THE VALUE OF ULTRA SONOGRAPHY IN THE DIAGNOSIS OF THYROID DISORDERS

Thesis

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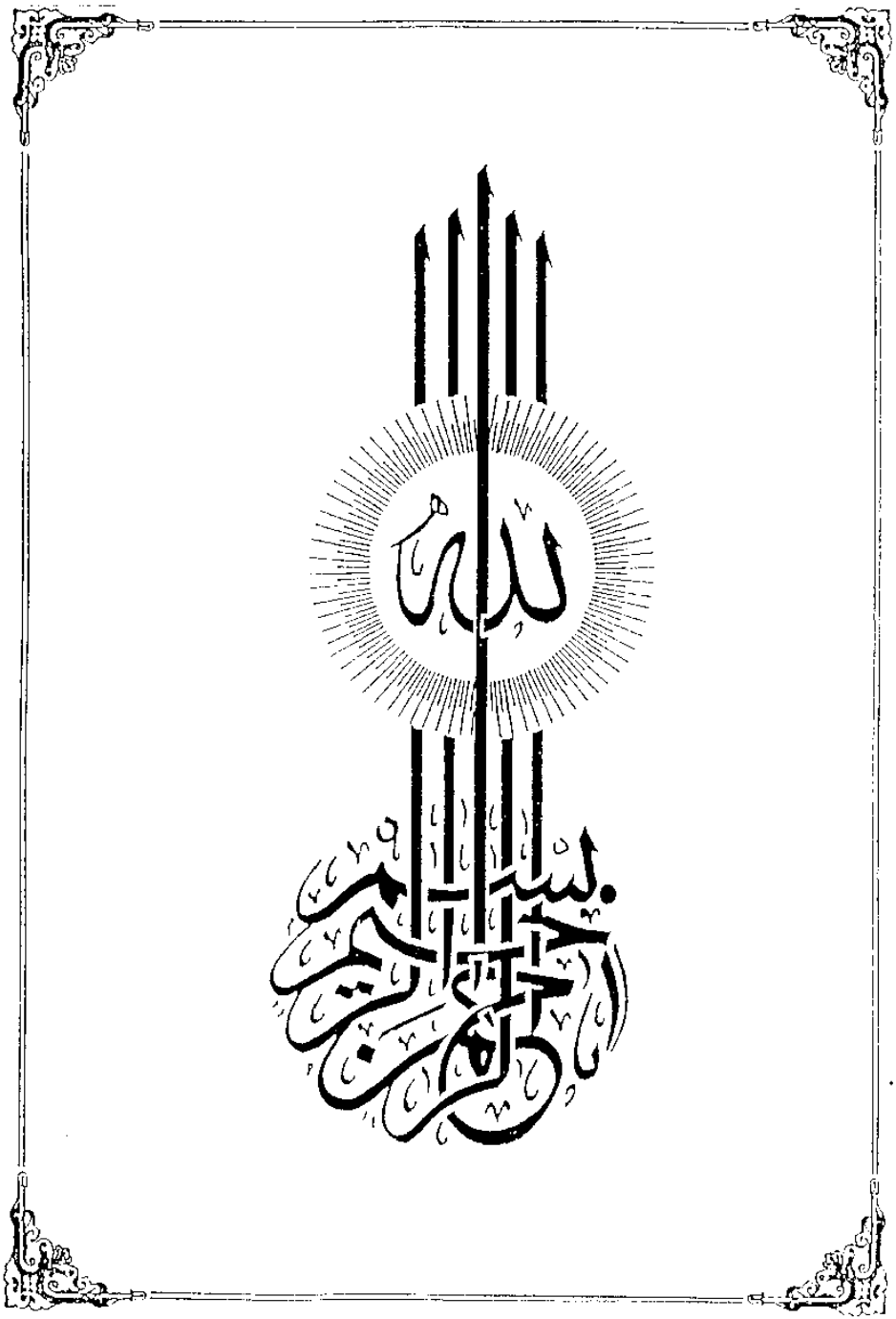
بسم الله الرحمن الرحيم

"وعلمك ما لم تكن تعلم وكان فضل الله عليك عظيمـــــا"

صدق الله العظيم

الآية ١١٣ (سورة النساء)



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INTRODUCTION AND AIM OF WORK

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Diagnostic ultrasound has become firmly established as a key imaging modality in obstetrics and gynaecology. Its role in abdominal and retroperitoneal diseases, is also well known and continues to expand.

In the past few years, sophisticated ultrasound systems specifically designed for the evaluation of superficial organs and structures have been developed. These "high resolution" scanners are particularly well suited to diagnostic imaging of the thyroid gland.

The various methods used for the investigation of the thyroid gland are mainly directed towards the determination and evaluation of its functional activity. The resulting information obtained by such functional tests is in many cases insufficient to establish a confident diagnosis of the underlying disease condition.

In this study, we aim to evaluate the use of the "high resolution", "high frequency" scanners, in the interpretation of various thyroid disorders, as well as, the important role of ultrasonography as a recent imaging modality in the diagnosis, follow-up and guidance to the precise management of thyroid diseases. Moreover, a comparison between our results, clinical data, laboratory findings and other modalities used; is discussed.

ANATOMY AND PHYSIOLOGY OF THE THYROID GLAND

ANATOMY OF THE THYROID GLAND

The thyroid gland is a brownish-red, highly vascular organ, situated anteriorly in the lower part of the neck, at the level of 5th , 6th and 4th cervical and the 1st dorsal vertebrae. It is ensheathed by the pretracheal layer of the deep cervical fascia, and consists of right and left lobes connected across the median plane by a narrow region, termed the isthmus (Fig. 1). Its weight is somewhat variable, but is usually 25 gm. It is slightly heavier in the females, in whom it becomes enlarged during menstruation and pregnancy (Warwick & Williams, 1973).

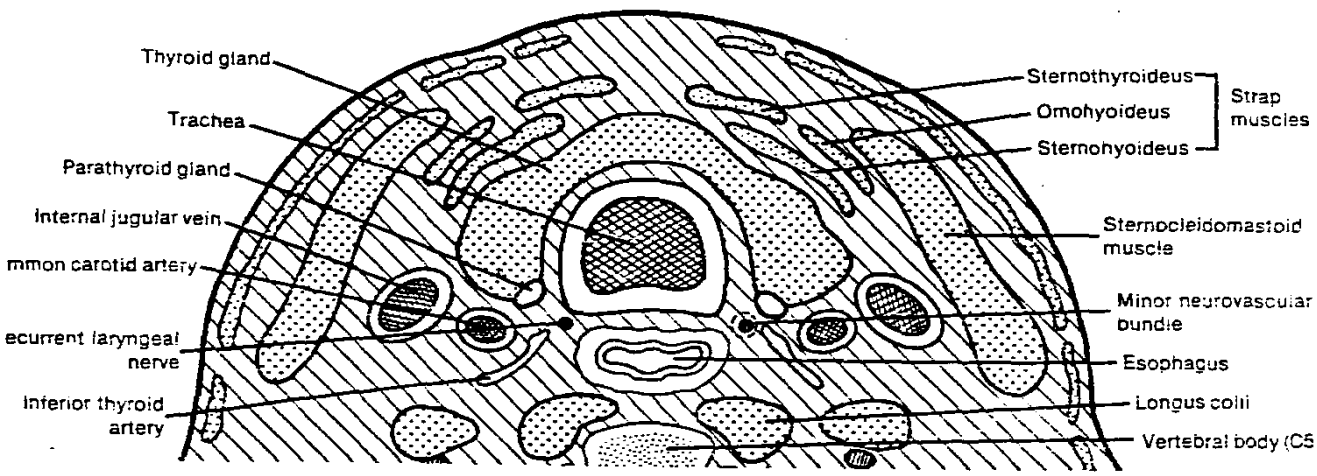

Fig.(1): Cross section of the thyroid region showing organ, vessel and muscle relations.
(Schorzman, 1983 Text-book of D.U. p. 240).

The lobes are approximately conical in shape, the apex of each ascending and diverging laterally to the level of the oblique line of the thyroid cartilage; the base is on a level with 4th or 5th tracheal ring. Each lobe is about 5 cms long; its greatest transverse and antero-posterior dimensions being about 3 cm and 2 cm. The posteromedial aspect of each lobe is attached to the side of the cricoid cartilage by a ligamentous band, called the lateral ligament of the thyroid gland.

The lateral or superficial surface is convex. External to the sheath of pretracheal fascia, this aspect of the gland is closely covered with the sternothyroid and it is the insertion of this muscle into the oblique line on the lamina of the thyroid cartilage which prevents the upper part of the lobe from extending forwards on to the thyrohyoid muscle. More anterior still are the sternohyoid and the superior belly of the omohyoid, overlapped below by the anterior border of the sternocleidomastoid. The medial surface is adapted to the larynx and trachea. At its superior pole, it is in contact with the inferior pharyngeal constrictor and the posterior part of the cricothyroid, which intervene between the gland and the posterior part of the lamina of the thyroid and the side of the cricoid cartilages. The external laryngeal nerve is medial to this part of the gland on its way to the cricothyroid. Below, it is related to the side of the trachea in front and to the recurrent laryngeal nerve and to the oesophagus posteriorly.

The posterolateral surface is related to the carotid sheath and overlaps the common carotid artery. The anterior border is closely related to the anterior branch of the superior thyroid artery. The posterior border, blunt and rounded is closely related to the inferior thyroid artery and an anastomosing branch which connects it to the posterior branch of the superior thyroid artery (Fig. 2).

In addition, the parathyroid glands are usually related to the posterior border.

The lower end of the posterior border of the left lobe is closely related to the thoracic duct.

The isthmus connects the lower part of the two lobes; it measures about 1,25 cm transversely, and the same vertically and usually extends to the second and third rings of the trachea. Its situation and size present, however, many variations. A third conical pyramidal lobe is often present; it ascends towards the hyoid bone from the upper part of the isthmus, or from the adjacent part of either lobe. It is occasionally quite detached, or may occuras two or more separate parts. A fibrous or muscular band is sometimes attached above the body of the hyoid bone, and below to the isthmus of the gland, or its pyramidal lobe. This band is termed the "levator of the thyroid gland".

Sometimes small detached portions of the thyroid tissue are found in the vicinity of the lobes and above the isthmus.

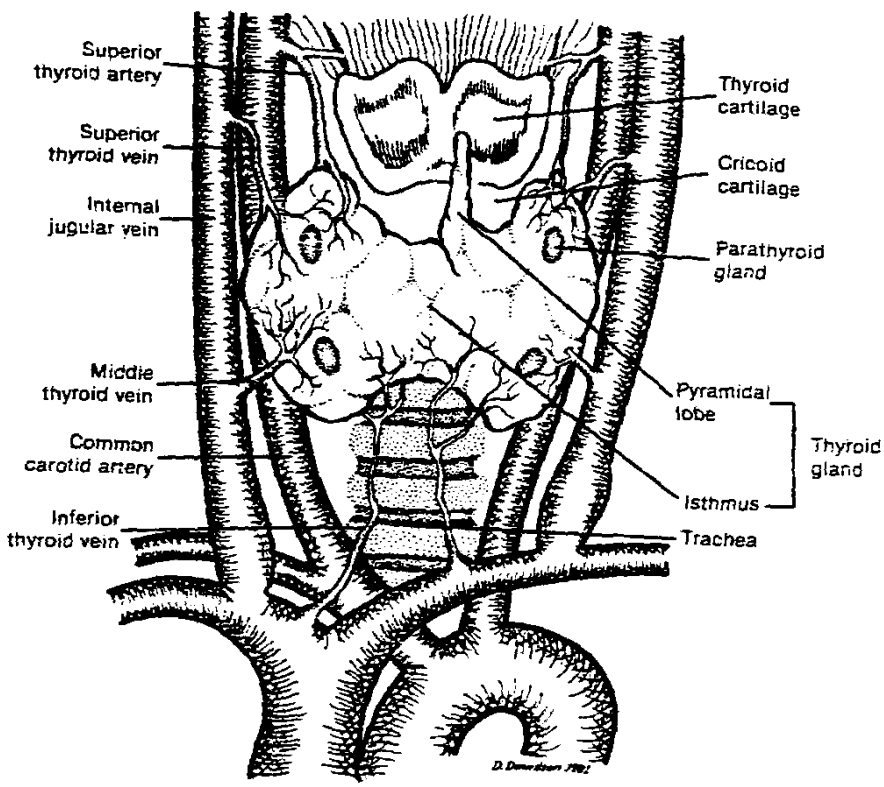

Fig. (2): Anterior view of the thyroid and parathyroid region (Schorzman, 1983 Text-book of D.U. p. 240).

These are called, accessory thyroid glands.

Remnants of the thyroglossal duct may persist between the isthmus and the foramen caecum of the tongue. These may give rise to accessory nodules of thyroid tissue or cysts situated in or near the median plane, even in the substance of the tongue (Romanes, 1975).

Arterial supply

The arteries supplying the thyroid gland are the superior thyroid and inferior thyroid arteries. The superior thyroid artery is the lst branch that arises from the anterior aspect of the external carotid artery after giving off its sternomastoid and superior laryngeal branches, it pierces the pretracheal fascia as a single vessel to reach the summit of the upper pole. It divides on the gland into an anterior and a posterior branch that runs down the back of the lobe and anastomosis with an ascending branch from the inferior thyroid artery from the lower pole. The inferior thyroid artery on the other hand, divides outside the pretrcheal fascia into 4 or 5 branches that pierce the fascia separately to reach the lower pole of the gland. The recurrent laryngeal nerve lies normally behind these branches but commonly it passes between them before they pierce the pretracheal fascia.

The thyroidaema artery enters the lower part of the isthmus in 3 per cent of individuals. It springs from brachiocephalic

trunk or direct from the arch of the aorta. The arteries are remarkable for their large size and frequent anastomosis.

Venous drainage

The superior thyroid vein follows the course of the artery and enters either the internal jugular or common fascial vein. The middle thyroid vein is usually present and may be double and passes from the middle of the lobe directly into the internal jugular vein.

From the isthmus and lower poles, the inferior thyroid vein drains into the left brachiocephalic vein. The veins from a plexus on the surface of the gland and on the front of the trachea; and from this plexus, the superior, middle and inferior thyroid veins arise. The capillary blood vessels form a dense vascular plexus in the connective tissue around the follicles, between the epithelium of the follicles and the endothelium of the lymph vessels which surround a greater or smaller part of the circumference of the follicle.

Nerve supply

The nerves of the thyroid gland are derived from the superior, middle and inferior cervical ganglia of the sympathetic.

Lymph vessels

The lymph vessels run in the interlobular connective tissue, not uncommonly surrounding the arteries which they accompany, and communicate with a network in the capsule of the gland; they may contain colloid material. They end in the thoracic duct and the right lymphatic duct (Last, 1966).