Management of acute poisoning

Acute poisoning requires prompt supportive treatment to ensure the best outcome. Once this is achieved, the poison must be identified and treatment initiated.

The object of treatment is to prevent and/or limit absorption of the poisonous substance and to maintain vital functions, such as ventilation and circulation. Once life support measures have been addressed, attention should be given to other aspects such as identification of the poison, specific treatment and enhancement of elimination. In the management strategy, distinction should be drawn between exposure to poisonous substances and true poisonings, since the one does not necessarily lead to the other.[1-5]

In the management strategy, distinction should be drawn between exposure to poisonous substances and true poisonings, since the one does not necessarily lead to the other.

TERMINATING EXPOSURE

Skin

Absorption of toxins through the skin and corrosive damage to the tissues at the point of contact should be limited by immediately removing contaminated clothing, and washing with copious quantities of soap and water. The corrosive effects of hydrofluoric acid can effectively be terminated by applying a 10% calcium gluconate solution to the affected areas.

Eyes

Corrosive alkalis and acids, and other irritants, should be removed from the eyes by continuous irrigation with tap water or 0.9% saline for 30 minutes. In all but minor incidents the patient should be referred to an ophthalmologist for specialist advice.

Emesis

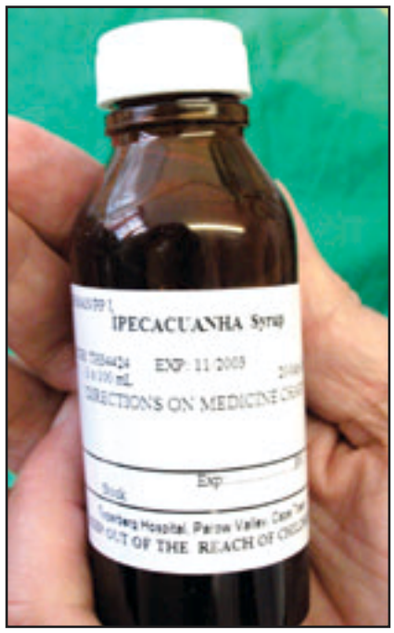
Stimulation of the pharynx to induce emesis is safe provided that the patient is fully conscious and no contraindications (see elsewhere) to the procedure exist. Induction of emesis in this way is not always effective but efficacy may be improved by giving the patient a glass of tepid water to drink before the attempt. Saline emetics should not be used, since they may cause hypernatraemia.

Ipecacuanha

The use of ipecacuanha is discouraged, since there is no evidence in the literature to indicate that the potential benefits of its use outweigh the risks. Furthermore, ipecacuanha may cause persistent vomiting, diarrhoea, lethargy and drowsiness, effects which may complicate making an accurate diagnosis.

Gastric lavage

Lavage should not be used routinely in the management of oral exposure to poisonous substances.



There is no evidence that its use improves outcome, and it may even cause significant morbidity. Unfortunately, this procedure is often used as a means of 'punishment' of a patient who has taken an overdose. There is no convincing clinical evidence that lavage, later than 1 hour after ingestion of a poisonous substance, is of therapeutic value.

Lavage should only be considered within 1 - 2 hours after ingestion where a patient has taken a large amount of a poison with high inherent toxicity. Lavage can in fact enhance the absorption of a poisonous substance; the large volumes of water increase dissolution of the toxic compound and may even flush it into the duodenum. A large-bore orogastric tube/hose, 32 - 40F in adults, and 16 - 28F in

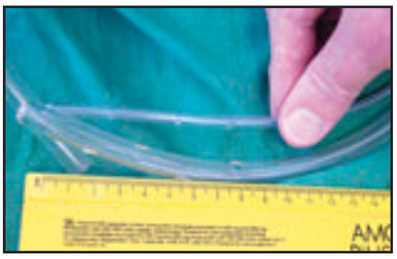


Fig. 1. The larger tube is the minimum diameter required for effective gastric lavage in adults (32F). The stomach tube held (minimum size required for children) is the size (16F) routinely used for adults in most South African hospitals. It is clear that much larger tubes should be used for the effective removal of solid materials, e.g. tablets.

children, should be used if solid material, such as tablets, capsules, etc. has been ingested (Fig. 1). In patients at risk of aspiration (e.g. patients with CNS depression or predisposed to seizures) airway protection is essential before gastric emptying is attempted.[6]

Activated charcoal

Charcoal (see also the article on antidotes, p. 452) adsorbs (binds) poisons, thereby limiting their absorption. The greatest benefit is achieved if the charcoal is administered within 2 hours of ingestion of a poisonous substance. Activated charcoal is inert and generally safe and easy to use. Large doses may occasionally cause constipation. The usual single stat dose is 1 - 1.5 g/kg (50 - 100 g for an adult and 15 - 30 g for a child) given as an aqueous slurry, with 250 - 500 ml of water, i.e. 1 glass of water for every 30 - 50 g of charcoal. Activated charcoal is contraindicated after ingestion of a corrosive substance or when immediate endoscopy is to be undertaken. Water-soluble substances are not effectively adsorbed by activated charcoal. These include acids and alkalis, alcohols (including ethylene glycol and methanol), heavy metals (such as iron), arsenic, lithium and potassium salts. Contrary to what would be expected, charcoal does not effectively bind paraffin and related substances.[6]

Cathartics

The use of cathartics (e.g. sorbitol), with or without activated charcoal, is not recommended for gastrointestinal decontamination since they may induce fluid and electrolyte disturbances, particularly in children.

SYMPTOMATIC AND SUPPORTIVE CARE

Apart from specific measures directed at the poison itself (emesis, charcoal, antidotes, etc.), careful ongoing observation and frequent re-evaluation of the patient form the cornerstones of management and care. Appropriate supportive care and effective relief of symptoms should not be neglected. Emergency procedures should be directed at maintaining a patent airway, providing respiratory support, and effecting cardiovascular resuscitation if and when necessary. The loss of an effective airway and inadequate ventilation are the most common causes of serious morbidity and death in poisoning.[4]

Hypotension occurs most commonly after sever barbiturate poisoning.

In comatose patients reliable venous access should be established and urine flow should be monitored.

Hypoventilation

Inadequate ventilation should be prevented by ensuring an adequate airway with immediate access to suction equipment, oxygen, and mechanical ventilation. Most poisons that depress consciousness also impair respiration. An obstructed airway needs immediate attention: dentures and oral secretions should be removed, an oral airway tube should be inserted, and the jaw should be extended forwards with the patient turned onto the left side (left lateral position).[3]

Hypoglycaemia

Adequate blood glucose levels should be ensured in the comatose patient. If hypoglycaemia is present, 50 ml of 50% dextrose solution should be administered intravenously (adult dose). Hypoglycaemia should be suspected in poisoning/overdose with oral hypoglycaemics, salicylates and ethanol. Dextrose solution (50%) should not be administered before low blood glucose levels have been confirmed by a bedside finger prick blood glucose test. The empiric administration of high glucose concentrations should be avoided in patients at risk of central ischaemia, e.g. patients with raised intracranial pressure, poor cerebral perfusion, cardiac output

abnormalities, severe systemic hypotension, and in patients receiving CPR.[7]

Volume depletion

Loss of fluid secondary to vomiting, diarrhoea and sweating is common and losses should be corrected. It is a common complication of severe, cytotoxic snake bite (puff adder bite), which may be quite pronounced in children.

Hypotension

Hypotension occurs most commonly after severe barbiturate poisoning. Irrespective of the cause, e.g. volume depletion or venous pooling, central venous pressure monitoring should be resorted to for accurate assessment of fluid requirements.

Cardiac conduction and rhythm defects

Dysrhythmias and conduction defects may occur in acute poisoning with various substances. ECG monitoring is advisable and attention should be given to aggravating factors such as acidosis, hypoxia and electrolyte/fluid disturbances. Treatment will depend on the toxin involved and the type of dysrhythmia.

Seizures

Seizures that are self limiting and of short duration do not require immediate anticonvulsive therapy. Intravenous diazepam should be administered if convulsions are protracted or recur. Phenytoin is an effective alternative agent. For the treatment of status epilepticus which is unresponsive to the usual measures, thiopentone and muscle relaxants may be indicated (with appropriate respiratory support).

Hypothermia

Hypothermia (< 35°C) may develop in comatose patients and may be missed by the unwary clinician. A low-reading rectal thermometer should be used to record the temperature whenever hypothermia is suspected.

Specific treatment/antidotes

The management of poisoning with specific substances is discussed in greater detail in the article 'Antidotes, supportive agents and other essentials in the management of acute toxic exposures and poisonings', p. 452 of this issue.

INCREASING ELIMINATION

Multiple-dose activated charcoal (MDAC)

The elimination of poisons (drugs) with a small volume of distribution (< 1 l/kg), low pKa (which maximises transport across membranes), low binding affinity and prolonged elimination half-life following overdose, is particularly likely to be enhanced by MDAC. This form of treatment should be considered if a patient has ingested a life-threatening quantity of carbamazepine, dapsone, phenobarbitone, quinine or theophylline. MDAC may also increase the elimination of amitriptyline, dextropropoxyphene, digoxin, phenytoin, nadolol and sotalol. Follow-up doses of at least 12.5 g (less in children) of activated charcoal should be administered every hour. The concurrent use of a cathartic is not recommended for reasons discussed above.

Multiple-dose activated charcoal is a safer and easier alternative to alkaline diuresis.

Alkaline diuresis

Although alkaline diuresis increases the elimination of salicylates, phenoxyacetate herbicides, phenobarbitone and barbitone, it is not always possible to achieve the required urinary pH of 8 and higher with administration of the recommended 4.2% sodium bicarbonate solution. Furthermore, the procedure should not be undertaken without access to intensive care facilities since frequent biochemical monitoring and appropriate responses to results are required. Consequently, this method of enhanced elimination is not generally resorted to. Acetazolamide has been reported to be an effective urinary alkalinising agent at a dose of 250 - 500 mg intravenously. However, acetazolamide should not be used in the management of salicylate poisoning since it may exacerbate toxic effects on the central nervous system. Multiple-dose activated charcoal is a safer and easier alternative to alkaline diuresis.

Activated charcoal is safe and easy to use.

Whole-bowel irrigation (WBI)

This is achieved by oral administration of large amounts of an isoosmotic polyethylene glycol (PEG) electrolyte solution. This is better known as Go-Lytely. The long-chain PEGs are poorly absorbed and retain water by virtue of their high osmotic character; the retained water stimulates peristalsis. WBI is not a procedure that is used routinely but it is a treatment option following the ingestion of large amounts of iron tablets, or sustained-release or enteric-coated medicines with a high inherent toxicity. It has also been used for the purpose of forcing the passage of packages of illicit drugs through the gut (e.g. cocaine in condoms, commonly known as 'body packers').

Dialysis and haemoperfusion

These procedures are of limited value for the removal of toxins which have a large volume of distribution (e.g. tricyclic antidepressants). Haemodialysis enhances the elimination of water-soluble compounds, e.g. lithium, methanol, isopropanol, ethylene glycol and ethanol, and some lipid-soluble compounds that (contrary to expectation) have a small volume of distribution. Haemoperfusion through an activated charcoal cartridge is highly effective in reducing the concentration of lipid-soluble compounds with a small volume of distribution (< 1 l/kg). This procedure will effectively remove barbiturates, carbamazepine, meprobamate, methaqualone, and theophylline. However, there is evidence that multiple-dose activated charcoal is as effective as haemoperfusion in removing phenobarbitone, carbamazepine and theophylline from the body in the poisoned patient.

Serotonin syndrome

Management includes monitoring the urine for myoglobin (rhabdomyolysis), reducing the temperature in hyperthermic patients, correcting acid-base and electrolyte imbalances and treating seizures promptly with a benzodiazepine. Cyproheptadine (4 - 8 mg orally) has been used in the treatment of serotonin syndrome. The dose should be repeated in adults at 1 - 4-hour intervals, until a therapeutic response is observed or a maximum dose of 32 mg has been administered. In children the recommended dose is 0.25 mg/kg/day, divided into 6-hourly doses, to a maximum of 12 mg/day.

Rhabdomyolysis

Initial treatment should be directed towards controlling acute metabolic and electrolyte disturbances, hyperthermia, hypovolaemia, seizures, restlessness, and muscle contractions. The mainstay of therapy is early and aggressive administration of fluids. It is also necessary to alkalinise the urine. The urine pH should be kept at ≥ 7 and the serum bicarbonate level at ≥ 20 mmol/l. Mannitol and diuretics may be needed to ensure adequate urine flow. Haemodialysis should be considered if acute renal failure develops.

References available on request.

IN A NUTSHELL

Continuous observation, re-evaluation and supportive and symptomatic treatment are the cornerstones of the management of the poisoned patient.

Emergency care begins with maintaining the airway, supporting respiration, and instituting cardiovascular resuscitation where necessary.

Loss of airway or inadequate ventilation is the most common cause of serious morbidity or death in poisoning.