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Role of cervical ultrasound in detecting thyroid pathology in primary hyperparathyroidism



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ABSTRACT

Background: Minimally invasive parathyroidectomy for primary hyperparathyroidism is made possible with accurate preoperative imaging. In addition to the detection of parathyroid adenomas, cervical ultrasound also provides concomitant assessment of the thyroid gland, and many surgeons believe that it is essential. However, the incidental identification of thyroid nodules may then subject patients to further workup and potentially invasive thyroid procedures. We sought to determine the long-term consequence of omitting preoperative ultrasound on the development of thyroid pathology and cancer.

Methods: At our institution, 222 patients with primary hyperparathyroidism underwent parathyroidectomy without preoperative cervical ultrasound from 1990–2001. Thyroid pathology discovered by follow-up after parathyroidectomy, subsequent biopsy, and surgical interventions were analyzed.

Results: Of the 222 patients who underwent parathyroidectomy, the mean age was 55 ± 1 y and 149 were female (67%). In the course of their follow-up after parathyroidectomy, 13 patients (6%) received a cervical ultrasound, and seven of 13 (3%) underwent fine needle aspiration of a thyroid nodule. Only one of seven (0.4% of all patients) was ultimately diagnosed with thyroid cancer. Four additional patients were discovered to have thyroid malignancies as a result of intraoperative decision making. All five patients are currently alive with an average follow-up time of 14.9 ± 1.6 y. No patients in this series had an unnecessary thyroid intervention.

Conclusions: In patients who underwent parathyroidectomy without a preoperative ultrasound, only a small number (0.4%) were subsequently diagnosed with thyroid cancer. Furthermore, omission of ultrasound during the localization of parathyroid glands does not have a negative impact on the diagnosis of thyroid pathology as all patients who had thyroid cancer had good outcomes, and in fact, may prevent unnecessary thyroid interventions. Therefore, the use of cervical ultrasound for parathyroid localization should be considered optional rather than essential.

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1. Introduction

Primary hyperparathyroidism is characterized by the unregulated overproduction of parathyroid hormone, resulting in

the disruption of bone and mineral metabolism. Although surgical excision of the overactive parathyroid glands is the only cure for the disease, minimally invasive approaches have demonstrated improved cosmesis, reduced postoperative

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pain, shorter length of hospital stay, and quicker return to preoperative activity level [1–5]. These minimally invasive approaches are made possible with accurate pre- and intraoperative imaging, typically using technetium 99m (Tc 99m) sestamibi scan and cervical ultrasound [4–8].

Although the objective of using each imaging modality is to reduce the need for unnecessary exploration, controversy remains regarding the most efficacious approach. In a retrospective study examining various imaging techniques for localization of nodular parathyroid lesions, the authors concluded that a combination of Tc 99m sestamibi scintigraphy and ultrasound by well-trained operators is the best preoperative option [9]. On the other hand, Mihai et al. [10] recommended Tc 99m sestamibi as the first test, with ultrasound by an experienced technician as a reasonable alternative.

A primary concern regarding the use of cervical ultrasound in preoperative evaluation of parathyroid glands is the concomitant assessment of the thyroid gland. Discovery of thyroid gland pathology in patients with primary hyperparathyroidism is relatively common; indeed, Adler et al. [1] approximated the prevalence of thyroid pathology in 29% of patients with parathyroid disease. Although identification of clinically significant thyroid disease before parathyroidectomy allows patients to avoid the risks associated with reoperation, many patients with incidentally discovered thyroid nodules do not manifest any clinical symptoms related to the thyroid. These patients will receive further workup and be subjected to potentially invasive thyroid procedures [11–14]. The utility of these procedures remains unclear, in part due to the high prevalence of thyroid nodules in the general population that do not necessitate intervention. A study performed at the Mayo Clinic discovered thyroid nodules in approximately 50% of 821 autopsies of patients with clinically normal thyroid glands [15]. Despite the high prevalence of thyroid nodules, the Surveillance, Epidemiology, and End Results program of the National Cancer Institute estimates the prevalence of thyroid cancer as <0.1% of the population [16].

The aim of the present study was to further understand the role of preoperative cervical ultrasound in discovering unrecognized thyroid pathology in patients with primary hyperparathyroidism. More importantly, we sought to determine the long-term consequence of omitting preoperative ultrasound on the development of thyroid pathology and cancer.

2. Methods

We reviewed a prospectively maintained database of patients undergoing surgery for primary hyperthyroidism from 1990–2001 at the University of Wisconsin. All patients who did not receive a preoperative cervical ultrasound were identified and included in the study. Patient demographics and preoperative biochemistry were obtained from the database. Thyroid pathology discovered by follow-up ultrasound after parathyroidectomy and also subsequent biopsy and surgical interventions were analyzed. The Institutional Review Board of the University of Wisconsin approved this protocol.

Table 1 – Patient characteristics and parathyroid disease etiology.

| Characteristic/etiology | Data |
|---------------------------------------|------------|
| Age (y), mean ± SEM | 55 ± 1 |
| Female, n (%) | 149 (67) |
| Preoperative biochemistry, mean ± SEM | |
| Calcium (mg/dL) | 11.1 ± 0.1 |
| Phosphate (mg/dL) | 2.7 ± 0.1 |
| Parathyroid hormone (pg/mL) | 126 ± 7 |
| Parathyroid etiology, n (%) | |
| Single adenoma | 184 (83) |
| Double adenoma | 18 (8) |
| Hyperplasia | 10 (5) |

SEM = standard error of the mean.

3. Results

3.1. Patient demographics

At our institution, 222 patients with primary hyperparathyroidism underwent parathyroidectomy without preoperative cervical ultrasound during the study period (Table 1). The mean patient age at the time of surgery was 55 ± 1 y, and 149 were female (67%). Preoperatively, the average calcium was 11.1 ± 0.1 mg/dL, phosphate was 2.7 ± 0.1 mg/dL, and parathyroid hormone was 126 ± 7 pg/mL. The cause of primary hyperparathyroidism was a single adenomatous gland in 184 patients (83%), double adenomas in 18 patients (8%), and four-gland hyperplasia in 10 patients (5%).

3.2. Management of thyroid pathology

As a result of intraoperative decision-making, 23 patients had concurrent thyroid procedures performed during their initial surgery for primary hyperparathyroidism (Table 2). In most cases, the thyroid tissue removed was suspicious for parathyroid tissue. Final pathology of the nodules was benign in 19 patients (83%), and malignancies were discovered in 4 patients (17%). Of those that had malignancies, one patient had papillary thyroid cancer, one patient had follicular thyroid cancer, and two patients were diagnosed with multiple endocrine neoplasia, type 2 as a result of the surgery. None of the patients with intraoperatively diagnosed thyroid cancers developed recurrences that required additional neck operations.

Table 2 – Pathology of thyroid abnormalities.

| Pathology | n | % (n = 222) |
|-----------------------------------|----|-------------|
| Benign nodule | 19 | 9 |
| Malignancy | 4 | 2 |
| Papillary thyroid cancer | 1 | 0.4 |
| Follicular thyroid cancer | 1 | 0.4 |
| Medullary thyroid cancer (MEN 2A) | 2 | 1 |

MEN = multiple endocrine neoplasia.

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