Surgical.

THE TECHNIQUE OF OPERATIONS ON THE THYROID GLAND.

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PART II.

RESECTION OF THE GLAND.

(2) HEMITHYROIDECTOMY—USUALLY FOR LARGE GOITRES CAUSING DYSPNŒA.

THE gland is dislocated in a similar manner to that described in the previous section. If the goitre is big it nearly always extends well towards the mid-line, behind the œsophagus. Unless this portion is dislodged it will be impossible to bring up the gland. The inferior thyroid vessels are secured in clamps; the same precaution described in the previous operation, regarding the recurrent laryngeal nerve, must be observed. Once the lower pole of the gland is free, further manipulations are easier.

Ligature of Superior Thyroid Vessels.

The lobe should now be pulled downwards, so as to expose the superior thyroid vessels. These are best secured by the method described by Dunhill. Three clamps are placed on these vessels, securing the upper pole of the gland. An incision is made between the lowest and the next clamp, leaving two clamps on the vessels. The upper clamp prevents them retracting upwards before they are firmly secured, an accident that might well be disastrous.

Dissection of the Lobe.

After the main superior vessel has been cut, there is nearly always another branch deeper to the main branch which must be secured. A space is now opened up around the upper pole, which is free, and it is now usually easy to turn the lobe inwards, using the isthmus as a fulcrum. The vessels can now be seen entering the lateral lobe. Each vessel should be clipped at right angles to its course and divided in front of the clip with scissors. The scissors should cut into thyroid tissue, and the cuts should go deeper and deeper into the tissue, aiming at leaving a thin slice posteriorly. The incision should be made in an inward and forward plane towards the anterior surface of the trachea. The trachea should be defined, as it is by no means impossible to open it, especially if it be much displaced. The incision

Protection of Recurrent Laryngeal Nerve.

should be carried inwards and forwards until the junction with the isthmus is arrived at, when the severed lobe can be removed. In this way a thin layer of thyroid gland is left covering the recurrent laryngeal nerve, which protects it from injury.

Scope of Operation.

Speaking generally, one need not be too particular to remove the whole lobe in these cases. Safety first should be the guiding principle, and only so much should be removed as will relieve the symptoms—usually dyspnœa.

It is always as well to examine the lower pole of the opposite side, as a small adenoma may exist, or the pole may extend downwards behind the clavicle. If so, it is a good thing to remove it, in case eventually it may become a true retrosternal goitre. In young subjects with much dyspnoea (always a serious symptom), the lower pole of the opposite side should be removed if the trachea has been at all compressed, and the trachea should always be inspected to estimate its calibre. The danger of not removing the lower pole of the opposite side is that it may suddenly compress the trachea (which in the young is very compressible, as the cartilaginous rings are soft) after the patient has returned to bed, and sudden death may occur. Fortunately, these cases seem to be very rare these days. The technique of section of the lower pole will be described under the section for exophthalmic goitre.

(3) RESECTION FOR EXOPHTHALMIC GOITRE.

The essential feature of this operation is to remove as much gland tissue as possible consistent with (a) leaving a sufficiency of the gland for thyroid function to be retained; (b) safety of the patient.

How much is to be removed? These patients are frequently extremely ill, and the operation is always an anxious one for the surgeon. A very nice judgment is required and possibly some courage to stop short of removing as much as is consistent with a certain cure. It is always better to have a live patient with an incomplete operation than to perform a perfect and thorough operation which may result in a dead patient. Therefore it is always wise to warn a patient beforehand that as much will be removed as is consistent with safety, but a second operation may be necessary. If the patient is seriously toxæmic and the heart does not improve with preliminary medical treatment, ligature of the superior pole of the gland under a local anæsthetic as a preliminary measure should be carried out. This may be followed ten days or so later with ligature of the opposite pole. In this way the patient may be rendered fit for a more extensive thyroidectomy than would have been possible previously.

The technique of ligature of the thyroid vessels is so well described in the textbooks that it need not be dealt with here. Personally, I only ligature the vessels in exceptionally bad cases. The majority, after suitable medical treatment, will stand removal of a lobe and the isthmus quite well, and a portion of the other lobe can be removed subsequently if it be considered desirable to stop short at the first operation. In the majority of cases (but not in all) the second operation will be necessary, as it is essential that a sufficiency of thyroid tissue be removed, or recurrence of symptoms is inevitable. With increasing experience, the operation of removal of one lobe, isthmus and a portion of the opposite lobe is more and more frequently performed.

Technique.—The technique for removal of the original lobe is very similar to that described above for hemithyroidectomy. In these cases, however, the gland is usually small, frequently friable, and almost invariably very vascular. If X-ray or radium have been used prior to operation, considerable difficulty may be encountered in entering the right space. Even if this space has been entered, it may be obliterated around the upper pole, rendering dislocation impossible until the adherent connective tissue has been carefully stroked away by a pair of blunt dissecting forceps. As soon as the gland is free above and below, it is turned inwards until the posterior border is fully exposed. Care must be taken in doing this that no connective tissue is adherent to this border or

to the outer surface of the gland, or the parathyroids may be in danger. All vessels entering the gland are severed between clips. The question of leaving a small piece of gland tissue at the postero-internal aspect of the gland has given rise to much discussion. Mr. Dunhill believes that no vestige of gland tissue should be left, but that the lobe should be dissected away clear up to its attachment to the isthmus. Most surgeons believe in leaving behind a thin layer at the postero-internal aspect of the gland as a protection for the recurrent laryngeal nerve. Undoubtedly, there is more danger of damage to the nerve if a thin layer of gland tissue at the "hilus" be not left. It is said that if this thin layer is left, it may subsequently hypertrophy and cause a recurrence of symptoms. Inasmuch as only a very small amount of tissue is to be left, I prefer to remove rather more of the opposite lobe in order to prevent this possible hypertrophy.

**Should the
"Hilus"
be left?**

The lobe attached to the isthmus is held up and the isthmus separated from the trachea. Here considerable hæmorrhage may occur, at times to an alarming extent. If this occurs, pressure with a swab for a few minutes will usually control it and allow the bleeding points to be defined, when they can be caught. Great care must be taken not to dig deeply in catching the bleeding points, as a forceps may damage the recurrent laryngeal nerve.

In this way the lobe (usually the right, unless the left is marked by the larger) and the isthmus are separated in one piece. The decision has now to be made whether the operation is to be terminated or whether a portion of the opposite lobe is also to be excised. If the surgeon considers that he has done enough, he should divide the isthmus from its attachment to the opposite lobe and be careful not to expose the remaining lobe by separating the pre-hyoid muscles covering it. If he does, a subsequent operation will be rendered much more difficult, as fibrous tissue will be laid down and the lobe will become adherent.

**Removal of
Portion of
Opposite Lobe.**

If the operation is to be completed in one sitting, the second lobe is dislocated as previously described. The inferior thyroid vessels are clamped and divided and the lobe turned partially inward. The upper pole need not be exposed. The operator must now decide how much he is to remove. A good working rule is to remove as much tissue as will leave behind slightly less than

a normal sized lobe. The tendency is to remove too little rather than too much. The vessels feeding the gland are clamped and divided with scissors, which cut into the gland from above, downwards and inwards, so that the incision joins the separated isthmus and lobe of the opposite side. In this way, the lobe is divided obliquely. If the vessels on the surface of the gland are secured as described above, there will be little bleeding. As the scissors cut into the thyroid tissue, one or two points may require to be secured.

The excised mass of thyroid tissue consisting of one lobe (with the exception of the hilus), the isthmus and a portion of the opposite lobe is now removed.

**Some
Difficulties.**

At times the isthmus may be very prominent, and enlarged, and the pyramidal lobe also very big. In these cases, it may be difficult or impossible to turn the lobes inwards. When this occurs, it is better to start at the isthmus and divide the lobe from it. Great care, however, must be taken of the recurrent nerve. The isthmus will then be removed separately. Not infrequently, the pyramid must be cut away after the main mass is removed.

Although it is essential, as stated above, to remove a sufficiency, experience is required not to remove too much. Although tetany is believed to be due to removal of the parathyroid bodies, there is some evidence to show that it occurs in those cases where a considerable removal of thyroid tissue has been done. Of course it is in these extensive operations that the parathyroid bodies are most likely to suffer injury—an additional argument for leaving behind the hilus of the gland, which guards the postero-internal body, as well as the recurrent laryngeal nerve.

(4) REMOVAL OF RETROSTERNAL OR INTRATHORACIC GOITRE.

It is not unusual for the lower poles of large adeno-parenchymatous goitres to extend downwards below one or both clavicles. These are not retrosternal goitres, and their inclusion as such has vitiated statistics. Hence it is probably wise to drop the term "retrosternal" in favour of "intrathoracic," that is goitres situated well within the thorax, which may be continuous with a goitre in the neck, or at times may be nearly separate and connected to the true gland by a narrow stalk. This latter point has an important practical bearing, namely, that

Which Side is involved? frequently it is the least prominent side as viewed and palpated from the neck, from which an intrathoracic goitre is to be removed. In other words, the prominent, obvious enlargement of the thyroid in the neck is not the cause of the paroxysmal dyspnoea, but a deep-seated intrathoracic swelling on the opposite and non-obvious side is. An X-ray will, of course, make matters clear.

Technique.—The preliminary steps of exposure are the same as for the removal of other varieties of goitre. It is as well to make the incision low. As soon as the perithyroid space is defined—and not before—a finger will detect the prolongation downwards, or if there be no enlargement in the neck, a finger carefully inserted into the superior mediastinum will feel the tumour. A long finger is an advantage in this operation. There is always a stalk which connects the tumour with the respective lower pole of the gland, and it is important that this stalk or the enlarged lower pole, as the case may be, should be well defined. It is here that all vessels must be clamped, as these vessels feed the tumour lower down. Were it not for this fact,

Securing of Feeding Vessels.

that the intrathoracic tumour receives its blood-supply from above and not from within the thorax, the removal of such tumours would be a hazardous, if not impossible, procedure. If the vessels are secured above, it is surprising how easily even a deep and large tumour can be delivered into the neck, with little hæmorrhage. With the vessels secured, several pairs of forceps are clamped on to the lower pole or stalk, as the case may be, and holding them in the left hand gentle traction is made. At the same time the forefinger of the right hand is inserted into the mediastinum *behind* the gland, care being taken that the palmar surface of the finger is kept in close contact with gland tissue all the way down as far as possible. By a combination of movements of the finger performed very carefully and gently, and always in contact

Delivery of Tumour.

with the tumour, and traction from above by means of the forceps, the inserted first finger may be able to be hooked underneath the tumour, which can then be gently delivered through the thoracic inlet.

However, it may be impossible for the finger to get sufficiently low to act as a lever. If this be the case, the manœuvre first suggested, and frequently practised by

Sir James Berry, should be performed. A teaspoon, or in some cases a dessertspoon with a rounded extremity, and the spoon bent forwards to the shaft, should be inserted *behind* the tumour. Then, by traction from above, assisted by the spoon below, the tumour can be delivered.

During delivery through the thoracic inlet, the nurse holding the head can be of assistance by flexing the head, thereby slightly increasing the narrow space through which the tumour is to be delivered. If it be very big, it can be rendered smaller by puncturing it if it be a cyst, or by breaking it up slightly if it consist of soft adenomatous tissue. No harm will be done if this is necessary, as the vessels have already been

Removal of Tumour. secured above. As soon as the tumour has been delivered, it should be severed from the lobe or removed together with a portion of the lobe.

This is usually a simple matter.

Dangers. On the right side, care must be taken in dragging up the tumour through the inlet, as the recurrent laryngeal nerve may be injured in so doing. In some cases I believe this accident is almost unavoidable, however much care is taken. Hence it is better to penetrate the tumour and reduce it in size as mentioned above than to drag too much. Although the danger exists on the left side, it is not so great owing to the anatomical difference in the situation of the nerve.

On no account must a finger or spoon be inserted downwards in *front* of the tumour for fear of damage to the great veins at the root of the neck.

In order to facilitate delivery of the tumour, some surgeons advocate splitting the sternum. This step may be advantageous in very large tumours.

As soon as the tumour is delivered through the thoracic inlet, the remaining cavity (always a large one) should be lightly packed with gauze until the surgeon is ready to close the wound. When the gauze is removed, oozing has usually stopped or been reduced to a minimum. Moreover, it is surprising how quickly the lung expands and tends to obliterate the cavity. This is usually apparent even before closing the wound. But of course drainage has to be arranged for. It is, however, not wise to insert too long a tube or packing. Postural drainage, which will be mentioned later, is valuable here.

C.—CLOSURE OF THE WOUND.

As soon as all bleeding points are stopped, preparations are undertaken to close the wound and provide for drainage.

Be sure of Hæmostasis. The most important of these is to make sure that no vessel, either in the depths of the wound or superficially, will bleed after the patient is returned to bed. The wound may be apparently dry, and yet subsequently, some small vessel, not bleeding at the time of inspection, may ooze or even bleed vigorously and give rise to a troublesome hæmatoma. The only sure way of preventing this is to make the patient strain.

During the latter part of the operation the anæsthetist should gradually allow the patient to become lighter. The self-retaining retractor is removed and the upper flap held well up by means of a clip applied to the subcutaneous tissue. The anæsthetist

Importance of Straining. now opens the patient's mouth with a gag, and a swab on a pair of forceps applied—not roughly—to the posterior pharyngeal wall. If the

anæsthetic is of the right depth, the patient will immediately strain and any bleeding vessel can be seen and tied. The straining must be sufficient to fill the vessels with blood. A few convulsive general movements may occur, without filling these vessels. A good, real, proper strain will always do so. If this cannot be obtained, it means that the patient is still too deeply anæsthetised.

Many surgeons omit this step and consider it an unnecessary, vexatious and cumbersome manœuvre. All I can say is that many times I have discovered a vessel bleeding in what was an apparently dry wound before the straining occurred. It is better to spend a few extra minutes to make sure of hæmostasis than to have a hæmatoma form or even to be forced to reopen the wound because of a post-operative hæmorrhage. I learnt this point of technique from Sir James Berry, who always insisted on it, and I am convinced that it is not only wise, but that its omission is fraught with some danger.

The question of drainage will be considered separately.

Suture of Muscles. The next step in closure of the wound is to bring the prehyoid muscles together. If they have been separated and not divided this is a simple matter. If they have been divided, sutures must be inserted to bring the divided ends together before approximation in the mid-line is commenced. I always

Diagram to show method of suture in order to avoid puncturing the anterior jugular vein.

use three or four interrupted sutures for this latter purpose. Care must be taken that the deep fibres of the sternothyroid muscles are not overlooked. These usually retract further than the superficial muscles, and are apt to escape inclusion in the suture. It is always well not to include the fascia over the muscles in the suture for fear of puncturing the anterior jugular vein. A curved needle is passed on the left side, commencing underneath the fascia through the left muscle layer, then across the wound, through the right-hand muscle layer from within outwards in such a way that the point of the needle emerges deep to and misses the deep cervical fascia.

The tissues come together quite nicely and snugly by this method. If the vein is punctured it must be completely divided, and each end ligatured.

Closure of Platysma. The next step is to close the platysma. This is important, as failure to achieve accurate apposition will cause the scar to spread. Again interrupted sutures are used, and the head-holding nurse is now directed to flex the neck in order to approximate the upper and lower platysmal sheets. In nine cases out of ten the nurse will lift the head upwards, which is of course useless from the surgeon's point of view. If the neck is correctly flexed, approximation not only of platysma, but also of the skin is rendered much easier.

Suturing the Skin.

The skin suture is a continuous one. The most meticulous care should be taken in inserting it. The needle should enter the skin at one angle of the wound (usually the right) and pass through skin and subcutaneous tissue, about $\frac{1}{8}$ in. from the cut margin on each side, and tied. The next bite of the needle should take only the skin, as near the cut margin as possible, and these two bites should alternate one with the other. In this way the incision is closed accurately, and there is little or no chance of a skin edge being turned inward. Care should also be taken to see that before any stitch is tightened all blood-clot is wiped away from between the two skin edges. The presence of such blood-clot is a frequent cause of delayed healing and a wide scar. The stitches must not be pulled too tight, or slight œdema of the skin may occur, again interfering with the production of the best possible scar.

Drainage.—It is sometimes possible, after the removal of a small encapsuled tumour, to close the wound completely. If, however, the tumour is of any size, drainage must be provided. There is never any contra-indication to drain; the occasions when it is permissible to omit the drain are very few.

Median Drainage by Kocher's Glass Tube.

I have usually used a Kocher's glass tube placed in the middle of the incision, just above the sternal notch. It has been objected that the use of a drain in this situation leaves a small indentation, which is noticeable in the scar. This is true, but the pucker very soon disappears, and two or three months later no indentation can be noticed. I cannot help feeling that this drawback, which is a temporary one, has been exaggerated. Kocher's glass tube is admirable for drainage. It keeps a cylinder of tissue open, especially if the skin is snugly but not too tightly closed around it. It should not be too long. If it irritates the trachea a troublesome cough will result. It should be just long enough to penetrate deep to the prehyoid muscles. A silk ligature should be tied round the tube underneath the glass shoulders and the ends of the ligature threaded through a hole cut in a square of gauze placed on the wound. There is then no fear of the tube slipping in.

Lateral Drainage.

The other method of drainage is to bring a piece of corrugated rubber out through an opening in the prehyoid muscles at each outer angle of the wound. This allows the wound to be sewn up completely except at the outer angles. It is quite a satisfactory method, but I think there is more chance of irritation of the trachea, and I doubt if the drainage is so free as in the other method. However, it is used by many surgeons specially experienced in this branch of work with excellent results.

D.—GENERAL REMARKS ON TECHNIQUE.**Swabbing.**

The assistant should be instructed never to swab by rubbing when the thyroid gland is reached. Dabbing only should be used. Rubbing may cause hæmorrhage or displace a ligature already tied.

Ligature Material.—I never use catgut. This material is always treacherous, and while its use in the abdomen is almost universal, I do not trust it in the neck. All ligatures and sutures are of the finest silk (size 0000). No smaller size is made. It is so fine that it is absorbed, as evidenced by the fact that no trace of it can be found if the neck be re-opened at some later period. It is difficult to work with and requires considerable practice to prevent it breaking

0000 Silk in preference to Catgut.

Nevertheless, it ties with a firm knot, which takes up very little space. The knot of oooo silk is both more compact and less bulky than that of catgut. If a large vessel has to be tied, e.g., the superior thyroid, a double strand may be used. I can recommend this material with the utmost confidence. I use it not only for operations on the neck, but elsewhere. For an excision of a breast it is used throughout. The dangers and drawbacks of silk do not apply to this oooo variety, but to thicker sizes.

Anæsthesia.—It is fashionable to-day to use local anæsthesia instead of general. This is frequently combined with drugs, such as avertin, nembutal or morphia and others. I have never been enamoured of this. It is true that in some bad cases of

Is Local Anæsthesia necessary? exophthalmic goitre local anæsthesia may be indicated. But since the introduction of lugol solution as a preparatory measure, these cases are diminishing in number. It is a little difficult to believe that exophthalmic goitre, in itself largely an emotional disease, can be rendered safer by such

Advantages. an emotional disturbance as a local anæsthetic incurs. The great advantage of this method in removing large and difficult goitres is that the patient, if not heavily drugged, can be made to phonate, when working in the region of the recurrent laryngeal nerve. The dislocation of the gland nearly always causes the patient some distress.

Disadvantages. The objection to avertin, morphia, scopolamine and the like is that at the end of the operation it is difficult if not impossible to make the patient strain, for the purpose set out above. A light, general anæsthesia of open ether is, I believe, the best. But it must be really light, so light that the patient can be made

Advantage of Light Ether. to strain when wanted. I have never seen any harm come from a really light ether narcosis. It is more comfortable for the patient, and certainly for the surgeon. Moreover deaths have occurred under local anæsthesia, as well as under general anæsthesia in bad cases. The whole secret is for the depth of narcosis to be as light as possible, and this is not so easy to secure as at first sight it would appear to be.

The bandage is of some importance. It should include the head, neck and upper part of the chest, so that the head and neck are kept firm in one piece with the chest.

For the first few hours the nurse is instructed to place the patient on the side not operated upon. Afterwards the patient is sat as upright as possible. This assists drainage. The tube is removed on the morning after operation, and on the following morning the hole where the tube was is very gently opened with a pair of forceps to allow

Importance of Posture. any fluid to drain off. Postural drainage is important, especially in cases of removal of intrathoracic goitre. It is a good thing to encourage the patient to turn face over on the bed, resting on the hands and knees, for five or ten minutes twice a day. The same principle can be adopted in the removal of very large tumours.

On the night of the operation in cases other than exophthalmic ones, the patient is encouraged to get out of bed for two or three minutes while it is made. Sometimes they do not like to do this, generally they comply. On the next evening, however, they must get up and from thenceforward on every evening for gradually increasing periods. In exophthalmic patients, however, four or five days must usually elapse before they are allowed out of bed. The pulse-rate is

here the guide. These patients also must be sat upright with care, as they are apt to become faint.

There are two danger signals to look out for :—

(1) Deep bleeding. When this occurs, it is no use plugging or trying styptics. Another operation must be immediately performed—the wound laid widely open, and

Danger Signals. the bleeding point sought for and tied. Remember to make the patient strain after apparently stopping the hæmorrhage.

(2) Pain on swallowing. This is always complained of for three or four days after operation. On each day after the first it is always less. If it increases and actual dysphagia occurs, combined with fever, it is of serious import, and usually means deep infection, probably extending into the mediastinum. Needless to say, such a condition is one of the utmost gravity. The only thing to do so is to lay the wound wide open, regardless of ultimate cosmetic effect and arrange ample drainage.

Removal of Stitches. Skin stitches should be removed by the fifth or sixth day. The continuous stitch is cut in two or three places on the third day and pieces of it removed. This is again repeated on the next day, and by the fifth, or at latest the sixth, day after operation, all stitches should be out. It is unwise to remove the whole suture at one time.