staff. The records should be kept in the record for future reference.
Format for Revision /Amendment of STGs
(Use Photocopy(ies) of the Format)

Standard Treatment Guidelines (STGs) are not intended to include treatment guidelines for each and every disease prevalent in the state. Any attempt to include every disease would defeat the purpose of the STGs (small, handy, concise, etc.) and would result into a library of books. These guidelines are intended to be comprehensive, but not exhaustive and seek to summarize information on treatment of patients presenting with priority diseases. Further, STGs cannot be the static document and would require periodic revision/updating to cope up with the emerging and changing scenario in respect of priority diseases as well as therapeutic options. Doctors are welcome to make suggestions with supporting evidence for the revision/amendment of STGs format as under:

Please indicate the nature of suggestion by marking appropriate box and give details in the format below (Please note that suggestions not accompanied by the appropriate data/evidence may not be entertained).

- Addition of a new/priority disease to the list (Please include epidemiological data, and if possible a draft guideline).
- Replacement of a listed drug. Please indicate data/evidence on proven benefits of the indicated drug/recommended product (on the basis of efficacy, safety, suitability and/or cost effectiveness) in relation to the listed drug which is sought to be replaced.
- Inclusions of a new drug (Please include data/evidence on the benefits of such addition).
- Deletion of the listed drug (Please attach evidence of the harmful/useless effects of the drug).

Name of the Drug (INN)/generic:
Dosage form and strength: Therapeutic Class:
Reason for amendment: Reference(s):

Advantage over existing drug(s) in the same therapeutic class

Proposed treatment guidelines

Submitted by
(Name & Address)

Date

Contact Persons: Tele/Mob. No. Please send to: Dr. B. S. Ohri, Director Training, Directorate Health Services, Bhopal.