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Oxford Textbook of Endocrinology & Diabetes, 1st Edition

Surgical procedure

Part of "3.3.6 - Surgery for thyrotoxicosis"

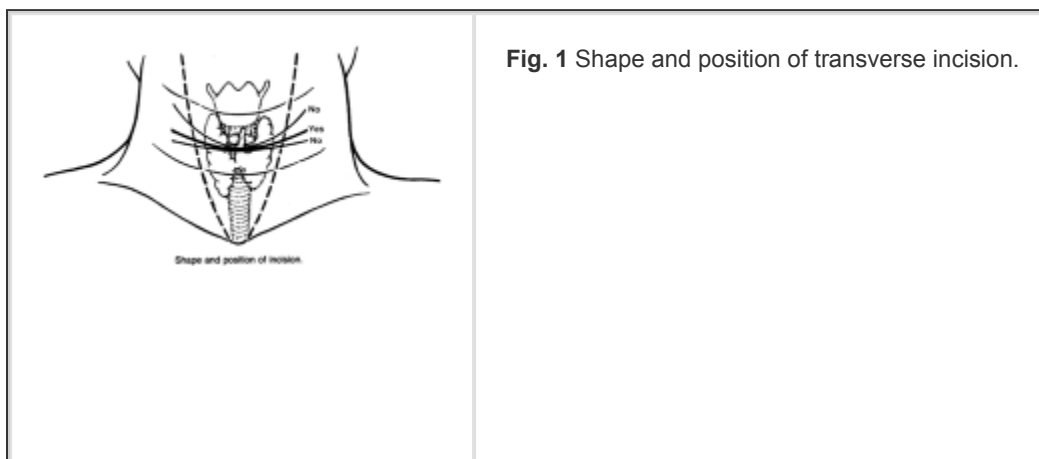
The goal of surgical intervention in patients with thyrotoxicosis is to reduce the excessive secretion of thyroid hormone. The ideal surgical therapy depends on the aetiology of the disease. In Graves' disease and/or in toxic multinodular goitre a subtotal thyroidectomy leaving approximately 5 g of thyroid is the procedure of choice. A toxic adenoma confirmed by radionuclide scan can be treated by excision or a unilateral lobectomy. If coexisting thyroid pathology is present, such as thyroid carcinoma or severe endocrine ophthalmopathy, total thyroidectomy is recommended.(8)

Thyroid operations are usually quite safe and are associated with minimal morbidity and virtually negligible mortality when performed by experienced surgeons. Most operations are done under general anaesthesia for airway protection and patient comfort. In the operating room, the anaesthesiology team should have intravenous β -blockade and sodium ipodate on hand in the event of a thyroid storm. This is an extremely rare event today and is preventable by diagnosing untreated hyperthyroidism preoperatively. It occurs most often when patients with uncontrolled hyperthyroidism require an emergent operation for acute inflammation such as appendicitis.

For thyroid operations the patient is placed on the operating-room table in the supine position with the neck hyperextended. Care should be taken to assure that the head is supported and that the upper extremities are properly positioned to prevent ulnar nerve palsies. A rolled drape is placed longitudinally along the patient's

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spine to allow the shoulders to gently fall posteriorly, moving the thyroid gland anteriorly and cephalad. The chin, neck, and upper chest should be visible after draping for easier landmark delineation. The site of the incision is chosen approximately one centimetre below the cricoid cartilage (Fig. 1).



This is usually two finger breadths above the sternal notch and places the incision directly over the isthmus of the thyroid gland. The incision is made and carried through the subcutaneous tissues and platysma muscle. Midline dissection is carried out between the strap muscles. The sternothyroid muscle is dissected free from the sternohyoid muscle to provide better exposure. These muscles are retracted laterally and freed from the thyroid gland. The carotid sheath is retracted laterally, tensing the middle thyroid veins and inferior thyroid artery. The tissues adjacent to the thyroid gland are gently pushed away and dissected free of the gland using blunt dissection. Careful inspection for the parathyroid glands and recurrent laryngeal nerve begins once the middle thyroid veins are ligated. A silk ligature placed through the thyroid gland parenchyma is sometimes used to help mobilize the gland. This manoeuvre rotates the thyroid medially and anteriorly and creates tension on the inferior thyroid artery, usually bringing it and the recurrent laryngeal nerve into view. If the nerve is not identified at this point, it can be recognized with careful dissection along the capsule of the gland down to the level of the cricoid cartilage. Here it enters the posterior, caudal-most portion of the cricothyroid muscle. Meticulous care is taken to avoid dividing any structure that could possibly be nerve. The recurrent nerve courses obliquely after travelling around the subclavian artery on the right and more nearly vertically after traversing around the ligamentum arteriosum on the left. Keeping this in mind helps in nerve identification.

(Fig. 1, Fig. 2 and Fig. 3: From *Endocrine Surgery of the Thyroid and parathyroid Glands*. Clark OH, ed. CV Mosby Co., St Louis Missouri, 1985 with permission.)

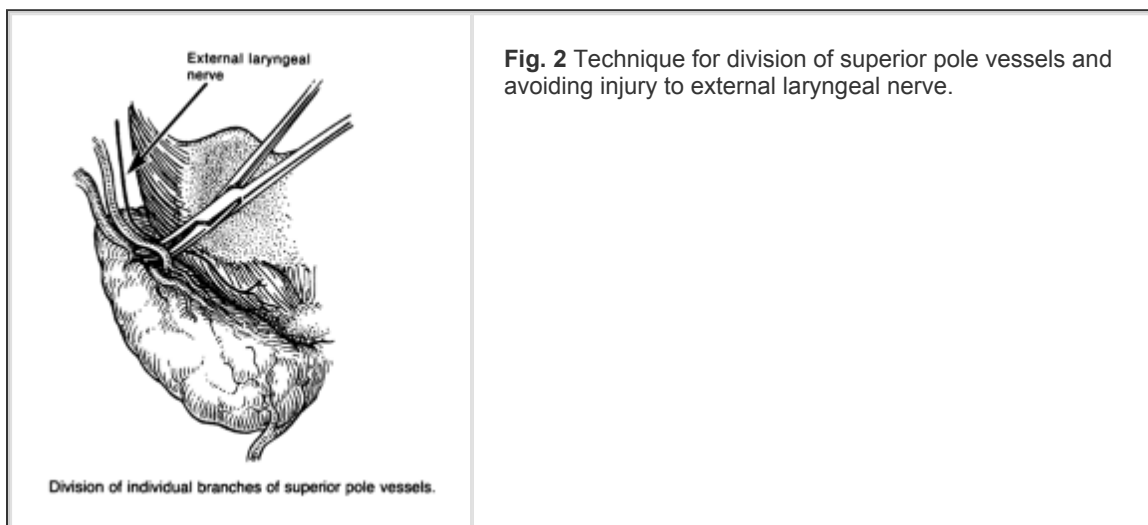
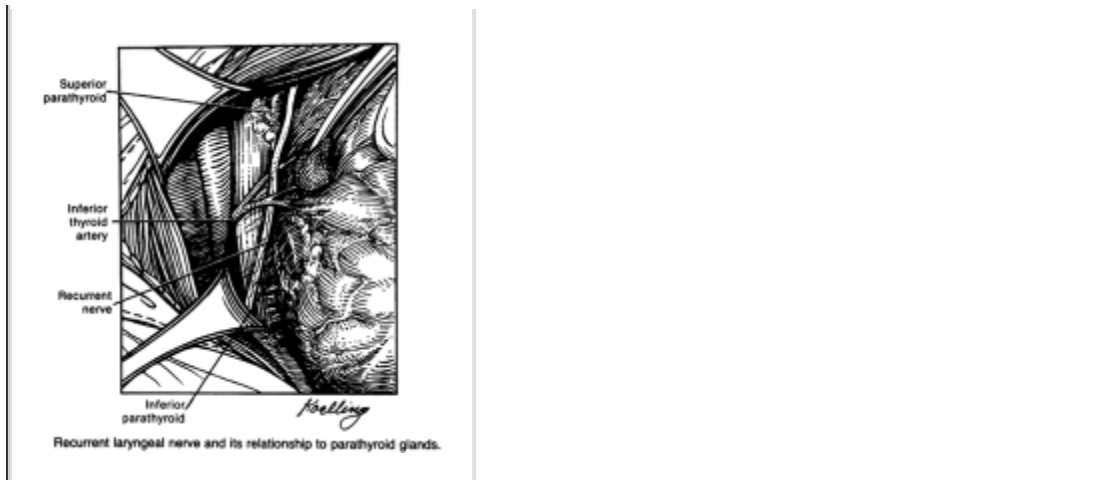


Fig. 3 Anatomy of position of recurrent laryngeal nerve.



Attention is then directed to the superior pole. The superior thyroidal vessels are routinely divided early in the operation. The superior thyroid artery and vein should be ligated individually as low as possible on the thyroid parenchyma to avoid possible injury to the external laryngeal nerve (Fig. 2).

No thyroid tissue should remain cephalad to the point of ligation as this could result in a suggestion of metastatic thyroid cancer if the patient were to have a radioiodine scan postoperatively. Care is taken to avoid injury to the external laryngeal nerve, which is responsible for high-pitched sounds and is referred to as the 'high note nerve' or 'Amelita Gala Curci nerve'.

The upper parathyroid glands are usually identified where the recurrent laryngeal nerve enters the cricothyroid membrane. This is at the level of the cricoid cartilage.

The thyroid is retracted medially and the tissues on the undersurface carefully dissected. The lower parathyroid glands are almost always anterior to the recurrent nerve and 80 per cent of the time are within 1 cm of the junction of the inferior thyroid artery and the nerve (Fig. 3).

A broad tissue plane is left around the parathyroid glands when they are dissected from the thyroid to minimize the risk of devascularization. In the rare event that this cannot be successfully accomplished, the parathyroid should be excised, its identity confirmed, and 1-mm sections autotransplanted into separate pockets in the sternocleidomastoid muscle. Once the thyroid is elevated away from the parathyroid glands and the recurrent nerve, the inferior thyroid veins can be safely ligated. The gland is then dissected away from the anterior surface of the trachea. A dense posterior ligament (the Ligament of Berry) firmly attaches the thyroid to the first two

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tracheal rings. This is the most common site of nerve injury and special care must be taken if there is bleeding from the small artery and vein that was situated in this ligament. No vessels should be clamped in this area until the recurrent laryngeal nerve is identified. If a lobectomy is to be performed, the isthmus and pyramidal lobe should also be removed in continuity with the lobe. For subtotal resection a similar process is repeated on the opposite side, except that a thyroid remnant should be left in the area of the intersection of

the recurrent nerve and cricothyroidal muscle. The inferior thyroid artery is also usually kept intact to provide a blood supply to the remnant. Remnant size can be approximated by matching it to a measured and weighed tissue sample taken from the contralateral lobe. If the indications call for total thyroidectomy, no remnant is left in the neck. For patients with Graves' disease we prefer the Hartley–Dunhill operation, which is total lobectomy on one side and a subtotal or near total on the other, leaving 2 to 6 g, depending on the desired outcome.

Perfect haemostasis is achieved. The sternothyroid muscles are approximated leaving a small opening in the midline at the suprasternal notch to allow for escape of blood and to make bleeding more evident if it were to occur postoperatively. The sternohyoid muscles are brought together in a similar fashion. The platysma muscle is aligned and approximated, and the skin is closed with butterfly or wing clips. Dressings are applied and the patient is awakened, extubated, and transported to the postoperative recovery area. Most patients are ready for discharge on the evening of the operation but outpatient procedures are not recommended because of the rare possibility of postoperative bleeding that could compromise the airway. This danger is more likely to be life-threatening if it occurs out of the hospital setting.

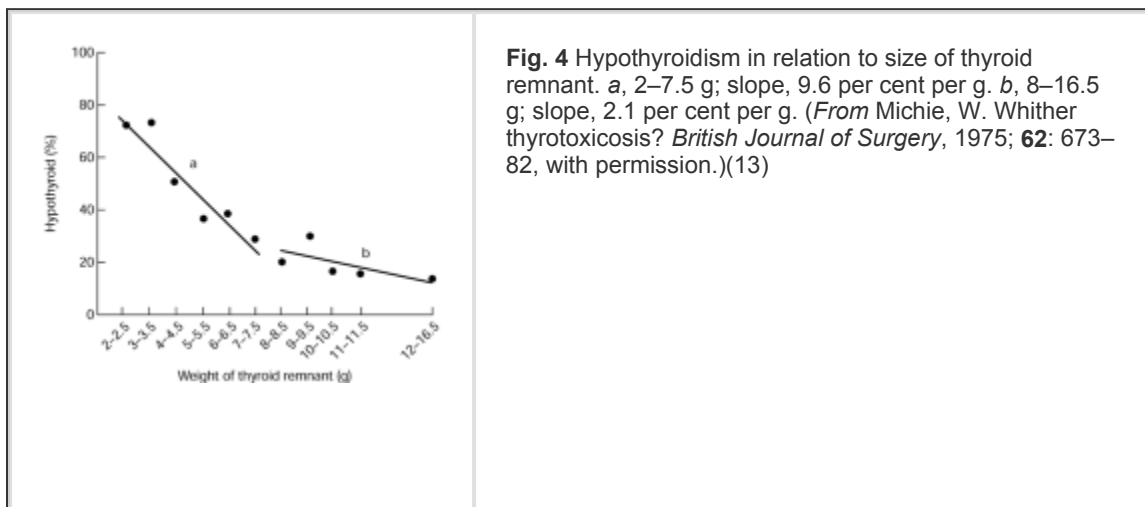
The quantity of the residual thyroid tissue is the most important factor regarding the postoperative development of hypothyroidism, euthyroidism, or recurrent hyperthyroidism after a subtotal thyroidectomy for thyrotoxicosis.(9) Leaving too much or too little tissue can make the difference between recurrent thyrotoxicosis, a euthyroid state, or hypothyroidism. Other factors that affect postoperative function include the functional abilities of residual tissue, regeneration, and the state of hormonal and immune systems. (10) For example, children are more likely to develop recurrent hyperthyroidism, so that it is essential to leave a smaller thyroid remnant. Factors that have been found to influence and not influence thyroid function can be found in Table 2.(11)

Table 2 Postoperative thyroid function

Influence on thyroid function		No influence on thyroid function	
Remnant size		Initial size of gland	
Antibody titres		Type of antithyroid medication	
Age of patient		Dose of antithyroid medication	

Type of goitre	Duration of antithyroid medication
Lymphocytic infiltration in gland*	
Timing of follow-up	
<hr/>	
<p>* Some studies suggest that lymphocytic infiltration and fibrous septa may predispose to hypothyroidism.</p>	

There are several schools of thought on 'how much is enough'. Some surgeons aim to create hypothyroidism and not achieve a euthyroid state by leaving a 'magical quantity' of thyroid tissue behind.(12) Others aim for euthyroidism by preserving functioning tissue. In a range of 2 to 8 g, increasing the remnant size by 1 g decreases the rate of postoperative hypothyroidism by about 10 per cent. This calculation is based on a 70 per cent rate of hypofunction if 2 g are left intact. However, increasing the remnant size above 10 g does not lead to further decrease in hypothyroidism but rather to more recurrences (Fig. 4).



Some surgeons leave 3–5 g of tissue on both sides of the neck. This procedure is associated with a recurrence rate of 10 per cent and a hypothyroid rate of 10 per cent.(14) We aim to leave between 4 and 7 g of thyroid remnant on one side of the neck. If our aim is to render the patient euthyroid the size is tailored to take into account factors that may increase the likelihood or hazard of an adverse result in either direction. For example, a smaller remnant is left in children because recurrence is more likely and in patients in whom radioactive iodine therapy is undesirable, in adult patients with other problems when recurrent disease would put them at risk (that is, cardiac disease), and in all patients with

severe complications to antithyroid drugs. The practice of leaving a remnant on one side results in having only one side of the neck to re-explore or irradiate in the uncommon event of a recurrence, and decreases the small risk of nerve injury on the remnant side. It is also easier to tailor the precise size of the remnant.