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# The Incidental Thyroid Lesion in Parathyroid Disease Management

**Uthman Alamoudi, MD[1], Eric Levi, MBBS, FRACS[1], Matthew H. Rigby, MD, MPH, FRCSC[1], S. Mark Taylor, MD, FRCSC[1], Jonathan R. B. Trites, MD, FRCSC[1], and Robert D. Hart, MD, FRCSC[1]**

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## Abstract

*Objective*. The incidental thyroid lesion is a common finding during general imaging studies. Their management has been the subject of numerous studies and recommendations. Parathyroid disease workup necessitates imaging investigation of the adjacent thyroid gland and therefore provides a unique window to the perioperative management of thyroid incidentaloma. The specific prevalence of incidental thyroid lesions in the context of parathyroid disease is unknown. We seek to investigate its prevalence during parathyroid workup and surgery and to ascertain if there was a change in management of these patients.

*Study Design*. Five-year retrospective database review.

*Setting*. Tertiary care medical center.

*Subjects and Methods*. The source and indication for referral, preoperative investigation findings, and management of the incidental thyroid lesions were examined. The actual procedure performed and final pathology results were assessed.

*Results*. A total of 98 patients and 106 operations, including revision surgeries, were identified. There were 21 incidental thyroid lesions (21.4%) detected, whereby 15 patients underwent fine-needle aspirations and 12 subsequently had diagnostic hemithyroidectomies. This decision was made preoperatively in 5 patients and intraoperatively in 7 patients at the time of parathyroid surgery. Along with other pathologies, there were 7 patients with micropapillary thyroid carcinoma identified.

*Conclusions*. In our series, the prevalence of incidental thyroid lesion and thyroid malignancy is comparable to the general population. The management of the initial parathyroid disease in our patients was altered by the imaging and cytological findings of these thyroid lesions. This has implications on perioperative counseling of the thyroid and parathyroid disease.

**Keywords**

parathyroid, thyroid nodule, incidentaloma

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## Background

The incidental thyroid lesion is a common problem affecting the general population. The medical and surgical management of these thyroid incidentalomas is the subject of much research, discussion, and debate. Most of these lesions occur asymptomatically in an otherwise healthy population. Small subsets of these lesions, however, are identified in the context of another primary disease such as parathyroid gland pathology.

The incidental thyroid nodule is defined as an asymptomatic nonpalpable thyroid nodule found in the course of radiological investigation of a non-thyroid-related condition. The prevalence of incidental thyroid nodule ranges from 1% to 67% depending on the radiological technique.[1,2] They are seen in 20% to 67% of ultrasound studies,[3,4] up to 25% of contrast-enhanced chest computed tomography (CT) scans,[5] and 16% to 18% of CT and magnetic resonance imaging (MRI) scans of the neck.[6,7] The prevalence of incidental thyroid lesions found on positron emission tomography (PET) scans is lower, at 1% to 2%.[8,9]

The true prevalence of thyroid nodules is actually much higher. A study found that 50% of those with no thyroid

[1]Division of Otolaryngology Head and Neck Surgery, Department of Surgery, Dalhousie University, Halifax, Nova Scotia, Canada

**Corresponding Author:**
Uthman Alamoudi, MD, Division of Otolaryngology Head and Neck Surgery, Department of Surgery, Dalhousie University, 5850 University Avenue, Halifax, NS, B3K 6R8, Canada.
Email: ut788798@dal.ca

history actually had thyroid nodules at autopsy.[10] In another autopsy study, the actual rate of occult papillary thyroid cancer was 33%.[11] Population studies have shown that the incidence of thyroid cancer has nearly tripled in the past 30 years, but the actual mortality rate from thyroid cancer remains stable.[12] This would strengthen our observation that thyroid cancer, particularly the most common type, papillary thyroid carcinoma, is a relatively indolent disease and that the exponential increase in diagnosis is due to earlier detection and management of these incidental thyroid lesions.

In view of this low morbidity and low mortality association with thyroid cancer, most guidelines recommend a more conservative approach to investigating and managing incidental thyroid nodules (American Thyroid Association [ATA] guidelines, 2015).[13] Thyroid surgery is reserved for those with sonographic or cytologic findings of malignancy or those that are highly suspicious of malignancy. If the sonographic or fine-needle aspirate cytology suggests a benign lesion and meets the sonographic criteria for a low-risk lesion, then no further action is usually recommended.

To the thyroid and parathyroid surgeon, a conundrum exists when an incidental thyroid lesion is identified during a parathyroid workup. Parathyroid disease is not an uncommon problem presenting to the clinician. The most common type is primary hyperparathyroidism from a parathyroid adenoma. Tertiary hyperparathyroidism (which is a state of high levels of parathyroid hormone after a prolonged period of secondary hyperparathyroidism with resultant hypercalcemia usually found in patients with chronic renal failure) is less common but increasing in prevalence. True parathyroid malignancy is rare. In the usual workup of primary hypercalcemia and hyperparathyroidism, imaging of the parathyroid is performed with an ultrasound, sestamibi scan, or single-photon emission computed tomography (SPECT)/CT scan, which can identify any abnormal lesions in the adjacent thyroid. This thyroid lesion can then be biopsied by way of a fine-needle aspirate cytology study. If a lesion is found to be malignant or has a high index suspicion for malignancy, then the thyroid will be addressed at the time of the parathyroid surgery through a hemithyroidectomy or total thyroidectomy, with or without level 6 neck dissection. However, what should be done to the thyroid gland when the cytology findings are indeterminate, benign, or atypia of undetermined significance (AUS)/follicular lesion of undetermined significance (FLUS)? There is no strong consensus at this stage as the risk and benefit ratio is unconfirmed, on the other hand one considers that during the surgical approach to the parathyroid, the thyroid is well exposed and freely palpable to the operating surgeon's fingers. Performing a hemithyroidectomy during the dissection of a parathyroid does not significantly increase the potential complications or morbidity of the procedure. The nodule is palpated, the recurrent laryngeal nerve is dissected, and therefore both the parathyroid and thyroid glands can be excised at the same time for definitive gold-standard histopathological diagnosis.

We are therefore interested in seeing if the prevalence of incidental thyroid lesions during a parathyroid surgery workup is similar to that of the general population. Subsequently, would the discovery of this thyroid incidentaloma lead to a change in the surgical management of the thyroid and parathyroid? And if it did, we wanted to investigate if the change of surgical plan was beneficial for the patient, that is, if there was any malignancy that would otherwise not be discovered had the patient not had a diagnostic hemithyroidectomy.

## Methods

With the approval of Nova Scotia Health Authority Research Ethics Board (NSHA REB ROMEO File 1020779), a 5-year retrospective chart review was undertaken, which included all patients who underwent parathyroid surgery at the Queen Elizabeth II Health Sciences Centre in Halifax, Nova Scotia, Canada, between July 1, 2010, and June 30, 2015. The demographic data on the patients were collected. The source and indication for referral, preoperative investigation findings, and management of the incidental thyroid lesions were examined, including the radiological report provided by our radiologists. The actual procedure performed and final pathology results were assessed. We excluded patients who were referred to the service with previously known thyroid nodules or lesions. We also excluded those who had the diagnosis of multiple endocrine neoplasia (MEN) syndrome or any other associated thyroid syndromes.

## Results

A total of 114 patients underwent parathyroid surgery during the 5-year study period. Sixteen patients were excluded since they had previously known thyroid nodule and thyroid disease (10 patients) or had been referred with MEN syndrome (6 patients). This left 98 patients with a total of 106 parathyroid operations that were included in this study. Of these patients, primary hyperparathyroidism was the reason for the referral in 78 patients, while hypercalcemia or tertiary hyperparathyroidism was the reason in 20 patients. Most were referred to the service by family practitioners and endocrinologists while some were by general medicine internists, general surgeons, and others (**Table 1**).

Twenty-one patients (21.4%) were found to have incidental thyroid nodules during the imaging investigation, 10 found on initial ultrasound (US), 7 on sestamibi scan, 2 on CT scan, and 2 on SPECT scan. Subsequent US was ordered in 11 patients. Thyroid lesions were single thyroid nodules in 11 patients and multinodular lesions in 10 patients. Subsequently, fine-needle aspiration (FNA) biopsy was performed in 15 patients, while the remaining 6 did not have an FNA since the ultrasound features of the nodules were benign.

Twelve of these 21 patients (57.14%) had thyroid surgery at the time of their parathyroid surgery, with 1 patient having a completion thyroidectomy as a second operation. These 12 patients had their diagnostic thyroidectomy decided preoperatively based on FNA and ultrasound or intraoperatively depending on the intraoperative findings. The final tissue histopathology revealed that there were 4

**Table 1.** General Patient Characteristics (N = 98).

| Characteristic | Value |
|---|---|
| Age, mean (range), y | 62.2 (29-86) |
| Sex, male/female, No. (%) | 23/75 (23.5/76.5) |
| Referral source, No. (%) | |
| Family physician | 38 (38.8) |
| Endocrinology | 40 (40.8) |
| Other | 20 (20.4) |
| Parathyroid diagnosis, No. (%) | |
| Primary hyperparathyroidism | 78 (79.6) |
| Tertiary hyperparathyroidism | 20 (20.4) |
| Incidental thyroid lesion, No. (%) | 21 (21.4) |

**Table 2.** Thyroid Final Pathology with Reference to FNA Results (n = 21).

| FNA Cytology (Number) | Thyroid Pathology (Number) |
|---|---|
| FNA not performed (6) | Thyroidectomy not performed (4) |
| | Nodular hyperplasia (1) |
| | Micropapillary carcinoma (1) |
| Unsatisfactory (2) | Thyroidectomy not performed (1) |
| | Micropapillary carcinoma (1) |
| Benign (8) | Thyroidectomy not performed (4) |
| | Nodular hyperplasia (2) |
| | Micropapillary carcinoma (2) |
| Indeterminate (1) | Micropapillary carcinoma (1) |
| AUS/FLUS (4) | Nodular hyperplasia (1) |
| | Follicular adenoma (1) |
| | Micropapillary carcinoma (2) |

Abbreviations: AUS, atypia of undetermined significance; FLUS, follicular lesion of undetermined significance; FNA, fine-needle aspiration.

nodular hyperplasias, 1 follicular adenoma, and 7 micropapillary thyroid carcinomas in those who had diagnostic hemithyroidectomy performed (**Table 2**).

As detailed in **Table 2**, 2 patients who did not have a preoperative thyroid FNA had a diagnostic hemithyroidectomy at the time of the parathyroid surgery due to the intraoperative concerns of the surgeon on palpating the thyroid gland. One did turn out to have a papillary carcinoma. For the 2 patients who had unsatisfactory FNA, one had a hemithyroidectomy revealing micropapillary carcinoma, while the other did not have a hemithyroidectomy as the surgeon did not have any concerns at the time of surgery. Of the 8 who had benign FNA, 4 did not have any thyroid resection, 2 had nodular hyperplasia, and 2 had micropapillary thyroid carcinoma. Finally, for the 5 patients who had indeterminate FNA and FLUS, all had diagnostic hemithyroidectomy, and subsequent results revealed thyroid pathology, including a nodular hyperplasia, a follicular adenoma, and 3 micropapillary carcinomas.

There were 7 patients with papillary thyroid carcinoma in our study, out of a total of 21 who had an incidental thyroid lesion. These patients were then subsequently discussed at a thyroid multidisciplinary meeting for further treatment according to the ATA guidelines. The incidence of papillary thyroid carcinoma in our study population was 7.14%, although the true incidence may well even be higher. All of the patients with incidental thyroid nodules in our study had a preoperative discussion on possible diagnostic thyroidectomy with the surgeon, as reflected in the clinic discussion and consent form.

A careful examination of the preoperative and intraoperative decision making in these patients revealed that there were 5 patients in whom a decision for hemithyroidectomy was made preoperatively and 7 patients in the total cohort of 21 patients (33.3%) with thyroid incidentaloma for which the intraoperative findings definitively changed the actual procedure. The decision to proceed or not to proceed with a diagnostic hemithyroidectomy was made by the surgeon on the basis of direct palpation of the thyroid gland at the time of parathyroid surgery. The surgeons proceeded to perform hemithyroidectomy for 2 indications on the basis of operative note reviews: probable malignancy on palpation (firmness on palpation and/or adherence of the thyroid nodule to adjacent structures) and improvement of surgical exposure of the parathyroid and recurrent laryngeal nerves. A change in intraoperative decision was defined as those who had a hemithyroidectomy when the preoperative imaging or FNA results (benign or unsatisfactory) did not indicate the need for hemithyroidectomy, or the reverse, those for whom the ATA guidelines would be recommended for hemithyroidectomy (indeterminate or FLUS) but did not have the hemithyroidectomy performed. In our study, we found 7 cases (33.3%) where this decision change was made intraoperatively.

## Discussion

Incidental thyroid nodule is a very common problem presenting to the clinician. It also presents a diagnostic and management challenge when it occurs in patients who are being worked up for another pathology in the adjacent parathyroid glands. Our study has shown that surgeons would alter their preoperative plan and intraoperative actions on the basis of this incidental finding. Subsequently, patients are better counseled about the operation when incidental findings are discovered preoperatively.

Incidental thyroid nodules have been reported in up to 40% of patients undergoing parathyroidectomy.[14] In a prospective cohort study in 2010 by Adler et al,[15] incidental thyroid lesions were found in 29% of 310 patients who underwent ultrasound testing for primary hyperparathyroidism. Norman's group reported a prevalence of thyroid cancer in 27.6% of their last 25,000 patients.[16] These results are comparable to our data. Another study revealed that approximately only 2% of all patients with primary hyperparathyroidism undergoing ultrasound testing subsequently had thyroid cancer,[17] which is very low compared with our findings and other published data. Ogawa et al[18] did show

the high prevalence of thyroid disorders in patients with hyperparathyroidism, and they found malignant thyroid tumors in 10.6% of their study population. As such, preoperative evaluation of the thyroid is critical in the management of parathyroid disease, as high concomitant rates exist. This is especially true if one compares the low clinical sensitivity of examination intraoperatively that misses thyroid nodules <2 cm in more than half of the cases to the higher sensitive modality of preoperative imaging.[19] Also, intraoperative discovery of thyroid nodules without preoperative imaging and evaluation resulted in a higher rate of thyroid resections in one-third of patients compared with 6% in patients with proper preoperative US and FNA biopsy.[20] Strichartz et al[21] found that the incidence of thyroid incidentaloma in their patients who underwent hyperparathryoid surgeries was 21% (52 out of 308). Also, in Jovanovic and Giuliano,[22] the incidence was 26.4% (224 of 849). Incidental thyroid nodules in patients with parathyroid disorders were found in 21.4% of our study population. In this group, a standard thyroid workup was then carried out. In our literature review, we found a significant difference in detection rates between various imaging methods. Cervical ultrasound is the gold standard to detect malignant thyroid nodules, but looking at radiological reports of small incidental thyroid nodules <1 cm will raise a management dilemma in how we can proceed. One of the solutions is to obtain US-guided FNA, but that in turn can lead to a higher incidence of an inadequate sampling rate.[23] Where CT and MRI scans cannot differentiate between benign and malignant nodule characteristics, the use of the technetium-99m methoxy isobutyl isonitrile (MIBI) scintigraphy (Tc-99m MIBI) scan seems to be promising, with a sensitivity and specificity of 61% and 78%, respectively.[2,7,24]

Based on the preoperative imaging and FNA results, 5 patients who were recommended to have a diagnostic hemithyroidectomy did have the procedure at the time of the parathyroidectomy (23.8%). Some were found to have micropapillary carcinoma, while others had nodular hyperplasia or follicular adenoma. Appreciably, 7 patients who would not usually be recommended for diagnostic hemithyroidectomy on the basis of the ATA guidelines did have the procedure during the parathyroidectomy. This intraoperative change in decision was made on the basis of direct clinical palpation of the thyroid gland. We noted that there was an intraoperative modification of surgical plan in 33.3% of those patients in our study who had an incidental thyroid nodule. Malignancy was found in 4 of those 7.

The total incidence of papillary thyroid malignancy in our study population was 7.14%, which is comparable to the literature.[21,22,25]

Microcarcinoma is defined as a papillary thyroid carcinoma of 10 mm or less based on the World Health Organization definition.[26] Some clinicians argue that hemithyroidectomy for a microcarcinoma might represent an overtreatment given the prevalence of microcarcinoma in the general population and their nature of slow progression. Whether hemithyroidectomy and diagnosis of malignancy altered the long-term prognosis of the patient is beyond the scope of this study. Long-term follow-up of these patients is required.[27,28] However, this does not minimize the importance of properly, perioperatively finding thyroid pathology and also addressing it intraoperatively to reduce the risk of reoperation. Some studies have shown an increased rate of morbidity of reoperation for thyroidectomy following parathyroidectomy, including recurrent laryngeal nerve injury in 10% to 12% and hypocalcemia in <15% compared with <1% in concomitant thyroid/parathyroid surgery.[29,30] What we do know from our data is that the prevalence of incidental thyroid nodules and papillary thyroid carcinoma in our study population is comparable to that of the general population and published findings. We observe that for those in whom an incidental thyroid lesion is found, a significant number (23.8%) will then undergo a diagnostic hemithyroidectomy at the time of parathyroidectomy, and in approximately 1 in 3, an unplanned diagnostic hemithyroidectomy will be undertaken on the basis of intraoperative findings despite having favorable preoperative imaging and cytological features. This would therefore have a significant clinical impact on perioperative discussion with regard to diagnostic hemithyroidectomy in the context of parathyroid surgery. Limitations in this study include the retrospective design and small size of our single-institution population. Also, different surgeons cared for these patients at different times with different experience to attribute to the intraoperative findings. Perhaps future studies, possibly in the form of a survey, should focus on what other, if any, intraoperative findings help surgeons make their decisions and how we train our residents to become experts in this skill set prior to graduation. We were unable to comment on the quality of the ultrasound imaging as it exceeds the scope of this study, but the recommendation in the literature is to have it performed by a dedicated head and neck sonographer.[19] We feel that based on the results of this study, all patients who are to have operative management of parathyroid disease should have an ultrasound as a routine part of the preoperative workup. Any nodules identified should be further explored as per the ATA guidelines.[13] This will allow for a more informed patient and a clearer preoperative plan.

## Conclusions

In our series, the prevalence of incidental thyroid lesion and thyroid malignancy is comparable to the general population. The management of the initial parathyroid disease in our patients was altered by the imaging and cytological findings of these thyroid lesions. This has implications for perioperative counseling of the thyroid and parathyroid disease and should draw the surgeon's attention to the critical preoperative imaging and/or the intraoperative cautious examination.

### Author Contributions

**Uthman Alamoudi**, acquisition of data for the work, drafting the paper, final approval of the version to be published, agreement to be accountable for all aspects of the work; **Eric Levi**, data analysis, article drafting, final approval, accountability for the work; **Matthew H. Rigby**, study design and analyze the data, drafting

the article, final approval, accountability for the work; **S. Mark Taylor**, data acquisition, critical revision of the article, final approval of the version to be published, accountability for the work; **Jonathan R. B. Trites**, study design, critical revision of the article, final approval of the version to be published, accountability for the work; **Robert D. Hart**, substantial contributions to the conception and design of the work, revising it critically for important intellectual content, final approval of the version to be published, agreement to be accountable for all aspects of the work.

## Disclosures

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