# THYROID FUNCTION IN THE AGING

THESIS

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ENDOCRINOLOGY

By

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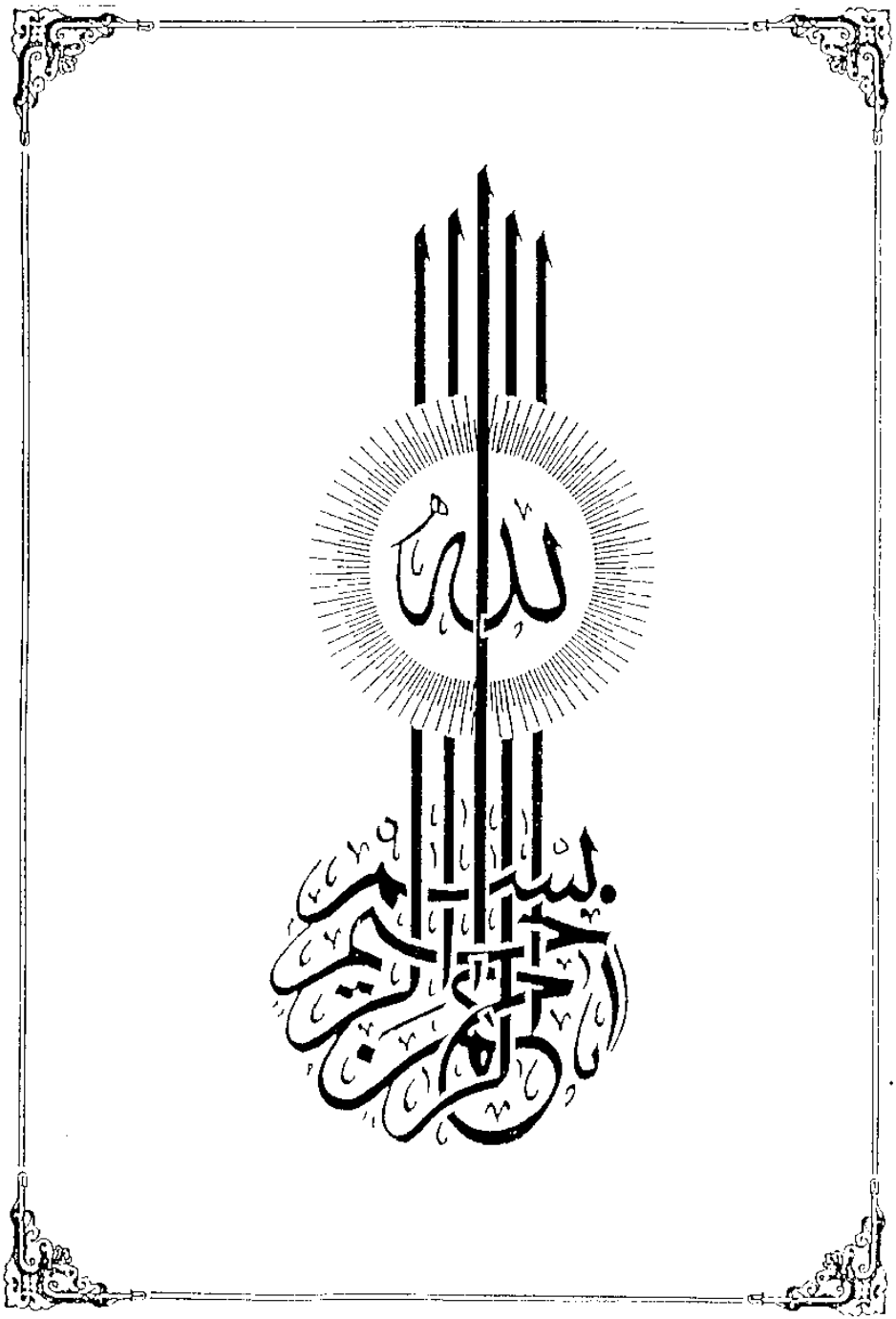
وقل اعملوا فسيرى الله عملكم ورسوله والمؤمنون

" صدق الله العظيم "



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# AIM OF THE WORK

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Thyroid hormones are one of the important endocrinal factors thought to play a role in the aging process. Whether the decrease in these thyroid hormones is due to aging itself or due to concomittent undiagnosed non-thyroidal illness is the point of argument between most of the investigators .

The aim of this thesis is to study thyroid functions in completely healthy Egyptian individuals and find out wether it decreases with age or not.

Measurement of serum thyrotropin (TSH), serum thyroxine ($T_4$), and serum triiodothyronine ($T_3$) or these subjects will be done by the radioimunoassay method (RIA) in a trial to detect any abnormality with aging.

## ANATOMY OF THYROID AND HISTOLOGY

The thyroid gland is one of the largest of the endocrine organs, highly vascular ductless gland, weighing approximately 15-20 gms. and extending from the fifth or the sixth tracheal ring inferiorly to the side of the thyroid cartilage superiorly. The gland is enclosed in a sheath of pretracheal fascia which is attached to the arch of the cricoid cartilage and the oblique line of the thyroid cartilage superiorly, the gland moves therefore with the larynx in all its movements. Internal to the sheath it is enclosed in its own fibrous capsule and between these, lie the arteries and veins of the gland. The gland varies greatly in size and always relatively larger in women and children than in men.

Normally thyroid is made up of two lobes joined by a thin band of tissue, the isthmus. Each lobe is conical in shape, and has a convex superficial surface which is covered by the sternothyroid sternohyoid, and omohyoid muscles, and is overlapped by the anterior border of sternocleidomastoid. The medical surface is moulded inferiorly on the trachea and oesophagus with the recurrent laryngeal nerve between them, while superiorly it is fitted to the cricoid and thyroid cartilages with the cricothyroid and inferior constrictor muscles and the external branch of the superior laryngeal

nerve intervening. Each lobe is about 2.5 cm. or 2.0 cm. in both thickness and width at its largest diameter and is approximately 4.0 cm. in length. The right lobe is usually larger and move vascular than the left lobe and is the one that tends to enlarge more in disorders associated with a diffuse increase in size. The posterior surface varies in width, it is applied to the prevertebral muscle (longus colli) and overlaps the medigal part of carotid sheath. Two pairs of parathyroid glands are embedded in this surface.

The Isthmus is about 0.5 cm. thick, 2cm. wide and 2cm. high, lying on the second to fourth tracheal rings.

Occasionally a pyramidal lobe is seen as a finger-like projection upward from the isthmus, generally just lateral to the midline usually on the left. It extends superiorly towards the hyoid bone and may be attached to it by a narrow slip of muscle, the levator glandulae thyroideae or a fibrous strand. This strand is the remnant of the thyroglossal duct indicating the embryonic path along which the thyroid develop. (Cunningham's Mannual of Practical Anatomy).

## BLOOD SUPPLY

### ARTERIES :

The superior thyroid arteries arising from the external

iodine more than does thyroid venous blood probably in the form of iodoprotein.

They drain mostly to nodes on the surface of the gland, on the front and sides of the trachea, and on carotid sheath (deep cervical nodes). Occasionaly some drain to a retropharyngeal node, others end in a mediastinal node, yet some may pass to the thoracic duct or even directly into internal jugular vein without passing through a lymph node.

NERVE SUPPLY :

It is supplied by branches from the cervical ganglia of the sympathetic trunk and from the cardiac and laryngeal branches of the vagus, therefore it is innervated by both adrenergic and cholinergic nervous systems.

Afferent fibers pass through the laryngeal nerves and regulate an active vasomotor system. Although changes in BL. flow do not alter the rate of hormonal release, still the rate of perfusion infleunces the delivery of TSH, iodide and metabolic substrates and may eventually influence glandular function and growth.

In addition a network of adrenergic fibers terminates near the basement menbrane of the follicular wall. Also saturable adrenergic receptors are present in thyroid plasma membranes.

CUT SURFACE : (Morbid Anatomy)

The thyroid is invested with a thin fibrous capsule that penetrates the gland, forming irregular pseudo-lobules. The gland itself is firm yet resilient, cut surface normally have a spotted beefy red appearance. Minute vesicles (follicles) from which the amber-colored sticky colloid excudes are more or less evenly distributed.

WITH LIGHT MICROSCOPE :

Gland is composed of closely packed sacs called acini or follicles, the interior of each is filled with a clear proteinaceous colloid which normally present the major consistuent of the total thyroid mass. The diameter of the follicles varies even within the same gland but avarages about 200 $\mu$.

Iodine-accumulating function of individual follicle varies with its surface area. The wall of the follicle is lined with a single layer of closely packed cuboidal cells approximatly 15 $\mu$ high. This hight varies with the degree of glandular stimulation becoming colomnar when active and flat when inactive (Doniach 1967).

The epitheum rests upon a well defined basement membrane

that stains positivly with reagents for mucopoly-saccarides and seperates the follecular cells from the serrounding cappillaries. From 20 to 40 follicles are demarcated by connective tissue septa to form a lobule supplied by a single artery. Function of each may vary from its neighbour.

WITH ELECTRONE MICROSCOPE :

From apical aspect of follicular cell numerous microvilli extend into the colloid. The neucleus has no distinctive features, cytoplasm contains an extensive endoplasmic reticulum (ER) laden with microsomes this (ER) is distincive in being composed of a network of wide irregular tubules that contain the precursor of thyroglobulin. Golgi apparatus is located apically and is probably placed for adding the carbobydrate component to this precursor. Lysosomes and mitochondria are scatered through our the cytoplasm.

Upon stimulation by TSH enlargement of Golgi apparatus and formation of pseudopodia at the apical surface where many droplets exocytotic and endocytotic containing colloid appear at the apical portion of the cell. They contain colloid taken up from follicullar lumen (Fawett et al 1969).

The Parafollicular or C cells are another type of cells that never border upon follicular lumen, they are rich in both mitochondria

and glycerophosphate dehydrogenase.

They are the source of the hormone Calcitonin

## EMBERYOLOGY

The Thyroid gland begins as a pouch in the pharyngeal floor which elongates inferiorly as the thyroglssal duct, and becomes bilobar as it descends through the neck.

Human thyroid an lage is first recognizable at about one month after conception when embryo is approximately 3.5-4.0mm. in length (Boyd, 1964).

The primordium begins as a thickning of epithelium in the pharyngeal floor which later forms a diverticulum. With continuing development, the median diverticulum, undergoes relative caudal displacement and the primitive stalk connecting perimordium with pharyngeal thyroglossal duct undergoes elongation. During its caudal displacement, the primordium assumes a more bilobate shape, coming into contact and fusing with the ventral aspect of the fourth pharyngeal pouch.

About seconed month after conception the thyroglossal duct normally undergoes dissolution and fragmentation leaving a small dimple at the point of origin at the Junction of the middle and posterior third of the tongue, the foramen cecum. If the migration is arrested a lingual thyroid at the base of the tongue may develop.