REFRESHER COURSE FOR GENERAL PRACTITIONERS

THE TREATMENT OF ACCIDENTAL POISONING

BY

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The necessity for treatment of cases of poisoning occurs but infrequently in the routine of the general practitioner. On this account, when he is faced with the emergency of acute poisoning he is all too often taken off his guard and thus found ill prepared to provide adequate treatment. In poisoning cases, unless the correct treatment is promptly given it is of little value and fatality may ensue. The practitioner may thus find that the life of his patient depends in great measure on the action he initiates during the very short period after being notified that a case of acute poisoning has occurred.

It is proposed in this article to deal first with the general principles of treatment and thereafter with the specific lines of treatment to be employed in poisoning by a few of the commoner and more important poisons. Finally, the equipment, which should always be maintained in readiness for treatment, will be touched upon.

There are four general principles of treatment: removal of the poison from the stomach, or interception of its action prior to absorption; conversion of toxic substances into less toxic compounds; elimination of the toxic substances; and general symptomatic treatment. The prominence which should be afforded to each of these will be determined in large measure by the nature of the poison and the interval which has elapsed between its ingestion and the opportunity for seeing the patient.

Removal of the Poison and Prevention of its Action Prior to Absorption

Despite the development of antidotes, the rapid removal of poisons from the stomach remains the dominating factor in the treatment of poisoning by ingestion. This can be effected either by the induction of emesis or by gastric lavage. Probably the best method of causing vomiting is by subcutaneous injection of apomorphine, 1/12 gr. (5 mg.). With this dosage voidance of the gastric contents may be accomplished without much concomitant nausea and depression. This drug may prove ineffectual in comatose cases, in which there is a varying degree of impairment of the reflexes. Vomiting can be induced by merely tickling the soft palate. The traditional method of doing this was by means of a fine feather, but feathers of the appropriate character are not always at hand and it may be necessary to attempt the procedure with a piece of cotton-wool, gauze, or cloth. The more courageous may use a finger. These simple and homely methods are often unsuccessful but are probably worth a trial, especially with children, for when successful they are both rapid and effective. But it is a dangerous waste of time to persist in such manipulation once the initial attempts have proved a failure.

Many other methods of inducing sickness have been suggested, such as the administration of solutions of salt or mustard in water; but since the two previous methods are usually satisfactory, and should always be readily available to the practitioner, it is considered that he should confine himself to their use. Some of the other methods, such as the use of tartar emetic, are dangerous to the patient and should be discarded.

Gastric lavage is the most effective way of removing a poison from the stomach, and when carried out early can

be a life-saving measure. Despite the fact that a considerable time has elapsed since the ingestion of the poison, gastric lavage may still form a useful part of the treatment. Cases are met with at necropsy in which numerous fairly large particles of phenobarbitone tablets are seen in the stomach because, apparently, lavage has been thought to be a useless procedure in view of the lapse of time between ingestion and the beginning of treatment.

In performing gastric lavage it is essential that a tube with a sufficiently large bore should be used. It is impossible to wash out an adult's stomach effectively by means of a Ryle's tube. Unfortunately this is sometimes attempted. A tube suitable for adequate gastric lavage in cases of poisoning in adults should be about $\frac{1}{2}$ in. or slightly less (1 cm.) in diameter, be composed of flexible rubber, and be about 5 feet (150 cm.) in length. In the case of children a tube of narrower calibre and shorter length should be employed. The entering end should be perforated by several openings, since even with a large-bore tube a single hole may readily become blocked. Since the average distance between the lips and the cardiac end of the stomach is approximately 18 in. (45 cm.), it is a convenience if the tube be marked at a point about 20 in. (50 cm.) above the entering end, thus providing an indication when the tube, on being passed, has entered the stomach. The termination of the lower end should be rounded off to avoid friction, and mechanical discomfort is further eliminated by warming the rubber and smearing it with a lubricant such as glycerin, olive oil, or petroleum jelly. In sensitive cases it may be of assistance to smear the tube thinly with a 1% cocaine ointment. A filter funnel should be inserted into the upper end of the tube.

In using the tube it is advisable that the head of the patient should be placed over the end of the bed. In this position the mouth and pharynx will be at a lower level than the larynx and trachea, and thus regurgitated fluid around the tube will not enter the air passages. The tip of the tube should be passed to the back of the pharynx, the tongue having been depressed with the finger, which is used as a guide for the tube, and so into and down the oesophagus. During this process the patient should be induced to swallow continuously and thus aid the passage of the tube.

For lavage, tepid water should be employed. It is advisable to test the temperature against one's own cheek or lip before pouring the fluid into the funnel. To aid the gravity feed the funnel should be held above the level of the patient, and to facilitate the siphon action, as the last portion of the fluid is being poured in, and the tube and a portion of the funnel are full of water, the tube at its junction with the funnel is pinched between the finger and thumb. The tube is then lowered below the level of the stomach, thus emptying the stomach contents. The process may be repeated as often as deemed necessary. A pint of fluid (rather more than half a litre) should be used for each lavage. For thorough lavage about 2 gallons (9 litres) of water in all should be employed. When the poison which has been swallowed is identified, a suitable antidote may be dissolved in the solution used for lavage. A small quantity of this fluid should be allowed to remain in the stomach on the completion of the process of gastric cleansing. In cases in which the poison swallowed is not known it may be necessary to retain some of the stomach washings for prompt analysis as a guide for subsequent treatment.

It is generally regarded as inadvisable to perform lavage in corrosive acid poisoning on account of the danger of resultant perforation. This complication should be kept in mind, but need not be adhered to as an inflexible rule. The specific circumstances of each case should decide the matter. For example, in a case seen very shortly after a strong acid has been swallowed the potential benefit which might accrue from immediate lavage should probably be allowed to outweigh the possible danger of perforation.

Conversion of Toxic Substances into Less Toxic Compounds

Next to be considered is the prevention of the action of the poison. This can be accomplished by the use of antidotes. These operate either in some part of the gastrointestinal tract before the poison has been absorbed or in the blood stream subsequent to absorption. Antidotes may be utilized after the removal of the poison by emesis or gastric lavage, during lavage, or initially where these procedures are not feasible. They may also be employed as a first-aid measure.

The simplest antidotes are those which neutralize the action of strong acids or alkalis. If given promptly these are effective. Lime water or magnesium oxide should be used to neutralize acids. The use of sodium bicarbonate is strongly contraindicated on account of gas formation and consequent gastric distension. Vinegar, or a 5–10% solution of citric acid, will be found effective in the treatment of alkali poisoning. White of an egg can be used effectively to limit the absorption of certain poisons by the formation of albuminates. It is particularly successful in the treatment of poisoning by heavy metals. Tannic acid can also be employed in an attempt to precipitate some of the metallic and alkaloidal poisons. It can readily be administered as strong tea. It is difficult to estimate the degree of precipitation of which it is capable, but it seems to act in cases of poisoning by strychnine, cinchona alkaloids, and the salts of cobalt, copper, mercury, nickel, zinc, uranium, aluminium, lead, and silver. Charcoal can be employed to delay the absorption of poisons. This should be given as a tablespoonful dose of activated charcoal in water.

There are a number of so-called specific antidotes which operate by neutralizing the action of the poison after its absorption. These are discussed in more detail below. Some of the more important of them are: ferric chloride and dimercaprol ("B.A.L.") for arsenic; amyl nitrite for cyanides; "lethidrone" for morphine; barbiturates for cocaine and procaine; sodium amytal for strychnine; and atropine for the organic phosphorus insecticides.

Elimination of Toxic Substances

This can be attempted by increasing the excretory functions of the body. During this process steps must be taken to treat shock and to counteract, so far as is possible, the general effects of the poison. Provided the condition of the patient is suitable, the consumption of large quantities of tea will increase the rate of renal excretion, and in the less serious class of case may prove a useful measure.

By far the most effective method of diluting the absorbed poison and increasing its rate of elimination from the body is the intravenous administration of fluids. The best solution for this purpose is a 5% solution of glucose. It also has the important added advantage of replenishing the reduced liver glycogen. The quantity administered must, however, be controlled, since a danger arises from the use of an excessive quantity. If the heart's action is impaired, and it often is in serious cases of poisoning, there is a definite risk of "drowning" the patient. In most cases the use of diaphoretics in an attempt to increase the elimination of poison will do more harm than good.

It will be seen, therefore, that, while eliminating the toxic agent may be attractive in theory, in practice it should be used with great caution.

General Symptomatic Treatment

This must be approached along broad lines and be directed to the clinical manifestations of individual cases. It is sufficient to add that stimulation of the respiratory and circulatory systems should be resorted to immediately indications present themselves.

Specific Treatment

Aspirin (Acetylsalicylic Acid).—Although aspirin is a relatively non-toxic substance, its widespread domestic use and the carelessness with which it is left lying about have caused it to become an important cause of poisoning, more especially in children. Recently there has been some suggestion that it is being increasingly used for suicidal purposes. The important steps to be taken in acute aspirin poisoning consist in gastric lavage and combating acidosis. Acidosis is best overcome by the administration of intravenous sodium lactate (70%), 60 ml. per kg. body weight, at a rate not exceeding 300 ml. an hour. To obviate dehydration, fluids should be given either orally or intravenously. The patient should be kept warm, and if there is any sign of cyanosis oxygen should be used and 5 ml. of nikethamide given intravenously.

Arsenic.—While preparing the apparatus to wash out the stomach give a mixture containing 1 oz. (30 ml.) of tincture of ferric chloride and 1 oz. (30 g.) of sodium bicarbonate in 4 oz. (120 ml.) of water. Gastric lavage should be very thorough. Dimercaprol should be given intramuscularly as a 10% solution in peanut oil, using 2–3 mg. per kg. body weight, every four hours.

Barbiturates.—Acute barbiturate poisoning is becoming increasingly common and is the cause of a large number of deaths every year. There is growing evidence that a number of barbiturate compounds are more toxic than was originally supposed. Early effective gastric lavage is the most important factor in successful treatment. This should be carried out thoroughly despite the fact that a considerable time may have elapsed since the barbiturate was swallowed. About 60 g. of magnesium sulphate in solution should be allowed to remain in the stomach on the completion of the process of stomach washing. The following additional measures should be adopted. The air passages must be kept clear by aspiration and oxygen should be administered continuously. Penicillin, 50,000 units, should be injected every three hours in cases in which the respiratory function is depressed or in which coma has supervened. If the coma is prolonged, 5% intravenous glucose should be given until improvement becomes manifest. The bladder will need catheterization. The use of a large number of drugs has been advised in the treatment of barbiturate poisoning, but the balance of opinion inclines to the more conservative line of treatment as outlined. It is highly important for practitioners to have formulated in their minds a definite routine to employ in cases of barbiturate poisoning.

Hydrocyanic Acid and Cyanides.—If the poison has been inspired the patient should be removed immediately into fresh air. Should it have been ingested, gastric lavage should be commenced without delay. Amyl nitrite should be given by inhalation, 0.3 ml. for a period of twenty seconds every three minutes. This should be followed by intravenous sodium nitrite, 0.3 g. in 10 ml. of water at the rate of 2.5 ml. a minute. The patient must be kept at complete rest. If required, artificial respiration and oxygen should be used.

Morphine and Opium.—The stomach should be repeatedly washed out with a 1% solution of potassium permanganate. A solution containing 30 g. of magnesium sulphate should be left in the stomach at the last washing. If respiration is depressed, and in nearly all serious cases this is so, give 40 mg. of amphetamine sulphate intravenously. Inhalation of oxygen should also be given. If the patient is comatose inject penicillin and do not forget to catheterize the bladder. Recently, lethidrone (N-allylnormorphine hydrobromide) has been advocated as a specific antidote. It may be used either subcutaneously or intramuscularly in a single dose ranging from 10 to 40 mg.

Inorganic Corrosive Acids (including Nitric, Sulphuric, and Hydrochloric Acids).—If the patient is seen very shortly after the ingestion the question of passing a stomach tube must be carefully weighed. If this is considered expedient, in the light of all the clinical aspects of the case, gastric lavage with an alkaline solution—for example, a solution of cream of magnesia or lime water—may be found valuable. Thereafter, such bland fluids as milk, egg albumen, olive oil, or barley water may be given. Alkaline carbonate should be avoided on account of the likelihood of gastric distension due to the liberation of carbon dioxide. To alleviate pain morphine may usefully be employed.

Carbolic Acid and Phenols.—If the patient is seen after a considerable lapse of time following the ingestion of one of the concentrated phenols and is complaining of severe abdominal pain, the use of the stomach tube or emetics is probably fraught with danger. It is then advisable to administer egg albumen, concentrate on maintaining the patient's strength, and treat symptoms as they may arise.

Organic Phosphorus Insecticides ("T.E.P.P." and "H.E.T.P."*).—The patient must be kept at complete rest. All contaminated areas should be washed. Atropine, 0.5 mg., should be given subcutaneously and repeated hourly until the symptoms have abated. If necessary, oxygen should be administered and artificial respiration applied.

Carbon Tetrachloride.—This substance is in extensive industrial use and cases of poisoning are relatively frequent. When a person in contact with carbon tetrachloride shows evidence of poisoning the case should be regarded as serious even though the initial symptoms are slight. The patient should immediately be removed from all possibility of further poisoning and must be kept at absolute rest in bed. If the poison has been ingested gastric lavage should be used and a fairly large dose of magnesium sulphate should be left in the stomach. A high carbohydrate and protein diet should be given, and 3 g. of methionine should be injected intravenously daily. Alcohol should be avoided as a stimulant. In addition to the risk of damage to the liver, there is also a danger of renal failure, and every effort should be made to stimulate renal function by the oral administration of large quantities of fluid and by the use of hypertonic intravenous glucose.

Poison Kit

It is a sound provision for a practitioner to have in readiness for immediate use a small case containing equipment for treating cases of poisoning. The following are some of the essentials: a stomach tube suitable for adults and one for children; a container with suitable ordinary lubricant and one with anaesthetic lubricant; a filter funnel for attachment to stomach tube; amyl nitrite ampoules; olive oil; iron sulphate solution; magnesium sulphate; amphetamine; lime water; sodium amylal; nikethamide; apomorphine; and calcium gluconate.

Next Refresher Course Article.—"Death Certification," by Dr. W. P. D. Logan.

RESPIRATORY PARALYSIS IN POLIOMYELITIS

A meeting at the Ministry of Health last month, under the chairmanship of Sir John Charles, the Chief Medical Officer, discussed the implications of the recent Danish outbreak of poliomyelitis in which there were many cases with respiratory paralysis. These cases were treated by Professor Lassen by a new method: a tracheotomy was performed and a cuffed endotracheal tube inserted, through which intermittent positive-pressure ventilation with a nitrogen-oxygen mixture was maintained by manual compression of a rubber bag (see leading article at p. 1208). The opening speakers had been to Denmark to see Professor Lassen's method in action.

*"T.E.P.P." is tetraethylpyrophosphate and "H.E.T.P." is hexaethyltetraphosphate.

Reports from Visitors to Denmark

Dr. W. H. KELLEHER said that Lassen's method deserved careful study. It should be used, perhaps with some modifications, for appropriate cases in this country. The Danes had found that postural drainage alone was not always enough for some of the bulbar cases, and they claimed that their method had brought about a considerable fall in the mortality. He questioned, however, the need for a closed-circuit apparatus with the danger of inhalation of soda-lime particles. The use of silver tubes instead of rubber ones might lessen the risk of producing tracheal stenosis.

Dr. B. A. SELICK had had the impression that in Denmark more cases than necessary were subjected to tracheotomy, and suggested that instead of immediate tracheotomy an endotracheal tube should be passed through the mouth (when the upper air passages had been cleared) and allowed to remain there for 8 to 12 hours while the patient's condition was being assessed and the causes of respiratory embarrassment defined. He mentioned the practice of Nielsen, of Sweden, who leaves an endotracheal tube in place for as long as three days in the treatment of barbiturate poisoning, although this might not be easy in a conscious patient. He wondered why so much stress was laid on the 50/50 mixture of oxygen and nitrogen; at any rate in the more chronic cases mixtures of air and oxygen, or compressed air alone, should be satisfactory. Adequate postural drainage was most important, and drugs to prevent bronchospasm and reduce sputum viscosity were also useful.

Dr. A. B. CHRISTIE and Dr. J. R. ESPLEN discussed the types of case for which Lassen's method was suitable. Postural drainage was difficult when the patient was in a tank respirator, but could easily be carried out with the Copenhagen method; the amount of secretion that could be aspirated through the endotracheal tube was impressive.

Dr. G. E. BREEN, whose visit to Copenhagen had been more recent, said that the Danes were now inclined to think that cuffed tubes were not always necessary and that well-fitted silver cannulae were quite satisfactory in some cases. They had completely abandoned the use of tank respirators and were relying on bag ventilation. He thought that a Bang respirator, compressed air with a Kifa motor, or a Spiropulsator might perhaps replace manual compression. A Bang respirator cost £40 to £50 and a Spiropulsator about £150.

Discussion

Mr. T. HOLMES SELLORS emphasized the valuable part that anaesthetists with experience in chest surgery could play. They were skilled at treating "wet lungs," and their advice should be sought in the early stages. It was important to avoid unnecessary tracheotomies, and he stressed the value of proper postural drainage.

Dr. W. RITCHIE RUSSELL agreed with Mr. Holmes Sellors; nurses needed training in performing postural drainage. Pure spinal cases should be treated in tank respirators, while postural drainage was the treatment of choice for pure pharyngeal cases. He was somewhat sceptical about the claims put forward for the Copenhagen method, and thought that it was only likely to be useful for combined bulbar and spinal cases.

Mr. T. CAWTHORNE reminded the meeting that tracheotomy could be mutilating; when resorted to, it should be carried out below the first ring of the trachea so as to avoid subsequent laryngeal stenosis. The use of an expiratory valve would allow the patient to cough and use his voice, the valve being removable to permit the aspiration of secretions. Tracheotomies should be performed by persons with experience of them: a circular hole was best, as it was least likely to cause stenosis.

Dr. A. C. SMITH, an anaesthetist with experience of head injuries, described his practice of emptying the stomach and bronchi in patients whose cough reflex had been lost. There was a danger of ulceration of the glottis and trachea if endotracheal tubes were left in place for too long. He