ABC of 1 to 7

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POISONING

Accidental swallowing of drugs and household fluids is common among children, especially between the ages of 2 and 3 years. Most of them take trivial amounts of drugs, but every child must be assessed carefully to ensure that effective treatment is given when a potentially fatal dose has been swallowed. A health visitor's report on the family may be helpful as the event may indicate a chaotic household or a non-accidental injury. Child-resistant containers have reduced the incidence of poisoning by tablets.

The name of the drug may be on the bottle, or the tablets may be identifiable from charts. The prescriber, hospital pharmacist, or the pharmacist who dispensed the tablets may be able to help. The time the drug was taken should be written in the clinical notes and whether any symptoms such as vomiting have occurred. The maximum amount of drug that could have been taken should be estimated. The original number of tablets in the bottle may be known. Usually the dispensing pharmacist knows the original number of tablets dispensed.

Examination

Initially, maintaining adequate ventilation and circulation is more important than making an exact diagnosis. The level of consciousness is the most important single sign. The frequency and depth of the respiratory movements are noted. Slow shallow movements suggest impending respiratory arrest and the need for assisted ventilation. A low blood pressure indicates that cardiac arrest is imminent.

Particles of tablets may be present in the mouth or vomit. The odour of paraffin (kerosene) may be present in the breath. Caustic or acid substances may cause burns on the lips and tongue and in the mouth. Deep sighing respiratory movements or a raised respiratory rate suggests salicylate poisoning, while tachycardia and dilated pupils are found in atropine poisoning. Opiates cause constriction of the pupils.

General management

If the child is drowsy or unconscious a member of the paediatric unit should be called or the patient admitted to the intensive care unit. The following are contraindications to both induced vomiting and gastric lavage: (a) deterioration in the level of consciousness; and (b) poisoning with paraffin, caustics, or acids.

If no contraindication is present the child should be given 15 ml of syrup of ipecacuanha (USP) followed by about 200 ml of water, which may be flavoured to taste. Syrup of ipecacuanha (USP) is the only safe preparation. The child should walk around the room or be put on a rocking horse. If he does not vomit after about 20 minutes the same dose of ipecacuanha syrup and water is repeated. In the few children who do not vomit after the second dose gastric lavage should be performed. If emesis has been successful this should be noted in the clinical notes. Admission depends on the amount and the type of substance which has been taken (see below).

The poison may be known from the bottle or by identifying the tablets from charts. A specimen of vomit and of urine should be kept. Heparinised tubes should be used for collecting blood for salicylate estimation. The types of blood specimens required for estimating other poisons depend on the methods used in that laboratory.

Gastric lavage

If the child is drowsy or unconscious gastric lavage should be postponed until an anaesthetist or paediatrician has ensured the security of the airway as there is a serious danger of aspiration into the lungs. The child should be wrapped in a blanket with his arms well secured and held firmly in the prone or left lateral position with his head lower than his trunk. The suction apparatus must be fitted with an adequate pharyngeal suction catheter, for example, FG 14, and must be shown to be working before the gastric tube is passed. The length of tube needed to reach the stomach is estimated by measuring the distance from the mouth to the ear lobe and from there to the lower end of the sternum. A tube of adequate bore, at least FG 24, is passed through the mouth into the stomach and the gastric contents are aspirated and a portion kept for later analysis.

Fifty ml of 1.4% sodium bicarbonate solution is allowed to pass into the stomach by gravity from the barrel of a 50-ml syringe. After a few minutes a similar volume is aspirated from the stomach by gravity or by using the 50-ml syringe. The procedure is repeated until about 500 ml has been used. The child is then admitted to the ward.

Salicylate poisoning

Aspirin is still a common cause of poisoning though the incidence of aspirin poisoning has fallen since the introduction of child-proof containers. If aspirin has been given to treat an acute illness the toxic effects may be attributed to that illness. Infants may become more severely ill than older children even when the blood salicylate concentration is similar. Poisoning may result from the cumulative effect of frequent therapeutic doses. Vomiting and deep respiratory movements are early signs of salicylate poisoning and may mimic pneumonia, while drowsiness and coma are late features.

Methyl salicylate (oil of wintergreen) used as an embrocation in adults is dangerous, as only 4 ml may be fatal in infants. The child can usually tolerate a single acute ingestion of 100 mg of aspirin/kg body weight without serious effect and if there is no doubt that he has taken a smaller amount than this he need not be admitted to hospital. If the dose is uncertain the child must be admitted. Aspirin is one of the few drugs where there is benefit from delayed gastric lavage, even 12 to 24 hours after ingestion. When facilities are available measuring blood salicylate concentrations may be helpful in management. Blood concentration should be estimated six hours after ingestion and again several hours later to ensure that it is not continuing to rise. If the plasma salicylate concentration is over 300 mg/l (2.2 mmol/l) the child has moderate or severe poisoning.

A Dextrostix test should be carried out to detect hypoglycaemia or hyperglycaemia. Urine from a child who has taken salicylate turns Phenistix brownish red. Absence of this colour change when the tablets were taken at least six hours earlier excludes salicylate poisoning. The urine of a child who is receiving desferrioxamine for iron poisoning also changes Phenistix to brownish red. Children with severe salicylate poisoning need intravenous fluids and partial correction of the severe metabolic acidosis.

Barbiturates

As the smallest dose of barbiturates ingested is usually an adult dose the child must be admitted. The timing of the onset of symptoms depends on the type of barbiturate. Repeat estimations of the level of consciousness are essential for management and can be recorded as in the chart.

Slow shallow respiratory movements are signs of impending respiratory arrest. An anaesthetist should be called immediately, and intubation and mechanical ventilation may be needed; 100% oxygen can be given by face mask. The child must be nursed prone or on his side to avoid aspirating vomit. Debris should be removed from the mouth with gauze swabs or by suction. Intravenous fluids are started.

Paracetamol

If the child is drowsy or unconscious an emetic or gastric lavage should be considered by a senior member of the paediatric unit. An anaesthetist should be present for either of these procedures if there is any drowsiness. If the level of consciousness is normal emesis is induced.

Estimations of blood barbiturate concentrations do not help management but may be useful if there is doubt about the diagnosis. Clinical features are the best guide.

Serious toxicity occurs when more than about 150 mg/kg body weight of paracetamol has been taken. The initial features are nausea and pallor but there may be some improvement over the next 48 hours before the features of hepatic necrosis appear in severe poisoning. Necrosis is shown by jaundice, an enlarged tender liver, hypotension, and arrhythmias. Excitement and delirium may be followed by sudden coma, which is usually fatal. Hypothermia, hyperthermia, hypoglycaemia, or metabolic acidosis may occur.

Initial management is similar to that in barbiturate poisoning. Oral methionine or N-acetylcysteine (oral or intravenous) given *within 10 hours* of the ingestion of paracetamol can reduce liver necrosis in children with moderate or severe poisoning. If the child has vomited an intravenous preparation is preferable. This specific treatment should be given if the plasma paracetamol concentration is above a line joining 200 mg/l at 4 hours and 70 mg/l 12 hours after ingestion. These high plasma concentrations are usually confined to older children who have attempted suicide. Intravenous bicarbonate may be needed to correct severe metabolic acidosis and intravenous glucose for hypoglycaemia.

Tricyclic drugs

Amitriptyline and imipramine are widely used to treat depression in adults. An overdose of the paediatric syrup may be taken by a child being treated for enuresis. Drowsiness occurs within a few hours interrupted by periods of restlessness. Ataxia and tachycardia follow. If the child has taken more than 10 mg/kg body weight of amitriptyline or imipramine, convulsions, coma, and respiratory depression occur rapidly. Hypotension and cardiac arrhythmias may occur and the child should be observed with a cardiac monitor. Diazepam is effective in controlling convulsions.

Phenothiazines

The phenothiazines include chlorpromazine, which is used as a sedative, piperazine, used to treat threadworms, and perphenazine, prescribed as an antiemetic.

Drowsiness is common and is managed as in barbiturate poisoning. The effects may resemble those of meningitis and there may be dyskinetic movements, including torticollis, facial grimacing, and abnormal eye movements. There may be symptoms similar to those seen in Parkinson's disease with muscular rigidity and tremor. Hypotension and hypothermia are common. The clinical features are similar to those of acute encephalitis or tetanus but there is no trismus.

Various cardiac arrhythmias may develop, and the electrocardiogram often shows prolongation of the Q-T interval and flattening of the T waves. The diagnosis may be confirmed by examining the urine for phenothiazine. General treatment is similar to that of barbiturate poisoning; cardiac arrhythmias are treated with an appropriate drug such as lignocaine or propranolol. Dyskinetic movements or convulsions can be treated with the chemical antagonist procyclidine (0.5-2 mg intravenously for under 2 year olds and 2-5 mg for 3- to 10-year olds; the ampoule should be diluted to 10 ml with saline). The dose should be repeated after 20 minutes if the symptoms have not been relieved.

Iron

A toddler may take his mother's iron tablets prescribed for pregnancy. Swallowing a large number may be followed by necrosis of the gastrointestinal wall and rapid absorption of iron. During the first few hours after ingestion there may be vomiting, haematemesis and melaena, and severe abdominal pain accompanied by low blood pressure. After about six to 24 hours restlessness, convulsions, coma, and further haemorrhage may occur with metabolic acidosis and hepatic necrosis. *All* children who have ingested iron tablets should be admitted and kept in hospital for 48 hours because there may be a transient and deceptive improvement. A blood concentration of over $90 \mu\text{mol/l}$ ($500 \mu\text{g}/100 \text{ ml}$) suggests serious poisoning, but low levels cannot be considered safe as there may be rapid deposition of iron in the liver.

Blood should be taken for urgent serum iron estimation and grouping and cross-matching of blood. Gastric lavage should be performed with desferrioxamine and treatment with intramuscular and intravenous desferrioxamine considered.

Alcohol

Some children are particularly susceptible to the hypoglycaemic effects of alcohol, and any child who has taken even a small wine glass of ordinary wine should therefore be admitted to hospital for frequent feeds containing glucose or a continuous intravenous infusion of 10% glucose. The blood glucose concentration must be monitored by Dextrostix readings at least three hourly for the first 24 hours.

Belladonna alkaloids

The belladonna alkaloids include atropine, hyoscine, and deadly nightshade. A child who has taken an overdose of any of these will have dilated pupils, a dry skin and mouth, fever, tachycardia, abdominal distension, excitement, and confusion. Admission for 48 hours is essential, though drug treatment is rarely necessary.

The commonest cause of an overdose of atropine is when the child takes too much Lomotil, which consists of diphenoxylate hydrochloride with atropine. With the addition of respiratory depression, the symptoms are the same as in atropine poisoning alone, except that the pupils are small. The diphenoxylate can be antagonised by naloxone; the dose may be repeated after about three minutes if there is no improvement.

Paraffin or petrol

Although poisoning with paraffin is common, deaths, which are mainly due to respiratory complications, are rare. Turpentine is distilled from wood and differs chemically from paraffin but produces similar effects. Aspiration of paraffin into the lungs during ingestion or vomiting are the main dangers so emesis or gastric lavage should be avoided. There may be an increased respiratory rate, dyspnoea, and adventitious sounds, but extensive radiographic changes may be present with only slight symptoms. Radiological changes, which are usually bilateral, show patchy areas of consolidation in both lower lobes. Admission is always necessary as it may take 12 hours or more for the pulmonary features to appear.

Antihistamines

Some examples are chlorpheniramine, diphenhydramine, and promethazine. The clinical signs result from both excitation and depression of the central nervous system. Drowsiness and headache may be followed by fixed dilated pupils, incoordination, hallucinations, excitement, and convulsions. Other effects include hypotension, tachycardia, and occasionally cardiac arrhythmias, respiratory depression, or hyperpyrexia. The principles of treatment are similar to those of barbiturate poisoning. There is no specific antidote. Central nervous system excitation can be treated with diazepam.

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National Poisons Information Service

Several poisons information centres are in operation and are open day and night. They provide information on the contents of medical and domestic preparations and the effects of these substances. The main centres are:

Guy's Hospital, London. Telephone: 01-407 7600
Royal Infirmary, Edinburgh.
Telephone: 031-229 2477
Royal Infirmary, Cardiff. Telephone: 0222 492233
Royal Victoria Hospital, Belfast.
Telephone: 02 324 0503:

There are also centres in Newcastle, Leeds, and other cities which operate independently of the National Poisons Information Service.

Examples of features suggesting a specific poison

Coma—Sedatives and anticonvulsants, salicylate, alcohol, antihistamines.

Convulsions—Tricyclic antidepressants, amphetamines, antihistamines, alcohol.

Hallucinations—Belladonna group, amphetamines, antihistamines.

Involuntary movements—Phenothiazines, metoclopramide, antihistamines.

Small pupils—Opiates, diphenoxylate.

Large pupils—Belladonna, amphetamines, antihistamines.

Tachycardia—Amphetamines, belladonna group.

Arrhythmias—Tricyclic antidepressants, phenothiazines.

Haematemesis—Caustic agents, iron.

Guidance for parents of children with various illnesses or handicaps

Asthma—The Chest, Heart, and Stroke Association, Tavistock House North, Tavistock Square, London WC1H 9JE (01-387 3012).

Leaflets: *Our child has asthma: some parents questions answered*; *Breathing instruction for children*.

Cerebral palsy—The Spastics Society, 12 Park Crescent, London W1N 4EQ (01-636 5020).

Leaflets: *What is "spasticity"?*; *"But our child has a very severe physical and mental handicap"*; *The handicapped child within the family*.

Coeliac disease—The Coeliac Society of the United Kingdom, PO Box 181, London NW2 2QY (01-459 2440), produces the *Coeliac Handbook* (£1.50), which includes general, medical, and dietetic information on coeliac disease.

Cystic fibrosis—Cystic Fibrosis Research Trust, 5 Blyth Road, Bromley BR1 3RS (01-464 7211).

Leaflet: *Cystic fibrosis*.

Deafness—National Deaf Children's Society, 45 Hereford Road, London W2 5AH (01-229 9272).

Leaflets: *Is your child deaf?*; *You and your hearing impaired child*; *Help for parents of deaf children*; and other leaflets.

Diabetes—British Diabetic Association, 10 Queen Anne Street, London W1N 0BD (01-323 1531).

Leaflets: *Children and adolescence*; *The diabetic at school*; *An introduction to diabetes*.
Down's syndrome—Down's Babies Association, Quinborne Community Centre, Ridgeacre Road, Birmingham 32 (021-427 1374).

Leaflet: *You've had a Down's baby. Perhaps we can help*; and other information for parents.

Epilepsy—British Epilepsy Association, New Wokingham Road, Wokingham, Berkshire RG11 3AY (034 46 3122).

Leaflet: *Epilepsy: what to do*; *The schoolchild with epilepsy*.

Handicap—Voluntary Council for Handicapped Children, 8 Wakley Street, London EC1V 7QE (01-278 9441).

Leaflet: *Help starts here: for parents of children with special needs*.