شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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Introduction

The name thyroid gland, in English, is derived from the Latin glandula thyreoidea, meaning shield-shaped gland, named by Thomas Warton in 1656. As the first endocrine gland to develop embryologically, it possesses important functions from fetal development until death ***(Gharib, 2018).***

Nodular thyroid disease is a common finding in the general population, in particular in iodine-deficient areas. Thyroid nodules are palpable in 5% of people. The majority of thyroid nodules are benign; however, 15-30% are classified as indeterminate or suspicious for malignancy **(*Vorla¨nder et al., 2010*).**

The primary challenge in the evaluation of thyroid nodules is to reliably identify the majority of benign nodules that do not require surgical removal, while avoiding the risk that malignant (or pre-malignant) nodules are not identified, so missing an opportunity to provide effective early surgical treatment ***(Lyshchik et al., 2005).***

Fine-needle aspiration (FNA) is the standard procedure to determine whether a thyroid nodule is cancerous. However, FNA is an invasive procedure, and about 10–20% of FNAs yield inadequate results and lead to repeat biopsy ***(Wu et al., 2013).***

Thyroid ultrasound (US) being easily accessible, noninvasive, and cost-effective, is a key examination for the management of thyroid nodules. Thyroid US assessment of the risk of malignancy is crucial in patients with nodules, in order to select those who should have a fine needle aspiration (FNA) biopsy performed. Certain features of thyroid nodules on ultrasound (US) are predictive of malignancy and are used as criteria for FNA**.** Ultrasound characteristics that have been reported as potential predictors of thyroid malignancy include irregular margins, hypo-echogenicity, absence of a halo, a predominantly solid composition, or presence of calcification. These criteria have various sensitivity and specificity, but unfortunately none of them alone is sufficient to discard or detect malignancy efficiently ***(Russ et al., 2017).***

Alternative ultrasound techniques are now being used to improve the diagnostic accuracy of ultrasound, as many suspicious ultrasound features can exist in both benign and malignant nodules ***(Wienke et al., 2003).***

Ultrasound elastography, which was introduced in the 1990s, provides real-time information regarding the tissue elasticity and allows in vivo assessment of the tissue's mechanical properties, mapping of tissue stiffness, and characterization of soft tissue lesions. Ultrasound elastography is based on the principle that, under compression, the softer parts of tissues deform easier than the harder parts. Ultrasound Elastography is reported to be useful in differentiation of the benign and malignant lesions of the prostate, breast, pancreas, and lymph nodes. In the last years, important studies have been conducted in the differential diagnosis of thyroid nodules by US elastography ***(Cantisani et al., 2016).***

Aim of the Work

The aim of this study is to assess the diagnostic value of elastography in the evaluation of thyroid nodules.

Anatomy of the Thyroid Gland

Surgical anatomy

The thyroid gland is small-sized gland, flat reddish-tan color, located in the midline in the anterior neck, posterior to the strap muscles, and anteriorly in the lower aspect of the neck, extending from the level of the fifth cervical vertebra down to the first thoracic vertebra lying on either sides of the trachea and esophagus. The thyroid functions as an endocrine gland and is responsible for the production of thyroid hormones and calcitonin, thus contributing to the regulation of metabolism, growth, and serum concentration of electrolytes such as calcium ***(Brennan et al., 2020).***

The gland varies from an H to a U shape. The thyroid gland consists of two symmetrical lobes united in front of the second, third, and fourth tracheal rings by an isthmus. Each of the lateral thyroid lobes measures an average of 50 to 60 mm (8 to 10 ml in volume). Even though the weight of the thyroid gland varies, it averages between 15 g to 30 g in adults and it is somewhat heavier in women and increases in size during menstruation and pregnancy ***(Arrangoiz et al., 2018).***

Each lobe is pear-shaped with a narrow upper pole and a broader lower pole. It appears approximately triangular on cross-section with lateral, medial, and posterior surfaces. The superior poles of each lobe diverge laterally at the level of the oblique lines on the laminae of the thyroid cartilage, while the lower poles diverge laterally at the level of the fifth tracheal cartilage ***(Flint et al., 2010).***

The isthmus joins the anterior surfaces of the lobes towards the lower poles. The posterior surface of the isthmus is firmly adherent to the second, third, and fourth tracheal rings. The thyroid attaches to the trachea via consolidation of connective tissue (false capsule), referred to as the suspensory ligament of the thyroid gland or Berry's ligament. This fixation and the investment of the whole gland, along with the larynx, trachea, and esophagus by the pre-tracheal fascia are responsible for the gland moving up and down with the larynx during swallowing ***(Standring, 2008).***

Apart from the false capsule, the thyroid gland has its own true capsule, which is continuous with the connective tissue septa that make up the stroma of the gland ***(Wood et al., 2010).***

A pyramidal lobe may extend superiorly from the ismuth or from the medial portion of the left or right lobes toward the hyoid bone, to which it may be attached by a fibrous or fibromuscular band, the levator of the thyroid gland **(Figure 1)** ***(Oertli and Udelsman, 2012)*****.**

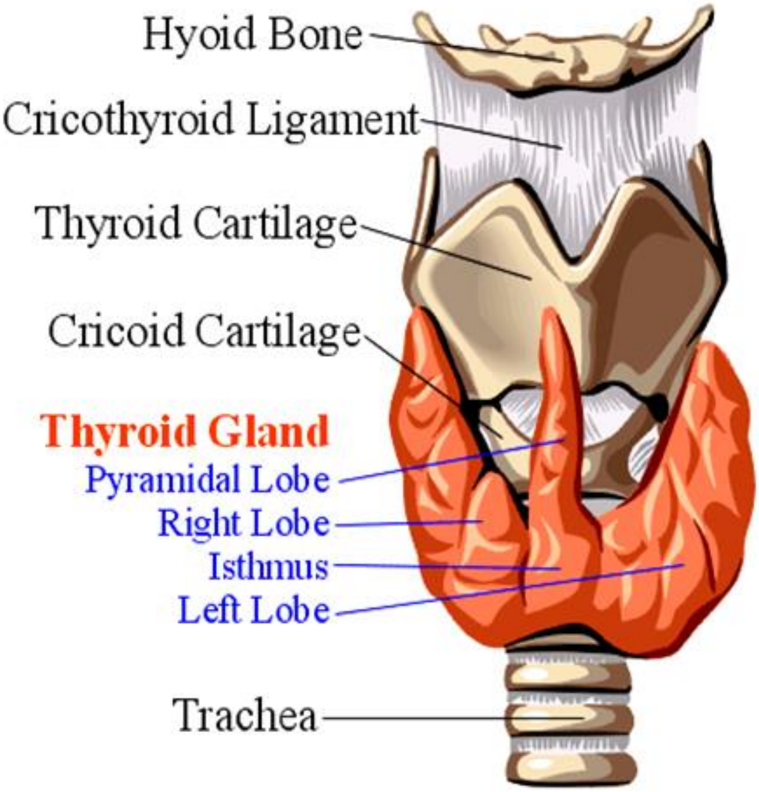

Figure (1): Thyroid gland anatomy ***(Quoted from Standring, 2008).***

Relations

The lateral (superficial) surface is covered by sternothyroid and more anteriorly by the sternohyoid and superior belly of the omohyoid muscle; these muscles are absent in the midline, the ismuth of the gland is subcutaneous in the midline. The upper pole is tucked away beneath the upper end of the sternothyroid muscle whose attachment to the oblique line of the lamina of the thyroid cartilage prevents the superior pole from extending superiorly under the thyrohyoid muscle. The lower end of sternocleidomastoid overlaps the strap muscles **(Figure 2)** (***Naidoo et al., 2007).***

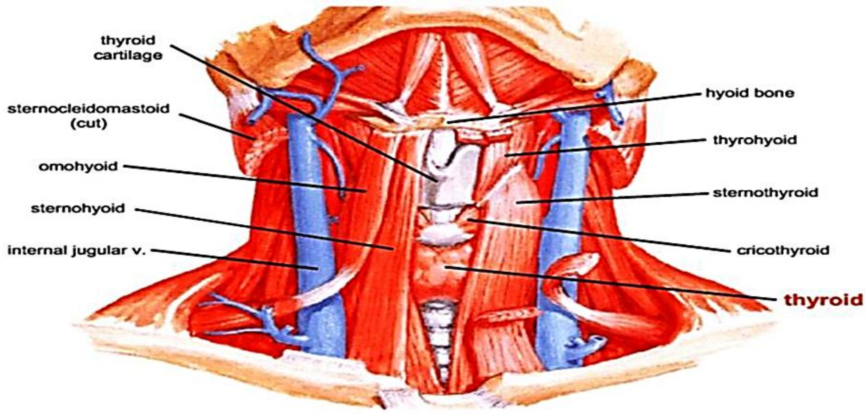

Figure (2): Muscular covering of the thyroid gland ***(Quoted from Netter, 2010)***.

Medially, the superior part of the gland is related to the larynx and laryngopharynx, which contains the cricothyroid and inferior pharyngeal constrictor muscle and the thyroid and cricoid cartilages. The inferior part of the thyroid is related to the esophagus and trachea. The external and recurrent laryngeal nerves are related to this surface from above and down respectively **(Figures 3 and 4)** ***(Oertli and Udelsman, 2012).***

The posterior surface overlaps the medial part of the carotid sheath (the sheath containing the carotid artery and the jugular vein). The parathyroid glands usually lie in contact with this surface between it and the fascial sheath. The superior part of the gland is related to the longus coli and longus capitis muscles **(Figures 3 and 4)** ***(Naidoo et al., 2007).***

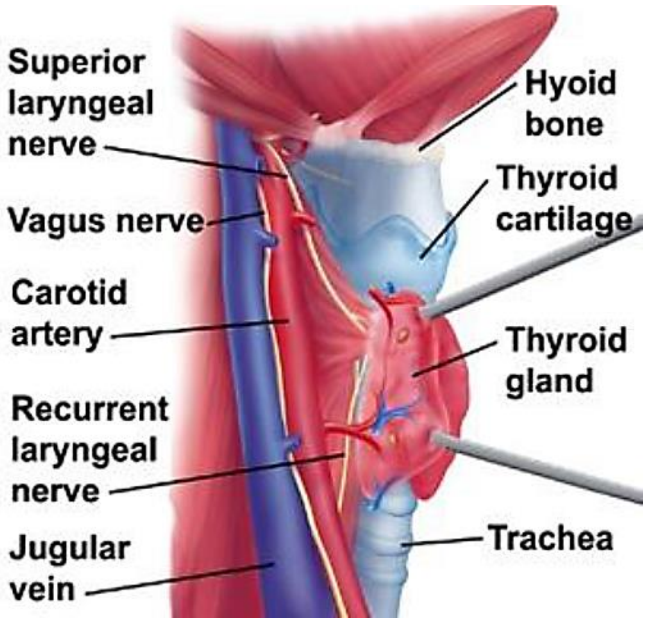

Figure (3): Lateral view showing posterior and medial relations of thyroid gland ***(Quoted from Netter, 2010).***

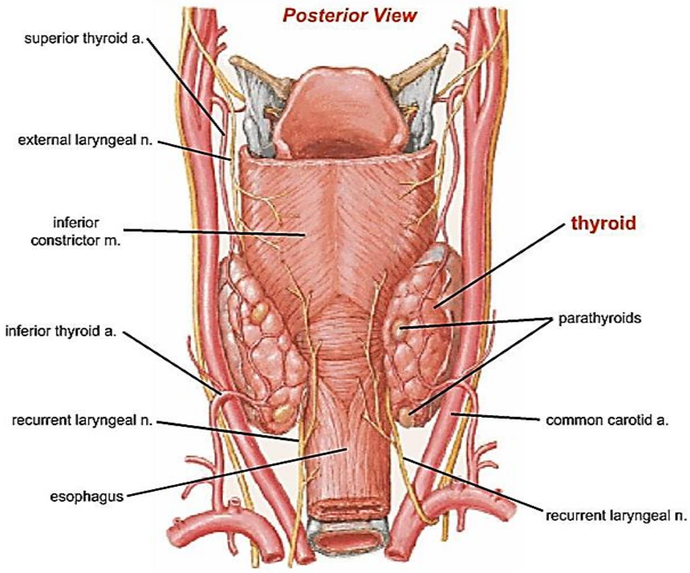

Figure (4): Posterior view showing medial and posterior relations of thyroid gland ***(Quoted from Netter, 2010).***

Arterial Supply ***(Figure5)***

The thyroid gland has a rich blood supply with abundant anastomosis. The arterial supply is bilateral through both external carotid systems via the superior thyroid, and through the subclavian systems via the inferior thyroid branch of thyrocervical trunk. There may be a single thyroidea ima artery that arises from the brachiocephalic artery ***(Oertli and Udelsman, 2012).***

- **Superior thyroid artery:**

The superior thyroid artery is the first anterior branch of the external carotid artery. In rare cases, it may arise from the common carotid artery just before its bifurcation. The superior thyroid artery descends laterally to the larynx under the cover of the omohyoid and sternohyoid muscles. The artery runs superficially on the anterior border of the lateral lobe, sending a branch deep into the gland before curving toward the isthmus where it anastomoses with the contralateral artery ***(Standring, 2008).***

- **Inferior thyroid artery:**

Inferior thyroid artery arises from the thyrocervical trunk, a branch of the subclavian artery. It ascends vertically and then curves medially to enter the tracheoesophageal groove in a plane posterior to the carotid sheath. Most of its branches penetrate the posterior aspect of the lateral lobe ***(Standring, 2008).***

- **Thyroidea ima artery**

The thyroidea ima artery is a single vessel, which originates, when present, from the aortic arch or the innominate artery and enters the thyroid gland at the inferior border of the isthmus ***(Standring, 2008).***

Venous drainage

Three pairs of veins provide venous drainage to the thyroid gland. The superior thyroid vein ascends along the superior thyroid artery and becomes a tributary of the internal jugular vein. The middle thyroid vein follows a direct course laterally to the jugular vein. The inferior thyroid veins follow a different path on each side. The right passes anterior to the innominate artery to the right brachiocephalic vein or anterior to the trachea to the left brachiocephalic vein. Occasionally, both inferior veins form a common trunk called the thyroidea ima vein, which empties into the left brachiocephalic vein **(Figure 5)** ***(Ritchie and Balasubramanian, 2014).***

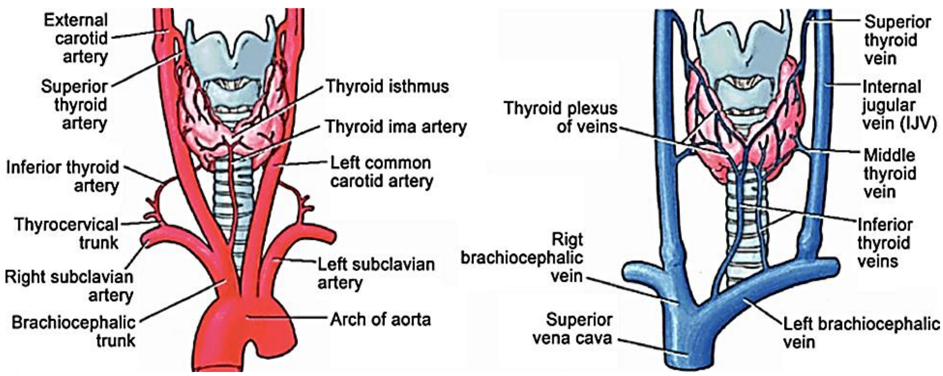

Figure (5): Blood supply and venous drainage of the thyroid gland ***(Quoted from Arrangoiz et al., 2018).***