

## SOME CONSIDERATIONS ON THE OPERATION FOR EXOPHTHALMIC GOITRE.

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### GENERAL OBSERVATIONS.

WHEN surgeons, in places far distant from one another, are working at the same problem, it is inevitable that they will evolve ideas and corresponding technique along lines that differ in some respects. Especially will this be so in such a matter as the operation for exophthalmic goitre, where, in the beginning, the death-rate was arrestingly high, and where there were differences of opinion as to what were the causes of death and what measures in the technique made for safety.

The following is the technique which I follow. Each step has been worked out as seemed best under the various difficulties met with in a long series of cases. It differs in some respects from that followed at the Mayo clinic, chiefly in three points: (1) Anæsthesia; (2) No preliminary ligation of arteries; (3) Not leaving a shaving of the first lobe posteriorly. These points will be referred to later. It cannot be said that one way is right and another wrong, although sometimes practices that we follow rigidly, believing them to be essential, may in reality be only habits.

### OPERATIVE TECHNIQUE.

In writings on this subject, some authors are vague on points where extreme lucidity is required; some give directions which I think are wrong, and cause unnecessary danger; few, if any, give details of the procedure for removing a portion of a second lobe. Although Kocher spoke and wrote long ago of the collar incision, too often the incision made approaches a U shape. This is not only seen on watching surgeons operate, but is figured in articles on the subject. The incision should be a true collar shape accurately following the crease in the neck (Fig. 225). The subsequent disappearance of the scar depends on this more than on any accuracy of skin approximation or method of suturing. The slightest deviation from what may be called the 'line of cleavage' in the skin means a thickened scar. This is as unnecessary as it is ugly. Furthermore, there is no goitre of such size or position that it cannot be removed easily through a true collar incision. This incision should be deepened until it divides the platysma completely, but it should not divide the deep fascia; thus it leaves the anterior jugular veins and the infrahyoid muscles intact. These veins and the infrahyoid muscles require transverse division only on the rarest occasions. The upper flap should be dissected well up to the upper level of the thyroid cartilage, the lower one well down to the episternal notch. This is in order that the next step—the median incision which divides the deep fascia down to the thyroid cartilage and the thyroid isthmus—may be of such vertical extent that it will permit wide lateral retraction

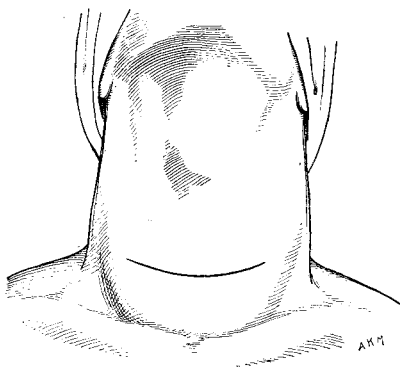


FIG. 225.—The collar incision, which can be extended to any necessary length. It leaves the minimum scar and gives sufficient access for any goitre.

of the fascia. The deep fascia, on either side of this incision, contains the anterior jugular veins and the infrahyoid muscles. In all the illustrations which I have seen, these muscles are shown divided. I have found this to be seldom necessary. It does facilitate the dislocation of very large goitres, lessening the strain felt by the patient as the upper pole is drawn down; but except in these cases, the muscles are not cut.

At this stage it is necessary to pick up and divide areolar tissue which invests the gland, forming pseudo-capsules, until there is nothing surrounding the gland outside its own true microscopical capsule. The separation between the areolar pseudo-capsules and this true capsule must be carried out very thoroughly if one is to avoid getting into wrong planes, with all the consequent difficulty and hæmorrhage. Once the separation is well defined—and it should only be defined on the side on which the lobe is to be removed—it is best carried out at first by the handle of the knife, under vision, until it

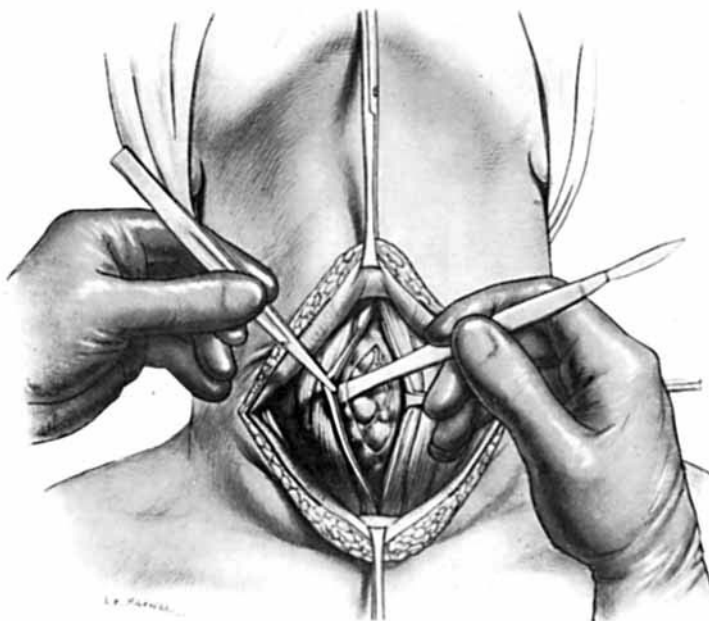


FIG. 226.—Showing the collar incision; the vertical separation between the infrahyoid muscles of the two sides; the beginning of the separation of the innermost encapsulating layer of areolar tissue. This layer should have been shown picked up by the forceps.

is well begun, lifting up the deep fascia containing the infrahyoid muscles of the corresponding side with a pair of Rutherford Morison tissue forceps (*Fig. 226*); then by the finger slipped under the same layer, and feeling its way in the right plane, first upwards and then downwards, up to the superior pole, and then around the anterolateral border of the lobe to the posterior surface and well behind the upper pole (*Fig. 227*). At this stage I find it convenient to change round to the other side of the operating table. This is purely a personal matter, but I find it much easier to dislocate the lobe when I work from the opposite side of the table; it enables me to use the thumb (of the left hand) as a fulcrum on the mesial aspect of the lobe, while the index and the middle fingers can grip the lobe firmly on its posterolateral aspect. This separation of the lobe from its enveloping areolar sheaths should be carried out very thoroughly before any attempt is made to dislocate the lobe. When the separation has been carried out in this thorough fashion,

FIG. 227.—The operator has changed sides; the forefinger of the left hand sweeps up and down, freeing the right lobe from the upper to lower pole on the anterior and lateral aspects.

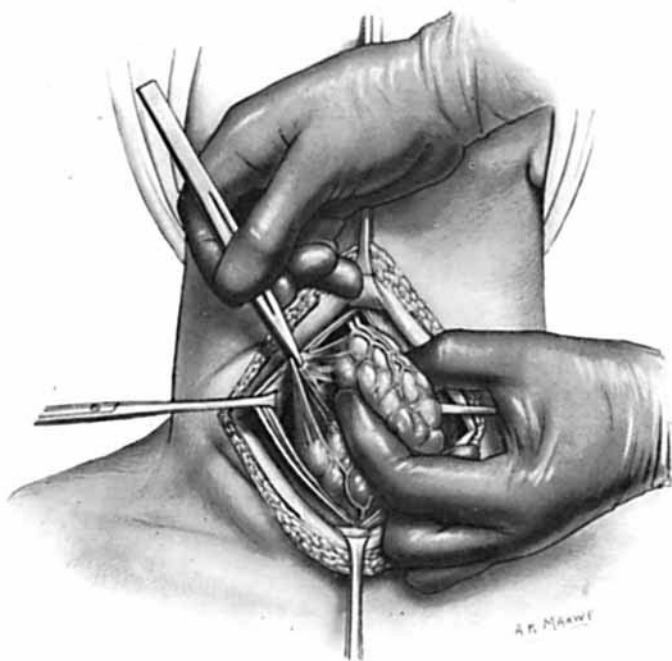
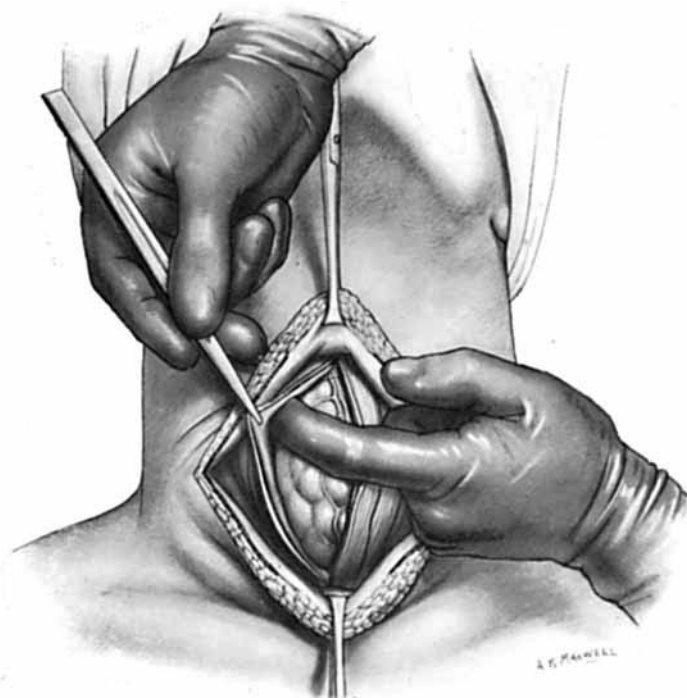


FIG. 228. — Peeling back the enveloping layers of areolar tissue, after partially delivering the lobe, thus carrying back the inferior laryngeal nerve and parathyroids. This allows complete delivery and cleans the vessels as they reach the upper pole. There has been no transverse division of the infrahyoid muscles.

and the lobe gripped in the manner indicated, the upper pole can be fairly readily dislocated. It may be difficult if the lobe approaches the base of the skull, or wraps itself behind the larynx. In this case it is wise to divide the infrahyoid muscles of that side, high up; otherwise these muscles, with their investing fascia, are well retracted by an assistant, and at the same time pressed backwards behind the lobe which is being delivered. Whilst the lobe is being delivered, it will be seen to be bound down in position by investing layers of areolar tissue on its lateral surface. Some of these run off laterally into the planes of the neck. Others invest the gland, its protuberances, and intervening clefts very intimately. In this tissue run many newly-formed blood-vessels. In it also may lie the parathyroid glands and the recurrent laryngeal nerve. Frequently, before the dislocation can be completed, this areolar tissue must be peeled back from the lateral

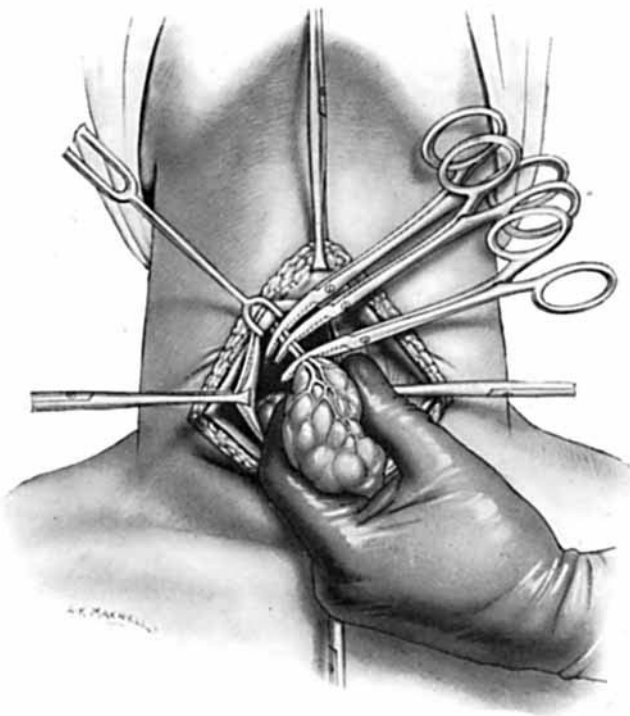


FIG. 229.—Forceps clamping superior thyroid vessels.

surface by the aid of a pair of plain-pointed dissecting forceps, the lobe being held firmly by the thumb and fingers the while (*Fig. 228*). The more thoroughly this is done, the more readily will the lobe be dislocated. The vessels which run in this tissue do not interfere with the dislocation if the proceeding is carried out in the manner indicated. They almost all enter the gland at the posterolateral margin and the posterior surface.

As the upper pole comes out of its bed, this stripping of the areolar tissue is to be carried on until the pole and its pedicle are very clean and the vessels clearly defined. The pedicle is clamped with three pairs of forceps (*Fig. 229*), preferably with a curved grip. The pair nearest to the gland is to stop reflux bleeding after division of the vessels. Of the other two, the proximal one is to crush a collar in which a ligature may lie with no fear of slipping off, whilst the vessels are held down by the other to facilitate tying. It is to be remembered that in the dislocation the upper pole has been drawn far down from

the position which it has become accustomed to occupy, and therefore, when the vessels have been clamped and divided, there is still great tension on them when they are held sufficiently far down for them to be ligated. Unless some provision, such as crushing out a collar, be made for preventing the slipping of the ligature, the surgeon will certainly find himself, not infrequently, searching for a bleeding superior thyroid artery which has retracted far behind the neck muscles. When I followed the practice of ligating this stretched vessel and dividing it between ligatures, as still figured in some books on operative surgery, I had many thrills and one catastrophe. Since I have adopted the plan of applying two pairs of forceps, one to crush out a neck around which a ligature may safely lie, I have never had a ligature slip, and, consequently, never a hæmorrhage from the superior thyroid vessels

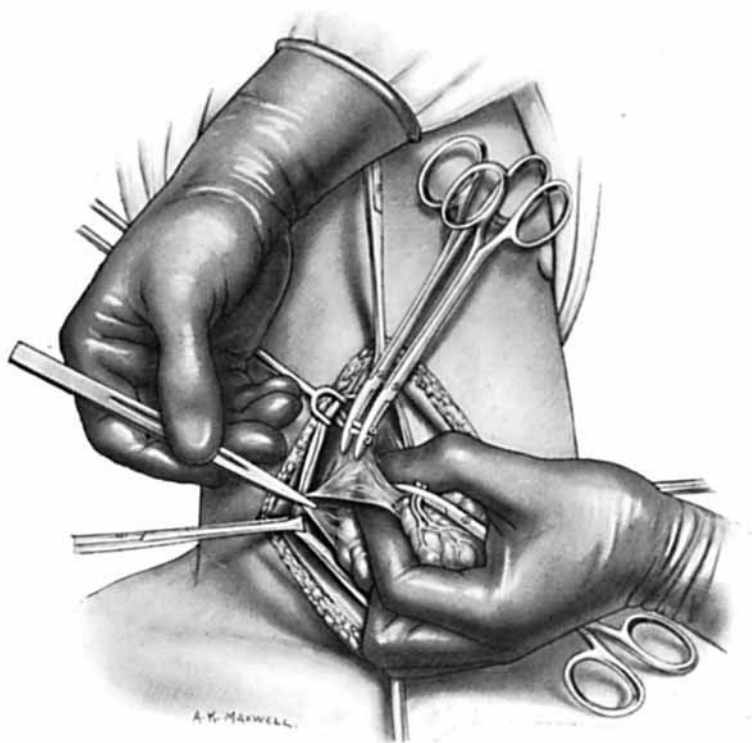


FIG. 230.—Vessels divided. Freeing the posterior surface from the investing areolar tissue.

When the pedicle has been divided, the clamp which has been applied close to the gland, and which practically grips the upper pole where the vessels join it, is used to draw this pole forwards; as it does so, the pole, drawn forwards from its bed, lifts forwards like the roof of a tent the layers of areolar tissue which covered the lobe and extended on to the vessels and laterally over the carotid sheath. This opens, behind the pole, a more or less triangular space bounded by the lobe in front, the trachea mesially, and the areolar tissue carrying many small and some large vessels which join the gland about its posterolateral margin. The lateral surface has been already fairly well cleaned. Into this very definite space (the surgeon being on the opposite side of the patient) the thumb of the left hand is placed, while the fingers of the same hand grip the outer side of the lobe; thus the lobe can be drawn firmly forwards and downwards (*Fig. 230*). This puts on the stretch

the areolar tissue carrying the vessels which run to the posterolateral margin. The vessels are defined with the point of a pair of plain dissecting forceps, the areolar tissue being stroked well away from the gland and carrying with it the parathyroid glands and the recurrent laryngeal nerve. The vessels are clamped very close to the gland, and divided. As each successive portion is cleaned and freed in this way, the next portion is put on the stretch, and this rather difficult part of the operation is made comparatively easy. It is when this is not done in a careful way that parathyroids may be injured or recurrent laryngeal nerves divided. There are always some large veins about the middle of the lobe, and many adventitious vessels, called into being or enlarged by the pathological activity of the gland.

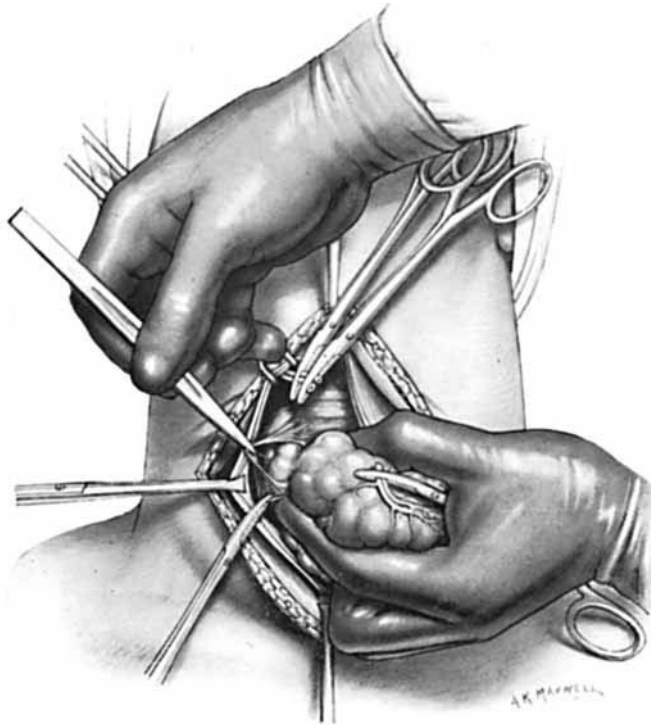


FIG. 231.—The protuberance from the posterior border sometimes present; sometimes extending behind trachea, sometimes pedunculated, and generally closely invested with areolar tissue.

In a large percentage of severe cases there are, growing from the posterior border as it lies along the posterolateral aspect of the trachea, one or more protuberances, more or less pedunculated, and with the bases often enough tightly invested with areolar tissue (*Fig. 231*). These outgrowths wedge themselves in behind the trachea, and if, as frequently happens, there is a narrow neck, they are difficult to enucleate and very easy to leave. They must be enucleated, or they will increase in size later, with recurrence of all the symptoms; and they must be enucleated with the greatest care, or the recurrent laryngeal nerve will be certainly damaged.

The inferior thyroid vessels, which enter about the junction of the middle and lower third, are defined, cleaned, and divided in the same way. The lower pole can then usually be completely rolled out from its bed.

If, on the other hand, this part of the operation is performed in a manner originally

described by Halsted and followed extensively, viz., by intracapsular ligation of vessels, it may prevent injury to parathyroid glands and recurrent laryngeal nerves, but in my opinion it will leave so much gland tissue that it will prevent efficient amelioration of the symptoms of the disease.

In dealing with the postero-internal surface, the surface which embraces the trachea, one small portion of this surface, the 'threepenny patch' of Professor A. Watson, will be found to be attached to the upper one or two rings of the trachea without the intervention of obvious areolar tissue. Apart from this, there is no actual adhesion of the gland to the trachea; it can be separated along the plane of areolar tissue. At the same time this part of the operation may be extraordinarily difficult. This areolar tissue conducts, in a severe case of Graves's disease, newly-formed, brittle, and often surprisingly large vessels, almost too short to clamp or to hold a ligature when clamped, and covered by a gland which is rigid, quite unpliant, but friable in the extreme. It can cause a situation of great difficulty, and will sometimes make a surgeon wish that he were well out of the job.

The lower end of the pole is invested quite loosely by areolar tissue containing some small veins and one large vein. This pole is cleaned and freed without difficulty. There only remains the separation of the isthmus from the front of the trachea, and the decision as to where the division is to be made. The isthmus is to be peeled cleanly off the trachea. Failure to keep to the areolar tissue plane between the isthmus and the trachea results in leaving attached to the trachea a certain amount of gland tissue which will inevitably grow and reproduce symptoms later. The gland is never actually adherent in this situation.

As to where the division should be made, one must always remember that it may be necessary to operate again, and a patient should be so left that a subsequent operation will be as free from difficulties as possible. If the isthmus is left it will almost certainly grow into a lobe. Even if it does not, it is left in what has been the field of operation, and it will become surrounded with scar tissue. Therefore its removal at a subsequent operation will be difficult, and impossible to do nicely. To avoid this, pull gently on the isthmus; at the same time the assistant retracts the deep fascia of the opposite side (containing the uncut and undisturbed infrahyoid muscles) sufficiently to enable the isthmus to be divided cleanly at its junction with the left lobe. The fascia and muscles fall back into place, and the left lobe is in this way left undisturbed. The only adhesions or scar tissue likely to form will be over the very slight raw surface where the isthmus joined the lobe.

Kocher devised a clamp for crushing the isthmus before dividing it, and others have figured the presenting portion of the left lobe which had adjoined the isthmus at the site of division as accurately closed by sutures. I regard both procedures as unwise, and have given my reasons in a previous article.<sup>1</sup> No thyroid tissue should ever be crushed, and no cut surface of gland should ever be closed by suture, with the exception of underrunning a point to control a bleeding vessel.

The vessels are then ligated. It is not wise to stop during the removal of the lobe to ligate them; when once one has begun to handle a lobe, the sooner it is out the better. It is unnecessary to insist on the careful ligation of these vessels (*Fig. 232*). They are situated in a position where every movement of swallowing rubs them against the structures which are in relation to them. Drainage is provided through a small stab incision in the mid-line below the collar incision, for twenty-four hours. Rolled rubber dam makes a good drain.

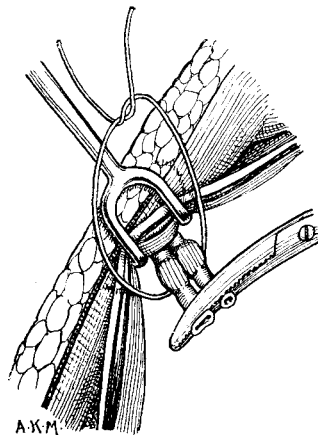


FIG. 232.—Method of ligating superior thyroid artery. The knot lies in the neck crushed by the proximal pair of forceps.

In most cases, the surgeon should stop after the removal of one lobe and the isthmus (Fig. 233). In some this will be sufficient to restore the equilibrium of the patient, but not in many. In many more it will be as much as the patient can stand at one time. In some cases the surgeon's judgement will tell him that more will need to be done, and he

will know that the patient is well able to stand it at the one operation. Under such circumstances he will go on.

To close the deep wound the fascia of each side containing the infrahyoid muscles is sutured in the mid-line. This line of sutures should begin below, close to the manubrium sterni, only leaving sufficient space for the small drain. If it does not commence as low as this, the skin for some reason always becomes adherent to the trachea at the root of the neck, and ultimately is drawn down, forming an unsightly depression. The skin incision is closed accurately. Some of the sutures are removed on the second day; most on the fourth; a few remaining sutures are left until the sixth or seventh day.

The second operation will usually be performed about three or four months after the first. The skin incision is made accurately in the line of the first, and deepened to the same extent. The vertical incision will be made sufficiently lateral to the corresponding

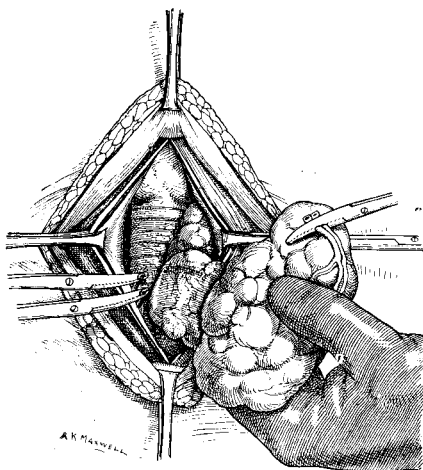


FIG. 233.—The right lobe free, and the isthmus cleanly dissected off the trachea. In a two-stage operation the isthmus and the right lobe would be removed at the first operation.

incision of the first operation to ensure that it will be away from the scar tissue of the original operation, so that when it is deepened it comes on to non-adherent gland. At the original operation the infrahyoid muscles of the untouched side were lifted only sufficiently to enable the isthmus to be followed cleanly to its junction with the lobe which was to be left, and no further. As far as that separation went there will be scar tissue. At this operation, one reaps the advantages of the care bestowed on the finishing of the previous operation. It will probably be wise to make the vertical incision near the outer border of the sternohyoid muscle. One dissects down to the gland with the same meticulous care as before. After cleaning the front of the lobe—which is free from adhesions because undisturbed at the first operation—well on to the lateral aspect and the lower pole, the part which adjoins the mesial edge of the lobe and is embedded in scar tissue resulting from the original division at this spot, should be cleaned and freed most carefully. The greater the care with which this is done, the more free from anxiety will the subsequent steps of the operation be. When this is cleaned accurately right on to the trachea—to which it has now become adherent—the lower pole is dislocated. This is readily done; the thyroidea ima vein and the inferior thyroid vessels do not prevent its dislocation. The upper pole is left *in situ*, care being taken to ensure that it is not drawn out when dislocating the remainder of the lobe. The dislocated portion is cleaned around its lateral and inferior aspects in the same fashion as the first lobe. The thyroidea ima vein is clamped and divided. This allows the lobe to swing up. The inferior thyroid vessels are dealt with in a similar way. This leaves the lower pole quite free, the upper pole never having been disturbed. A number of artery forceps are then applied, biting a little into the gland, along a line extending from behind the lower pole close to the trachea at about the junction of the middle and lower thirds of the lobe, crossing obliquely outwards and upwards around the lateral border, then upwards and forwards to the mesial side of the upper pole, and as close as possible to it without damaging the superior vessels in any way. These forceps are placed where vessels are seen or known to enter the gland. They mark the circumferential line along which the lobe is to be



FIG. 234.—The surgeon has gone back to the right side of the patient. He holds the right lobe in his left hand. The left lower pole has been dislocated, and four forceps bite into the gland tissue high up behind it.

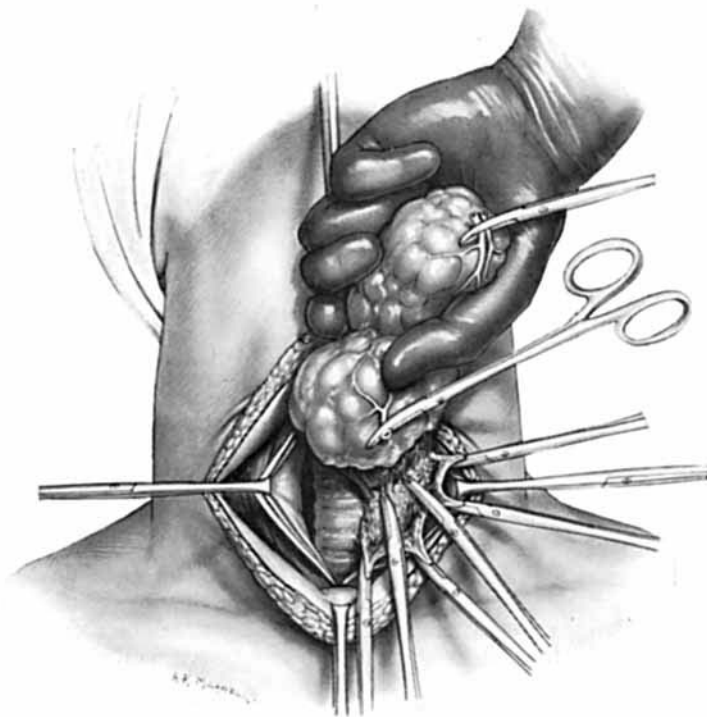
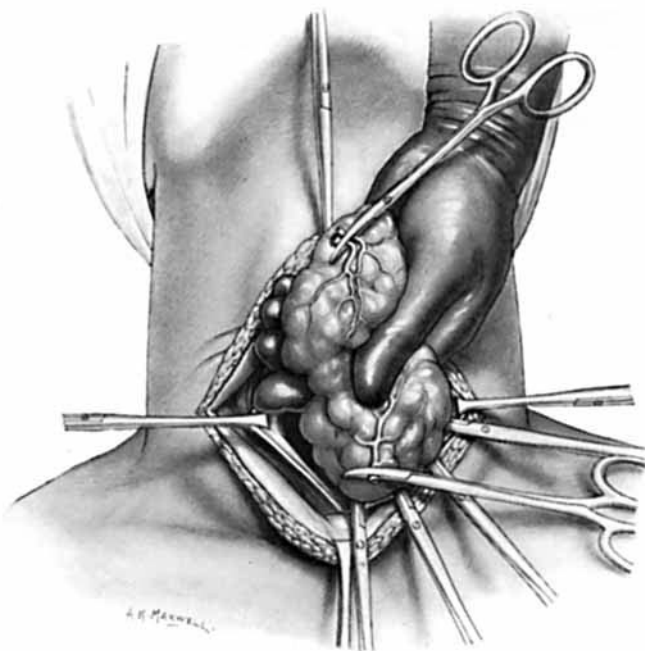


FIG. 235.—The left lobe is being divided above the four forceps placed as guys. It is divided obliquely from behind, upwards, and in such fashion forwards as to take away the large lower pole, leaving part of the posterior surface and the upper pole intact and *in situ*.

divided (*Fig. 234*). Some of them control hæmorrhage by their bite on to individual vessels; and by exercising gentle pressure with one or two of them, much of the spurting or oozing from the cut surface can be controlled temporarily. This mass pressure can be made by the assistant, whilst the surgeon devotes himself to the individual spots. The lobe is then cut boldly across (*Fig. 235*) with a pair of scissors curved on the flat. One soon comes to know where troublesome vessels on the cut surface may be expected. These are gripped by Kelly's fine-pointed forceps (made with curved points for convenience in ligating afterwards). The vessels are tied, including all the points gripped by the circumferentially-applied forceps. Small vessels on the cut surface may need underrunning with light catgut on a fine curved needle. Very slight pressure with underrun catgut is sufficient to control the bleeding from these vessels on the cut surface, for their walls are extremely thin, while a ligature will often stay on them only with difficulty. No attempt is made to close the cut raw surface of the gland. In my opinion suturing

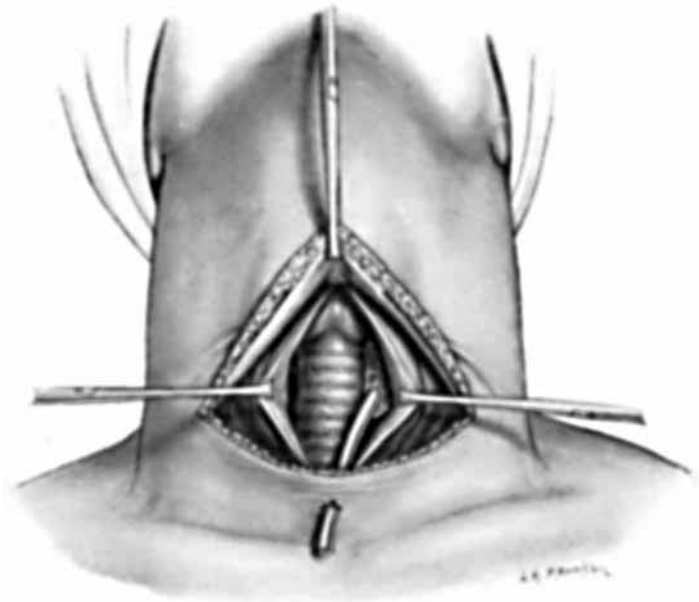


FIG. 236.—Shows the portion left and tube inserted.

over the raw surface shuts up crushed gland tissue and increases the post-operative intoxication.

Drainage is arranged for in the same way as at the previous operation, and through the same spot (*Fig. 236*). First the fascia containing the muscles is drawn carefully together, next the subcutaneous tissues and platysma, and then the skin.

On rare occasions a third operation has been found necessary before the patient has been placed on what, for her, is the optimum plane of health. In these cases the patient, after the second operation, is greatly benefited, but some symptom may still remain. Perhaps it is a pulse unduly fast, perhaps an uncontrollable tremor even though the pulse has become slow. A third operation should not be performed on account of prominence of the eyes alone. When sufficient gland tissue has been removed, the eyes generally recede considerably, sometimes greatly; I have seen them do this so completely that one would never suspect the disease had been present; and that even after extreme

prominence during the disease and right up to the time of operation. But if exophthalmos has existed a long time, the tissues behind the eyeball apparently become fibrotic, and it is scarcely possible for complete retraction of the eyeball to take place or even for there to be much change.

In the cases in which a third operation is necessary, it is generally discovered that there has been an unsuspected mass of thyroid tissue growing from the postero-internal border of the upper remaining portion of the left lobe and lodged well behind the larynx. As has been pointed out, the portion which is to be left is never dislocated from its bed. Although one can tell pretty accurately how much is being left, it sometimes happens that through unusual difficulties the second operation has had to be completed more quickly than was desirable, thus, perhaps, leaving more tissue than one would have left if not pressed.

If a man suffers from the disease severely, the gland, strangely enough, is often much larger than in a woman, and its blood-supply seems to be increased to a greater relative extent. The gland bleeds more, and the bleeding is altogether more difficult to control. I would go so far as to say that in general surgical work in a public hospital extending over a number of years, the most difficult cases I have ever had were the second operations in each of two men suffering from Graves's disease. The glands were enormous, and the toxæmia was intense. In cases like this—and there are many which approach this degree—the second operation will tax the skill and judgement of the operator to their limits, and in such cases he will be prone to leave more gland tissue than he knows to be wise. At the same time it is his only alternative, and unless he is only going to operate for statistics, he must undertake these cases. This will necessitate a third operation.

One cannot tell always from the external appearance of the neck how much gland tissue remains. Several times, when the neck gave no indication of its presence, this mass behind the larynx has been found at operation. On the removal of a sufficient portion of this, the result has been striking and immediate.

In performing a third operation there are considerable difficulties. One is compelled to operate in a field which has already been the site of two operations; therefore the cut surface of the gland is firmly adherent to the surrounding structures. At the operation, time spent in defining and freeing the gland before attempting to cut into it is, as before, of paramount importance. There is always more oozing after a second and third operation than after a first, because of the adhesions and the cutting across of gland tissue, so that temporary drainage is again necessary. It is arranged for through the original stab below the collar incision: this incision, re-opened for each operation, remains much less conspicuous if it has not been traversed by the drain.

Apart from lightness and dexterity in manipulation, the two chief points in a first operation are: (1) Secure ligation of the superior vessels; (2) Meticulous cleaning of the lateral and posterior aspects of the lobe.

At the second operation the two important points are: (1) Efficient display of the whole field before one begins to incise the gland; (2) Judgement as to how much should be removed at this operation.

One must be prepared for severe hæmorrhage, not easily controlled, when one begins to cut the second lobe across.

At a third operation the important point is to approach the remains of the gland by a *flank* and not by a *frontal* attack. By this I mean that one should approach a spot where there is still normal undisturbed relationship between the remaining piece of gland and the surrounding structures. This will be the lateral aspect high up; then work towards the part where the adhesions are dense. How much gland tissue should be left can only be decided by the surgeon, after carefully judging the case subsequent to the two previous operations, the response to the operations, and the amount of gland tissue found present at the third operation. I do not consider that a patient can become myxœdematous who has an amount of thyroid tissue left as large as a Spanish chestnut. One cannot give the amount by measurement, but by balanced judgement in each case.

It is not my practice to perform a preliminary ligation of the superior thyroid arteries. This proceeding is considered by many to be essential to the safety of the major operation. It has been demonstrated at the Mayo clinic that ligation of an artery causes a decrease in the metabolic rate of the individual for a certain time in a large number of cases; occasionally it does not. My reasons for not doing it are as follows:—

1. It is not necessary except in severe cases.
2. In the severe cases in which I have done it, there has been as much disturbance as in similar cases in which I have removed a lobe under local anæsthesia.
3. In the latter case, the final object of surgical interference has been attained, whilst in the former the major operation has still to be done.
4. The statement that ligation of an artery may cause as much disturbance as removal of a lobe may not carry conviction, but in a severe case the upper pole—with the entering artery—frequently extends as high as the base of the skull, and is wrapped around the back of the larynx. To dislocate it from this position in order to ligate the artery is not a simple matter.
5. If it is so difficult as to necessitate passing an aneurysm needle around (or through) the pole *in situ*, then I am convinced that the ligation fails in its object and causes much disturbance.

The clinics in which preliminary ligation is the rule are those in which general anæsthesia is given for the major operation. Where the practice is to give general anæsthesia there is always rougher handling of the gland than is the case where the operation is performed under local anæsthesia. It is not the general anæsthesia that adds the danger, so much as the fact that general anæsthesia does not necessitate the same gentleness of handling.

Then again, in dealing with the posterior parts of the gland, it is frequently the custom to leave a layer of gland tissue, for two reasons: One is to leave a portion of the gland on both sides for physiological purposes. The other is that this layer of gland may cover the recurrent laryngeal nerve and the parathyroid glands. Both these reasons are sound for non-toxic goitres, but for toxic cases there are reasons against the practice. Firstly, the layer is left by biting into the gland with forceps and cutting above them. This is a safe proceeding in a non-toxic goitre, or a second-lobe operation in a toxic goitre, when one lobe has been removed some time previously; but it definitely increases the risk of the first operation in a toxic goitre. Secondly, there are frequently protuberances arising from the posterior margin of the lobe by narrow necks, as mentioned above, and extending behind the larynx and trachea. If the posterior border is left, these protuberances will remain with it, and as they consist of active thyroid tissue, the degree of amelioration of the symptoms will be much less than if there had been a clean and complete enucleation of that side. (These protuberances always increase in size after partial thyroidectomy.) Thirdly, in the event of a recurrence of symptoms later in life, it is almost impossible to remove more tissue when the portion left has been a broad flat shaving on both sides. It is incomparably easier to remove a third portion when a compact piece has been left at the narrower upper pole of the second lobe. One can always be sure of leaving the superior thyroid artery nourishing this upper-pole portion.

The cases which the surgeon has failed to relieve as much as he would like are those in which scraps of thyroid tissue have been left adhering to the trachea and elsewhere. These scraps always proliferate in an exophthalmic goitre case, and are so buried in scar tissue that it is almost impossible to remove them subsequently. Certainly a better cosmetic effect is obtained when a small portion is left in the region of the inferior thyroid arteries on both sides; but the disease is so disabling, and its cure so dependent on removal of sufficient tissue, that one has to guard against leaving bits of gland tissue in places from which it is difficult or impossible to remove them later.

In spite of not performing a preliminary ligation, I believe that I operate on cases with a severer grade of the disease than do most other surgeons.

## AMOUNT OF GLAND TISSUE TO BE REMOVED.

It is to be stated at once, and emphatically, that the removal of one lobe, one lobe and the isthmus, or one lobe with the ligation of a main artery of the opposite side, will only cure the disease in a small number of cases. If, following the earlier literature, the surgeon promises a cure after such operative procedures, he will be disappointed, and the patient will be more than disappointed. The patient should be told in the beginning that her condition can be so greatly improved as to make her almost a well woman, but that she must permit the removal at successive stages of what the surgeon and physician consider wise and safe. For most cases it is necessary to remove the whole of one lobe cleanly and quite two-thirds of the other, always leaving sufficient for physiological purposes.

The writer has passed through several stages, and has been compelled to modify his opinions in the light of maturing experience. When he first recognized that removal of one lobe was not enough, it seemed to be wise to do a very complete operation in one stage: one lobe, isthmus, and half to two-thirds of the other lobe. This can be fairly readily accomplished if the patient is not too ill, but it cannot be done with complete safety if the patient is very ill—and she often is very ill.

If in the experienced judgement of the surgeon it is safe, it gets all the patient's troubles over at once, and the relief to her is great. But it has always to be remembered that the cutting completely across of the second lobe causes considerable bleeding, and leaves many bleeding points to be dealt with. It adds considerably to the exhaustion of the patient, and very considerably to the exhaustion of the surgeon. A patient may stand a hemithyroidectomy very well, when an operation taking perhaps more than twice the time would be a much graver proceeding. There are two points to be remembered. Firstly, a patient may be so improved after a hemithyroidectomy as not to need a second operation. This is not often, but the cases in which it does happen are those who could quite obviously stand a big operation, and where therefore a surgeon might be lured into doing it. Secondly, even a very ill patient is so much improved after a hemithyroidectomy that she can practically always take a general anæsthetic for the second operation. And it is during the operation on the second lobe that the surgeon should not be hurried nor worried unduly: when he has to decide on the amount to be removed and the amount to be left, and to deal with the hæmorrhage consequent on the complete section of a big and active lobe. These are the points of greatest difficulty and those that demand the greatest judgement, and a surgeon should not be called upon to deal with them at the end of a long and difficult operation.

Cases which are not very severe may benefit sufficiently by the extirpation of one lobe, and it may be questioned if such cases require operation at all. That must be decided by the surgeon and physician in consultation. These patients do not see a surgeon early. The physician has been piloting the cases for some time, has sought for all the causes, and has tried all the remedies. If there is improvement, the surgeon never sees the case. If the patient remains stationary for months or years, not grievously ill, but ill enough to prevent her engaging in either work or play, if medical measures fail to raise her plane of health, and her life is being lived year after year with this handicap, then it is very much worth while lessening the amount of thyroid secretion manufactured and absorbed. The time when this should be done is a matter of discussion between the physician and the surgeon. The physician knows exactly how much he has been able to do in the individual case, the surgeon knows how much he can depend on doing, judging from his previous experience. The patient can be at once moved to a higher health level where she may enjoy her pleasures and carry on her duties without distress. This gives no guarantee that some time in her life, later on, more gland may not need to be removed. What was done was sufficient for the time, and it was necessary at the time. It would have been bad surgery to have done more. If the remaining lobe hypertrophies, part of it must be removed. This is obviously the condition in the woman whose photograph

is published in McCarrison's book,<sup>2</sup> showing an obviously ill woman "after operation for the cure of exophthalmic goitre." I have recently discussed this aspect of the question fully.<sup>3</sup>

Unfortunately this disease is not like appendicitis, where, if you remove the appendix, the disease is gone. It is a disease in a gland whose secretion is essential to health. Thus one is always faced with the problem of removing enough to place the woman on her optimum plane of health, and still satisfy the physiological demands of the body. In the meantime every effort is to be put forth to discover the causes which are perpetuating the disease in the individual, and so lessen, as much as may be, the necessity for surgical interference.

#### **Conclusions.—**

1. Only remove what is necessary to begin with.
2. When a second operation is indicated, try to remove all that will be necessary ; but, while doing this, leave the portion which is to remain as undisturbed as possible, and with its supplying vessels intact.
3. If a third operation is necessary, do it—you cannot cure your patient unless you remove sufficient gland tissue.

One cause of failure is leaving gland tissue which should have been removed cleanly, i.e., the posterior surface of the first lobe, or portion of the isthmus attached to the trachea. Small portions such as these always grow and function, and they cannot subsequently be dug out of their surrounding scar tissue without great difficulty. What you remove, remove cleanly ; what you leave, leave undisturbed. See that the portion left has always its blood-supply intact. Failures are due to leaving too much gland behind.

#### **ANÆSTHESIA.**

The question of anæsthesia is very important. There can be no doubt that many of the deaths that occurred at operation on thyrotoxic goitre cases when surgeons began to operate on this disease, were due to chloroform on top of an already gravely poisoned heart ; and that others were due to the length of time that the operation took, together with the amount of handling that general anæsthesia permitted without protest from the patient. The operation may have been "completely successful, but the patient died." So that, both directly and indirectly, general anæsthesia, and particularly chloroform, has been responsible for many deaths.

Local anæsthesia served two purposes. It did away with the anæsthetic poison, and it compelled the surgeon to be light-handed and quick. The results of this were soon apparent. I used no general anæsthetic until I had performed a large number of operations—I think I should be safe in saying several hundred. Then I wondered whether the local anæsthesia or precision and rapidity in operating was the important factor. I began to do the second operation under ether anæsthesia in selected cases. As no ill results followed, the original operation was done under open ether in cases where it was thought safe.

I consider that open ether is safe in cases in which the heart muscle is good and there are no obvious signs of visceral degeneration. Among the cases sent to a surgeon for operation the number which come under this heading is of course limited, and many have very advanced degeneration.

I next tried various modifications of these methods. This is a disease in which there is always great psychological unrest : essentially unsuitable cases for local anæsthesia one would think ; and yet many hundreds of very ill cases have stood it well. If the patients could be rendered less susceptible to painful stimuli, it would be a relief to them, and it would also remove a great strain from the surgeon. With this end in view I tried morphia before the operation, and then the combination of scopolamine with morphia. After considerable trial, I found it had two disadvantages. There was an occasional

tendency to make the patients vomit at the operation, and, more than that, it took away the patients' powers of self-control without giving them sufficiently complete narcosis to render them unconscious of their discomfort, so that in these cases they were more unhappy and much more difficult to manage than when they were in full possession of their senses. One never has difficulty in completing the operation under local anaesthesia, and the patients are so much better immediately after than if they had narcotic drugs (as well as being in full possession of their faculties), that I have no doubt it is preferable for both patient and surgeon to rely on local infiltration alone in those cases where local anaesthesia is indicated.

Then, for very restless and excitable patients, for whom local anaesthesia is obviously unwise, and for the occasional very young person for whom it would be an unwarranted ordeal, is any modification of open ether desirable? I have given a reasonable trial to two methods. In each series the ether has been administered by Dr. Frank Davies. They are: (1) Ether and olive oil given by the rectum; (2) Warmed ether vapour given through a catheter passed into the trachea.

The first method, after Gwathmey, consists in mixing 75 per cent ether with 25 per cent olive oil; then injecting high up into the rectum one fluid ounce of the mixture for each 20 lb. body weight. The bowels have previously been efficiently emptied, and a preliminary injection of morphia given. This does not irritate the rectum, and the anaesthesia is generally efficient. Patients who have had anaesthesia induced in this way and by the open method have told me that they prefer the open method. I know of two deaths that have followed rectal anaesthesia (one in my own practice) in patients that I do not think would have died otherwise. The deaths were due to respiratory failure some hours afterwards. It is possible that they were due to too big a dose of morphine. When the patients tell me that they prefer the open method, and considering the two deaths of which I know, I feel that the advantages are not such as to induce me to use ether rectally administered in preference to the open method. In passing, I want to say that I always use this method for such operations as cancer of the tongue, where it has many and obvious advantages. Also, if one wished to 'steal' the gland, following the idea described by Crile, I think that this is one of the best methods of doing it. The anaesthetic mixture is given to the patient as an ordinary enema, when she is already drowsy from the morphia previously given.

The second modification, viz., intratracheal administration of warmed ether vapour, the method of R. E. Kelly, of Liverpool, is valuable when there is tracheal obstruction such as frequently occurs with an intracheal goitre; but for the thyrotoxic cases I prefer open ether.

#### Conclusions.—

1. Unless one is sure of freedom from cachexia or visceral degeneration, local anaesthesia should be employed without other narcotics. It can be made very efficient, but it is essential that the operator should have confidence in himself

2. In cases where the state of the viscera permits it, and in relatively young or restless patients, open ether may be given.

3. Where there is doubt about the patient having the necessary self-control, it is wise to infiltrate the neck with the solution, and, when the time comes to deliver the gland, administer sufficient open ether to prevent any unpleasant stimuli reaching the cerebral cortex. When the neck has been so infiltrated, a skilled anaesthetist can easily keep a patient on the borderline of general anaesthesia with a minimum amount of ether. Chloroform should never be given in this manner; the combination of chloroform and adrenalin is dangerous.

4. The anaesthetizing solution consists of 6 grains of novocain in 7 fluid ounces of physiological saline solution; to this 15 minims of 1-1000 solution of adrenalin chloride are added. It has been suggested that this solution acts solely by its pressure effect in the tissues, and that saline solution would act as well.

On several occasions I have infiltrated the necks of three goitre cases before commencing to operate upon any of them. Then I have operated upon the three, one after the other, without difficulty. I think that if saline solution alone had been used, the second and third operations would not have been done painlessly.

In spite of what I have said about the safety of ether in selected cases, I still perform the greater number of operations under local anæsthesia.

Many thanks are due to Mr. A. K. Maxwell, of Glasgow, who was kind enough to come to London to make the drawings for me from cases at operation.

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REFERENCES.

<sup>1</sup> *British Medical Journal*, 1909, May 22.

<sup>2</sup> McCARRISON, *The Thyroid Gland*, 1917.

<sup>3</sup> *Lancet*, 1917, Dec. 15.