Open Right Thyroid Lobectomy

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Introduction

Surgery of the thyroid gland spans back to medieval times, with the first known operation dating back to 952 AD, when Abu al-Qasim (a renowned surgeon of the Middle Ages) performed the first goiter resection. In the mid-nineteenth century, thyroid surgery was considered so perilous that it was banned by the French Academy of Medicine. Over the next century, many prominent surgeons advanced techniques in thyroidectomy. For example, William Stewart Halsted was a strong advocate of distal vessel ligation to preserve blood supply to the parathyroid glands, and Frank Lahey described the identification and preservation of the recurrent laryngeal nerve [1]. More recently, technological advances such as bipolar energy devices and intraoperative nerve monitoring have become important adjuncts to thyroid surgery. In modern times, thyroid surgery is considered one of the most efficient and safest operations when performed by high-volume surgeons.

Thyroid lobectomy is considered to be an appropriate surgical management option for cases of toxic adenoma, indeterminate thyroid nodules, papillary thyroid microcarcinomas, and low-risk differentiated thyroid cancers. Compared to total thyroidectomy, thyroid lobectomy eliminates the risk of postoperative hypocalcemia as the contralateral parathyroid glands are spared from exposure to surgical risk. Thyroid lobectomy also avoids the risk of bilateral recurrent laryngeal nerve injury and is associated with lower overall morbidity. Thyroid lobectomy can be performed as an outpatient procedure for the majority of patients.

Procedure

A 35-year-old euthyroid woman presents to the surgery clinic with a right thyroid nodule, which she first noticed on self-examination. Ultrasound confirms a 2.2-cm right intrathyroidal nodule without associated cervical lymphadenopathy. Fine needle aspiration demonstrates Bethesda III cytology. Subsequent molecular testing indicates a 50% risk of malignancy. Preoperatively, a thorough discussion of the risks and benefits of thyroid lobectomy is shared with the patient. Risks of thyroid lobectomy include hoarseness, change in voice, pain, bleeding, infection, scar, need for reoperation, need for thyroid hormone replacement, and risks related to anesthesia. The patient elects to undergo diagnostic right thyroid lobectomy and signs a surgical consent.

In the preoperative holding area, the patient's neck is marked to indicate the appropriate laterality. She is transferred to the operating room, where general anesthesia is induced and a neural integrity monitor (NIM) electromyogram endotracheal tube is placed. In the majority of cases, we recommend a 7.0-mm endotracheal tube for women and 8.0-mm for men. A slightly larger NIM tube than a regular endotracheal tube is generally preferred to improve the approximation of the vocal cords to the electromyographic pads. An orogastric tube should be placed in the esophagus to allow the easy palpation of the esophagus during the process, thereby more easily delineating the tracheoesophageal groove and thus the likely path of the recurrent laryngeal nerve. This will make the surgery faster and easier. Antibiotics are not indicated for thyroid surgery, but preoperative steroids should be administered. A single preoperative dose of dexamethasone 8 mg has been shown to reduce nausea and pain postoperatively [2]. A time-out to confirm patient name, procedure, and laterality is performed.

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For optimal positioning, the patient is placed supine on the operating table with both arms tucked and a shoulder roll placed transversely beneath the shoulder to extend the neck. Hyperextension should be avoided. A 1-l pressure infusion bag can be used as an adjustable, inflatable shoulder roll. A gel donut headrest is placed under the occiput to stabilize the head during surgery. The patient is placed in semi-Fowler's position to help extend the neck further and bring the head above the heart level, thus reducing the venous pressure in the head and neck. For intraoperative nerve monitoring, leads are placed in the subcutaneous tissues of the arm or chest.

Once the patient's neck is prepped with sterile cleaning solutions, it is draped in such a fashion that visual symmetry of the neck is maintained. A transverse curvilinear incision is made ideally in a natural skin crease, preferably just below the cricoid cartilage, which approximates the level of the ligament of Berry. At the ligament of Berry, the thyroid is densely attached to the trachea, and the recurrent laryngeal nerve enters the larynx. To accurately center the incision, the midline can be marked with a silk suture extending from the chin to the sternal notch. The length of the incision will depend on the size of the thyroid gland to be removed. Typically, a 4–6-cm incision suffices for most thyroid surgeries (Fig. 2.1). Starting with a smaller incision, but extending it if needed, is a good approach to minimize its length, but the surgeon should be mindful about safety and adequate visualization.

Once the incision is marked, it is incised sharply with a #15 blade and deepened through the subcutaneous tissues with electrocautery. Subplatysmal flaps are then raised, superiorly and inferiorly (Fig. 2.2). Double-armed skin hooks are used to elevate the subplatysmal flaps. The anterior jugular veins that overlie the sternohyoid muscles should be preserved if possible to avoid bleeding. The fascia of the sternohyoid muscles should remain with the muscle to preserve natural tissue planes during flap creation. The median raphe is incised with cautery to separate the sternohyoid muscles and expose the thyroid gland beneath (Fig. 2.3).

We then turn our focus to the right lobe. The sternohyoid and sternothyroid muscles are dissected away from the anterior aspect of the right thyroid lobe with electrocautery, and they are retracted laterally. The fascia of the sternohyoid

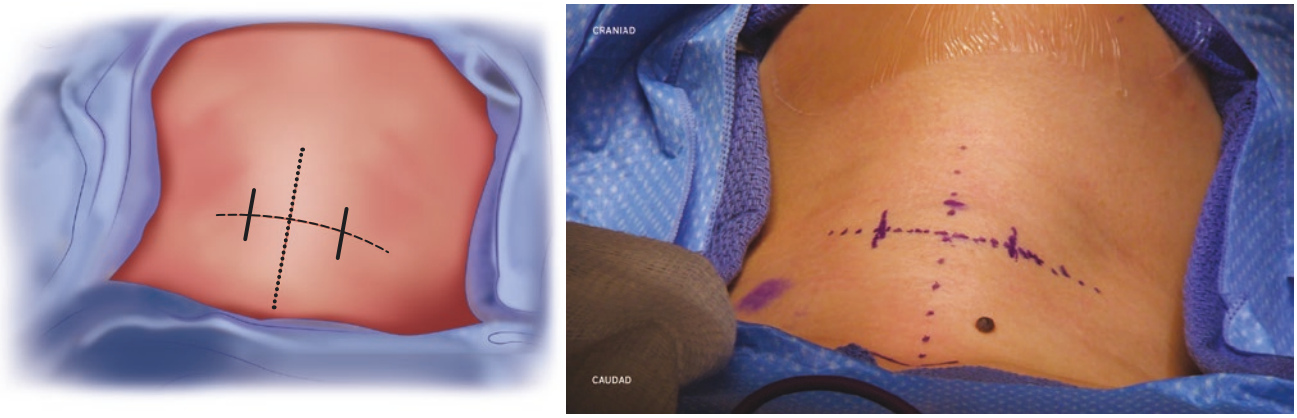

Fig. 2.1 Incision is marked on the neck, approximately two fingerbreadths above the sternal notch, ideally in a natural skin crease

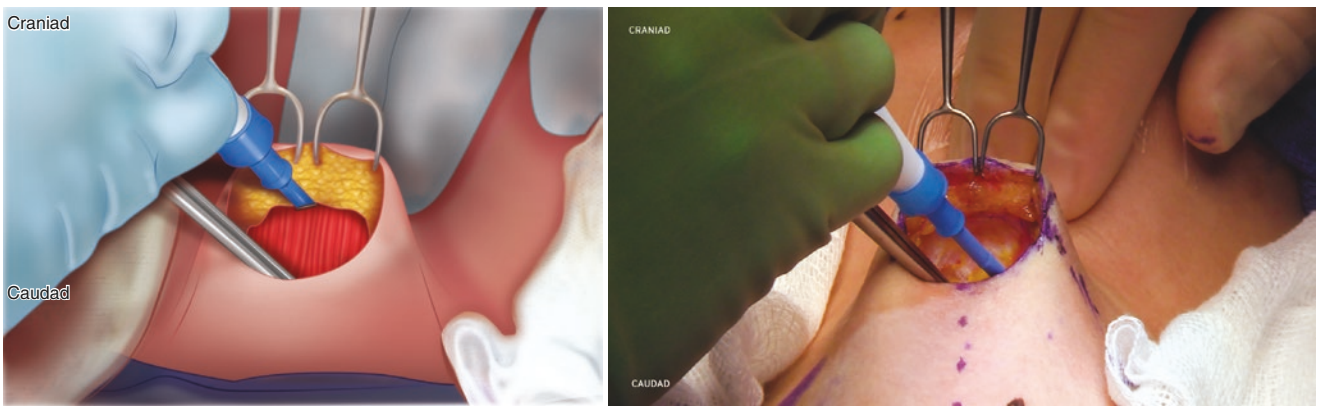

Fig. 2.2 Once the incision is deepened through skin and subcutaneous tissues, subplatysmal flaps are raised

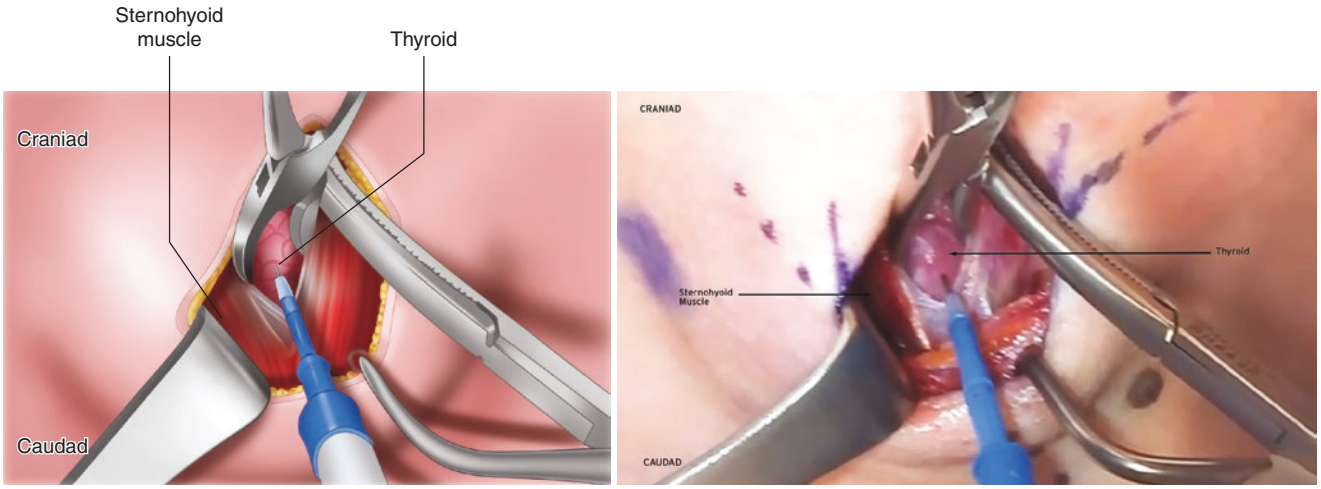

Fig. 2.3 The median raphe is incised to separate the sternohyoid muscles and expose the thyroid underneath

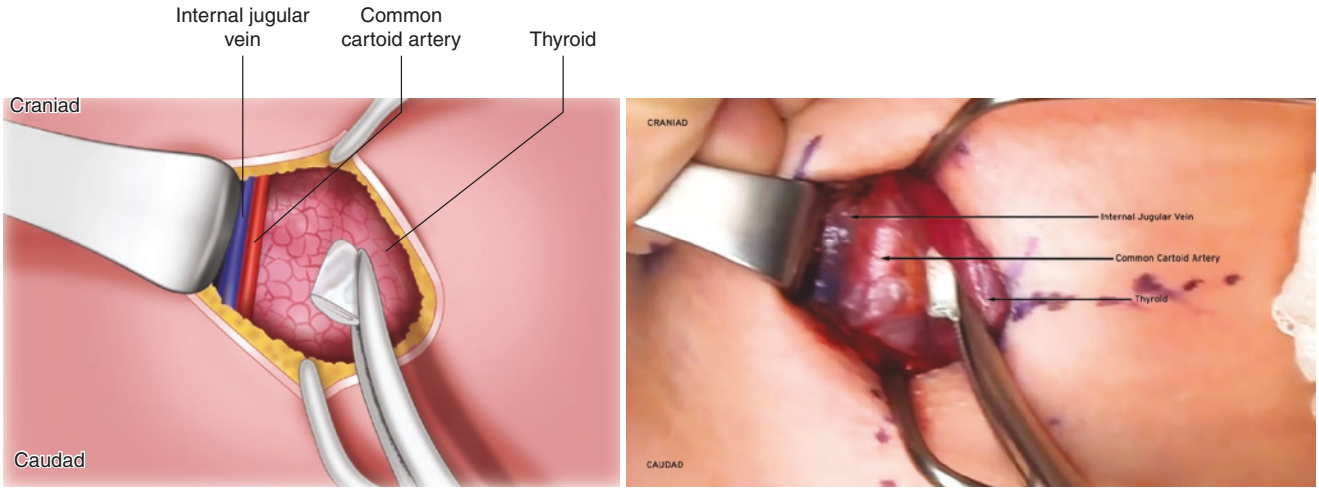

Fig. 2.4 Areolar tissue between the thyroid and common carotid artery is bluntly cleared, exposing the common carotid artery

muscles should remain with the muscle to preserve natural tissue planes during flap creation. The sternothyroid muscle can be divided at the level of the cricoid cartilage for additional exposure of the upper pole. The areolar tissue between the thyroid gland and the common carotid artery can then be cleared using blunt dissection and cautery (Fig. 2.4). The internal jugular vein is visualized adjacent to the common carotid artery; the vagus nerve lies between the internal jugular vein and the common carotid artery. The vagus nerve can be identified with the nerve monitor.

Technique Tip Care should be taken with the nerve monitor probe to avoid puncture or trauma to the carotid sheath; the authors routinely bend the tip of the probe to make it blunt. Touching the vagus in the carotid sheath low in the neck and obtaining a good NIM signal can indicate normal recurrent laryngeal nerve anatomy. If the signal cannot be obtained low in the carotid sheath, but rather is found high at the level of the upper pole, there is potential for a nonrecurrent laryngeal nerve. When seen, nonrecurrent laryngeal nerves are more commonly identified on the right. This maneuver can help plan the dissection of the nerve and alert the surgeon to potential variable anatomy.

The middle thyroid vein, which is the primary venous drainage of the thyroid gland, is seen in 70% of patients. The middle thyroid vein runs anterior to the carotid artery; it can be easily identified and ligated with 2-0 silk without concern [3]. The thyroid lobe then is mobilized anteromedially by

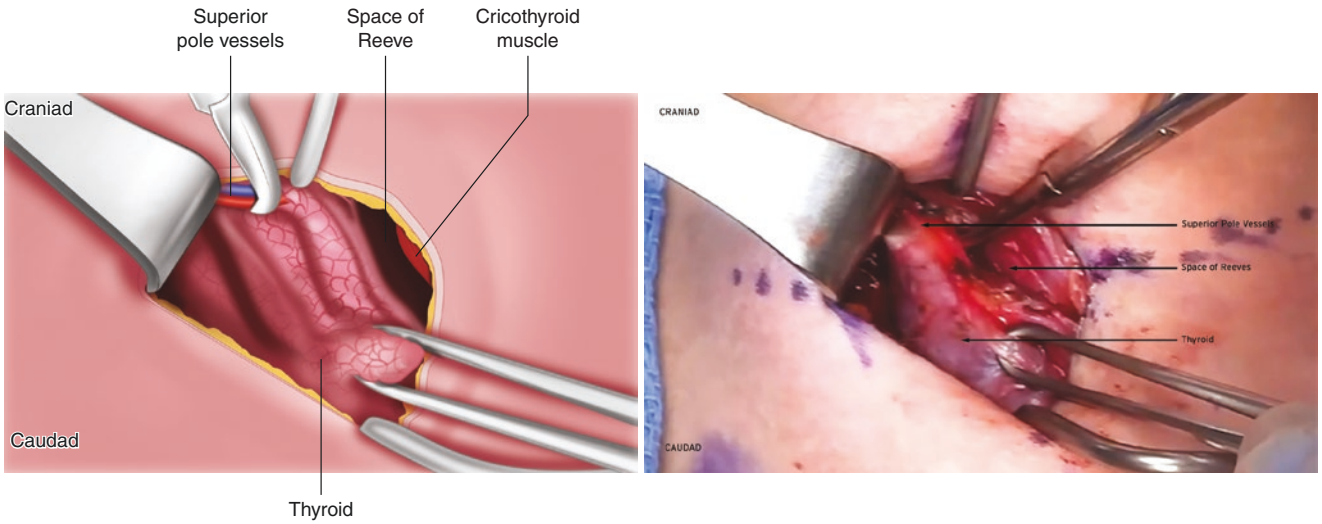

Fig. 2.5 The superior pole vessels are individually dissected and ligated with 2-0 silk ties

applying traction. A peanut sponge can be useful for applying traction and improving visualization in a small incision by keeping the hand out of the way.

Technique Tip The esophagus should be gently mobilized to the right side of the neck to allow better exposure of the tracheoesophageal groove. This can be done by gently pushing the right thyroid lobe medially and the thyroid cartilage pushed externally from the left side of the neck. Having the orogastric tube in the esophagus makes it easily palpable.

We turn our attention to the right superior pole of the thyroid. The superior pole is exposed with gentle caudal and lateral traction. Working medially to laterally, the avascular space of Reeves between the superior pole of the thyroid gland and cricothyroid muscle is opened, taking care to avoid injury to the external branch of the superior laryngeal nerve, which innervates the cricothyroid muscle and usually passes medial to the superior pole vessels. The external branch of the superior laryngeal nerve can be identified with the intraoperative nerve monitor. The superior pole vessels are individually ligated with 2-0 silk sutures and divided with a vessel-sealing device (Fig. 2.5). The right upper parathyroid gland also should be identified; parathyroid tissue is often orange-brown in color. The right upper parathyroid gland is preserved by incising the thyroid capsule and leaving behind extracapsular tissue surrounding the parathyroid gland.

Technique Tip In thyroid surgery, water is typically used for irrigation as it helps lyse red blood cells and clears the field quickly, allowing for the use of natural tissue color to identify structures.

With the superior pole freed, we turn our attention to the identification of the recurrent laryngeal nerve. The nerve can be visualized by dissecting anteriorly and parallel to the nerve, starting in the thyrothymic ligament. The recurrent laryngeal nerve passes between the branches of the inferior thyroid artery. More frequently, the right recurrent laryngeal nerve has an oblique trajectory compared to the left recurrent laryngeal nerve (Fig. 2.6). Intraoperative nerve monitoring can aid in the identification of variations in the nerve anatomy, such as a nonrecurrent laryngeal nerve (see *Technique Tip* above). Once the recurrent laryngeal nerve is identified, the tertiary branches of the arteries and veins surrounding the thyroid can be divided.

Technique Tip Use the lowest cautery settings necessary. When dissecting near the nerve or parathyroid glands, use bipolar cautery or no cautery.

By remaining close to the surface of the thyroid, the blood supply to the parathyroid glands can be better preserved. The right upper and lower parathyroid glands should be visualized and preserved by dissecting them away from the thyroid gland (Fig. 2.7). The thyroid lobe is dissected away from the recurrent laryngeal nerve. At the two upper tracheal rings, the recurrent laryngeal nerve embeds in the posterior portion of the ligament of Berry, which attaches the thyroid to the trachea. This area is where the recurrent nerve is most vulnerable to injury [4]. Undue medial traction on the thyroid gland can also injure the recurrent laryngeal nerve by stretching it, so care should be taken to avoid hard and prolonged rotation. At the ligament of Berry, the thyroid tissue is ligated with 2-0 silk sutures and cauterized

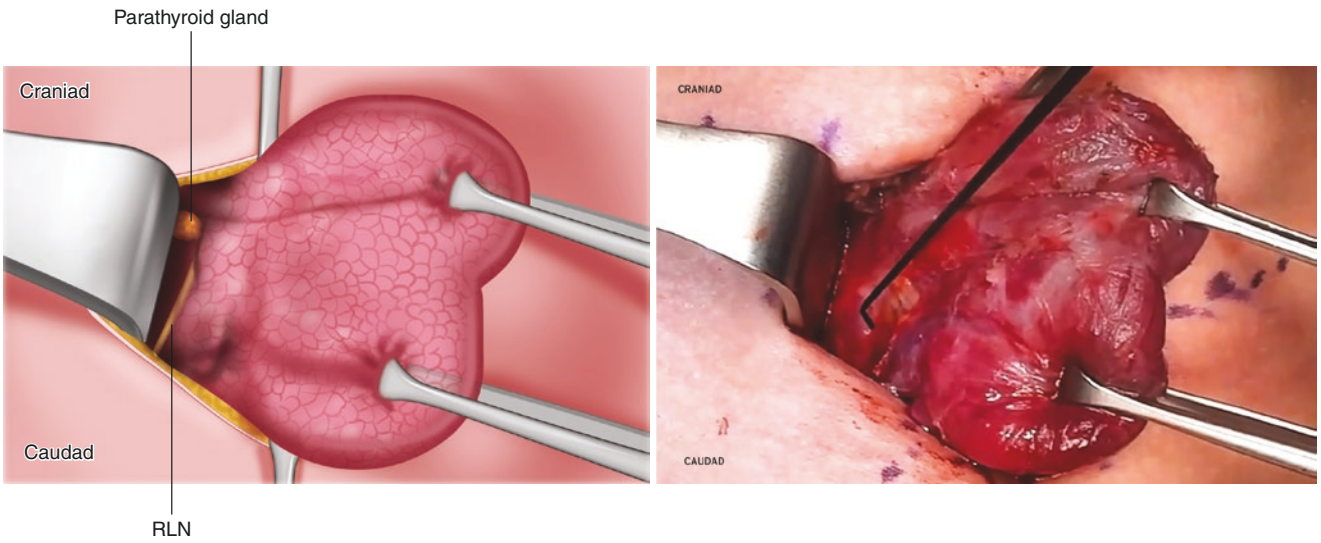

Fig. 2.6 With the thyroid retracted medially, intraoperative nerve monitoring is used to identify the recurrent laryngeal nerve, which generally has a more oblique trajectory on the right

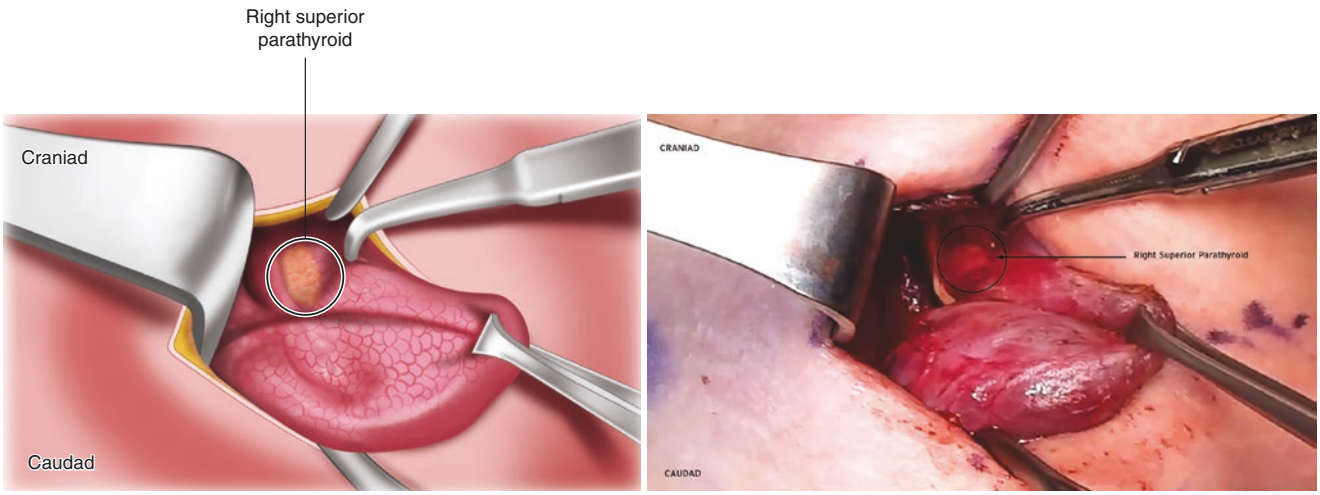

Fig. 2.7 The superior and inferior parathyroid glands should be visualized and preserved. The superior parathyroid gland will be posterior to the recurrent laryngeal nerve, while the lower parathyroid gland will be anterior to it

using bipolar energy to avoid injury to the recurrent laryngeal nerve (Fig. 2.8).

Technique Tip If a parathyroid gland is removed during thyroid surgery, it can be autotransplanted. First, the candidate parathyroid gland should be confirmed by frozen section to be indeed parathyroid tissue. Then it is minced with a #15 blade into 1-mm pieces and autotransplanted into a pocket of the adjacent sternocleidomastoid muscle. This pocket is closed with nonabsorbable suture.

Once the thyroid lobe has been separated from the recurrent laryngeal nerve, it is retracted medially and the trachea is exposed (Fig. 2.9). The isthmus is separated from the trachea using cautery. The pyramidal lobe should be resected at this point. The authors advise having the pyramidal lobe resected always at the first operation (lobectomy) as resecting it at a later time is very difficult, given the scarring, and may lead to remnant thyroid tissue in the neck.

A Kelly clamp is placed across the medial aspect of the contralateral thyroid lobe, which allows us to remove the isthmus with the thyroid lobe at the first operation. The thyroid is divided with a vessel-sealing device. The cut thyroid edge is then oversewn with interlocking horizontal mattress 2-0 silk sutures to compress the parenchyma and control the venous drainage of the thyroid (Fig. 2.10) [5].

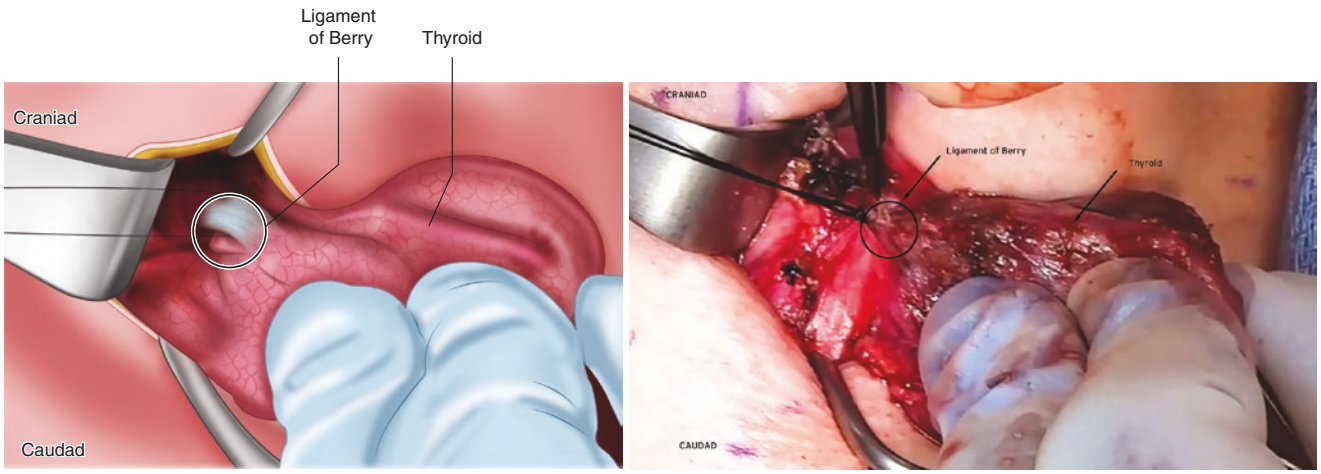

Fig. 2.8 At the ligament of Berry, the thyroid tissue is ligated with silk suture and cauterized with bipolar energy. Care should be taken to avoid injury to the recurrent laryngeal nerve with this maneuver

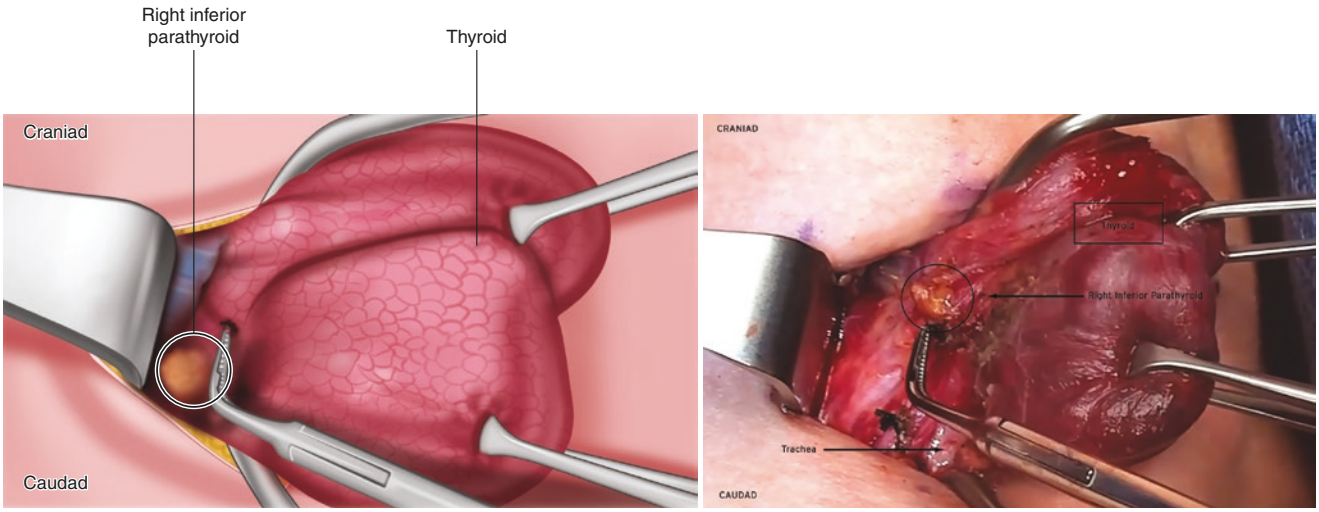

Fig. 2.9 Once the parathyroid glands and recurrent laryngeal nerve are dissected away from the thyroid, the lobe can be retracted medially to expose the trachea

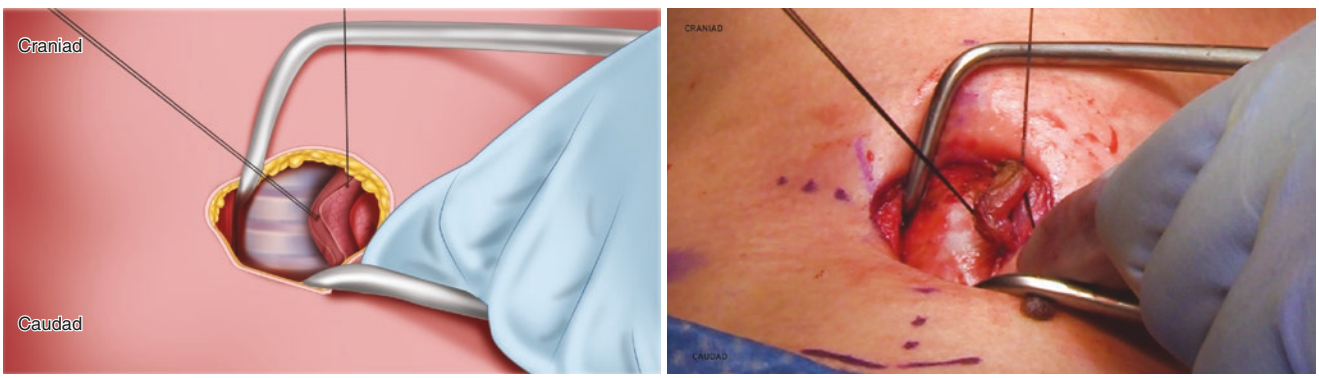

Fig. 2.10 Once the thyroid lobe is freed from the trachea and divided, the cut thyroid edge is oversewn with silk sutures for hemostasis

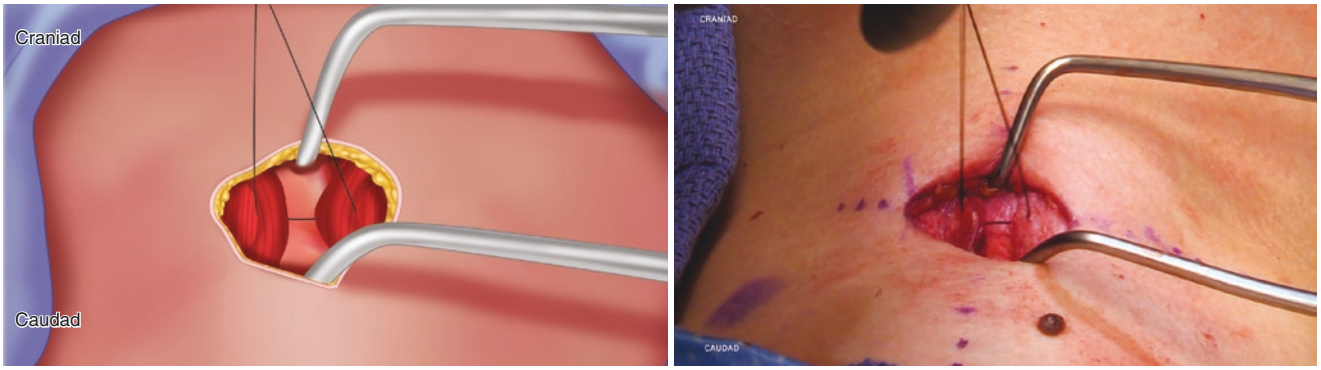

Fig. 2.11 After hemostasis of the thyroidectomy bed is assured, the sternohyoid muscles are reapproximated with silk sutures. If a complete thyroidectomy is required in the future, these nonabsorbable sutures will aid reidentification of the midline

The resection bed is irrigated with water and then examined for bleeding. Any bleeding points are controlled with cautery. The RLN should be tested again to assure that the NIM signal has been maintained. Hemostatic agents can be placed in the resection bed. The sternohyoid muscles are reapproximated in the midline. We recommend using nonabsorbable sutures, such as 3-0 silk, which will aid in the identification of the midline in the future if a complete thyroidectomy is required (Fig. 2.11). If the anterior jugular veins are very close to the midline, the authors recommend closing muscle from underneath the veins to allow the veins to roll away laterally from the midline incision. This will avoid injury and unnecessary bleeding if reoperation is needed in the future. If the sternothyroid muscle was divided, reapproximation is not necessary. The inferior aspect of the sternohyoid muscles is left open; if bleeding occurs postoperatively, blood can decompress through this open space. Using absorbable sutures, the platysma is reapproximated with a running, locking stitch, and the skin is closed with a subcuticular stitch. A final dressing, either with skin glue or adhesive bandage, is applied.

Technique Tip A running, locking stitch in the platysma avoids having the incision purse-string and misalign, with better cosmetic results.

After right thyroid lobectomy, the patient is awakened from anesthesia. After recovery in the postanesthesia care unit and an adequate observation period, the patient can be discharged home. Nowadays, thyroid surgery is often same-day surgery at many institutions, but the risk of bleeding can extend to 72 hours after thyroid surgery [6]. Thus, at discharge, patients should be provided with thorough postoperative instructions and appropriate contact information to reach the surgeon in cases of emergency.

Final surgical pathology demonstrates a benign thyroid nodule. This information is shared with the patient at her postoperative visit, approximately 2 weeks after surgery. Thyroid function tests should be measured at 6–8 weeks postoperatively to determine the need for a supplemental thyroid hormone (Video 2.1).

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