Surgical Management of Thyroid Disease

Rizwan Aslam, DOa,*, David Steward, MDb

Surgery of the thyroid gland has evolved in many ways since its modernization by Theodor Kocher in the late nineteenth century. Along with procedural modifications, the surgical indications for benign and malignant disease have also continued to evolve and have often been a source of controversy. Recently, the American Thyroid Association (ATA) and the National Comprehensive Cancer Network have developed task forces aimed at delineating the indications for surgery of both benign and malignant thyroid disease. The algorithms introduced in these guidelines were intended to simplify decisions on the surgical management of controversial issues. The authors at their institution use these guidelines, clinical experience, and informed patient preferences to perform appropriate surgical procedures. This article describes the indications, surgical management, and postoperative care for both benign and malignant processes of the thyroid gland.

PREOPERATIVE PLANNING

Before any surgical procedure, a detailed patient history, thyroid function testing, physical examination including laryngoscopy, and appropriate imaging studies should be performed. Patient history including family history, history of prior radiation exposure, and overall health should be solicited. If the patient or family history reveals findings suggestive of multiple endocrine neoplasia (MEN) IIA or IIB, a work-up for pheochromocytoma should be performed preoperatively. To avoid unfavorable outcomes associated with a thyroid storm, preoperative screening thyroid functions tests should be performed. In addition, laryngoscopy should be performed routinely before surgery. Recurrent laryngeal nerve (RLN) compression or invasion may be

---

a Head and Neck Oncology, Microvascular Reconstruction, Department of Otolaryngology–Head and Neck Surgery, University of Cincinnati College of Medicine, 231 Albert B. Sabin Way, ML 0528, Cincinnati, OH 45267–0528, USA

b Division of Thyroid/Parathyroid Surgery, Department of Otolaryngology–Head and Neck Surgery, University of Cincinnati College of Medicine, 231 Albert B. Sabin Way, ML 0528, Cincinnati, OH 45267–0528, USA

* Corresponding author.

E-mail address: aslamrn@ucmail.uc.edu

doi:10.1016/j.otc.2010.01.004

0030-6665/10/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
asymptomatic or slow to progress necessitating visualization to determine vocal fold function. The authors routinely use in-office ultrasound to evaluate lesions for their size and presence of any suspicious sonographic features. Suspicious radiographic findings include microcalcifications, hypoechoic solid nodules, hypervascularity, irregular borders, or a taller rather than wider nodule on transverse imaging. Preoperative awareness of contralateral nodules can also facilitate surgical planning. In cases of cytologically or sonographically suspicious nodules, the extent of disease including lymph node involvement in both the central and lateral neck can be demonstrated with ultrasound. The routine use of preoperative CT scan is not necessary in most cases; however, noncontrast CT scan is beneficial for determining the caudal extent and degree of tracheal compression secondary to large substernal goiters (SSG). Preoperative CT scans may also provide useful insight if there is a concern of laryngotracheal invasion associated with a malignant process. A careful synthesis of the aforementioned tools can help the surgeon optimize the extent of surgery and avoid potential shortcomings in their surgical interventions.

INDICATIONS FOR THYROIDECTOMY

Thyroidectomy can be performed for both benign and malignant disease. The first category includes hyperthyroidism, SSG, and nodular goiter. Hemithyroidectomy may also be of diagnostic use in the case of a suspicious nodule. In this discussion, the malignant category includes well-differentiated thyroid carcinoma (WDTC), medullary thyroid carcinoma (MTC), and anaplastic thyroid carcinoma.

Hyperthyroidism

Hyperthyroidism treatment is aimed at symptomatic relief with control of associated systemic morbidity. Optimal treatment of hyperthyroidism is dependent on the etiology. Hyperthyroidism associated with Hashimoto or de Quervain thyroiditis is self-limited. In general, medical management with the use of β-blockers and antithyroid medications (methimazole or propylthiouracil) achieves good control in most clinical scenarios. Antithyroid treatment may not be ideal long-term therapy in patients with toxic multinodular goiter or toxic adenoma because of the natural history of disease progression. Surgery and radioiodine therapy are definitive management options for toxic nodular disease or Graves disease.

Surgical options for those with hyperthyroidism include hemithyroidectomy for toxic adenoma or total thyroidectomy for toxic multinodular goiter or Graves disease. Patients who may benefit from surgery include those who cannot tolerate or are non-compliant with antithyroid medication, or have absolute or relative contraindications or aversion to radioactive iodine (RAI). Individuals desiring return to normal thyroid function sooner than can be achieved with RAI may also consider thyroidectomy. Shindo recommended that before surgery hyperthyroid patients receive antithyroid medication, propanolol, and potassium iodide especially for patients with Graves disease. The patient should be rendered euthyroid and have a resting heart rate less than 80. Potassium iodide or Lugol solution has the potential benefit of decreasing the thyroid gland vascularity, and minimizing glandular hemorrhage during surgery. This can be administered in 1 to 2 lingual drops 7 to 10 days before surgery. Occasionally, corticosteroids may be necessary in medically refractory Graves disease patients.

SSG

SSG can be challenging for both the patient and surgeon. SSGs generally behave in an indolent manner, following a path of least resistance through the thoracic inlet.
patients remain asymptomatic until the goiter impedes on adjacent structures of the thoracic cavity. Commonly associated symptoms include supine dyspnea, dysphagia, cough, and hoarseness.\textsuperscript{3} Vascular compression of the superior vena cava and vertebral arteries have been reported. The reported malignant potential for SSG is approximately 3\% to 21\%.\textsuperscript{4} Technically, obtaining a fine-needle aspirate for cytologic analysis can be limited by the intrathoracic or retrosternal position of SSGs. If there is not a significant cervical portion, obtaining tissue for diagnosis is contingent on removal of the SSG. Because the single most effective treatment for SSG is surgery, and because of the relative safety associated with this procedure, it is believed that the presence of SSG is an indication for surgery, irrespective of associated clinical manifestations especially in young or middle aged patients.\textsuperscript{5} A CT scan can help the surgeon identify its inferior extent and location within the mediastinum (anterior vs posterior), degree of tracheal compression, malignancy, and caudal extent of SSG (Fig. 1).

It is generally accepted that most benign SSGs can be removed through a cervical incision. For the remaining lesions not amenable for removal through a cervical approach, the authors use a ministernotomy, which is performed in conjunction with thoracic surgery. They involve the thoracic surgery service preoperatively for possible sternotomy on patients with posterior mediastinal goiters, those goiters with extension below the level of the aortic arch, and known malignancy in the chest. In addition, Cohen\textsuperscript{6} has recommended a sternotomy for the extraction of ectopic goiters. Anatomically, one must recognize the potential anterior displacement of the RLN by a posterior mediastinal goiter. Prior knowledge of this allows the surgeon to anticipate the location of the RLN during surgical dissection. Additional surgical exposure is gained by positioning the patients’ head in neck extension allowing for a cephalad displacement of the SSG. This facilitates improved delivery and visualization of the goiter.

**Nodular Goiter**

Thyroid nodules are a common finding, and often a source of diagnostic and management dilemmas. The low cost and availability of ultrasound have made detection of thyroid nodules very easy and has led to the 10 times increased detection rates.\textsuperscript{7} Coupled with the incidental detection of nodules during imaging for nonthyroid processes clinicians are seeing an epidemic. Although most of the nodules are benign, 5\% to 10\% of nodules are malignant. Surgeons should familiarize themselves with the sonographic characteristics of thyroid nodule pathology and their appropriate management.

![CT scan substernal goiter](image_url)
Appropriate treatment of thyroid nodules relies on diagnostic cytology obtained through fine-needle aspiration biopsy (FNAB). The risk of malignancy is the same for patients with a solitary nodule or multiple nodules. Sonographically benign-appearing nodules larger than 1.5 cm or sonographically or clinically suspicious nodules should be considered for biopsy. The results of FNAB combined with ATA published treatment guidelines help direct the management of thyroid nodules. FNAB results are classified as benign (70%); indeterminate (10%, “suspicious for malignancy” or possible follicular neoplasm); malignant (5%); and nondiagnostic (15%).

Ultrasound-guided FNAB greatly improves diagnostic accuracy over palpation with reduction in false-negative and nondiagnostic rates. Management of cytologically benign thyroid nodules includes observation with interval follow-up caused by the FNAB false-negative rates of up to 5%. A significant increase in nodule size greater than 20% to 50% or development of suspicious sonographic features warrants repeat ultrasound-guided FNAB or surgical excision.

Nodules with FNAB demonstrating indeterminate cells (“suspicious,” “follicular,” or Hurthle cell neoplasm) carry approximately a 10% to 20% risk of malignancy. Solid or complex nodules yielding persistent nondiagnostic findings may demonstrate a 5% to 10% risk of malignancy. For these patients with associated risk factors, the ATA suggests thyroid lobectomy as an initial treatment. Following lobectomy, intraoperative frozen histopathologic analysis positive for carcinoma requires a total thyroidectomy and possible central node dissection if gross nodal metastasis is identified. If the pathologist defers diagnosis until permanent sectioning, all patients with malignancy except those with a single focus or subcentimeter disease should undergo completion thyroidectomy. Completion thyroidectomy is usually performed in the first month following the initial procedure. Scenarios that may benefit from a total thyroidectomy rather than lobectomy include (1) individuals with tumors greater than 4 cm and cytologic atypia, (2) FNAB “suspicious for papillary carcinoma,” (3) patients with family history of thyroid carcinoma, and (4) childhood radiation exposure caused by increased risk of malignancy in these clinical settings.

Malignancy

Optimal surgical management of thyroid malignancy is dependent on the type and extent of malignancy: WDTC, papillary thyroid carcinoma (PTC), follicular thyroid carcinoma (FTC), Hurthle cell carcinoma (HCC), MTC, or anaplastic thyroid carcinoma.

Several variations of thyroidectomy exist but total or near total thyroidectomy is indicated for most thyroid malignancies. It is necessary to become familiar with the definitions, to communicate effectively with various members of the team. Partial lobectomy involves removing a portion of a single thyroid lobe and is not indicated in diagnosis or treatment of malignancy. Thyroid lobectomy or hemithyroidectomy involves resection of one thyroid lobe and may be sufficient for an isolated, subcentimeter FTC or PTC. Near total thyroidectomy is the resection of all grossly visible thyroid tissue, leaving a small fragment (1 g) of residual thyroid gland near the insertion of the RLN and ligament of Berry. A subtotal thyroidectomy involves leaving residual thyroid tissue greater than 1 g or with the ipsilateral posterior capsule intact. This is not an oncologically acceptable maneuver in the treatment of thyroid carcinoma. Total thyroidectomy implies complete removal of the thyroid gland and is the procedure of choice for PTC, FTC, HCC, and MTC. Completion thyroidectomy refers to the removal of the contralateral residual thyroid lobe following a prior hemithyroidectomy when the diagnosis is made postoperatively.

PTC represents approximately 80% of thyroid malignancies. It may display multicentricity in the ipsilateral or contralateral lobe in a high proportion of cases. This
multicentricity poses the predicament of hemithyroidectomy versus total thyroidectomy as definitive surgical therapy. At the Mayo Clinic, Hay and colleagues\textsuperscript{13} compared patients treated with ipsilateral thyroid lobectomy plus isthmusectomy with bilateral resection (total thyroidectomy, bilateral subtotal, or near total thyroidectomy) for PTC. This study analyzed long-term 20-year results of these procedures. The data revealed local recurrence rates of 14\% and 2\% for thyroid lobectomy and bilateral resection, respectively. Also, rates for nodal metastasis were less with bilateral resection compared with thyroid lobectomy, 6\% and 19\%, respectively. Although near-total–total thyroidectomy is considered the definitive surgical modality for PTC, there are certain clinical circumstances in which hemithyroidectomy may be performed. The ATA states that hemithyroidectomy may be adequate for less than 10-mm, low-risk, isolated, intrathyroidal papillary carcinomas without evidence of cervical nodal disease.

PTC can manifest with cervical nodal metastasis in 20\% to 90\% of cases.\textsuperscript{9} Some authors have demonstrated the presence of central and lateral neck metastases with rates of 62.2\% and 25.6\%, respectively.\textsuperscript{14} Preoperative ultrasound is a sensitive tool in detecting the presence of cervical nodal disease, but may be more sensitive for the lateral rather than central compartment. The central compartment or level VI is defined by the carotid arteries laterally, hyoid bone superiorly, and suprasternal notch or brachiocephalic vessels inferiorly.\textsuperscript{15} Therapeutic central compartment dissection should be considered in patients with PTC and nodal metastasis. For those with lateral nodal metastasis a functional level II to V neck dissection should be included.

FTC can be categorized as either minimally or widely invasive. Minimally invasive is the more common of the two and has no extension through the thyroid capsule with or without vascular invasion. Patients with lesions less than 1 to 1.5 cm may undergo hemithyroidectomy. For tumors described as minimally invasive with vascular invasion and widely invasive FTC near total or total thyroidectomy without central neck dissection is acceptable.\textsuperscript{7,8} Unlike PTC and HCC that spread through lymphatics, FTC primarily spreads hematogenously or by direct extension. This behavior eliminates the need for elective or prophylactic neck dissections.

HCC is considered a variant of follicular carcinoma. This rare tumor comprises a small percentage of thyroid cancers, in the neighborhood of 2\% to 3\%. They tend to behave aggressively, and can readily demonstrate lymphatic spread. Near-total–total thyroidectomy is the recommended intervention. Like PTC, therapeutic central compartment node dissection should be performed in the presence of nodal metastasis. Evidence of lateral compartment nodal disease requires a functional neck dissection of levels II to V.

MTC is derived from parafollicular C cells of the thyroid gland and is embryologically distinct and differs in its behavior from WDTC. It is unresponsive to RAI, and surgery is the accepted basis of treatment. MTCs are multifocal and metastatic in most patients, and total thyroidectomy with elective or therapeutic central compartment neck dissection is the procedure of choice. This has been shown to achieve 80\% biochemical cure rate, with a return to normocalcitonemia.\textsuperscript{16,17} If there is evidence of levels II to V nodal disease, a therapeutic lateral neck dissection is suggested. Patients with MTC require genetic testing for somatic \textit{RET} mutations associated with MEN IIA and IIB. Al-Rawi and Wheeler\textsuperscript{16} suggest that despite total thyroidectomy and selective neck dissection 20\% of patients recur or have residual disease. MTC association with MEN IIA and MEN IIB requires all first-degree relatives including children be tested for \textit{RET} mutations.\textsuperscript{18,19} It is generally accepted that children with MTC and those with MEN IIA should undergo a thyroidectomy by age 6 years. Those with the more aggressive
MEN IIB should have surgery within the first year of life. In addition, one can use microdissection effectively in this population.

**SURGICAL TECHNIQUE**

Contemporary thyroid surgery aims at eradicating disease while preserving parathyroid gland function, RLN integrity, and minimizing overall patient morbidity. In this discussion the authors’ technique with conventional thyroidectomy is described and minimally invasive approaches are briefly discussed.

*Preoperative Planning*

Before surgery, the authors have an open discussion with the patient regarding benefits and potential postoperative complications of their procedure that include postoperative hypocalcemia, laryngeal nerve injury, bleeding, and infection. Informed consent is then obtained. High-resolution ultrasound is performed and CT scans obtained when indicated. Biochemical tests and imaging are reviewed with the patient and again the day of surgery.

*Intraoperative Details*

The patient is appropriately marked and transferred from the preoperative holding area to the operating room. After the patient and procedures have been confirmed using standard time-out technique, general anesthesia is induced and the patient is orotracheally intubated with a Nerve Integrity Monitoring (NIM) tube (NIM-Response, Medtronic USA, Jacksonville, FL, USA). Anesthesia is instructed to use only short-acting muscle relaxants and no topical laryngeal anesthetics with the use of NIM. NIM is useful as a training tool and to confirm accurate identification and preservation of the laryngeal nerves. The authors conducted a retrospective review of 165 patients who underwent thyroidectomy at their institution to assess if NIM is associated with a decreased risk of postoperative RLN injury. Primary outcome measures included postoperative RLN paralysis, paresis, and total injury rates. They found that there were no statistically significant differences in RLN paralysis, paresis, or total injury rates between control and NIM groups, even in subsets with advanced T stage and increased baseline risk.

The patient’s neck is not extended but rather kept in a neutral position to minimize postoperative cervicalgia. A slight reverse Trendelenberg position prevents venous congestion. Superficial landmarks including cricoid cartilage and thyroid isthmus are identified. Ideal incision placement is in a natural skin crease at the level of the isthmus or cricoid. In most instances the authors are able to perform a thyroidectomy through a 3- to 5-cm incision. A 2- to 3-cm horizontal incision near the level of the cricoid for minimally invasive video assisted thyroidectomy (MIVATs) is preferred. Resection of larger inferior or mediastinal-based goiter requires a more traditional low cervical collar incision. When necessary a midline horizontal incision can be extended laterally for level V. The need for vertical cervical incisions is not required.

Next, the platysmal fascia (superficial cervical) is incised. The anterior jugular veins are identified and preserved. The midline linea alba is identified and dissected. The strap muscles are separated in the midline. The sternohyoid and sternothyroid muscles are grasped with Dabakey forceps on their medial surface. In so doing one does not inadvertently injure the anterior jugular veins. Next, dissection is carried laterally over the anterior and lateral surface of the thyroid glands with care to avoid disruption of the middle thyroid veins. Retraction of the straps laterally with an army navy is maintained while another retractor is placed under the superior aspect of the
sternothyroid muscle, which is retracted superiorly to expose the superior vasculature pole and cricothyroid muscle. Anterolateral retraction of the superior pole allows visualization of the triangular space created by the medial border of the superior pole laterally and the cricothyroid muscle medially. Dissection is carried between the superior pole and cricothyroid muscle until the superior laryngeal nerve (SLN) is identified. Visual identification can be confirmed using electrical stimulation with a Prass probe (Medtronic USA, Jacksonville, FL, USA). Stimulation of the SLN at 0.5 to 1 mA results in diffuse movement of the cricothyroid muscle. Preservation of the SLN maintains pitch, which is important in patients whose careers rely on their voices and patients involved in recreational voice use, such as singing. Right angle clamps are used to dissect and retract the superior pole. The authors routinely use the Harmonic Focus (Ethicon Endo-Surgery, Cincinnati, OH, USA) to free the superior pole by coagulation and ligation of the superior thyroid vasculature. Cordon and colleagues showed that operative time was decreased with the use of harmonic scalpel compared with electrocautery. Another similar study compared harmonic scalpel with conventional knot tying that showed harmonic scalpel shortened operative time by approximately 30 minutes. Once the superior pole has been mobilized the middle thyroid veins are taken and the thyroid gland is isolated medially to expose the RLN near the inferior thyroid artery as it courses anterior to the superior parathyroid gland. Once identified the anterior motor RLN branches are neurophysiologically confirmed and preserved. The superior parathyroid gland is identified posterior to the RLN and the vascular supply maintained from the inferior thyroid artery. Remaining fibrous attachments are dissected from the lateral surface of the thyroid gland, and the procedure is directed toward the inferior lobe. The inferior parathyroid glands may be less consistent in their location. These glands are dissected from the inferior pole and the thyroid is mobilized medially. The inferior thyroid veins and thyrothymic ligament are released to expose the anterior trachea. Antegrade dissection of the RLN is again carried toward the trachea following the RLN toward the ligament of Berry. The RLN turns posterolaterally through the inferior pharyngeal constrictor and then the ligament of Berry is sharply transected. If a pyramidal lobe is present it is taken with the dissection. If a nodule is present in the midline, the isthmus is resected with a margin. If a total thyroidectomy is being performed a similar dissection is undertaken on the contralateral side. Drains are then placed in patients with very large or SSGs; otherwise routinely the wound is closed in a layered fashion without a drain. A meta-analysis of 11 randomized trials comparing routine drain with no drains found no significant difference in respiratory distress or wound re-exploration but found an increased length of stay with drain usage. The skin is closed with subcuticular running 5-0 polysorb suture.

Recently, minimally invasive procedures have become increasingly popular among patients and surgeons. A desire for improved cosmesis and shorter recovery periods has led to the creation of video-assisted techniques. In 1998, Micolli and colleagues described the first gasless endoscopic MIVAT. Studies suggest that this procedure does not carry an increased potential for complications including hypoparathyroidism and RLN palsy. A minority of patients are amenable to this procedure, making most surgeons reluctant to perform them. The current indications include nodules less than 3 cm in diameter in glands less than 25 mL in volume, Graves disease with volume less than 20 mL, no history of thyroiditis, no previous neck surgery or radiation, follicular or “low-risk” papillary carcinoma, and RET gene mutation carriers. The patient is placed in a neutral supine position and a 2- to 3-cm incision is performed. A narrow flap is elevated in the midline playtsmal dehiscence. Elevation of lateral superior and inferior subplatysmal flaps is avoided because no benefit is gained with this
The strap muscles are divided as described in the conventional approach. A thirty-degree endoscope is introduced into the surgical field for visualizing critical structures during thyroidectomy, especially the SLN and RLN. The gland is delivered through the wound and the remainder of the thyroidectomy is performed as previously mentioned. Some institutions use skin adhesives for closure with rubber band drains; the authors use a subcuticular polysorb suture without drain. Ikeda and colleagues\(^{22}\) have also developed a unique endoscopic approach through the axilla. Recently, the

![Fig. 2. (A) Release of the thyrothymic ligament. (B) Trachea exposed after release of thyrothymic ligament.](image1)

![Fig. 3. RLN, superior parathyroid gland (SPG), and ligament of Berry (LB).](image2)
utilization of robotics has allowed to further minimize the need for an open cervical approach, by utilizing a transaxillary approach.

POSTOPERATIVE CARE

Postoperative care after thyroidectomy in the authors’ institution is driven by the patient’s need for a drain and postanesthesia care unit (PACU) parathyroid hormone (PTH) levels. In addition to risk from delayed hematoma formation, risk of hypocalcemia secondary to hypoparathyroidism has challenged ambulatory total or completion thyroidectomy. Patients are routinely discharged home following thyroidectomy if they meet the following criteria: no drain requirement and no evidence of hematoma with PACU PTH levels of at least 30 pg/mL or with PACU PTH levels of at least 20 pg/mL with oral calcium supplementation (Tums twice daily) and a calcium level at 1 week postoperatively. Routine calcium and vitamin D supplementation has been shown to reduce the risk of hypocalcemia. A meta-analysis of rapid postoperative PTH measurement confirmed a significantly increased risk of hypocalcemia for PTH less than 15 pg/mL.\textsuperscript{23} If a patient has a PTH level less than 20 pg/mL in the PACU they are admitted for overnight observation and treatment. On postoperative day zero the patient is started on oral calcium, 500 mg four times daily, and oral calcitriol, 3 $\mu$g, as a bolus. This is followed on postoperative day 1 with 1 $\mu$g of calcitriol. On postoperative day 2 the patient is discharged on 0.5 $\mu$g calcitriol daily with Tums (calcium carbonate, 500 mg) four times a day or oral calcium equivalent with a renal panel on postoperative day 3 or 4. The patient’s calcium supplementation is then reduced in a stepwise fashion over the next 3 to 4 weeks. Specifically, the next week the patient takes 500 mg of calcium by mouth three times daily, then the patient’s dose is decreased to twice daily, and then the dose is further decreased to once daily. A repeat renal panel is performed along with a thyroid-stimulating hormone (TSH) level 1 month postoperatively. If the patient has no comorbid conditions requiring inpatient care, and they meet the aforementioned conditions, they can be safely discharged with instructions to call for neck swelling, bleeding, or circumoral paresthesias.

FOLLOW-UP CARE

Patients undergoing hemithyroidectomy require TSH testing 1 month postoperatively and levothyroxine should be instituted for hypothyroidism. Those undergoing total

Fig. 4. Transection of ligament of Berry.
thyroidectomy are started on levothyroxine, 1.5 μg/kg, with a TSH level and dose titration at 1 month postoperatively. Patients requiring supplementation with levothyroxine after surgery for benign disease should have a target TSH of 1 to 3 mIU/L.

Patients with malignancy should have follow-up surveillance every 6 months for the first 2 years, and annually thereafter. Patients with WDTC should have thyroglobulin and antithyroglobulin antibody levels every 6 to 12 months. Stimulated or unstimulated elevated or rising serum thyroglobulin levels of greater than 2 ng/mL may indicate recurrence. Antithyroglobulin antibodies may falsely raise the thyroglobulin level. Cervical ultrasound to evaluate the thyroid bed and central and lateral cervical nodal compartments is recommended at 6 and 12 months and then annually for a minimum of 3 to 5 years. Studies have shown that TSH suppression may decrease adverse clinical events of thyroid cancer. We use levothyroxine to suppress TSH levels below 0.10 for high-risk patients and below 0.5 for low-risk patients. TSH levels should be checked semiannually and 6 weeks after the levothyroxine dose changes. Finally, patients are referred for RAI ablation if they have stage III or IV disease; less than 45 years old with stage II disease; most patients age greater than 45 years with stage II disease; and stage I patients demonstrating multifocal disease, nodal metastases, extrathyroidal or vascular invasion, or aggressive histologies.

SUMMARY

The surgical management of thyroid disease can often be challenging. The authors’ experience with both benign and malignant pathologies is described. To eliminate ambiguity, they use experience, guidelines, and patient interest to drive the decision-making process. Current advancements in thyroid surgery are making the process more efficient and desirable for patients and surgeons. When managed appropriately thyroid surgery can be safe and rewarding.

REFERENCES