

# ANESTHESIA FOR THYROIDECTOMY

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**P**ATIENTS with simple goiter usually are good operative risks; they are mentally and emotionally stable, and they tolerate general anesthetics well. Patients with hyperthyroidism, however, are often critically ill and a prolonged depression with a general anesthetic agent may lower the vital reserve to such a degree that a fatal postoperative pneumonia will develop. On the other hand, the accomplishment of the operation under local anesthesia is rendered difficult by the exaggerated emotional and fear responses.

The ideal anesthesia for patients with hyperthyroidism should provide the following:

1. The operation should be performed without psychic trauma induced by undue fear or discomfort.

2. Dangerous depression such as accompanies ether anesthesia or full doses of avertin should be avoided, particularly in bad risk patients.

3. The patient should remain at least partially conscious so that she may talk during the operation, thus allowing the anesthetist to judge her mental as well as physical reaction to the operative procedure and to be aware of any trauma to the recurrent laryngeal nerves.

4. Anoxemia should never occur.

5. There should be no undue apprehension before or during the operation and the patient should have no recollections of having experienced discomfort.

It is quite obvious that no one anesthetic agent fulfills all these prerequisites. For many years, Dr. George Crile, Sr. has used a combination of local anesthesia and nitrous oxide-oxygen analgesia in which just enough gas is given to dull the sensory responses and to render the patient slightly euphoric. This type of anesthesia requires

an anesthetist who is well trained in the administration of analgesia, and it is necessary during its induction to keep the patient talking about extraneous subjects in order to divert her attention from the operation. Often it is possible with this technique so to divert the patient's attention that the operation can be performed before she realizes that anything more than a "little treatment" has been given.

## PREPARATION FOR OPERATION

Medication preoperatively has consisted of relatively large doses of morphine and  $\frac{1}{150}$  gr. of atropine given at least one hour before the operation is begun. The dosage of morphine is given in accordance with the weight of the patient and the severity of the hyperthyroidism as indicated by the basal metabolic rate. The higher the metabolic rate, the more tolerant is the patient of sedatives of all types. Practically no depression of respiration follows the hypodermic administration of  $\frac{1}{2}$  gr. of morphine to a patient who weighs 120 pounds and has a metabolic rate of plus 75 per cent. We are careful, however, not to use these larger doses in patients over 60 years of age unless we are certain that no hypersensitivity to morphine exists. When dealing with a patient with an excitable temperament and in whom it is desirable to give the maximum preoperative dose of morphine, we give trial doses before the operation to make certain that no untoward reaction will follow.

In patients with unstable temperaments, it has been our custom to have the anesthetist visit the patient on the ward and give oxygen inhalations every day for a week before the time of the actual operation. This acquaints the patient with the anesthetist and removes the fear of the gas

machine. When the operation is performed, the patient often does not realize that it is not merely the same treatment that she has had before. In order to make this possible, the patient is never informed of the date or time of the proposed operation and the operation is performed in the patient's room without moving her from her bed. When a nervous and emotional patient with hyperthyroidism has been prepared in this manner, when she has had a maximum dose of morphine, and when she is thoroughly accustomed to the anesthetist and the gas machine, it is relatively easy to prepare her for operation in the room.

#### TECHNIQUE OF LOCAL ANESTHESIA

If the neck is pinched hard before the insertion of the first small hypodermic needle and if the first injection is carried out slowly, the novocaine can be infiltrated practically without sensation. The anesthetist is always careful to warn the patient to expect this initial pinch. A solution of novocaine, 0.75 per cent, is used and adrenalin is never added when hyperthyroidism is present.

The first wheal is placed in the midpoint of the neck between the cricoid cartilage and the suprasternal notch. From this point the novocaine is infiltrated into the subcutaneous tissue along the line of the proposed incision. The injection is carried out slowly and care is taken not to allow the point of the needle to come through again to the sensitive skin. Painful intracutaneous infiltration is avoided, the solution being injected well beneath the skin. Sufficient time is allowed for the novocaine to anesthetize each area before a second needle is inserted. When the line of the proposed incision has been infiltrated thoroughly, the infiltration is carried upwards and downwards at the extremities of the transverse area of infiltration. In this way the cervical plexus, as it comes out from behind the sternocleidomastoid muscle, is blocked and the nerves traversing the neck from the lateral to the medial

aspects are anesthetized. The central portion can then be infiltrated quickly and without pain because the greater part of

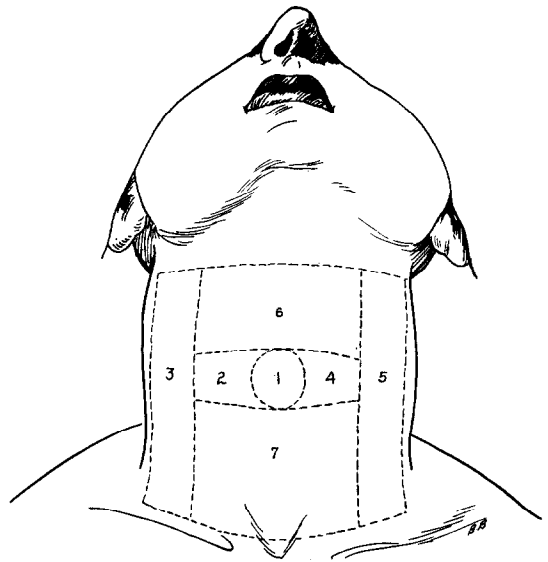


FIG. 1. The numbered areas are infiltrated in sequence in order to avoid as much sensation as possible during the procedure.\*

the innervation of this area has already been anesthetized by the lateral infiltration. (Fig. 1.)

After the skin incision has been made and the flaps elevated, the muscles are infiltrated with novocaine so that the patient will not be conscious of pressure sensations when the muscles are retracted to expose the gland. As a rule, the thyroid gland itself is almost without sensation and the injection of a little novocaine around the capsule, especially at the superior pole, is all that is necessary during the actual resection of the gland.

When the procedure is carried out in this manner, the patient is awake and talking with the anesthetist during the entire operation. Her general condition can be judged and the operation can be terminated after the resection of one lobe if the response is not satisfactory. Also, when the patient is conscious, she is better able to adjust herself to distortion of the larynx

\* No claim for originality is made for this technique. It is merely the method for infiltration which has been found to be most effective.

and trachea and can maintain an adequate respiratory exchange with greater ease than can a patient who is relaxed under a general anesthetic. Following such an anesthetic, the patient is alert and conscious and depression does not occur.

#### BASAL ANESTHESIA

There are certain cases in which it is practically impossible to carry out the above procedure satisfactorily. This is particularly true in the case of foreigners who do not understand English and whom it is impossible to reassure or distract by conversation during the operation. Younger patients tend to be less coöperative than elderly patients. Any patient who has been persistently uncoöperative during the pre-operative period is apt to be an unsuitable subject for this type of anesthesia. With experience, one can usually make a fairly accurate prognosis of how the patient will behave during the operation and when it is thought that she will not coöperate sufficiently to tolerate a thyroidectomy under local anesthesia with gas oxygen analgesia, it is usually advisable to consider the administration of some basal anesthetic agent.

When dealing with highly emotional patients, fear can produce so exaggerated an emotional response that a fatal thyroid crisis may ensue. We have seen one instance in which such a patient was merely draped for operation in her room and a small amount of gas oxygen analgesia given. The neck was not so much as infiltrated with novocaine, yet the pulse rate rose to 200 and within forty-eight hours she had died of a thyroid crisis. On the other hand, we have seen the pulse rate of a patient with severe hyperthyroidism rise 40 points within four hours after the administration of avertin anesthesia given as a sedative, in a dose of 60 mg. per kilogram of body weight, no operation having been performed.

The ideal basal anesthesia for thyroid surgery would be one whose action was not longer than one hour, one in which the

effects were constant and predictable, one which would produce amnesia or at least a dulling of the sensory threshold, one which would not be depressant to respiration, and finally a drug which would render the patient coöperative, quiet, and yet allow sufficient responsiveness for the patient to converse with the anesthetist during the operation.

In elderly patients and in patients who are emaciated or feeble, the depressing action of a basal anesthesia such as avertin may be sufficient to endanger life. For a number of years we have used small doses of avertin (60 to 70 mg. per kilogram of body weight) in younger patients and have found that it is both effective and safe, and that a satisfactory analgesia results in the majority of cases. The patients find that the induction of this type of anesthesia is pleasant and, despite the fact that they will talk and respond, there is almost complete amnesia.

Recently, paraldehyde has been recommended as a basal anesthesia.<sup>1</sup> Since our criticisms of avertin were: (1) that too profound a depression was produced to make its use safe in elderly patients; (2) that the drug was somewhat too variable in its action and produced a profound depression in some cases and a very slight effect in others; and (3) that its depression of respiration not infrequently led to definite cyanosis, we tried paraldehyde to see whether this drug had any advantages as a basal anesthesia.

#### COMPARISON OF RESULTS OBTAINED WITH DIFFERENT TYPES OF ANESTHETIC AGENTS

One hundred consecutive thyroidectomies were analyzed in regard to the effectiveness of the anesthetic agents used. In all cases the neck was infiltrated with an 0.75 per cent solution of novocaine. In forty-six of these cases, the operation was performed under gas oxygen analgesia with the administration of morphine and atropine preoperatively. In forty cases, the operation was performed under a basal

anesthesia of 1.4 c.c. of paraldehyde for each 10 pounds of body weight, this dosage being increased 25 per cent for each 50 points of elevation of the basal metabolic rate. We found the latter modification of dosage to be essential in the use of paraldehyde, because the susceptibility of the patient to the drug varied markedly with the degree of elevation of the basal metabolic rate. Lastly, in fourteen cases the operation was performed under 60 mg. of avertin per kilogram of body weight. The patients who received paraldehyde or avertin as a basal anesthesia were given small doses of morphine, usually  $\frac{1}{6}$  gr., whereas the patients who had only gas oxygen analgesia received  $\frac{1}{4}$  to  $\frac{1}{2}$  gr. of morphine at least one hour before operation. The paraldehyde was given by rectum in 2 or 3 ounces of starch water one hour or one and one-half hours before operation.

Paraldehyde is a simple depressant of the hydrocarbon group. It is an extremely safe drug and has a wide margin of safety (it has been said that 100 c.c. can be administered without untoward results). It produces quiet sleep with a minimum depression of respiration and blood pressure and it has no unpleasant side actions. It is eliminated largely by the lungs. After its administration by rectum, the patient is usually dozing in half an hour and the maximum depression occurs from one to one and one-half hours after the solution is given. It did not appear to be irritating to the rectum in any patient in this series, and on only one or two occasions was the drug expelled. As a rule, the patient is conscious and responds during and after the operation. In only two instances in the forty cases which have been reviewed did the patient fail to react sufficiently to answer questions. In these two cases the patients slept for approximately one hour. In three cases it was necessary to supplement the paraldehyde with gas oxygen analgesia, and in one case deep gas oxygen anesthesia was necessary because of the failure of the patient to cooperate. In all other instances, little or no gas was used.

In the group in which avertin was used, three of the fourteen patients could not be aroused at the close of the operation, and the period of unconsciousness varied from one-half to one and one-half hours. In one instance the basal anesthesia had to be supplemented with deep gas oxygen analgesia in order to obtain relaxation.

In the group in which morphine alone was used preoperatively, there were forty-seven patients, and in six instances deep analgesia had to be resorted to in order to obtain relaxation. In no instance was complete anesthesia (patient unconscious) necessary.

The coöperation of the patient, the drowsiness at the beginning of the operation, and the responsiveness of the patient during the operation were estimated by the anesthetist and graded from zero to four. For example, if the patient was so uncoöperative that deep gas oxygen analgesia and restraint were required, the coöperation would be graded zero. If the patient coöperated well and was not restless during the operation, the coöperation would be graded four. The amount of vomiting postoperatively, the amount of mucus postoperatively, the degree of amnesia, and the extent of the patient's unpleasant recollection of the operation were also graded from zero to four. The results of this tabulation appear in Table 1.

It is clear that the patients who had medication with only morphine preoperatively and were carried under gas oxygen analgesia were slightly more coöperative than were those who had basal anesthetics of either avertin or paraldehyde. It must be remembered, however, that extremely nervous patients in whom we anticipated difficulties were usually given a basal anesthetic. Nevertheless, it is our impression that a patient who has good emotional control will be more coöperative under gas oxygen analgesia with preoperative medication of only morphine and atropine than will the same patient under a light basal anesthesia. The basal anesthetic frequently appears to make the patient lose her

emotional control so that it is impossible to reason with her, an effect which is also noted when morphine is supplemented with nembutal or other barbiturate compounds given as a preoperative sedative.

TABLE I

RELATIVE EFFECTIVENESS OF ANESTHESIA IN 100 CONSECUTIVE THYROIDECTOMIES  
Graded from Zero to Four

	Patients Receiving Morphine Gr. $\frac{1}{4}$ – $\frac{1}{2}$ and Gas Oxygen Analgesia	Patients Receiving Paralde- hyde (1.4 C.c. per 10 Lbs. Wt.) and Morphine Gr. $\frac{1}{8}$	Patients Receiving Avertin (60 Mg. per Kilo) and Morphine Gr. $\frac{1}{8}$
Coöperation of patient during operation.....	3.8	3.7	3.2
Drowsiness at beginning of operation.....	0	1.8	2.1
Responsiveness during operation.....	4.0	3.3	3.1
Vomiting after operation....	0.95	0.8	1.0
Mucus after operation.....	0.46	0.68	0.5
Amnesia regarding operation.....	0.15	1.9	2.7
Unpleasant recollections of operation.....	0.72	0.05	0.07

The patients who had avertin were the most drowsy at the time of operation. Those with paraldehyde appeared to be somewhat more alert. Likewise, the patients with paraldehyde appeared to be more responsive than those who had avertin but not so responsive as those who had morphine alone.

The combination of paraldehyde and morphine appeared to produce some gagging and vomiting during the operation in about one case in ten. This same reaction was noted, however, in some patients who had morphine alone, and it is therefore not improbable that it represents a sensitivity to morphine rather than to paraldehyde.

After operation, the patients who had paraldehyde appeared to have somewhat more trouble with mucus. In addition to this, pneumonia developed postoperatively in two instances in this group. One of these patients had recently had an infection of the upper respiratory tract, on which this complication could be blamed, but the other patient was a young man with a

simple goiter who had no complication at the time of operation and yet a mild pneumonia developed postoperatively. Both of these patients convalesced uneventfully, but it is our impression that paraldehyde, since it is excreted largely through the lungs, may predispose to pulmonary complications. No pulmonary complications occurred in the group of forty-six patients who had morphine alone. This is significant, because patients in this group were the oldest in the entire series and only one death occurred—that being the result of cardiac failure secondary to a coronary thrombosis.

It is interesting to note that some degree of vomiting occurred in exactly 50 per cent of the cases in all three groups. The reason for this vomiting is not clear, because in many instances it appeared to be completely independent of the administration of narcotics. It is not improbable that it represents a reflex carried by the innervation of the thyroid and pharyngeal regions.

Thirty-three (72 per cent) of the forty-six patients who had morphine alone stated that the operation caused no discomfort whatsoever. Three patients stated that there was a slight unpleasant sensation, but that, on the whole, they would rather have the operation under local anesthesia than to be asleep. The remaining ten patients (22 per cent) experienced varying degrees of discomfort and stated that they considered the experience of the operation to have been definitely unpleasant. It is interesting to note in this connection that five of these ten patients had been graded preoperatively as having a "4+ nervous temperament." In short, the complaints are generally the result of fear, the patient interpreting pulling sensations or choking sensations as pain. It is extremely rare that actual pain is experienced.

In the group in which avertin was used as a basal anesthetic, only one patient complained of any unpleasant sensation, but this patient also stated she would rather be conscious and undergo the slight discomfort than to have a general anes-

thetic. In the group having paraldehyde, only two of the forty patients complained of discomfort. Both of these patients stated that they preferred to be awake and to experience this discomfort.

In summarizing the subject of discomfort, it can be said that in the great majority of instances, the sensations are caused by emotional instability which results in the interpretation of pressure sensations as pain. When large doses of morphia are given, this reaction is diminished and when a basal anesthetic is given, practically all unpleasant sensations are abolished.

Some degree of amnesia occurred twice in the forty-six patients who had morphine alone. By this it is meant that the patient was not certain whether or not the operation had been performed. She remembered certain experiences but was unable to interpret them and the entire operation seemed like a dream.

Fifteen of the forty patients who received paraldehyde had complete amnesia, that is, they were able to remember nothing whatever of the operation. Four patients had almost complete amnesia and remembered only talking with the anesthetist. One patient could remember in a general way that the operation had been performed, but could not remember where she felt the sensation. Two patients felt that the entire operation had been a dream. Eighteen patients had no amnesia whatever, remembered the operation clearly, but could recall no apprehension or discomfort.

More complete amnesia was obtained in the patients receiving avertin. Nine of the patients remembered nothing, one patient remembered hazily that the operation was being performed, but was not certain whether she had any sensation, and four patients remembered the entire procedure clearly, but experienced no discomfort.

Our experience with the use of paraldehyde as a basal anesthetic agent can be summarized in the following manner:

1. This drug affords a satisfactory basal anesthesia, but the duration of its action is longer than is necessary for thyroid surgery. The patient is depressed for several hours and the odor of paraldehyde remains on his breath for at least twenty-four hours.

2. Paraldehyde appears to produce some slight irritation of the respiratory tract and in two instances in this series mild cases of pneumonia developed postoperatively.

3. The odor is offensive.

4. The drug is absorbed slowly and must be administered from an hour to one and one-half hours before operation, a length of time which is not always convenient.

5. In a few instances it appears that the tendency to gag and vomit at the time of operation is increased by the use of this drug.

The advantages of paraldehyde, however, are:

1. The respiratory rate and exchange do not seem to be depressed, as is occasionally the case when avertin is used.

2. The patients appear to be slightly more coöperative with paraldehyde anesthesia than with avertin.

3. Its action is perhaps a little more consistent and predictable than is that of avertin.

#### SUMMARY

1. No single anesthetic agent which is available at the present time is ideal for all operations upon the thyroid gland.

2. In some instances, it is essential to avoid the psychic shock of operation under local anesthesia and in these cases, particularly in younger patients, a basal anesthesia is of definite advantage.

3. It is inadvisable to subject elderly or debilitated patients to the depressant effects of either general or basal anesthetics. In these cases the postoperative course is smoother if the operation can be performed under local anesthesia with a minimum of gas oxygen analgesia.

4. It should be remembered that the drug sensitivity of patients with hyperthy-

roidism varies with the basal metabolic rate and that patients with high rates tolerate larger doses of morphine and larger doses of the basal anesthetics than do those with normal or low metabolic rates.

5. In patients who are poor operative risks and to whom it is not desirable to administer a basal anesthetic, yet whose temperament is such that psychic trauma should be avoided, it is important to have the patient become accustomed to the presence of the anesthetist and the gas machine before the operation. If this plan is followed, if the operation is performed in the patient's room, and if an adequate dose of morphine is given before the operation, the great majority of patients can be carried through the operation under local anesthesia without experiencing undue apprehension or discomfort.

6. In young patients who are good risks, there is no contraindication to the administration of an adequate basal anesthesia, so that amnesia can make the operation an experience which can be looked back upon without unpleasant recollections.

7. Avertin in doses of 60 or 70 mg. per kilogram of body weight or paraldehyde in doses of 1.4 c.c. per 10 pounds body weight is a satisfactory basal anesthetic for young patients who are good operative risks. Our preference is for avertin.

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