

25 The thyroid

25.1 Introduction

The common surgical problem with the thyroid is a painless increase in its size, known as a goitre, or the appearance in it of a painless mass. A painful thyroid is due to either haemorrhage, not uncommon in colloid goitre, carcinoma, trauma, or infection: as in an abscess or thyroiditis (6.12).

(a) Diagnosis

Note the patient's age and gender (more commonly female), and where she lives. Simple and colloid goitres are common in females from 20-40yrs, and in anyone who lives in an iodine-deficient area (25.5). How long has it been present? Has there been a sudden increase in the size of the mass in the neck? Is it painful? Is there difficulty in breathing or swallowing?

Inspect the neck from in front, and feel it from in front and from behind. Give the patient a drink, and confirm that the thyroid swelling moves up on swallowing. Feel the size of its lobes and its isthmus; feel its surface and consistency, and listen for a bruit. If it is woody hard, it is likely to be a thyroiditis, and if it is fixed in the neck, an anaplastic carcinoma. Note the position of the trachea.

Look for retrosternal extension by asking the patient to raise her arms over the head and demonstrating superior vena cava obstruction (prominent neck veins). Look for enlarged neck nodes.

(b) Thyroid activity. You can diagnose moderate and severe thyrotoxicosis clinically. Minor degrees require measurement of the basal metabolism and/or hormone assays.

Suggesting hyperthyroidism: Loss of weight, tremor (especially of the outstretched arms and fingers), sweating, anxiety, hyperactivity, palpitations, tachycardia, cardiac irregularities (flutter, fibrillation), heart failure and exophthalmos, characterized by seeing the sclera below the inferior limbus of the cornea.

If exophthalmos is pronounced, there is sometimes even conjunctival oedema (chemosis), conjunctivitis and diplopia. The thyroid is usually but not always enlarged, and may or may not be nodular. You can often hear a bruit.

(c) Solitary thyroid nodule? First confirm that the nodule is in the thyroid, and then feel carefully for other nodules.

If there are other nodules, there probably is a nodular colloid goitre. If it really is a solitary nodule, it is quite likely to be a papillary carcinoma (which has a good prognosis with radical surgery) or a follicular carcinoma

(which has equally good prognosis if found early, less so if found later).

(d) Special tests

(1) **ULTRASOUND** is very useful to detect a cyst, which you can then aspirate. If this has clear fluid, it is unlikely to be malignant.

(2) **FINE NEEDLE ASPIRATION** is only helpful if it can distinguish a well-differentiated carcinoma from normal thyroid tissue: this needs an expert.

(3) **RADIOGRAPHY** of the neck gives important information about compression and deviation of the trachea. Radiography of the chest will show if there is retrosternal extension or signs of cardiomegaly.

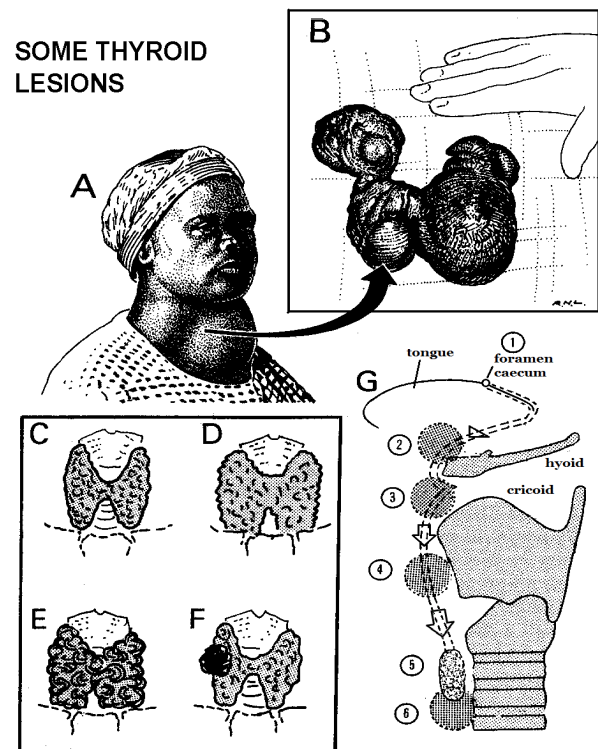


Fig. 25-1 SOME LESIONS OF THE THYROID.

A, patient with a non-toxic adenomatous mass in her thyroid gland. B, mass removed at thyroidectomy. C, smooth, soft, symmetrical goitre of puberty or pregnancy. D, large, smooth, firm, symmetrical swelling of a colloid goitre (25.5), thyrotoxicosis (25.2), or Hashimoto's disease (25.8). E, large, nodular, firm, asymmetrical goitre. F, solitary nodule of an adenoma, carcinoma, or cyst. G, congenital abnormalities of embryological thyroid 'migration' (25.3): (1) *foramen caecum*. (2,3,4) positions for thyroglossal cysts. (5) pyramidal lobe (sometimes absent). (6) mediastinal (substernal) goitre.

A,B, after Bowesman C. *Surgery and Clinical Pathology in the Tropics*, Livingstone, 1960 with kind permission.

25.2 Hyperthyroidism (Thyrotoxicosis)

There are two main types of hyperthyroidism:

- (1) Idiopathic, often related to introduction of iodine to the salt in an endemic goitrous area,
- (2) Auto-immune, where circulating antibodies cause exophthalmos. The first is much more common.

Features are weight loss, sweating, heat intolerance, agitation, and tachycardia.

There is a much rarer form of hyperthyroidism (de Quervain's thyroiditis) which may be viral and starts with fever, pain and tenderness in the neck and transient release of excess thyroid hormone into the circulation. Occasionally the thyroid may be over-stimulated by the use of amiodarone in treatment of cardiac dysrhythmias.

(a) Medical treatment is the first choice for almost all cases. Treat with propranolol 20-40mg tds to control the tachycardia and carbimazole 5-20mg tds. Propranolol gives a rapid response but is not useful for long-term treatment; you should use it, though, in preparation for surgery. You may have to adjust the dosages in terms of the response; carbimazole will take about 6wks to get a patient euthyroid.

To maintain medical treatment, you can then stop the propranolol, and lower the dosage of carbimazole to 5mg tds and continue for 12-18 months; unfortunately >50% of patients relapse after stopping treatment.

You can use propylthiouracil 200-400mg od instead of carbimazole, reducing the dose to 50-150mg od once you have rendered the patient euthyroid.

Both anti-thyroid drugs are contraindicated in pregnancy, and both can cause leucopenia or thrombocytopenia, so you should warn patients if they develop a sore throat or bleeding problems.

Remember, rarely, a choriocarcinoma (23.10) may present as thyrotoxicosis.

N.B. In de Quervain's thyroiditis, use anti-inflammatory drugs or steroids, *not anti-thyroid drugs*.

(b) Surgical treatment

INDICATIONS

- (1) Thyrotoxic goitre,
- (2) Poor supply of anti-thyroid drugs,
- (3) Relapse of thyrotoxicosis >18 months of medical treatment.

PREPARATION

The patient must be euthyroid before surgery.

Propranolol orally is only effective for about 6h. If the presentation was with severe hyperthyroidism, a crisis may follow the omission of a single dose. Regular doses are especially important just before and immediately after surgery; continue them up to 10 days afterwards to avoid a rebound phenomenon.

Make sure you control the blood pressure well before the operation. Remember to make sure the patient receives both medications with a little water *on the day of operation* (1.8)!

CAUTION! *It is dangerous to operate on thyrotoxic patients who have not had anti-thyroid drugs for 6wks pre-*

operatively. Even then, post-operative thyrotoxic crises (hyperpyrexia (>41°C), agitation, confusion, and seizure) may occur, and prove fatal.

Recurrence of hyperthyroidism after a bilateral subtotal thyroidectomy is very unusual. However, 30% of patients become hypothyroid within 10yrs and need levothyroxine 0.1-0.2mg od. This is an especial hazard if surgery is done on a small thyroid gland. You therefore need to follow up such patients.

25.3 Thyroglossal cyst

A thyroglossal cyst is a smooth, painless, subcutaneous lump which usually lies at or below the hyoid bone in the midline (25-1G). These cysts occur in both sexes equally, usually between 15-40yrs, and are formed from the epithelial pouch that gives rise to the thyroid gland. This runs from the junction between the anterior $\frac{2}{3}$ and the posterior $\frac{1}{3}$ of the tongue (the foramen caecum), to the pyramidal lobe of the thyroid, just above the isthmus (25-1). Cysts can arise anywhere along this track.

Excision is usually not difficult. Occasionally, however, an extension of the cyst goes up to and through the hyoid bone, which you may need to divide.

EXCISION OF THYROGLOSSAL CYST (GRADE 2.3)

Make a 6cm transverse incision in a skin crease over the swelling. Retract the skin flaps with a self-retaining retractor. Dissect around the cyst carefully, detaching it laterally from the infrahyoid (strap) muscles.

You can inject a little dye into the cyst to delineate any extension superiorly. If it does extend so (behind the hyoid bone), cut a small central segment of the hyoid away with the track using bone cutters. Then use Lahey swabs or a MacDonald's blunt dissector to detach the cyst posteriorly off the thyrohyoid membrane and *mylohyoid*. If the track extends further upwards, ask the anaesthetist to push down on the tongue to improve your view. Excise the cyst, track and hyoid segment *en bloc*.

No vital structures are in the way, and the divided hyoid does not need repair. If a remnant is left behind, the cyst may well recur.

25.4 Physiological goitre

A physiological goitre presents as a uniform, smooth, painless swelling of the thyroid gland, mainly in girls and women of 12-20yrs. It appears to be about equally common everywhere, and does not cause dyspnoea or dysphagia. It often resolves spontaneously as the period of maximal hormonal activity passes. *Don't operate on these goitres!*

25.5 Colloid goitre

Colloid goitres are worldwide, but are endemic in areas of iodine deficiency. They can be prevented by the administration of iodine to the entire community, which also prevents the other manifestations of endemic iodine deficiency (iodine embryopathy, etc).

Colloid goitres occur between 20-50yrs, and affect women more than men. Large ones obstruct breathing by narrowing or displacing the trachea, and they may occasionally obstruct swallowing. Sometimes, they extend into the thorax. They can be 'simple', in which case they are larger and firmer than a normal thyroid and have a regular surface. More often they are nodular. Although the patient may complain of a single nodule, she usually has more than one, with one lobe of the thyroid much larger than the other. There is no bruit over the nodule unless it is a toxic (hyperthyroid) nodule. Treatment, when it is indicated, is surgical. One of the dangers of a colloid goitre is that haemorrhage may cause it suddenly to increase in size.

If a colloid goitre is small, and is causing no obvious symptoms, surgery is not really necessary, and the indications for its removal are cosmetic. Discuss this with the patient in the light of the available surgical and anaesthetic skills and priorities.

If there is dyspnoea or dysphagia, or the gland is large, subtotal thyroidectomy or thyroid lobectomy is indicated, but is seldom urgent.

If there has been a sudden increase due to haemorrhage, and if dyspnoea is present, aspirate the haematoma, if possible under ultrasound guidance. You may have to aspirate at several sites. If this does not relieve the problem, you may have to try tracheal intubation, which will be difficult.

25.6 Thyroid tumours

(a) **Papillary carcinomas** are of low-grade malignancy, and present as a nodule with or without spread to the lymph glands of the neck. They may be multifocal or bilateral, and are often dependent on thyroid stimulating hormone (TSH) and so may be suppressed by levothyroxine therapy.

(b) **Follicular carcinomas** spread to bone early, so that the first sign may be a bony metastasis. The patient may have a lump or area of thyroid enlargement, or the thyroid may be clinically normal. Tumours are often greedy for iodine, so treatment with radio-iodine is very effective.

N.B. There may be mixed follicular and papillary features in the same specimen.

(c) **Medullary carcinomas** are rare and may have a familial incidence, and are transmitted as a Mendelian autosomal dominant. They have a characteristic histological appearance, a poor prognosis, and may be part of a system of multiple endocrine tumours (phaeochromocytoma and parathyroid, or neuro-fibromas).

(d) **Anaplastic carcinomas** are less rare and occur mostly in elderly women, and are insensitive to radiotherapy; radio-iodine is not taken up.

(e) **Lymphomas** may also occur in the thyroid (17.6), especially in elderly women.

CAUTION!

(1) Enucleation (*i.e.* remove the nodule only) is easy, but is *not satisfactory* because:

(a) It does not remove a carcinoma completely. This is particularly important if it is papillary.

(b) It gives the false impression of a cure.

(c) It makes a second operation more difficult.

(2) *Don't explore a solitary nodule* unless you can perform a thyroidectomy.

Follow up patients regularly, and measure the nodule. If it enlarges, try to persuade her to be seen again by an expert.

25.7 Thyroidectomy

Thyroid surgery is not easy; you need to have gentle fingers and enjoy careful anatomical dissection. You need to judge carefully whether you have adequate expertise to perform this sort of operation and whether your hospital can cope with the aftercare, because although it is very nice when all goes well, complications are serious and often unforgiving!

INDICATIONS

- (1) Goitre, especially causing respiratory compromise.
- (2) Hyperthyroidism, especially if associated with a sizeable goitre, well controlled.
- (3) A thyroid nodule.

CONTRAINDICATIONS

- (1) A physiological goitre (25.4).
- (2) A small goitre where the indication for surgery is mainly cosmetic, especially in a young woman who may develop a recurrent goitre later in life.
- (3) Thyrotoxicosis not controlled.
- (4) Thyroiditis.

N.B. Operating on an anaplastic carcinoma of the thyroid or a repeat thyroid operation are difficult, as anatomical planes are obscured, and need an expert.

PREPARATION

It is essential that your patient is euthyroid before you start (25.2). Get neck and chest radiographs to determine the narrowing and deviation of the trachea. Perform an indirect laryngoscopy (29.13) to check whether both vocal cords are working: if you damage the recurrent laryngeal nerve on one side, and the other cord was paralyzed pre-operatively, you will be in trouble because paralyzed cords are closed cords (29-15)!

Cross-match 2 units of blood. Place the patient supine with a sandbag between the shoulders, the neck extended with the head held on a rubber ring, and the operating table raised head-up to an angle of 20°.

Drape the head putting two towels below it, and then fold the top one across the chin, thus leaving the neck exposed: in this way, the towels won't fall off, but still allow the anaesthetist access if he needs it. Make sure the suction is working properly.

ANAESTHESIA

It is perfectly possible to perform thyroidectomy under LA; this has the advantage that you can ask the patient to talk and check on the vocal cords as you go along. Learn this technique from an expert.

Otherwise, endotracheal intubation (especially with a long flexible tube) is necessary. If there is respiratory distress, this may be very difficult.

METHOD (GRADE 3.5)

A unilateral multinodular goitre needs only a unilateral thyroid lobectomy; a large bilateral or diffuse goitre will require a subtotal thyroidectomy. For hyperthyroidism, a subtotal thyroidectomy is necessary, aiming to leave behind enough gland not to render the patient hypothyroid afterwards. A confirmed malignant thyroid nodule should have a total thyroid lobectomy on that side; it is controversial whether more than this is required. Since the risks of surgery, and hypocalcaemia and hypothyroidism, are substantial with more radical surgery, this is unlikely to be appropriate. Since you are only likely to know about the histology of the gland after you have operated, the question is whether you need to excise more of the thyroid gland. The risks of doing this almost certainly outweigh the advantages. Suppress further tumour growth with levothyroxine or radio-iodine, if you can (25.6).

INCISION

Mark the position of the incision with a thread held taut against the neck; put this 4cm above the suprasternal notch, or higher if the goitre is very large. Infiltrate along this line with 1:500,000 adrenaline solution to reduce bleeding, and cut through *platysma* which is just under the skin.

Develop the upper skin flap by holding it with tissue forceps or skin hooks, and dissecting it off the subcutaneous layer with either a knife, scissors or the finger.

Keep anterior to the anterior jugular veins (25-2A). If you damage these or their tributaries, tie them. Continue your dissection till you reach the cricoid cartilage: this is important, because if you don't, you will not have enough room to mobilize the upper pole of the thyroid gland. It helps to re-apply the tissue forceps further up as you go along.

Then develop the lower skin flap in the same way. You may find it easier to change to the opposite side of the patient to do this. Continue the dissection down to the suprasternal notch, carefully controlling bleeding vessels as you go; get your assistant to retract the skin edges firmly downwards to let you see clearly.

Now hold the skin flaps open with two self-retaining Joll's retractors if you have them; otherwise use towel clips or simply suture the flaps down at the wound edges to hold the wound open.

Try to identify the midline between the strap muscles of each side; this may be significantly distorted in a unilateral goitre where the trachea is shifted. It does not matter too much if you divide some muscle fibres but the bleeding is reduced if you remain accurately between the strap muscles.

Cut gently down to the thyroid gland along this 'midline' and pull the strap muscles laterally with retractors of Babcock forceps (25-2B). It is important that you cut through all the fine layers including the pre-tracheal fascia which covers the thyroid gland itself, because if you are not in the right plane of dissection at this point, you will encounter much bleeding. Once you are down onto the gland, you can use a Lahey swab to develop this plane.

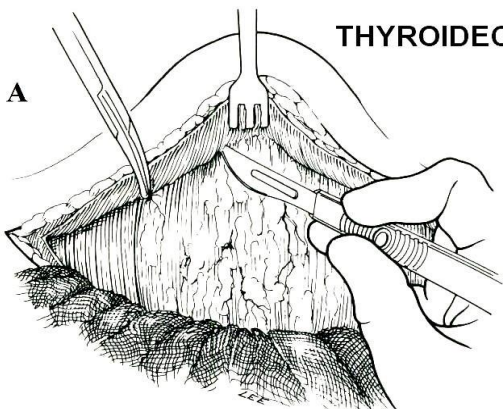
For very large goitres, where you simply cannot get far enough round laterally, you may have to divide the strap muscles between large straight artery forceps.

Stand on the opposite side of the lobe which you wish to remove.

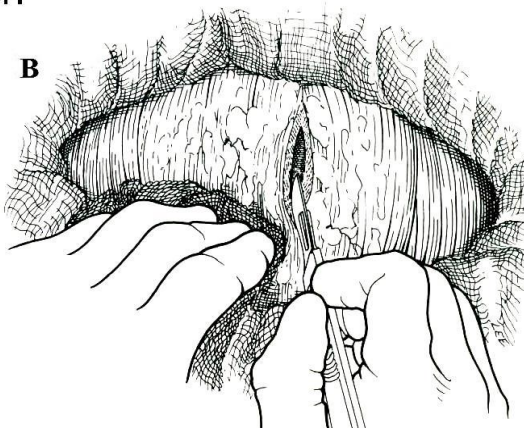
When you are confident that you are in the right plane below the pre-tracheal fascia, place a swab over the thyroid gland so it does not slip from your hand, and gently insinuate your finger between gland and fascia, pulling that thyroid lobe medially (25-2C). This is easier with large goitres which have stretched the fascia. At this point the middle thyroid veins may get in the way: you can divide and tie them. As you retract the thyroid lobe medially, you can use the Lahey swab gently to push away tissues so that you can identify the crucial inferior thyroid artery. This may be quite small, and runs transversely to the gland as a branch of the thyrocervical trunk, *behind* the carotid sheath. Tease away surrounding fibres from the vessel so that you can pass a fine well-curved forceps behind the crucial inferior thyroid artery.

Try to ensure that you pick up the artery on its own because its relationship with the recurrent laryngeal nerve is *variable but intimate*.

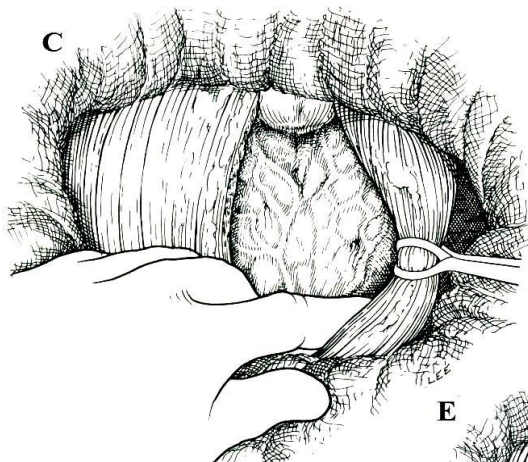
THYROIDECTOMY



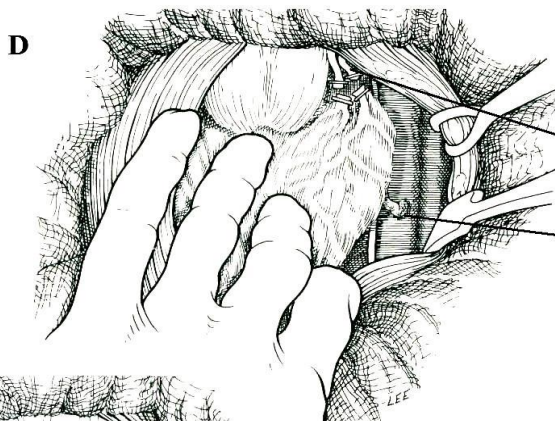
Dissect a skin flap below the intra-cutaneous platysma muscle



Incise the midline between the strap muscles on either side

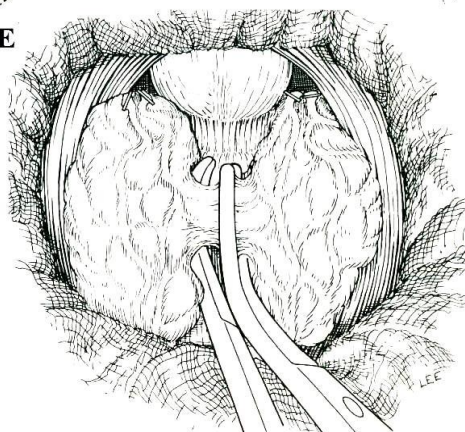


Develop a plane just over the surface of the thyroid gland, moving laterally.

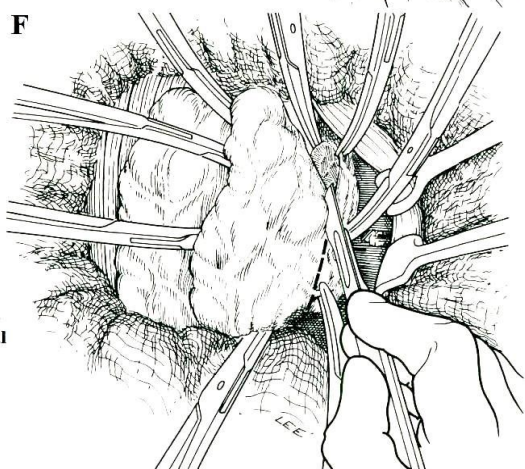


Mobilize and divide the superior pole with clips or double ligatures

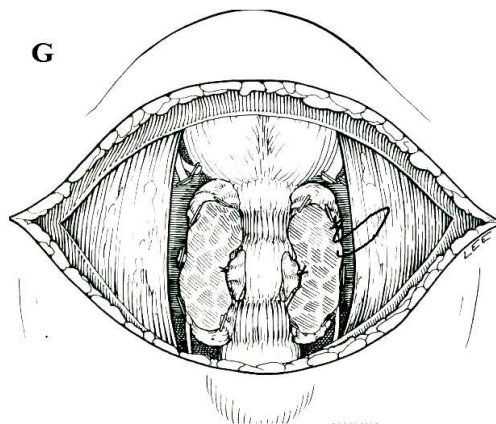
Identify the inferior thyroid artery and pass a ligature around it, but only the vessel



Divide the isthmus with a clamp unless you plan to remove the other thyroid lobe



Remove the part of the thyroid lobe superficial to the clamps



Secure haemostasis by a running suture along the thyroid 'capsule'

Fig. 25-2 THYROIDECTOMY. A-G, stages in the operation. N.B. The parathyroids lie posterior to the bulk of the thyroid gland. After Rob C, Smith R. Atlas of General Surgery. Butterworth 1981 p.706-11 (Figs 5,8-9,11,13-15).

Pass a 2/0 absorbable ligature mounted on an artery clip, and tie this around the artery; *don't divide it* because the vessel may recanalize and the blood supply of the parathyroid glands may still depend on this later.

You may see the recurrent laryngeal nerve, *but you should probably not go out of your way to look for it, in case, in so doing, you damage it inadvertently!*

Once you have ligated the inferior thyroid artery, the thyroid lobe will become a dusky bluish colour. Now turn your attention to the upper pole; sometimes it is easier to deal with this before the inferior thyroid artery but the vascularity of the gland will still then be undiminished.

Develop the pre-laryngeal space lateral to the thyroid cartilage so that you can pass a curved artery forceps around the branches of the superior thyroid artery and veins to the upper pole.

Ideally you should avoid the external laryngeal nerve which runs behind as division of this will affect the timbre of the voice (25-2D). Put 2 haemostats proximally and one distally, and divide between the latter.

Tie two 0 absorbable ligatures around the most proximal haemostat, release this, and then tie another ligature around the remaining haemostat; in this way you will avoid the ligature slipping and vessels disappearing deep into the neck causing a haematoma which will cause respiratory compromise.

Finally, you can mobilize the lower pole by ligating the inferior thyroid vessels. If the isthmus is not too thick, and you are only removing one lobe, you can insinuate a forceps between it and the trachea and clamp it across (25-2E).

Now, put fine haemostats all around the margins of the mobilized lobe especially where you see veins crossing over the surface, staying well *anterior* to the position of the recurrent laryngeal nerve and parathyroids (25-2F). Remove the excess bulk of the thyroid lobe distal to these fine haemostats with scissors or a knife, having haemostats ready to catch any bleeding points. Aim to leave a remnant 5x1cm (25-2G).

To control bleeding, take a running absorbable suture along the 'capsule' (pre-tracheal fascia) of the thyroid and secure it to the tracheal fascia.

If you are going to perform a bilateral thyroidectomy, you can now change sides and proceed as before on the contralateral side.

When you are satisfied the bleeding is controlled, ask the anaesthetist to make the table level to horizontal, or better, head down to 30° of Trendelenburg: some vessels may then start oozing.

Control these, and when all is dry, insert suction drains through the strap muscles into the thyroid bed, and secure them firmly with sutures on the lateral sides of the neck, *not in the middle where keloids are more likely to form*. If you have divided the strap muscles, plicate and overlap them to reduce the dead space.

Close the investing fascia with a continuous absorbable suture, the subcutaneous layer with interrupted absorbable sutures, and the skin with a subcuticular suture.

DIFFICULTIES WITH THYROIDECTOMY

If there is heavy bleeding, make sure the head is tilted up. Apply swabs soaked in adrenaline solution. Press on the bleeding point(s) for 5mins by the clock. Obtain suction and then carefully expose the bleeding point in order to catch it in a haemostat.

Don't plunge forceps blindly into the wound!

If the bleeding is from the surface of the thyroid gland, hold it firmly in a gauze and expose the inferior thyroid artery as above. Ligation of this will substantially reduce haemorrhage.

If there is a retrosternal extension, you can usually deliver this by gentle traction, with a finger behind the gland. Occasionally, you may need a sterilized spoon to deliver it. Very rarely is it necessary to split the sternum!

If during operation, the temperature, pulse, and blood pressure all rise alarmingly, this is a thyroid 'storm' where excessive thyroid hormone is released into the circulation through manipulation of the gland, especially when operating on a thyrotoxic patient. Speed up IV fluids, add propranolol 5mg IV, hydrocortisone 100mg IV, and carbimazole or propylthiouracil via a nasogastric tube. Stop operating till the situation has normalized. (If you don't have propranolol IV, you can place crushed tablets in the vagina, where they are rapidly absorbed.)

If there is continued oozing at the end of the operation, be careful you don't put in sutures that may compromise the recurrent laryngeal nerve. Use absorbable haemostatic gauze and insert drains. Keep the patient intubated and sedated post-operatively, and re-open the wound the following day when identifying the source of the bleeding will be much easier.

If the goitre is huge and the trachea has been pulled forwards, insert a prophylactic tracheostomy before you close the wound.

If the patient cannot breathe properly after the operation, suspect vocal cord palsy if there is stridor and cyanosis without swelling of the neck. You will need to pass an endotracheal tube rapidly, or else perform a tracheostomy (29.15); the quickest access to the trachea will be through the surgical wound: re-open the midline fascial closure.

If there is stridor and swelling of the neck after the operation, suspect haemorrhage beneath the deep fascia. Open the wound on the ward, and re-open the midline

fascial closure. Scoop out the blood clots: the patient's respiratory distress will be immediately relieved. Then take her back to theatre to try and identify the bleeding points. Secure these, put in new suction drains, and close as before.

If there is tetany after the operation, you may have removed or devascularized the parathyroids. These are four small yellowish-brown glands, responsible for calcium homeostasis, which are at the back of the thyroid (25-2). Treat with 10% calcium gluconate 10ml IV qds, followed if necessary by oral calcium and vitamin D supplements.

N.B. If you have inadvertently removed a parathyroid gland, you can re-implant it, after slicing it into 1mm sections, into the sternomastoid muscle.

If hypothyroidism develops later, characterized by fatigue, weight gain, cold intolerance, menstrual irregularity, gruff voice and bradycardia, treat with levothyroxine 0.1mg od initially. You may need to adjust the dose later, so follow up the patient.

25.8 Other thyroid problems

You may see the following three non-neoplastic diseases of the thyroid. Apart from lymphocytic thyroiditis, they are uncommon, and you may have to do a needle biopsy to distinguish them.

If a goitre is uniform and feels unusually firm and very well defined, but is not particularly tender, suspect autoimmune lymphocytic thyroiditis (Hashimoto's disease, not uncommon). This occurs between 20-70yrs and is usually found in females. Spontaneous resolution is usual but slow. Hypothyroidism often develops, and needs replacement therapy with levothyroxine 0.1-0.2mg od.

If the thyroid becomes woody hard, is fixed to the surrounding tissues, and is either normal-sized or a little enlarged, suspect Riedel's thyroiditis. Inflammation replaces the normal thyroid tissue and adjacent tissues in the neck, and can lead to hoarseness, stridor, and dysphagia. Distinguish this from malignant tumours by aspiration cytology.

If the thyroid becomes inflamed, hot and tender, often with respiratory embarrassment, suspect a thyroid abscess, or HIV-related thyroiditis (6.12) or glandular fever (mononucleosis).