ANÆSTHESIA IN THYROID SURGERY.


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The subject of anaesthesia in thyroid surgery was discussed at a meeting of the Anæsthetic Section of the Royal Society of Medicine on December 2nd, 1927, following a most able paper read by T. P. Dunhill. Since that date, two innovations in anæsthetics have appeared which have to some extent modified our former views; these are: The introduction of avertin and percain. And it may be interesting to consider how we can take advantage of these drugs to diminish still further the risks of thyroid surgery. In order to evaluate to some extent the magnitude of these risks, the writer has compiled figures for the operation mortality of the consecutive one thousand thyroid operations of every description anæsthetised by him prior to the introduction of the above-mentioned drugs:

1,000 Consecutive Thyroid Operations (partial thyroidectomy or ligature of thyroid arteries): 160 male, 840 females.

Immediate Mortality, i.e., deaths on operating table: Two cases, 0.2 per cent.

1. Middle-aged woman with toxic goitre. Preliminary injection of morphia gr. \(\frac{1}{2}\); scopolamine gr. \(\frac{1}{100}\). Local infiltration with novocain 0.5 per cent, adrenalin 1 in 200,000. Sudden heart failure before operation started.

2. Young girl with toxic goitre (auricular fibrillation). Preliminary injection of morphia gr. \(\frac{1}{2}\), scopolamine gr. \(\frac{1}{100}\). Local infiltration with novocain 0.5 per cent, adrenalin 1 in 200,000. Inhalation anæsthesia with nitrous-oxide oxygen. Sudden heart failure at end of operation while skin was being sutured.

Remote Mortality, i.e., deaths within 48 hours: Four cases, 0.4 per cent.
Three patients developed acute hyperthyroidism, two of which had severe tracheitis in addition. They were anaesthetized with the morphia-scopolamine, local, N₂O/O₂ technique.

The fourth case had morphia-scopolamine and local analgesia only. She died of broncho-pneumonia. An influenza epidemic was prevalent at the time, and it was thought possible that she contracted the infection. This was the only instance of pneumonia in the series.

Non-fatal Complications.

(1) Reactionary haemorrhage, sufficiently severe to necessitate reopening the wound: Nine cases, 0.9 per cent. Six had local infiltration only and three had N₂O/O₂ in addition. It would seem that the comparatively dry wounds obtained with adrenalin without general anaesthesia do tend to give rise to subsequent oozing when the vaso-constrictive effect passes off.

(2) Tracheitis: 16 cases, 1.6 per cent.
Curiously enough, only two of these had endo-tracheal anaesthesia. The condition appeared to be due to the baring of the trachea during the operation and damage to the laryngeal nerves.

(3) Conjunctivitis and Keratitis: 21 cases, 2.1 per cent.
All occurred in patients suffering from pronounced exophthalmos. It is most important to see that the eyeball is kept lubricated with castor oil or liquid paraffin, and that no towels touch it during the operation. In extreme exophthalmias it may be necessary to keep the lids together with strapping.

In reviewing the fatalities of this series, we see that they total six cases (0.6 per cent). A figure which is lamentably high. The causes of death appear to be:

(1) Heart failure before operation, apparently caused by injection of novocain and/or adrenalin in a toxic goitre patient.

(2) Heart failure at end of operation possibly caused by too great limitation of oxygen in a toxic goitre patient.
Heart failure after operation caused by the toxic effect of excessive or abnormal thyroid secretion.

Pneumonia after operation, possibly due to intercurrent infection.

The question which naturally arises is—Can these causes be eliminated or lessened? There seems to be some hope that they can.

Considering avertin first of all, we have a drug which ensures a quiet induction of anaesthesia in bed with the elimination of that apprehension which is such an important factor in thyroid surgery. If given in safe dosage it permits of a superimposed nitrous oxide-oxygen anaesthesia with a sufficiently high percentage of oxygen to avoid the least suspicion of cyanosis. This is not the case if morphine-scolopomine is substituted. Again, there is some evidence to show that the bromine in avertin acts in a similar way to the iodine in Lugol's solution by combining with the unsaturated thyroxin so that acute hyperthyroidism after operation should be less common. It is possible that one of the barbituric acid compounds such as "nembutal" given intravenously may supersede avertin, but this remains to be proved, although Ramsay and Little have reported favourable results with sodium amytal in 27 partial thyroidectomies: at any rate there is no doubt that the benefits awarded by some basal narcotic are now established.

Turning next to percaine, we have to consider what advantage, if any, it has over novocain, the drug which until recently has been used almost exclusively for infiltration. In this connection we are faced with the difficulty, which always arises after fatalities occurring under local analgesia, of deciding whether the novocain or the adrenalin is the toxic factor. It is unfortunate that no known local analgesia except cocaine is a good vaso-constrictor and that a strength of at least 1 in 200,000 adrenalin is necessary to produce adequate ischaemia whether novocain or percaine is employed. Crile considers that adrenalin is definitely contraindicated in toxic goitre cases and uses pure novocaine. On the other hand it is now definitely established that novocaine solutions without adrenalin can cause death, and three such fatalities have
occurred quite lately. Furthermore there are few surgeons who are willing to forego the bloodless wounds offered by adrenalin; so we must leave this factor untouched for the present, and simply compare percaine with novocain. The newer drug can, of course, be used in a high dilution, and it appears to be generally agreed that 0.05 per cent percaine is less toxic than 0.25 per cent novocain which is the weakest effective solution. The total amount of percaine which is safe to inject into an adult at one time is estimated at 0.2 grms. which means 400 c.c. of a 1 in 2,000 solution, a quantity which should be more than adequate for the most ambitious anaesthetist. The analgesia afforded by percaine lasts considerably longer than that of novocain, so that post-operative pain is lessened. The few cases which the writer has infiltrated with 0.05 per cent percaine and 1 in 200,000 adrenalin have been quite satisfactory, but an inadequate number have been performed for a fair comparison with novocain to be made. Whichever solution is used, it is most important that none be injected intravenously, a point which will be elaborated later.

In the light of these recent developments in anaesthesia we might next consider the actual technique applicable to different types of thyroid operations.

The Classification of goitres from a pathological standpoint has involved much abstruse thought, but the anaesthetist may regard them in a totally unscientific and perfectly straightforward way. They may be simple, toxic, obstructive, or combined, i.e., both toxic and obstructive. The number of possible combinations of basal narcotics, local analgesics and general anaesthetics is, of course, enormous and the following is merely an attempt to describe briefly methods which the writer has found to be the most generally satisfactory in each type of case.

Simple goitres are those which give rise to no toxic or obstructive symptoms. In this connection one is reminded of the dictum of a famous surgeon who said: "Show me a gall bladder which is easy to remove, and I will show you one which does not need removing." Still, simple goitres are sometimes operated upon, mainly for cosmetic reasons. The
anaesthesia of such patients presents no special difficulty. A good technique is:

Preliminary hypodermic injection of morphia gr. $\frac{1}{4}$ and scopolamine gr. $\frac{1}{100}$ one hour before operation. Local infiltration of neck with 0.25 per cent novocain and 1 in 200,000 adrenalin followed by inhalation of nitrous oxide and oxygen.

Toxic goitres affect the anaesthetist mainly from their effect on the circulatory system. This may vary from a slight tachycardia to auricular fibrillation with decompensation. (93 patients out of the series of 1,000 were fibrillating). Certain patients with toxic goitre are also extremely nervous, and the slightest emotion greatly accelerates their pulse-rates. The basal metabolic rate of the group is always high. Patients suffering from the severe forms of this disease are very ill and require the most careful handling. Sometimes, indeed, it is unsafe to do more than ligature one thyroid artery at the first operation. After trying most anaesthetic techniques, the writer is of the opinion that the following gives the best all-round results. For some time before operation the patient is given an adequate daily dose of iodine and the date of the proposed surgical interference is never mentioned.

Two days before operation: Saline enema given.
One day before operation: Saline enema given at same time.
Three hours before operation: Lugol’s solution m. xxv.
Two hours before operation: Morphine gr. $\frac{1}{4}$ hypodermically.
One hour before operation: Avertin 0.1 grm. per kilogram of patient’s weight. This is slowly run into the rectum in a freshly prepared three per cent solution at body temperature. The injection should be at approximately the same time as that of the previous rectal salines. In nearly every case the patient will gradually become unconscious before realising that anything unusual is happening. The ears are then gently plugged with wool, the eyes are bandaged, and at the appointed time he is transferred to the operating table, where he is placed in the thyroid position and his forearms and thighs secured by towels against unexpected movements. The neck is
next infiltrated with either 0.25 per cent novocain or 0.05 per cent peracain and 1 in 200,000 adrenalin. A collar-shaped infiltration is performed starting from a mid-line wheal. The solution is then injected deeply through the analgesia area above and behind the upper pole of the thyroid gland so as to block the cervical nerves in the region of the transverse processes of the cervical vertebrae. In order to minimize the risk of the solution entering a vein, the needle point is kept on the move and the injection is made during the movements of withdrawal and not on those of entry.

The face-piece is next fixed in position with the rubber harness devised by Mr. Clausen and the operation is started. In a few cases no further intervention on the anaesthetist's part will be required. Usually, however, the enucleation of the thyroid gland gives rise to some tracheal traction and the patient may resent this and begin to move. If this is the case the flexible hose of the nitrous-oxide-oxygen apparatus is connected to the face-piece and inhalation anaesthesia started. It is unnecessary to interrupt the course of the operation and the patient is invariably still within two or three minutes. A high proportion of oxygen (usually 22 to 28 per cent) can be used, thus giving the main advantage of ethylene-oxygen without the drawbacks. The green towels now fashionable in certain surgical circles throw a blue shadow on the face and it is impossible to judge the patient's colour from observation of his lips or ears, and consequently the capillary ooze in the wound must be watched. This may sound a trivial matter, but the writer has often noticed that the faintest trace of cyanosis accelerates the pulse-rate of toxic goitre patients and is to be avoided. The frequency with which nitrous-oxide and oxygen is necessary can be judged by the fact that 72 out of the first 100 patients given this method required it. The anaesthetist should keep one finger upon the superficial temporal pulse and must be in a position to advise the surgeon whether the operation can or cannot be completed in safety in one stage. The after-effects of the anaesthetic are gratifyingly few, vomiting being rare. A nurse must, however, be in attendance for some time in case assistance is needed to clear the airway. Of the first 100 cases anaesthetized in this
way 84 were women and 16 men: 30 patients had continuous auricular fibrillation before operation. There has been one death, which occurred on the third day after operation from acute thyrotoxicosis.

Obstructive goitres present an entirely different problem and the main concern of the anaesthetist is to provide an efficient airway throughout the operation. It should be observed that if severe respiratory obstruction is present there will almost certainly be some venous obstruction as well, with consequent engorgement of the cervical veins. The commonest situations for tracheal obstruction are lateral compression in the neck from the two lobes of the thyroid gland and antero-posterior constriction in the thorax between the convexity of the spine behind and the tumour pushed back by the sternum in front. In addition, the whole trachea is sometimes displaced sideways from a unilateral goitre. A radiogram will often locate the site and nature of the obstruction.

The actual anaesthetic technique must be modified to suit each individual patient, but the following points seem worthy of attention. A small preliminary hypnotic incorporating a large dose of atropin is desirable, and the patient is placed upon the operating table in the position in which he breathes most comfortably. If he has a thoracic goitre this position will probably be with the head somewhat flexed. A local infiltration of the neck is next performed and most patients prefer to be rendered unconscious with nitrous-oxide and oxygen. Many operations can be safely accomplished with this simple method, but the anaesthetist must be prepared to pass a tracheal catheter at any moment should necessity arise. A soft rubber intubation tube will not, as a rule, be effective, as it will not pass the obstructions, but a semi-rigid catheter can usually be coaxed past, and on continuing the anaesthetic by insufflation, the gases will find their way out without the need for passing a second tube. A preliminary cocaineization of the larynx may render this manoeuvre less difficult. In extreme degrees of obstruction from thoracic goitre it may be necessary to have the head held right forward, and in these rare cases a smooth induction of anaesthesia may be made with
open chloroform. In the writer's opinion, this is the only occasion when chloroform is justifiable in thyroid surgery. When the sternum is split or the tumour is delivered by other means, the obstruction is usually relieved. During the course of the operation it is possible that one or rarely both pleural cavities may be opened. If this occurs, the anaesthetist must be prepared to maintain an adequate degree of positive pressure. If an endotracheal catheter has been used, caution must be observed when it is removed after operation. Certain types of large goitres lead to tracheal softening, and in one case complete obstruction occurred when the tube was removed owing to collapse of the trachea. The anaesthetist should, therefore, be prepared to reintroduce the catheter should this be necessary. A final word of caution may be added. In no circumstances whatever should an obstructive goitre be anaesthetized in bed or with any relative present. There are few situations more appalling than to see progressive respiratory obstruction occurring during the induction of anaesthesia in a bedroom with the anxious mother watching and with one's main apparatus in a distant theatre.

Combined toxic and obstructive goitres are not uncommon, and each case must be considered on its merits. One or other symptom is usually predominant and this should determine the anaesthetic technique to be adopted.

In conclusion it can be said that thyroid surgery offers a most interesting field to the progressive anaesthetist, and one in which his constant alertness is essential, since awkward situations can develop in a surprisingly short time.