Clinical Application of Thyroid and Parathyroid Ultrasonography in the Outpatient Clinic

Tien-Chun Chang*

Thyroid and parathyroid ultrasonography is a noninvasive, quick, and convenient method for observing morphologic abnormalities of the thyroid and parathyroid glands. The examination is also inexpensive in some countries. Given these qualities, the method can be used in outpatient clinics as a stethoscope for physical examination. When a pure cyst is observed, aspiration can be performed to treat the lesion, without the additional cost of cytology. Ultrasonography enables subacute thyroiditis to be easily differentiated from other lesions. If a hypoechoic lesion is observed associated with microcalcification, papillary or medullary thyroid cancers can be suspected early on the basis of ultrasonography. Combining information regarding the extent of the cancer lesions using ultrasonography and differentiation of cancer lesions by cytomorphology enables the most suitable method of surgery and management to be chosen for patients. This examination method is also important in the follow-up of papillary thyroid cancer recurrence in the neck lymph nodes, with or without elevation of serum thyroglobulin levels. Color Doppler is helpful in following up activity in Graves disease to determine whether medication can be discontinued. Ultrasonography is also useful in determining when to operate on patients with Graves disease or Hashimoto thyroiditis associated with thyroid nodules, and in avoiding unnecessary surgery in euthyroid patients with ectopic thyroid nodules. In patients with elevated serum calcium and parathyroid hormone levels, parathyroid ultrasonography is useful in determining the location of abnormal parathyroid glands and in reducing the need for a parathyroid sestamibi scan. In conclusion, it is of economic and medical importance to move the ultrasonography machine out of the examination laboratory and into the outpatient clinic.

KEY WORDS — aspiration cytology, outpatient clinic, parathyroid adenoma, parathyroid ultrasonography, thyroid cancer, thyroid ultrasonography

Introduction

Thyroid and parathyroid ultrasonography is a noninvasive, quick, and convenient method for observing morphologic abnormalities of the thyroid [1] and parathyroid glands [2]. Although thyroid ultrasonography has been considered a screening method without evidence of efficacy [3], it is currently
recommended as an initial test in the routine evaluation of thyroid nodules [4]. Thyroid or parathyroid ultrasonography is also inexpensive in some countries, e.g. Taiwan, where it costs less than US$20. With these benefits in mind, this examination method can be used in the outpatient clinic as a stethoscope for physical examination. The appointment time for thyroid and parathyroid ultrasonography is commonly arranged on a different day to the patient’s clinic visit, especially in medical centers; however, it is worthwhile performing this examination on the same day as the visit to the outpatient clinic. This article outlines previous experiences with this approach and its advantages.

Confirming that a Nodule is a Thyroid Cyst

When a pure thyroid cyst is observed, aspiration can be immediately performed at the outpatient clinic to treat the lesion [5]. It is not necessary to proceed with aspiration cytology if a thyroid nodule is not found following aspiration [5]; thus, the cost of cytology can be saved. If the lesion is partially cystic, however, aspiration cytology will be needed under ultrasound guidance to obtain a biopsy sample from the solid part (Fig. 1).

Confirming the Diagnosis of Subacute Thyroiditis

Subacute thyroiditis is also easily differentiated from other lesions by ultrasonography [6]. In addition to a history of upper respiratory tract infection before occurrence of the disease and tenderness and firm consistency during physical examination, the appearance of a focal, ill-defined hypoechoic lesion at the area of tenderness supports the diagnosis of subacute thyroiditis (Fig. 2). Interestingly, thyroid ultrasonography can also be used in follow-up of the course (Fig. 2). Regression of sonographic hypoechogenicity parallels the disappearance of acute inflammatory cells and gradual improvement in the degenerated follicular cells [6].

Suspected Diagnosis of Papillary Thyroid Carcinoma or Medullary Thyroid Carcinoma

Early suspicion of papillary thyroid cancers and medullary thyroid cancers can be made under ultrasonography when a hypoechoic lesion is associated with discrete particles without acoustic sign [1,7] (Fig. 3). These findings correspond to microcalcifications in the papillary thyroid cancer [1] and calcification in the amyloid in medullary thyroid cancers.

Designing the Best Treatment Protocol for Patients with Thyroid Cancer

The common use of thyroid ultrasonography in screening for thyroid lesions in health examinations means that thyroid nodules can be detected even when there is no palpable lesion. A previous survey found that 72.2% of persons undergoing health examinations had no palpable goiter; however, thyroid lesions could be found in 18.5% of these subjects with impalpable thyroid [8]. A preliminary study indicates that the progression rate of nonpalpable papillary microcarcinoma to clinically
significant lesions may be very low [9]. The cytologic features in fine-needle aspiration cytology samples of papillary thyroid carcinoma were recently found to have prognostic significance [10] (Fig. 4). Therefore, combining information regarding the extent of the cancer lesions using ultrasonography and differentiation of cancer lesions by cytomorphology enables the most suitable method of surgery and patient management to be identified.

Follow-up of Neck Recurrence Following Surgery in Patients with Papillary or Medullary Thyroid Cancers

Lymph node recurrence is common in the neck following surgery to papillary thyroid cancers, especially in patients with metastatic lymph nodes found during surgery [11]. Although serum thyroglobulin levels can detect the recurrence of differentiated thyroid cancers, these levels can be normal if neck lymph node metastasis alone is present in papillary thyroid cancer [12]. Thyroid ultrasonography is very useful in detecting local recurrence of papillary thyroid cancer [11]. In comparison, lymph node metastasis is also common in medullary thyroid cancer [13] (Fig. 5), meaning that thyroid ultrasonography is useful for follow-up in recurrence of medullary thyroid cancer in the neck, especially when the serum calcitonin level is elevated.

Fig. 2. Presence of a focal, ill-defined hypoechoic lesion (arrow) supports the diagnosis of subacute thyroiditis. The regression of hypoechogenicity over time parallels the disappearance of acute inflammatory cells and gradual improvement in the degenerated follicular cells. T = trachea.

Fig. 3. Transverse section of the right lobe of the thyroid by ultrasonography reveals a hypoechoic lesion (arrow) associated with discrete particles without acoustic sign in a case of papillary thyroid cancer.

Fig. 4. Irregular shape of nuclei in fine-needle aspiration cytology samples of papillary thyroid carcinoma is a poor prognostic sign (Riu’s stain, 200×).
Determining Discontinuation of Antithyroid Medications and the Choice of Surgery in Graves Disease by Thyroid Ultrasonography

Graves disease is the most common hyperthyroid disorder. The hyperthyroidism in this disease is easily controlled by antithyroid drugs; however, the high recurrence rate after discontinuation of the drugs [14] results in a choice between ablative therapy with radioactive iodine and surgery following treatment with antithyroid drugs for a period of time. Determination of a resistive index by thyroid Doppler ultrasonography could assist in determining the likelihood of relapse following discontinuation of the antithyroid drugs [15]. A previous study found that withdrawal of antithyroid drugs could be considered for a resistive index of less than 0.6 and with a normal serum TSH level; however, given that not all patients with Graves disease have diffuse goiter, a combination of thyroid ultrasonography and aspiration cytology in assessing nodular lesions in Graves disease (Fig. 6) can assist in deciding whether thyroidectomy or radioiodine should be chosen [16].

Determining Whether Medication or Surgery Should be Chosen to Treat Hashimoto Thyroiditis

Thyroid ultrasonography in patients with Hashimoto thyroiditis usually reveals a diffusely hypoechoic appearance, especially in patients with hypothyroidism [1,17,18]. Such patients can be treated with thyroxin; however, nodular lesions are sometimes observed by thyroid ultrasonography (Fig. 7), and these can be malignant. Fine-needle aspiration cytology with or without ultrasound

Fig. 5. Case of medullary thyroid cancer treated surgically 7 years ago, with a lymph node metastasis detected recently. C = carotid artery.

Fig. 6. Sagittal section of the thyroid by ultrasonography shows an isoechoic nodular lesion (arrow) in the hypoechoic right lobe in a patient with Graves disease.

Fig. 7. Sagittal section of the thyroid by ultrasonography shows an isoechoic nodular lesion (arrow) in the heterogeneous hypoechoic left lobe in a patient with Hashimoto thyroiditis.
guidance can assist in determining when to operate on patients with Hashimoto thyroiditis with nodular lesions [19].

**Diagnosis of Nodular Goiter as Ectopic Thyroid**

Ectopic thyroid is a rare entity that can occur in euthyroid or hypothyroid patients. In a euthyroid patient with ectopic thyroid tissue appearing in the foreneck, surgery will cause permanent hypothyroidism. Preoperative thyroid ultrasonography can diagnose a nodular goiter as ectopic thyroid if normal thyroid tissue is absent in the usual position of the thyroid [20].

**Localizing Parathyroid Lesions**

Parathyroid ultrasonography is useful in determining the location of abnormal parathyroid glands in patients with primary hyperparathyroidism and elevated serum calcium, low phosphate, and high parathyroid hormone levels (Fig. 8); it also reduces the need for a parathyroid sestamibi scan, saves operation time, and reduces the size of the surgical wound [2,21–23]. However, ectopic parathyroid glands can only be detected by scintigraphy [21].

**Fig. 8.** Parathyroid ultrasonography shows an abnormal enlargement of the parathyroid gland (arrow) in a patient with primary hyperparathyroidism. T = trachea.

**Conclusion**

In conclusion, given the economic and medical benefits stated above, it is of value to move the ultrasonography machine out of the examination laboratory and into the outpatient clinic.

**References**


15. Wang CY, Chang TC. Thyroid Doppler ultrasonography and resistive index in the evaluation of the need for ablative or antithyroid drug therapy in Graves’ hyperthyroidism. *J Formos Med Assoc* 2001;100:753–7.


