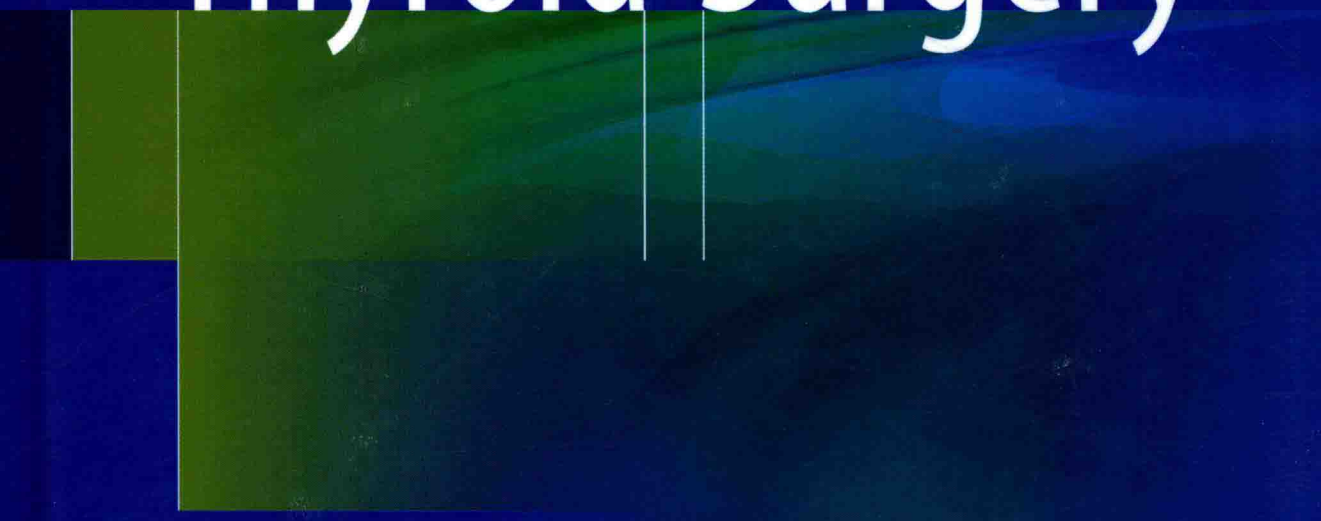
John B. Hanks
William B. Inabnet III
Editors

Controversies in Thyroid Surgery



Springer

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To Dorothy T Hanks (1916–2002), Librarian at the National Library of Medicine, National Institutes of Health from 1959 to 1987. In 1965, she told me when I was in High School that the computer was the way of the future in medicine as she worked with the initial instillation of Medline. Mom seemed to have a knack for being right.

And to our patients who put their trust in us to be up to date in our knowledge and skill and to commit to their optimal care.

John B. Hanks

I dedicate this book to my wife and children—Kathleen, Frances, and William. I am deeply grateful for their unconditional love and support.

William B. Inabnet III

Preface

Plus ca change, plus c'est la meme chose.

Jean Baptiste Alphonse Karr 1849

We both remember our very first thyroid operation as trainees: Dr Hanks with Dr. Sam Wells in 1973 when a first year resident in general surgery at Duke; Dr Inabnet with Blake Cady in 1990 during a visiting surgery rotation at the New England Deaconess Hospital as a 4th year medical student. Over the years, we are grateful to have learned from the very best of our time. We have witnessed the growing importance and relevance of Endocrine Surgery in the training of the General Surgery Resident.

The time tested French proverb, ".....the more things change, the more they stay the same" holds true for Thyroid Surgery. The basic necessity for a successful practice requires extensive knowledge of anatomy, physiology, postoperative care, intraoperative decision making, and skillful surgical techniques. None of these have changed over the last several decades. Yet new technologies, evidence-based decision-making, and interest in quality and outcomes have emerged which impact not just Thyroid Surgery but all of medicine.

So, when we decided to edit this work on "Controversies in Thyroid Surgery," we realized that many topics of current interest impact on the surgical technique we learned all these years ago—for example, the technology of neuromonitoring, robotic or "minimally invasive" approaches, preoperative imaging, and especially ultrasound. Additionally, quality and volume issues that impact referral patterns also impact surgical practice.

We chose each author recognized as an expert in the field and who has made significant national and international contributions to the field of endocrine surgery. Each contributor was assigned to offer their input to areas of thyroid surgery which impact practice patterns today. We are delighted with their response and thoughtfully prepared work. We asked each author to look into the "controversy" generated by the topic. What is the importance, relevance, or cost-effectiveness of the area covered? For example, robotic surgery is impacting general and thoracic surgical procedures; but is it relevant to thyroid surgery?

We hope you will enjoy the thoughts of authors who are well versed to give their opinions on their topics. We have had a ball putting it together.

Our sincere thanks go to Tracy Marton, our Editor at Springer, who stuck with us during the preparation of the work. She is a thoughtful and thorough partner, with the patience of a Saint. To her, we owe a great debt.

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Part I

General Topics

Controversies in the Management of Nodular Thyroid Disease

1

Judy Jin and Christopher R. McHenry

Introduction

In general, the evaluation and management of nontoxic nodular thyroid disease are straightforward. However, there remain several areas of controversy where differences in opinion exist regarding the nuances in evaluation and management of patients with a thyroid nodule and a specific fine needle aspiration biopsy (FNAB) result. Some of the controversial issues include: the appropriate evaluation and management of patients with a thyroid nodule and an FNAB categorized as atypia/follicular lesion of undetermined significance (AFLUS), the intraoperative management and extent of thyroidectomy for patients with an FNAB suspicious for papillary thyroid cancer (PTC) and the extent of thyroidectomy for patients with benign nodular thyroid disease with an established indication for surgical therapy. In this chapter, we will review the evaluation and management of nontoxic nodular thyroid disease with emphasis on areas of controversy.

Epidemiology

Thyroid nodules are common. The prevalence of thyroid nodules varies with the study population as well as the method used for detection. In the Framingham study performed during the era when physical examination was the primary method of diagnosis, a 4.2 % prevalence was reported, 6.4 % in women and 1.5 % in men [1]. However, the prevalence in autopsy series and studies examining results from neck ultrasound can be as high as 67 % [1–3]. Thyroid nodules are more common in women, and the incidence increases with age. Fortunately, 95 % of thyroid nodules are benign.

In the recent years, an increased number of thyroid nodules have been discovered incidentally on ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) performed for reasons unrelated to the thyroid gland. The rate of thyroid incidentalomas discovered on imaging studies varies from 20 to 30 % [4]. An incidental thyroid nodule with focal FDG uptake on PET imaging is of the most concern, because of a 35 % risk of malignancy [5].

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Evaluation

In general, a workup is initiated for thyroid nodules ≥1 cm in size. Nodules <1 cm are evaluated in patients with a prior history of head or neck irradiation, a family history of thyroid cancer in a first degree relative, or abnormal sonographic features. A thyroid nodule identified by a focal area of FDG uptake on ^{18}FDG-PET imaging should be evaluated even when it's less than one centimeter because approximately one-third of these are malignant.

The evaluation of a patient with a thyroid nodule should consist of a history and physical exam, a screening serum TSH level, a US exam of the neck, and an FNAB. Molecular testing of the fine needle aspirate may supplement this approach, particularly in a patient with an indeterminate FNAB. Currently, gene expression profiling may exclude cancer by determining which nodules have a benign RNA expression profile, while gene mutation panels may try to establish a diagnosis of cancer by identifying DNA alterations [6, 7].

The evaluation of a patient with a thyroid nodule begins with a complete history and physical examination. Patients are asked about symptoms of hyperthyroidism and hypothyroidism, dysphagia, dyspnea when supine, coughing or choking spells, hoarseness or change in voice, neck pain, obstructive sleep apnea, and rapid nodule growth. With the increasing rate of thyroid incidentalomas detected on imaging studies, patients may not have any signs or symptoms at presentation.

In addition, patients are asked about a prior history of head or neck irradiation and a family history of thyroid cancer, other familial syndromes, or endocrinopathies. Patients with a thyroid nodule and a history of head or neck irradiation have an approximate 40 % incidence of carcinoma, and the cancer may be found outside of the index nodule [8]. Familial nonmedullary thyroid cancer, defined as differentiated thyroid cancer occurring in two or more first degree relatives, accounts for 5 % of all thyroid cancers. Thyroid cancer may also occur as part of other familial syndromes including multiple endocrine neoplasia type IIA and type IIB, familial adenomatous polyposis, Gardner's syndrome, Cowden's disease, Carney's disease, and Werner's syndrome.

Physical examination should include an evaluation of the size and character of the index nodule, the presence of neck tenderness that can occur in patients with thyroiditis, and the presence of any other thyroid nodules. The presence of substernal extension should be determined, and the trachea should be evaluated for displacement. The rest of the neck should be evaluated for associated cervical or supraclavicular lymphadenopathy. At minimum, laryngoscopy should be performed for patients with hoarseness or a change in voice. Findings on physical examination that are suggestive of cancer include a firm, fixed nodule, a paralyzed vocal cord, and cervical lymphad enopathy.

A screening serum TSH level is obtained in all patients. The majority of the patients who present for evaluation of nodular thyroid disease are euthyroid, and no additional thyroid function tests are necessary. In patients with a thyroid nodule and a low serum TSH level, a free T4 and free T3 level are obtained, and FNAB is reserved for a hypofunctioning nodule identified on an iodine-123 thyroid scan. The risk of malignancy for a hyperfunctioning nodule is <1 %, and antithyroid drug therapy, radioiodine, and thyroid lobectomy are all options for treatment.

US is the best imaging modality for evaluation of the thyroid gland. Once a thyroid nodule has been detected, either on physical exam or by other imaging studies, all patients should undergo a US examination of the neck. This includes a survey of the thyroid gland and an assessment of the central and lateral compartments of the neck for abnormal lymphadenopathy. US is also used for routine surveillance of patients with a familial cancer syndrome known to be associated with an increased risk of differentiated thyroid cancer (DTC). When a thyroid nodule is identified, it should be evaluated for specific sonographic characteristics including hypoechogenicity; a shape that is taller than wide, irregular, or infiltrative borders; an absent halo; increased intranodular vascularity; and microcalcifications, all of which have been associated with increased risk

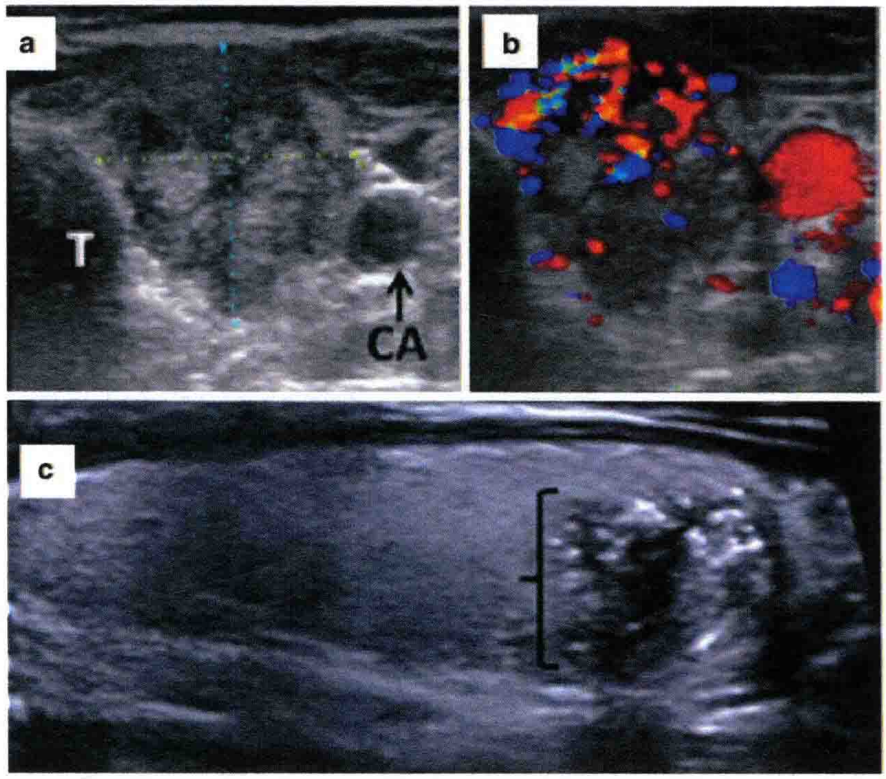

Fig. 1.1 Sonographic features raising suspicion for cancer: (**a**) a hypoechoic thyroid nodule with irregular borders that is taller than wide (**b**) increased intranodular vascularity, and (**c**) microcalcification. *T* trachea, *CA* carotid artery

for thyroid cancer [9–14] (Fig. 1.1). Increasing nodule size has not consistently been linked with cancer [15]. In the management of goiterous disease, when the lower pole of the thyroid lobe cannot be visualized with patient's neck in hyperextension, a neck and chest CT may be considered as the potential for substernal component is high.

An abnormal cervical lymph node seen is more rounded in appearance on US examination, with the absence of the hyperechoic stripe representing the vascular pedicle. The presence of cystic change and microcalcifications is also indicative of an abnormal lymph node. Figure 1.2 is a screening US examination from a patient with familial adenomatous polyposis demonstrating a sonographically normal thyroid gland and an abnormal lymph node in the central compartment of the neck with a rounded contour and microcalcification. An FNAB of the lymph node revealed papillary cancer. Figure 1.3 shows a US image from a patient with a solitary 3.2 cm left thyroid nodule who had an abnormal 2 cm contralateral, level III lymph node detected, and FNAB revealed metastatic papillary cancer. These examples underscore the importance of routine evaluation of the central and lateral compartments of the neck for abnormal lymph nodes in patients with nodular thyroid disease.

The American Thyroid Association Guidelines (ATA) [16], guidelines for patients with thyroid nodules and thyroid cancer, recommend FNAB for a thyroid nodule greater than one centimeter, with the exception of a pure cystic nodule, which comprise <2 % of thyroid nodules. FNAB is also recommended for a nodule less than 1 cm with abnormal sonographic features, PET positivity or in a patient with a family history of PTC, a personal history of treated thyroid cancer or a history of radiation exposure. FNAB with palpation has been the standard method of biopsy, while US-guided FNAB has been preferentially used for nonpalpable nodules, for nondiagnostic FNAB performed with palpation, and for

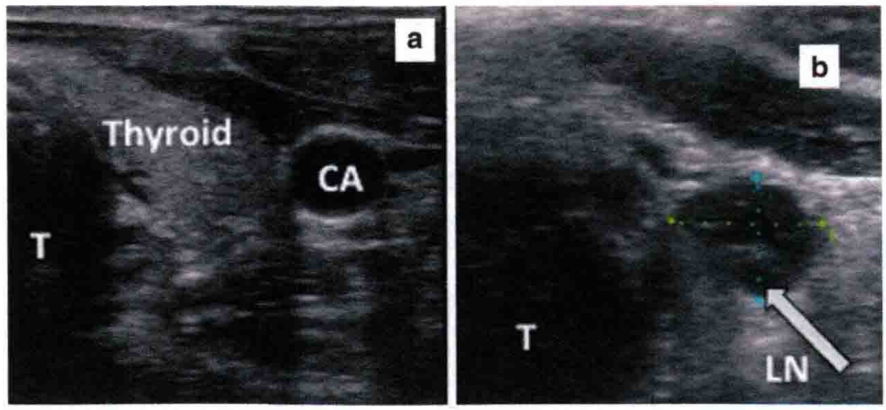

Fig. 1.2 Screening thyroid US in a patient with familial adenomatous polyposis syndrome: (**a**) normal-appearing thyroid lobe without any nodules (**b**) central neck lymph node that is round and contained calcification. *T* trachea, *CA* carotid artery, *LN* lymph node

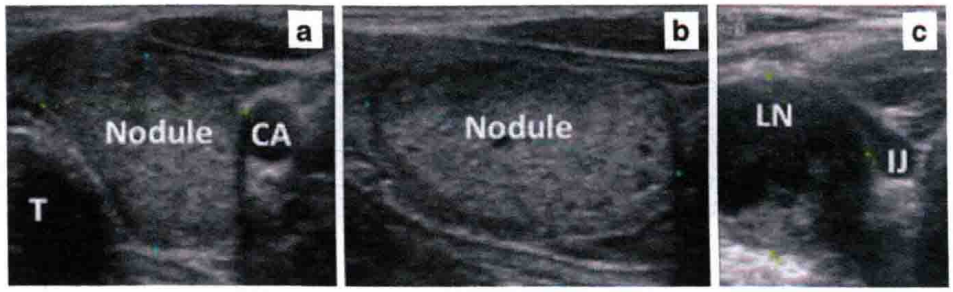

Fig. 1.3 A 27-year-old patient with a solitary left toxic nodule (**a**) and (**b**) a partially cystic contralateral level III lymph node. Biopsy consistent with metastatic papillary thyroid cancer, *T* trachea, *CA* carotid artery, *IJ* internal jugular vein, *LN* lymph node

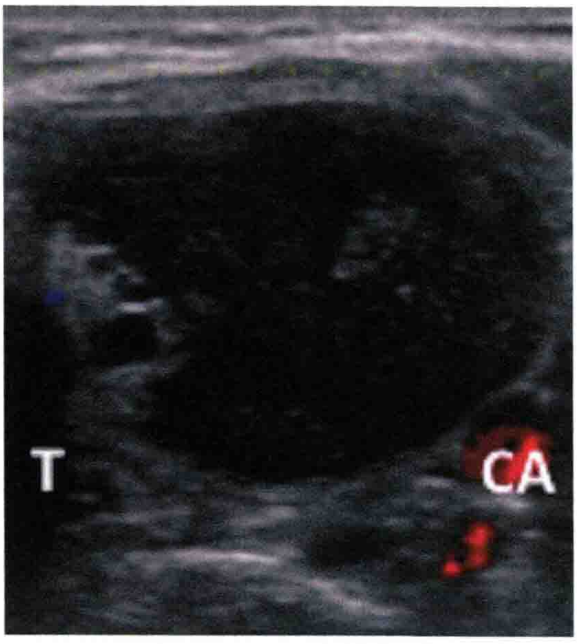

Fig. 1.4 Predominately cystic thyroid nodule where US guidance is necessary to biopsy the solid component

predominately cystic nodules to ensure biopsy of the solid component. However, with the increasing availability of US, some have recommended that all thyroid nodules be biopsied with US guidance [17]. Ultrasound is helpful in guiding the biopsy needle into the solid component of a mixed solid/cystic nodule and in the suspicious areas of a solid nodule (Fig. 1.4).

Management

The National Cancer Institute (NCI) hosted the "Thyroid Fine Needle Aspiration State of the Science Conference" in 2007, and from this conference, The Bethesda System for Reporting Thyroid Cytopathology (BSRTC) was developed [18]. The BSRTC was modeled after the Bethesda System for reporting cervical cytology and is composed of six cytologic categories, each with