BRIEF REPORT: Use and Misuse of Thyroid Ultrasound in the Initial Workup of Patients with Suspected Thyroid Problems Referred by Primary Care Physicians to an Endocrine Clinic

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BACKGROUND AND OBJECTIVES: Thyroid ultrasound (TUS) plays an important but limited role in the evaluation of some complaints related to the thyroid gland. This study was designed to examine how primary care physicians use TUS before referring patients to an endocrine clinic.

DESIGN: We audited all charts of first-time referrals for appropriateness of TUS use. Recommendations in practice guidelines and current textbooks defined appropriate indications for TUS: (1) patients with a thyroid nodule and a history of head or neck irradiation; (2) follow-up of patients with nodules not surgically removed; and (3) evaluation of patients with amiodarone-induced thyrotoxicosis.

SETTING: Endocrine referral clinic in a teaching hospital in Israel.

RESULTS: Two hundred and eight unselected referrals were reviewed. Sixty-nine (33%) of the patients presented with a TUS. Documented reasons for TUS were suspected thyroid mass (n=35, 51%), thyroid dysfunction (n=21, 30%), neck pain (n=5, 7%), dyspnea (n=4, 6%), and dysphagia (n=2, 3%). Of the 69 TUS reviewed, 64 (93%) were not appropriate.

CONCLUSIONS: Primary care clinicians obtain TUS studies in patients without recommended indications prior to referral to an endocrinologist.

KEY WORDS: physician's practice patterns; ultrasonography/thyroid; thyroid diseases.
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Surveys suggest that endocrinologists' use of thyroid ultrasound (TUS) in the evaluation of thyroid complaints is increasing,[1,2] even though there are no specific recommendations for the use of TUS in the initial evaluation of most common thyroid problems (E-Table, available online at http://www.blackwellpublishing.com/products/journals/suppmat/jgi/jgi05085/jgi05085sm.htm). We are not aware of studies assessing how appropriate the use of TUS studies is in clinical practice. We designed this study to assess how primary care physicians use TUS before referring patients to an endocrine clinic.

PATIENTS AND METHODS

We included 208 consecutive and unselected patients referred for the first time to the endocrine clinic for a suspected thyroid problem, and seen by 1 endocrinologist (Y. L). Various physicians-ultrasonographists serving the community performed the TUS examinations. In our setting, primary care physicians have unrestricted access to TUS, and patients were referred after their primary care physician reviewed the TUS.

Because there are no generally accepted indications for TUS, and in order to establish a set of acceptable indications for the performance of TUS, we searched the World Wide Web, Medline, and the Cochrane Library database, as well as common textbooks in endocrinology, Internal Medicine, and primary care medicine for clinical practice guidelines about the evaluation of common thyroid complaints, specifically thyroid dysfunction and thyroid nodular disease (E-Table, available online at http://www.blackwellpublishing.com/products/journals/suppmat/jgi/jgi05085/jgi05085sm.htm). Aware of the outcome of the endocrine consultation, we used this set of indications to determine the clinical appropriateness of TUS studies conducted on the patients referred to our endocrine clinic. Ambiguous cases were judged appropriate.

Statistical analysis

Logistic univariate regressions were carried out with SPSS for Windows (v 9.0). Predictors tested were age and gender. The Institutional Review Board approved this study.

RESULTS

Appropriateness of TUS examinations

Based on published recommendations for the use of ultrasound in practice guidelines and common textbooks in the management of patients with thyroid dysfunction and thyroid nodular disease (E-table, available online at http://www.blackwellpublishing.com/products/journals/suppmat/jgi/jgi05085/jgi05085sm.htm), we considered ultrasound examinations appropriate when performed in patients with thyroid nodule and a history of head or neck irradiation, and for the follow-up of known nodules not surgically removed. We also considered the use of TUS and flow-Doppler ultrasonography appropriate for the differential diagnosis of amiodarone-induced thyrotoxicosis (AIT).[3,4]

Patients and TUS Studies

Of the 208 thyroid-related patients included in the study, 164 (79%) were women and 44 (21%) were men. The patients' mean age was 48 (SD 18). Table 1 describes reasons for referral to the endocrine clinic, the number who had TUS, and their appropriateness. Of the 68 TUS, 64 (93%) were not appropriate. Age and gender did not appear to affect the distribution of reasons for TUS or their appropriateness. Of the 69 TUS, 66 identified thyroid abnormalities, of which 55 (83%) were thyroid nodules.

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Table 1. Presenting Problem and Ultrasound Studies

	Number of Patients
	TUS/Total Referred/Appropriate TUS
Thyroid dysfunction	
Hyperthyroidism	7/71*
Hypothyroidism	12/63*
Subclinical thyroid dysfunctions	2/5*
Thyroid mass	35/53†
Neck pain	5/6*
Dyspnea	4/5*
Dysphagia	2/3*
Fatigue	0/1*
Other (obscure)	1/1*
Total	68/208†

**None of these TUS were considered appropriate.*
†Of these TUS, 5 were considered appropriate.
TUS, thyroid ultrasound.

DISCUSSION

This study suggests that primary care clinicians obtain TUS for reasons that are inconsistent with current expert recommendations; indeed, some were performed in patients with complaints that were not specifically related to thyroid abnormalities. Because the results of the TUS may have influenced referral, we likely underestimated the number of TUS obtained in primary care (i.e., those with normal findings may be less likely to be referred to the endocrinologist). Our results may or may not reflect the pattern of use of TUS in other settings.

Inappropriate use of TUS may delay the evaluation and referral, overload diagnostic services, increase health care expenditure, and lead to harm through false positives that lead to further inappropriate action, the so-called "cascade iatrogenesis."[8]

Overuse of TUS likely occurs because it is relatively inexpensive, usually accessible, noninvasive, accurate in describing thyroid morphology, and in view of the relative inaccuracy of thyroid palpation,[9] it may supplement physical examination, particularly for physicians who lack confidence in their skill in thyroid palpation; however, it is rarely diagnostic and the practical value of many of its findings (e.g., incidental small thyroid nodules) is still controversial.

Ultrasound examination is not indicated for suspected thyroid dysfunction. Rather, history and physical examination, TSH and thyroid hormone determinations, and thyroid uptake in patients with thyrotoxicosis are the appropriate diagnostic procedures. A low uptake is indicative of subacute or "silent" thyroiditis, recent exposure to iodine or factitious thyrotoxicosis; diffuse uptake is suggestive of Graves' disease, or sometimes of the recovery phase of subacute thyroiditis, while focal uptake along with matching physical examination findings are usually diagnostic of an autonomous toxic nodular disease. Neither ultrasound nor thyroid scan/uptake is useful in the differential diagnosis of hypothyroidism.

Neck pain can result from thyroiditis, which is best diagnosed by the combination of tenderness on thyroid palpation, elevated erythrocyte sedimentation rate (ESR), and a thyroid scan revealing nonuptake. TUS is nonspecific in subacute thyroiditis.[5] Neck pain is rarely a presenting symptom of thyroid cancer,[6] and even when it precedes the diagnosis of thyroid cancer, it is more likely that the thyroid mass would be an incidental finding. Bleeding into a thyroid nodule (hemorrhagic cyst) may also cause neck pain and tenderness, which can be confusing. In this case, a nodule can usually be palpated and fine needle aspiration (FNA) has the advantage of being both diagnostic and palliative (as evacuation of the hemorrhagic fluid usually reduces the pain).

Dyspnea and dysphagia may be related to a large goiter. Thyroid ultrasound adds little to the physical examination of large cervical goiters. Substernal goiters could be missed by ultrasound[7] and are best defined by thyroid scan, computed tomography, or magnetic resonance imaging.

Because of its sensitivity, TUS often detects unsuspected small thyroid nodules.[1] It may seem, therefore, that the use of TUS should be advocated as a means for screening for early thyroid cancer. While the rate of thyroid cancer may be similar in nonpalpable thyroid nodules as in palpable nodules,[10] whether patients with screening-detected thyroid cancer have better cure rates, quality of life, or survival than patients with clinically detected thyroid cancer remains unclear. Indeed, given the indolent course of most nonpalpable thyroid cancers[11] and the relatively high rate of incidental, small thyroid cancers discovered by TUS-guided biopsies, harm seems more likely an outcome for such patients who will undergo unnecessary evaluations and suffer excess morbidity from anxiety and side effects of (overzealous) treatment.

While TUS is an excellent imaging tool, there are few recommended indications for its use in the initial evaluation of thyroid complaints. Given the high prevalence of thyroid complaints and the sensitivity of the test, the inappropriate use of TUS, such as was documented in this study, adds to expanding health care costs affording patients limited benefit and potential harm. Primary care clinicians and endocrinologists should consider a selective approach to the use of TUS in patients with thyroid complaints.

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REFERENCES

1. **Bonnema SJ, Bennedbaek FN, Ladenson PW, Hegedus L.** Management of the nontoxic multinodular goiter: a North American survey. J Clin Endocrinol Metab. 2002;87:112–7.
2. **Bonnema SJ, Bennedbaek FN, Wiersinga WM, Hegedus L.** Management of the nontoxic multinodular goitre: a European questionnaire study. Clin Endocrinol (Oxford). 2000;53:5–12.
3. **Bartalena L, Bogazzi F, Martino E.** Amiodarone induced thyrotoxicosis: a difficult diagnostic and therapeutic challenge. Clin Endocrinol (Oxford). 2002;56:23–4.
4. **Clark KJ, Cronan JJ, Scola FH.** Color Doppler sonography: anatomic and physiologic assessment of the thyroid. J Clin Ultrasound. 1995;23:215–23.
5. **Hegedus L.** Thyroid ultrasound. Endocrinol Metab Clin N Am. 2001;30:339–60.
6. **Holzer S, Reiners C, Mann K, et al.** Patterns of care for patients with primary differentiated carcinoma of the thyroid gland treated in Germany during 1996. U.S. and German thyroid cancer group. Cancer. 2000;89:192–201.
7. **Rodriguez JM, Hernandez Q, Pinero A, et al.** Substernal goiter: clinical experience of 72 cases. Ann Otol Rhinol Laryngol. 1999;108:501–4.
8. **Hofer TP, Hayward RA.** Are bad outcomes from questionable clinical decisions preventable medical errors? A case of cascade iatrogenesis. Ann Intern Med. 2002;137:327–33.
9. **Deandrea M, Mormile A, Veglio M, et al.** Fine needle aspiration biopsy of the thyroid: comparison between thyroid palpation and ultrasonography. Endocr Pract. 2002;8:282–6.

10. **Nam-Goong IS, Kim HY, Gong G, et al.** Ultrasonography-guided fine-needle aspiration of thyroid incidentaloma: correlation with pathological findings. Clin Endocrinol (Oxford). 2004;60:21–8.

11. **Ito Y, Uruno T, Nakano K, et al.** An observation trial without surgical treatment in patients with papillary microcarcinoma of the thyroid. Thyroid. 2003;13:381–7.

Supplementary Material

The following supplementary material is available for this article online:

E-Table 1. Practice guidelines recommendations regarding use of ultrasound for the evaluation of common thyroid conditions.