

THE USE OF CURARE AND PENTOTHAL SODIUM IN ENDOSCOPY

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The difficulties encountered in endoscopic examination of certain individuals are well known to all who are actively engaged in this type of work. In a short heavy-set person with a thick neck, it is often very difficult to obtain a satisfactory view of the larynx. In people who are excessive smokers and have a hyperactive gag reflex, it is very difficult to obtain sufficient anesthesia with topical applications alone for a satisfactory examination. This is also true of the hypersensitive, apprehensive person who lives in a state of nervous tension. When these patients submit to an endoscopic examination they are subjected to a maximum of psychic trauma, and in many instances the examination or operative procedure cannot be carried out satisfactorily.

The various general anesthetics now in common use have been employed at one time or another for endoscopic procedures. Certain disadvantages have accompanied the different agents employed:

1. Instrumental manipulation of pharynx and larynx has frequently resulted in a laryngospasm.
2. Deep anesthesia is required to produce sufficient relaxation to accomplish the examination.
3. The deep anesthesia thus produced causes a prolonged recovery period. This precludes the possibility of the examination's being accomplished on an out-patient basis.

Pentothal sodium anesthesia alone has been found to be very satisfactory for endoscopic procedures in the difficult patient. However, there are certain dangers and disadvantages to its use owing in part to the fact that it does not afford complete anesthesia. Any irritation in the pharynx and larynx of a patient anesthetized with pentothal sodium is likely to produce a laryngospasm which may prove troublesome but never dangerous to a competent endoscopist. However, this can nearly always be avoided by instilling a local anesthetic into the larynx and trachea just before induction of anesthesia. In addition, to produce sufficient relaxation fairly deep anesthesia is required. Deep anesthesia

is undesirable and may be dangerous. Furthermore, this type of anesthesia is not well tolerated by children. However, the smooth, pleasant, rapid induction and rapid recovery make pentothal sodium an extremely desirable agent.

One of the important advances in anesthesiology has been the supplementing of a general anesthetic agent with curare. There has been a large volume of material in the recent literature on curare* and its use in various surgical procedures as an adjunct to other forms of general anesthesia. Its property of producing relaxation of the skeletal muscles by bringing about a temporary paralysis led us to try it in combination with pentothal sodium for endoscopic procedures.

The pharmacologic action of crude curare has been described by many authors, but the actual mechanism by which it blocks the transmission of the nerve impulse at the myoneural junction is not fully known. Most investigators believe that curare interferes with the normal action or production of acetylcholine. Curare exhibits its effect on striated muscle but has little or no effect on smooth or cardiac muscle. Crude curare has been known and used experimentally for many years, but not until recently has it been produced in a sufficiently pure and standardized form for clinical use.

Curare is known to affect the muscles of the body in the following order:

1. Muscles innervated by the cranial nerves.
2. Muscles of the extremities and trunk.
3. Muscles of respiration, the last being the diaphragm.

Since one of the first actions of curare is to relax the muscles of the pharynx and neck, it is especially applicable to endoscopic procedures. Thus, only the minimum dose of the drug is required to obtain this desired effect. This margin of safety is further increased by the rapidity of excretion. If an overdose should be administered, artificial respiration can be instituted until spontaneous respiration returns. Furthermore, the toxic effect of the drug is rapidly counteracted by an intravenous injection of neostigmine.

Method of Administration

Precautions are taken to ensure an empty stomach. This lessens the possibility of vomiting during the administration of the local anesthetic and the danger of aspiration of stomach contents during general anesthesia or the recovery period.

*The curare preparations used by the method described in this paper are intocostin (Squibb) and d-tubocurarine chloride (Abbott).

For premedication $1\frac{1}{2}$ gr. of pentobarbital sodium is given from one-half to two hours before the procedure. Morphine sulfate $\frac{1}{6}$ to $\frac{1}{4}$ gr. and atropine sulfate $\frac{1}{150}$ to $\frac{1}{75}$ gr. is administered by hypodermic injection one-half to one hour before administration of the anesthetic.

Local anesthesia is accomplished by spraying the mouth and pharynx two or three times with 2 per cent pontocaine solution. Topical applications of 10 per cent cocaine solution are made in both pyriform recesses. Three or 4 cc. of 2 per cent cocaine solution is then instilled into the trachea, care being taken not to use more than 0.5 to 1 cc. at a time. This precaution in the instillation will prevent rapid absorption into the blood stream, and so-called "cocaine reactions" will seldom occur. If after each instillation the patient is encouraged to cough, the cocaine will be distributed over the tracheobronchial mucous membrane, providing better anesthesia and allowing only a small amount of alveolar absorption. The patient is then placed on the operating table and prepared for the endoscopic procedure in the usual manner.

One forearm is fixed in supination to an armboard by means of adhesive tape. The curare is given as the first step in the induction of the anesthesia, as its action does not appear until three or four minutes after injection, whereas the effect of the pentothal sodium is noted within thirty seconds. The needle to be used for the venipuncture is affixed to a 5 cc. syringe containing 3 cc. (60 units) of the curare preparation. The needle is inserted into the vein and the curare injected. The needle is flushed once or twice by the aspiration and reinjection of 2 cc. of blood, and the syringe is replaced with another containing 20 or 30 cc. of pentothal sodium in 2.5 per cent solution in distilled water. The flushing of the needle avoids the formation of the precipitate which results from mixing the two drugs in the concentrations used. Pentothal sodium anesthesia is induced in the usual manner, and after the lapse of four or five minutes the endoscopic examination may be begun. If the relaxation proves insufficient, an additional 2 or 3 cc. of curare may be injected after flushing the needle and rubber tubing, if employed, by a few cubic centimeters of physiologic saline solution. If the respiration is depressed by partial paralysis of the diaphragm, artificial respiration may be carried on by gentle intermittent manual pressure over the lower chest (sixteen times a minute, or synchronous with the diaphragmatic contractions). If the condition persists after the conclusion of the endoscopy, neostigmine 0.5 mg. should be given intravenously. Neostigmine acts as a physiologic antidote to curare by inhibiting cholinesterase from destroying acetylcholine. Administration of pentothal before the maximum effect of the curare has taken place avoids the unpleasant

choking sensation experienced when the muscles of the pharynx and neck are paralyzed in the conscious patient.

This method of anesthesia was used in 50 cases including 23 direct laryngoscopic, 11 bronchoscopic, and 5 esophagoscopic examinations. In our cases from 2 to 6 cc. of curare was used. Relaxation was not sufficient in the case in which only 2 cc. of curare was used and only fair in 2 of the cases in which 3 cc. was used. In all others, the relaxation and exposure were excellent. In none of the cases was there any laryngospasm or cessation of respiration. No vomiting occurred either during or after the procedure. After examination the patients were placed in a recovery room and were not allowed to leave the hospital for two or three hours and then were accompanied by a relative or friend.

This type of anesthesia is not recommended for all endoscopic procedures. In our last 100 endoscopies the curare-pentothal combination was used only thirteen times. It should be reserved for those in which difficulty in obtaining relaxation or cooperation is either anticipated or encountered. It should be given only by a competent anesthesiologist, and equipment to combat apnea and hypoxia must be readily available.