ANESTHESIA FOR ORAL SURGERY IN THE PRESENCE OF CAUTERY AND DIATHERMY * †

Howard L. Elliot, M.D., and Julia G. Arrowood, M.D.

Boston, Massachusetts

Many mechanical arrangements and the use of potent inhalation anesthetics provide safe and comfortable conditions for oral surgery consisting of manipulations, exodontia and the use of the surgical knife, but do not provide for the occasion when cautery or surgical diathermy is required, as in the modern treatment of neoplastic conditions occurring in the mouth, nose and adjacent sinuses, and other operations about the head. Although the exhaled air of a patient in first plane of surgical anesthesia by ether is theoretically inflammable, actually it has not proved to be so in practice, even in deeper planes. The power of ether-air mixtures to propagate flame is very low and entrance of any flame into the trachea is hardly to be feared. Unless the procedure is brief, however, open ether is troublesome, because the patient who is recently anesthetized recovers rapidly and runs the risk of aspirating blood or vomitus if more anesthetic has to be given. The use of basal narcosis by avertin, supplemented to the level of anesthesia with ether, offers more time in which to work. If chloroform must be used, it also is satisfactory within the same limitations. The objection to its use on the ground that irritating phosgene gas is formed from it by the action of heat is theoretical more than practical, especially as the operation is performed only while the patient is emerging from anesthesia and a high concentration of chloroform is no longer present.

Nitrous oxide can often be used to advantage in the presence of cautery and diathermy, and the benefits of tracheal intubation can be had while employing it as well, but the difficulties and uncertainties associated with its use are too well known to require discussion. It lacks assured results and enthusiasm for it seems to vary with the tolerance of the surgical team for suboxygenation of the patient.

Pentothal seemed to offer a solution to the problem, since it is a potent anesthetic and can be administered at a remote point, leaving the operative field entirely to the surgical team. Its benefits may prove illusory as surgeons often are not interested particularly in maintaining adequate airway and make unconscious, yet nevertheless deter-

* From the Department of Anesthesia and the Anesthesia Laboratory of the Harvard Medical School at the Massachusetts General Hospital, Boston, Mass.

† Read before the New England Society of Anesthesiology, February 8, 1944.

mined, efforts to block it entirely. This made it desirable to have an assistant anesthetist remain at the head to try to keep a partial airway for the patient. From the very inception of pentothal anesthesia, manufacturers and clinicians have repeatedly expressed a distaste for it in oral surgery, but all save the most conservative have largely disregarded this restriction because of the simplicity of administration and the usually prompt and comfortable recovery.

THEORY

At the Massachusetts General Hospital our attitude toward pentothal has been and still is conservative. We did not favor its use for oral surgery because of the dangers of respiratory depression, combined with respiratory obstruction, and because pentothal not only does not obtund pharyngeal and laryngeal reflexes but actually enhances them. We also knew that vomiting is not avoided by the use of pentothal. The patient can in fact be put in jeopardy most suddenly for a very trivial operation. When diathermy was not being used we considered it in the best interests of the patient to perform intubation under inhalation anesthesia for all but the briefest procedures, and so, desiring to have the same benefits for those undergoing surgical diathermy, we began to intubate patients while using pentothal as an anesthetic after obtaining thorough topical anesthesia as for bronchoscopy.

Surface anesthesia was used from the outset because of evidence both clinical and theoretical that pentothal is a vagomimetic drug (1, 2). We feared excessive coughing, spasm of thoracic muscles, larynx and bronchiolar tree, and even cardiac arrest. We have not so far heard of any case of cardiac arrest, but would not be surprised to learn of it any time. Death from cardiac arrest during or following bronchoscopy without pentothal has been known, presumably through a powerful vago-vagal reflex, and there are several reports of death following immediately upon intubation while using cyclopropane, which bears similarities to pentothal in its vagomimetic action. It seemed certain that pentothal would do nothing to subdue these reflexes, and probable that it might even enhance them (2). Because of these considerations we thought that local anesthesia might abolish, or at least diminish, the sensory side of the reflex arc arising from the pharynx, larynx and upper trachea and in November 1941 we began to employ it cautiously before intubation and the use of intravenous pentothal.

The particular feature we wish to present in this paper is the application of topical anesthesia before intubation. From the first, we believed it must be as thorough as for bronchoscopy, or even more so. Many patients cough violently during this operation, even before there is any stimulation of the carina, and pentothal did not give any promise of being able to reduce this reflex. We do not present any new technic or drugs but only affirm from our experience the desirability

of aiming at full anesthesia of the pharynx, region of the epiglottis and pyriform sinuses, the vocal cords and upper part of the trachea. We favor larocaine for injection into the trachea, but this drug was withdrawn from the market too soon to warrant a definite comparison with other agents. We have not found the action of 2 per cent pontocaine solution very reliable, and believe that cocaine is still the most suitable drug and should be used except when there is a history of idiosyncrasy. The strength varies from 4 to 10 per cent, or more; it should be adequate. No fear need be felt as oxygen and pentothal are both at hand to combat toxic reactions. Absorption can be reduced by the addition of epinephrine, but we have not used it since stronger solutions of cocaine are less likely to be absorbed than the weaker, because of the greater vasoconstriction produced.

METHOD

The pharynx is sprayed first, directing the mist downward while the patient is breathing in and out, or he gargles a small amount while lying on his back. The pyriform fossae are then anesthetized by introducing curved metal cotton applicator sticks or curved forceps over the back of the tongue and along the lateral wall of the pharynx. The cotton should be moderately wet, but not dripping, and should be left in place about one minute. This is more effective than spraying. Before the sticks are removed they should be moved toward the midline in such a way as to bring the anesthetic into contact with the region of the epiglottis. This movement of instruments in the pharynx affords an estimate of the amount of reflex activity still remaining and we advise that the same or any other effective measure be repeated if any degree of reflex activity is found, as it will not disappear after pentothal is given. The last maneuver is the anesthetization of the cords and upper part of the trachea; we do not profess to have found out how this can be made entirely successful. However, we can say that it is best to initiate it before giving pentothal by insufflation of 1 to 2 cc of anesthetic solution between the cords under indirect vision, using head and laryngeal mirrors and a curved cannula attached to a small syringe. The patient is either lying down or sitting and draws out his own tongue between the thumb and forefinger of his right hand, while the anesthetist holds the laryngeal mirror in his left hand and the syringe in his right. If the patient will not pull out his own tongue, someone else must do it for him. It is well to remember to place a thickness or two of gauze between the under surface of the tongue and the lower teeth. Patients will pull more effectively if pain can be avoided. The tip of the cannula is placed between the cords and, as the patient inhales deeply, the injection is quickly made. There is no need to proceed beyond this, instilling solution into the trachea while the patient leans to right and left, as there is no reason for the tube to go to the carina or bronchi as in bronchoscopy. The method of direct appli-

cation to the cords of 15 per cent cocaine on cotton applicators is described in an English journal. The method is worthy of trial in the expectation that it might be superior to instillation, just as direct application to the pyriform sinuses is more effective than spraying.

This completes the initial topical anesthesia and by the time the pentothal needle has been introduced into a vein and been secured in place the anesthetic will have attained its maximum effect. Pentothal solution is prepared in the usual way and apparatus is arranged according to individual preference with the object of carrying on the anesthesia alone. Any set-up requiring the presence of an assistant anesthetist is unnecessary, but it is well to have experienced assistance during the induction and intubation. Nevertheless, even this can be accomplished by one anesthetist with the assistance of someone sufficiently trained to be able to read a syringe. In this case, the induction is performed by the anesthetist who remains in charge of the syringe until the patient has passed through the brief period of apnea or very shallow breathing that may occur. When respiration is satisfactory he can then proceed to the head of the patient to do the intubation. He will by then know the patient's tolerance for pentothal and can instruct an assistant what amounts to inject.

There appears to be no advantage in hurrying through the intubation, as we have found some writers advocating on the grounds that if the procedure fails the patient would enter a condition of aggravated laryngeal spasm (4). They used either no topical anesthesia or one so inadequate as to be futile, and it has been our experience that even though a tube can be deftly inserted, an uncomfortable anesthetic course may follow since the reflexes do not tend to diminish later, as they do under ether, for example. For that reason we deliberately expose the glottis and attempt to improve the anesthesia of the cords and upper trachea by spraying with cocaine or pontocaine solution. This maneuver itself will indicate what reflex activity remains and if it is considerable will reward any attempts made to reduce it.

At first we used 2 per cent pontocaine jelly on the catheters but gave it up as being ineffective and no remedy for inadequate preliminary topical anesthesia. Even if the particular drug used in the jelly were sufficiently released from it and absorbed from the surface, it only operates at the point of contact and requires minutes to work. Any change of position of the catheter making new points of contact can therefore arouse reflexes and disturb the patient.

When the tube is in place it is connected with an anesthesia machine and nitrous oxide 50 to 75 per cent with oxygen is administered by the semi-closed method. If the absorber is put in the circuit, the amount of gases used can be greatly reduced. We now use the combined anesthetics in all but the shortest cases, because, in addition to the well known advantage of a reduced consumption of pentothal and quicker recovery to full consciousness, reflex activity is diminished, especially

when the higher concentration of nitrous oxide is used. Even with this, the patient is receiving more oxygen than from atmospheric air.

At the conclusion of the operation, suction is carefully performed through the tube and in the pharynx. The tube is then removed and the patency of the airway and absence of laryngeal spasm are ascertained. The patient is placed on his side and returned to the ward with instructions to keep on his side and use high blocks at the foot until consciousness is fully recovered in order to avoid any possibility of aspiration into the trachea.

RESULTS

This possibility of aspiration was considered for some time a deterrent to initiating and augmenting the series. We concede the liability especially if the instructions are not properly performed. In our series, not yet fully examined, we have found two cases in which postoperative pulmonary complications developed. Both of these occurred in cases in which the jaw had been fractured and there was considerable bruising of tissues in the mouth and presence of secretions. Intubation was difficult and accomplished only after repeated attempts which probably caused some trauma. The diagnosis of atelectasis was made in each case by a surgical house officer, but was insufficiently supported by the clinical evidence and was not confirmed either by roentgenograms or by the subsequent course. Nevertheless, we stress the importance of thorough aspiration both inside and outside the tube before removal, and attention to postural drainage without delay.

Since 1941 we have used this method in 80 cases. At the present writing, the statistics for the year 1943 and analysis and follow-up of the patients are not complete, so that discussion of results had best be omitted. Our attitude is favorable and the technic is being used increasingly.

DISCUSSION

Recent articles coming from the military fronts mention in a casual way intubation under pentothal anesthesia without any statement regarding associated surface anesthesia (3). Difficulties have scarcely been alluded to or have been brushed aside as of no consequence, stating, for example, that "if the patient has laryngeal spasm or coughs the anesthesia is too light and is a sign it should be deepened." In our experience this overcomes the coughing but the patient becomes cyanotic and apneic. He may resume breathing promptly, but before the cyanosis is alleviated commences to cough once more. We could not regard this with equanimity, even in a young man having the physical status of those in the army, and certainly not in our patients of advanced years, such as make up the larger part of this series.

Since these military anesthetists implied that intubation under pentothal is a well-known and casual procedure, a review of the liter-

ature from 1939 was undertaken to find what has been reported. Ruth and others wrote of it as a method to relieve respiratory obstruction occurring under pentothal anesthesia, and Knight, in his discussion of the paper, stated that he performed intubation for operations about the mouth under the same anesthesia. No unsatisfactory results were mentioned (6). At that time he referred to a cursory spraying of the pharynx with local anesthetic. He did not enlarge upon what happened when intubation was not quickly accomplished, and absence of remarks to the contrary lead a reader to suppose that when the tube was once in place everything was pleasant from then on. This was decidedly not our experience. Lundy may have found something to be desired in this method, because Adams and Lundy (1941) mention a more extensive application of local anesthetic than formerly, but still far short of what we think is necessary (5). No details are given regarding the course of anesthesia, the type of case for which it is used or the postanesthetic course. They also did not state how many times it had been used.

The first and only series of cases in the United States encountered is by Cooper in *Anesthesia and Analgesia,* 1939, who reports pentothal anesthesia for 27 cases of per-oral endoscopy (7). Pentothal alone was used. Troublesome coughing was reported as occurring in two cases. He does not refer to any difficulties while inserting the instruments, and spasm and cyanosis are not mentioned, and so we can only assume the endoscopist was very hardy or had a more amenable type of patient than it has been our fortune to get. Early in our experience coughing was encountered which was difficult to suppress without putting the patient in apnea and even considerable laryngeal spasm occurred before inserting the tube, but we are confident that these conditions are minimized by good local anesthesia.

Young and Pinkerton, of Glasgow, in 1941, reported 150 cases of pentothal sodium for per-oral endoscopy (8). They began by using pentothal sodium only and then by degrees a full local anesthesia, and stated that pentothal is used only for the purpose of producing unconsciousness. The operative or postoperative course is not mentioned. G. J. Thomas, of Pittsburgh, in March 1943, published an article on using pentothal for operations on the ear, nose and throat and describes the manner of performing the surface anesthesia, but details are not given regarding intubation or experiences during or after operation (9). Long and Ochsner, in 1942, give 200 references covering the literature on pentothal since its discovery, but no titles indicate more than passing attention to the technic outlined in his paper (10).

SUMMARY

1. The advantages of tracheal intubation under pentothal sodium anesthesia when diathermy is used in and about the head are stated.

2. The importance of extensive and adequate topical anesthesia of pharynx, glottis and upper trachea is stressed and the method of accomplishing it is described.

3. A series of 80 cases not studied completely has been followed with regard to major complications.

4. The method has given satisfaction and will be continued.

REFERENCES

1. Burstein, C. L., and Rovenstine, E. A.: Respiratory Parasympathetic Action of Some Shorter Acting Barbituric Acid Derivatives, J. Pharmacol. & Exper. Therap. 63: 42–50 (May) 1938.
2. Adriani, John, and Rovenstine, E. A.: The Effect of Anesthetic Drugs upon Bronchi and Bronchioles of Excised Lung Tissue, Anesthesiology 4: 253–262 (May) 1943.
3. Rose, Anthony J.: Sodium Pentothal: Actual Experience in the Combat Zone, Anesthesiology 4: 534–539 (Sept.) 1943.
4. Lundy, J. S.: A Technical Description of the Intravenous Administration of Pentothal Sodium based on Experience in More than 12,500 Administrations. Paper read before Ohio Society of Anesthetists, May 4, 1939.
5. Adams, R. C., and Lundy, J. S.: Intravenous Anesthesia: Its Increased Possibilities when Combined with Various Other Methods of Anesthesia, Southwest. Med. 25: 8–10 (Jan.) 1941.
6. Ruth, H. S.; Tovell, R. M.; Milligan, A. D., and Charleroy, D. K.: Pentothal Sodium; is its Growing Popularity Justified? J.A.M.A. 113: 1864–1868 (Nov. 18) 1939.
7. Cooper, M. P.: The Use of Pentothal Sodium Intravenously for Anesthesia in Laryngoscopy, Bronchoscopy and Esophagoscopy, Anesth. & Analg. 18: 181–185 (July-Aug.) 1939.
8. Young, Gavin, and Pinkerton, H. H.: Pentothal Sodium Anesthesia in Per-oral Endoscopy, J. Laryng. & Otol. 56: 337–346 (Oct.) 1941.
9. Thomas, G. J.: Pentothal Sodium in Ear, Nose and Throat Surgery, Ann. Otol., Rhin. & Laryng. 52: 35–44 (March) 1943.
10. Long, C. H., and Ochsner, Alton: Intravenous Pentothal Sodium Anesthesia; A Review of the Literature, Surgery 11: 474–495 (Mar.) 1942.

MEETING OF THE AMERICAN SOCIETY OF ANESTHETISTS, INC.

NEW YORK ACADEMY OF MEDICINE

Fifth Avenue and 103rd Street, New York City

THURSDAY, FEBRUARY 8, 1945—8:15 P.M.

"The Use of Spinal Anesthesia to Control Sympathetic Overactivity in Hyperthyroidism."

By Ralph T. Knight, M.D., University of Minnesota, Minneapolis.

"Continuous Drip Spinal Anesthesia."

By Julia Arrowood, M.D., Massachusetts General Hospital, Boston.

Discussants for these papers will be announced in the February News Letter of the Society.