

Ultrasonographic Evaluation of the Thyroid



Kathryn A. Robinson, MD*, William D. Middleton, MD

KEYWORDS

- Thyroid • Thyroid ultrasonography • Thyroid nodule evaluation • Fine-needle aspiration
- Diffuse thyroid disease

KEY POINTS

- Normal thyroid anatomy.
- Benign and malignant thyroid disease.
- Selection of nodules for fine-needle aspiration.
- Diffuse thyroid disease.

INSTRUMENTATION AND TECHNIQUE

Evaluation of the thyroid gland is best achieved with a linear transducer of high frequency, such as 7 to 18 MHz. Most current linear transducers provide high spatial resolution of 0.7 to 1.0 mm with deep penetration of up to 5 cm.¹ The patient is placed supine on a stretcher, and a towel or pillow is rolled behind the lower cervical spine to extend the neck as much as possible. The thyroid gland must be examined thoroughly in both longitudinal and transverse planes. In addition, the examination should include an evaluation of the lateral and central neck compartments for abnormal lymph nodes, Levels II to VII.² This evaluation is achieved by scanning laterally in the region of the carotid artery and jugular vein, superiorly to detect submandibular and upper central neck adenopathy, and inferiorly to visualize supraclavicular and lower central neck adenopathy.

ANATOMY

The thyroid gland is located in the anteroinferior neck, infrahyoid compartment. It is made up of 2 lobes located on either side of the trachea. The lobes are connected by a thin isthmus that crosses anterior to the trachea, at the lower third of the gland. A minority of patients have a small

pyramidal lobe arising superiorly from the isthmus and lying in front of the thyroid cartilage. The thyroid gland is bordered by thin strap muscles (sternohyoid, sternothyroid, and omohyoid) anteriorly, sternocleidomastoid muscles more laterally, and longus colli muscles posteriorly. The common carotid arteries are located lateral to each thyroid lobe, and the jugular veins are anterior and lateral to the carotids. In many patients the esophagus is seen posterior to the thyroid and trachea, on the left side more commonly than the right. It is identified by the typical target appearance of bowel in the transverse plane, and peristaltic movement when the patient swallows.

The normal thyroid gland has a homogeneous medium- to high-level echogenicity and is hyperechoic relative to the adjacent muscles. The thin hyperechoic line that surrounds the thyroid lobe is the thyroid capsule. The normal thyroid lobe measures 4 to 6 cm in length and 1.3 to 1.8 cm in anterior posterior and transverse diameter. The normal isthmus measures up to 3 mm in thickness (**Fig. 1**).^{1,3} Thyroid gland demonstrates scattered, readily detectable internal blood flow with color or power Doppler (**Fig. 2**).

Thyroid is enlarged when the transverse or anteroposterior diameter is greater than 2 cm or when the parenchyma extends anterior to the carotid artery. The superior thyroidal artery and vein are

The authors have nothing to disclose.

Mallinckrodt Institute of Radiology, Washington University School of Medicine, 510 South Kingshighway Boulevard, St Louis, MO 63110, USA

* Corresponding author.

E-mail address: robinsonk@mir.wustl.edu

Ultrasound Clin 9 (2014) 325–337

<http://dx.doi.org/10.1016/j.cult.2014.02.003>

1556-858X/14/\$ – see front matter © 2014 Elsevier Inc. All rights reserved.

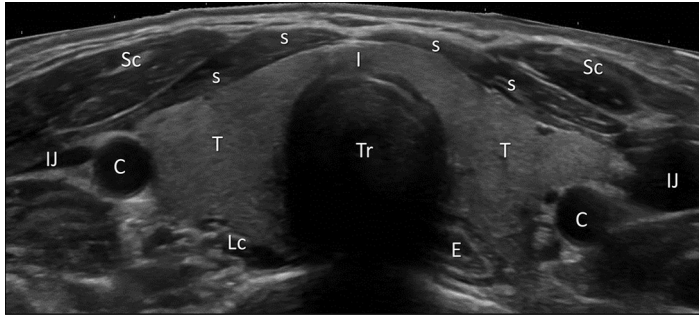


Fig. 1. Normal thyroid. Transverse extended-field-of-view scan of the neck shows the normal right and left lobes of the thyroid (T) located on either side of the trachea (Tr). The common carotid arteries (C) and the internal jugular vein (IJ) are seen lateral to the carotid. The overlying strap muscles (S) are immediately anterior to the thyroid, and the sternocleidomastoid muscles (Sc) are anterolateral to the thyroid. The isthmus (I) of the thyroid is anterior to the trachea. The longus colli muscle (Lc) is seen posteriorly on the right, and the esophagus (E) is seen posterior to left thyroid.

found at the upper pole of each lobe, the inferior thyroidal vein is found at the lower pole, and the inferior thyroidal artery is located posterior to the lower third of each lobe (Fig. 3). The recurrent laryngeal nerve and the inferior thyroidal artery pass in the angle between the trachea, esophagus, and thyroid lobe.

Histologically each lobe of the thyroid gland consists of numerous follicles that constitute the structural and functional unit of the gland. Each

follicle consists of a single layer of cuboidal epithelial cells constituting the follicular epithelium, enclosing a central lumen containing a colloid substance rich in thyroglobulin. The shape of the normal follicles ranges from round to oval, and they show considerable variation based on the degree of gland activity. Thyroid follicles are composed of 2 endocrine cell populations: follicular cells, responsible for secreting T3 and T4 hormones that control basal metabolism; and C cells or parafollicular cells, mainly known for producing calcitonin, a hypocalcemic and hypophosphatemic hormone (Fig. 4).

CONGENITAL THYROID ABNORMALITIES

Congenital abnormalities of the thyroid gland include thyroid ectopia, hypoplasia, or aplasia. Ectopic thyroid is a rare entity resulting from abnormal development of the thyroid gland during embryogenesis. It is typically found in a midline suprahyoid position between the foramen cecum of the tongue and the epiglottis. Alternatively, ectopic tissue can be found sublingually, intratracheally, paralaryngeally, laterally within the neck, or in distant places such as the mediastinum and subdiaphragmatic organs. Ultrasonography plays little role in the evaluation of thyroid ectopia. Instead, nuclear medicine scans are more commonly used to detect ectopic thyroid tissue. By contrast, hypoplastic and aplastic thyroid are easily evaluated with ultrasonography.

Thyroglossal duct cysts, which are cysts of epithelial remnants of thyroglossal duct, are the most common form of congenital cyst in the neck. During embryologic development, as the thyroid migrates from the foramen cecum of the tongue to the lower neck along a path through the tongue, hyoid bone, and neck muscles, it

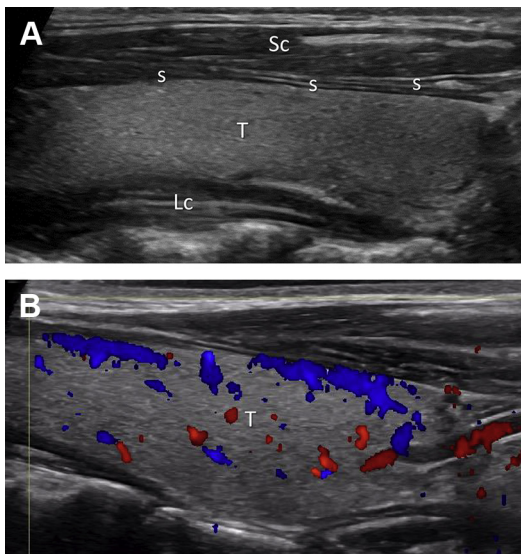


Fig. 2. Normal thyroid. (A) Longitudinal view of the thyroid (T) shows the lenticular shape of the thyroid and hyperechogenicity of the thyroid compared with the overlying strap muscles (S) and the sternocleidomastoid muscles (Sc). The longus colli muscle (Lc) is seen posteriorly. (B) Longitudinal color Doppler view of the thyroid (T) shows normal flow throughout the thyroid gland.

Download English Version:

<https://daneshyari.com/en/article/3842424>

Download Persian Version:

<https://daneshyari.com/article/3842424>

[Daneshyari.com](https://daneshyari.com)