ADVANCES IN PEDIATRIC RESEARCH

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Commentary

Commentary on Poisoning in Children

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COMMENTARY

Basic principles in the management of poisoning

In this, we deal with basic principles in the management of poisoning in children. A working knowledge of the management of poisoning in children is essential for all those involved in acute paediatric care. An estimated 52 000 people attended accident and emergency departments with poisoning in 1997, the majority of whom were children.1 Table 1 shows the commonest agents involved.

Poison identification

Wherever possible the constituents of the substance ingested and its dosage per kilo body weight should be identified as accurately as possible. In younger children the substance taken is often easily identifiable but the dosage can be difficult to ascertain. Some idea of the maximum amount of substance that could have been ingested can be gathered from comparing the number of tablets, or volume of liquid remaining, with details on packaging. Care must be taken not to overlook the involvement of other children in a poisoning incident. When children share a poisonous substance, it must be assumed that each child has taken the maximum amount. In older children, a clear history of ingestion may not be forthcoming and illicit drugs are more likely to be involved. Specific enquiry should be made into the medicines prescribed to each member of the household, both currently and in the past.

Recognisable poison syndromes

In cases where poisoning is suspected, but cannot be confirmed by clinical history, a detailed physical examination, including a full neurological assessment, is an essential part of substance identification. A number of toxins acting on the autonomic nervous system can produce a mixed clinical picture because of effects on both muscarinic and nicotinic receptors. In most cases of poisoning, clinical suspicion is raised because symptoms do not fit a common pattern. Certain poisons can produce symptoms that mimic common diseases.

Preventing absorption

There is no place for the use of emetics. The routine use of gastric lavage or activated charcoal is inappropriate. While the latter techniques may have a role in the early management of poisoning with a small number of specific substances, their effectiveness in these circumstances remains unproven. Gastric lavage is contraindicated if a corrosive substance or volatile hydrocarbon has been ingested. Adequate airway protection is essential if any of these procedures is to be performed in the presence of an altered level of consciousness.

Enhancing excretion

Active elimination techniques have a limited role in the management of poisoning. Their use should be restricted to situations where prolonged exposure to high concentrations of toxin is predictably deleterious. Examples of such situations would include haemodynamic instability despite supportive measures, intractable seizures, or organ failure. The use of repeated doses of activated charcoal to remove toxins undergoing enterohepatic circulation is one of the simplest active elimination techniques. The technique is not without its complications; these include bowel obstruction and perforation. Careful monitoring of bowel sounds is essential.

Forced diuresis has previously been recommended as a method of enhancing elimination of salicylates and barbiturates. The risk of fluid overload is high and this technique should be avoided. Urinary alkalinisation can be used to enhance the excretion of weakly acidic drugs. The unionised form of the drug is filtered and reabsorbed. Urinary alkalinisation increases the proportion of ionised drug in the tubule, preventing its reabsorption. Examples of substances which may undergo significantly enhanced excretion include salicylate, isoniazid, phenobarbitone, and dichlorophenoxyacetic acid.

Conversely, decreasing urinary pH can be used to enhance the excretion of weakly alkaline drugs. Urinary acidification, using ammonium chloride, has previously been used to enhance excretion of amphetamine, strychnine, quinine, quinidine, and phencyclidine. The dangers of acidosis and hyperammonaemia outweigh the benefits of this technique. Whole bowel irrigation can be used to physically eliminate highly toxic substances that are not absorbed by activated charcoal and have a long gastrointestinal transit time. Treatment is based on the enteral administration of

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large quantities (30 ml/kg/h) of osmotically balanced polyethylene glycol electrolyte solution to induce a liquid stool. Treatment is continued until rectal effluent clears. Substances for which this technique may prove useful include iron and sustained release or enteric coated preparations.

Dialysis, haemoperfusion, and haemofiltration have all been used to actively enhance toxin excretion. While many case reports exist in the literature, the efficiency of such methods is very difficult to assess clinically. Estimates of efficacy based on blood levels before and after treatment are likely to be misleading as they cannot take into account enterohepatic circulation, hepatic metabolism, or urinary excretion. It is generally accepted that extracorporeal elimination is worthwhile if it increases total body clearance by 30% or more.

For dialysis to be effective, a toxin must be of low molecular weight (<500 relative molecular mass (RMM)) and highly water soluble. It must have a small volume of distribution (<2 l/kg) and bind poorly to protein. Examples include salicylate, methanol, ethylene glycol, vancomycin, lithium, and isopropanol poisoning. Dialysis is of particular value where concomitant electrolyte or acid-base disturbance exists. Haemoperfusion is better suited to toxins with low water solubility. Such substances must have a high affinity for the adsorbent, a fast rate of equilibrium from peripheral tissues to the blood, and a low affinity for plasma proteins. Examples include carbamazepine, barbiturates, and theophylline.

Haemofiltration can remove compounds with a high molecular weight (>500–40 000 RMM). It is of particular use in aminoglycoside and theophylline overdose. Haemofiltration may also be of benefit in iron and lithium overdose. Substances not amenable to significant extracorporeal removal include benzodiazepines, tricyclic compounds, phenothiazines, chlordiazepoxide, and dextropropoxyphene.