RECENT TRENDS
IN
MANAGEMENT OF SOLITARY
THYROID NODULE

Essay

Submitted for Partial Fulfillment of the Master Degree

in

General surgery

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2009

بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما
علمتنا
إنك أنت العليم الحكيم "

صدق الله العظيم

سورة البقرة آية (٣٢)

ACKNOWLEDGEMENT

First of all, I would like to thank Allah for every thing and especially for my steady steps I have been taking in my career.

I would like to express my great appreciation to Prof. ***Dr. Mohammad Mostafa Abd EL-Wahab*** professor of general surgery Faculty of medicine, Benha University, who honoured me by his kind supervision and his great support.

I wish to express my deepest gratitude to ***Prof. Dr. Hasan El-Sweiny*** professor of general surgery Faculty of medicine, Benha University, for his irreplaceable encouragement, his expertise and his great directions all through the work.

No word can express my thanks to ***Prof. Dr. Abdu Gafar*** professor of general surgery Faculty of medicine, Benha University, for his precious help and fruitful guidance.

And Finally, I would like to say "thank you" to all those who supported me, help me with their suggestions, ideas, and made this work possible and enjoyable.

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2009

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ABBREVIATIONS

A.C.T.H.	Adrenocorticotropic Hormone
A.M.A	Antimicrosomal Antibodies
C.E.A.	Carcenoemberyonic Antigen
C.T	Computed tomography
F.N.A.C	Fine Needle Aspiration Cytology
H.L.A	Human Leukocytic Antigen
I	Iodine
I.L.P	Interstitial Laser Photocoagulation.
L-thyroxin	Levothyroxin
M.E.N	Multiple Endocrine Neoplasm
M.R.I	Magnetic resonance imaging
P.E.I.T	Percutaneous Ethanol Injection Therapy
R.I.A	Radio-immuno assay
R.L.N	Recurrent Laryngeal Nerve
S.C.M	Sternocledіomastoid muscle
S.T.N	Solitary Thyroid Nodule
T.S.H	Thyroid Stimulating Hormone
T.B.	Tuberculosis
T.B.G	Thyroxin Binding Globulin
T.C	Technetium
T_3	Tri-iodo thyronine
T_4	Tetra-iodo thyronine
T_3U	T_3 Resin Uptake test
T_4U	T_4 Resin Uptake test
U.S	Ultra Sound
W.H.O.	World Health Organization

LISt OF FIGURES

AIM OF THE ESSAY

The essay is aiming to study the recent trends concerning diagnosis and treatment of solitary thyroid nodule.

INTRODUCTION

A solitary thyroid nodule occurs commonly (4-7% of adults) and is usually a benign lesion such nodule may be associated with a multinodular goiter or with an otherwise normal thyroid. Nodules in the very young and very old especially men are more likely to be malignant also exposure to ionizing radiation increases the incidence of both benign and malignant thyroid nodule and is a well recognized risk factor for the development of thyroid carcinoma. This procedure is safe, inexpensive, and easy to perform, and it allows better selection of patients for operation than does any other technique. Ultrasound can differentiate between benign and malignant nodules but is a sensitive method for determining whether a lesion is solid or cystic however it is useful in the follow up period to identify any further nodular growth. Radionucletide thyroid scans detect areas of active or decreased thyroid hormone synthesis but do not provide information that allows clear separation of benign and malignant nodules ***(John et al., 1999).***

Solitary thyroid nodules are commonly seen in surgical outpatient clinics. A detailed history and a careful physical examination are essential. In the management of the solitary thyroid nodule. Fine needle aspiration cytology has become the corner stone investigation ***(Meab and Qureshi, 1998).***

U.S. guided interstitial laser photocoagulation could become useful non surgical alternative in the treatment of the the benign solitary solid cold thyroid nodule in patients who cannot or will not undergo surgery ***(Dossing et al., 2002).***

Percutaneous ethanol injection under sonographic guidance is a relatively safe, low cost, out patient method of treatment that has been applied successfully as an alternative to surgery for the management of benign and malignant lesions of various tissues and organs. Among endocrine diseases, thyroid nodules; both cystic and solid, have been treated effectively using this technique ***(Pomorski and Bastos 2002).***

Finally, conventional thyroidectomy leaves an undesirable scar on the anterior neck and for this reason, endoscopic thyroidectomy is a technically feasible and safe procedure that leads to an improved cosmetic result and a quicker recovery ***(Gagner and Inabnet, 2001).***

DEVELOPMENT OF THYROID GLAND

The thyroid, the earliest glandular structure to appear, is recognizable in 4mms embryo by the end of third week as a bulge on the floor of the. foregut ***(Loyed and Baker, 1992).***

This thyroid diverticulum is an endodermal pocket protruding between the first and the second pharyngeal pouches. This area is later evaginated to form median bud which appears during the later half of the fourth week and from which the thyroid gland develops ***(Charless and Russell 1992).***

It extends from the foramen caecum ventrally between the first and second pharyngeal arches then caudally in front of the remaining arches as far back as the commencement of the trachea. From its distal extrermity the bilobed thyroid gland grows out, a portion of distal extremity often remains as the pyramidal lobe. The thyroglossal duct passes ventral to the primordium of the hyoid bone behind which it may form a recurrent loop. This is a common site of thyroglossal cyst. The duct may, however, occasionally pass behind or more rarely through the hyoid bone ***(McMinn, 1990).***

The ultimobranchial body which arises from a diverticulum of the fourth or fifth pharyngeal pouch of each side amalgamates with corresponding lateral lobe. Parafollicular C-cells are derived from the neural crest and reach the thyroid via the ultimobranchial body ***(Charless and Russell, 1992***).

The thyroid is embryologically an offshoot of the primitive alimentary tract, from which it later becomes separated. A median anlage arises from the pharyngeal floor in the region of the foramen cecum of the tongue. The main body of the thyroid descends into the neck from this origin and is joined by a pair of lateral components originating from the ultimobranchial bodies of the fourth and fifth branchial pouches. It is from these lateral components that the C-cells enter the thyroid lobes. C-cells contain and secrets calcitonin and are the cells that give rise to a medullary carcinoma of the thyroid gland. ***(Charless and Russell, 1992).***

Congenital Anomalies

- Ectopic Thvroid Tissues:

  Some residual thyroid along the coarse of thyroglossal tract is not uncommon and may be lingual, cervical or intrathoracic. Very rarely the whole gland is ectopic ***(Kaplan, 1988).***

- Persistant remnants of the thyroglossal duct:

  The foramen caecum of the tongue and pyramidal lobe of the thyroid gland are normal remnants of the thyroglossal duct, between these structures the track forms an epithelial tube, usually broken at several places***.***

- Thyroglossal cyst:

  This may be present in any part of the thyroglossal tract. The common situation, in order of frequency, are prehyoid (75%), thyroid cartilage level (15%), suprahyoid (5%), cricoid level (4%), base of the tongue (1%), Such a cyst occupies the midline, except in the region of the thyroid cartilage, where the thyroglossal tract is pushed to one side, usually to the-left ***(Skamlalakis et al, 1995).***

- Thyroglossal fistula :

  It is never congenital and it is the result of infection, or a misdiagnosed abscess, or after inadequate surgical excision without removal of the hyoid, is present in 15% of cases ***(Ranadive et at., 1984).***

- Agenesis:

  Total agenesis of one thyroid lobe may occur. This rare but can be clinically important, leading to confusion in diagnosis, especially in toxic glands, where it could be diagnosed as a secreting nodule ***(Decker And DuPlessis, I986).***

  One lobe usually the right may be smaller than the other (7%) or even be completely absent (1.7%), the isthmus is absent in about (10%),and the pyramidal lobe is absent in about (50%) ***(Skandalakis et al., 1995).***

SURGICAL ANATOMY OF THE THYROID GLAND

The thyroid gland is a brownish red and highly vascular organ placed anteriorly in the lower neck, in level with the fifth cervical to the first throracic vertebrae. The gland consists of two symctrical lobes united in front of the second, thrid and fourth tracheal rings by an isthmus of gland tissue. Apart from its own thin capsule it is enclosed by an envelope of pretracheal fascia- Each lateral lobe is pen-shaped with a narrow upper pole and a broader lower pole, and appears approximately triangular on cross section with lateral, medial and posterior surfaces. A small portion of the gland substance often projects upwords from the isthmus, generally to the left of the midline, forming the pyramidal lobe. This lobe is attached to the inferior border of the hyoid bone by fibrous tissue. Muscle fibres sometimes present in this fibrous band named levator glanduale thyroideae and are innervated by branch of the external laryngeal nerve ***(McMinn, 1990).***

The thyroid gland has a connective tissue capsule, which is continuous with septa that makes up the stroma of the organ. This is the true capsule of the thyroid. Outside the true capsule lies a layer of fascia derived from pretracheal fascia and is known as the false capsule, perithyroid sheath or surgical capsule. Anteriorly and laterally their fascia is well developed, while posteriolly it is thin and losse, permitting enlargment of the thyroid gland posteriorly. There is a thickening of the fascia that fixes the back of each lobe to the cricoid cartilage. This thickening is called the suspensory ligament of Berry ***(Skandalakis, and Gray, 1983).***

There are group of muscles are applied to the anterior surface of the throid gland, this group of muscles called strap muscles. The strap muscles (Sternohyoid, superior belly of omohyoid and sternothyroid) are applied to the anterior surface of the gland separated only by the false capsule. These muscles are ensheathed by the general investing layer of the cervical fascia which unites them in the midline, and they are supplied by branches from the ansa cervicalis originating from the first , second aond third cervical roots**.** Note that the fibers of the ansa cervical is enter the muscles in its lower 1/3,

so if we do muscles cutting during thyroidectomy, we cute the strap .nusclcs in the upper part to avoid muscles parlysis ***(Decker and Du Plessis 1986).***

The lateral surface

It lies under cover of sternothyroid and stenohyoid, the upper pole is tucked away beneath the upper end of sternothyroid which limits extension of an enlarging lobe. The lower end of stemocledomastoid overlaps these strap muscle ***(McMinn, 1990).***

The medial surface

Lies against the lateral side of the larynx and upper trachea, the lower pole extending along the- side of trachea as lower as the sixth tracheal ring, with the lower esophagus and upper pharynx immediately behind. The cricothyroid muscles of the larynx and the inferior constrictor of the pharynx are medial muscular relations of this surface, with the external and recurrent laryngeal nerves approaching it from above and below respectively ***(McMinn, 1990).***

The posterior surface

It overlaps the medial part of the carotid sheath. I.E. the part containing the common carotid artery; if enlarged, the lobe may extend across the more laterally placed internal jugular vein. The parathyroid glands usually lie in contact with this surface between it and the fascia! sheath. The inferior thyroid artery arches behind the lower pole (at the level of C6 vertebra), and the thoracic duct on the left side but at a lower level (C7 vertebra). The important close surgical relations of the thyroid lobes is the recurrent laryngeal nerve. Approaching the meidal surface of the gland from below and at this level usually in front of the groove between the trachea and esophagus, the left nerve is more likely to lie behind the inferior thyroid artery than in front of it, while on the right there is an equal chance of lying in front of or behind the artery; but either may pass between branches of the artery***.*** The nerve is always behind the pretracheal fasica and behind the cricothyroid joint, where it passes upwards under cover of the inferior constrictor at the level of the upper border of the isthmus the nerve often divides into two. The external laryngeal nerve, smaller and much less important than the recurrent laryngeal, runs

down to supply cricothyroid and in its course lies a millimetre or two behind the superior thyroid artery, passing medial to the upper pole. ***(McMinn, 1990).***

As it is functionally important to the pitch of the voice because the cricothyroid muscle is a tensor of the vocal cords. Damage to this nerve alters the voice quite significantly and is specially noticeable in singers ***(Decker and Du Plessis, 1986).***

Arterial supply of the thryoid.

The thyroid gland receives about 5.5ml blood per gram of tissue per minute. Two paired arteries (the superior and inferior arteries) and an inconstant midline vessel (the thyroideaima artery) supply the thyroid gland. Also adequate supply of blood is provided by anastmosis of thyroid vessels with the bronchial, inferior laryngeal and tracheoesophageal arteries ***(McMinn, 1990)*.**

1-The superior thyroid artery

The first branch from the anterior aspect of external carotid, afrer giving off its sternocleidomastoid and superior layngeal braches, pierces the pretracheal fascia as a single vessel to reach the summit of the upper pole. The external laryngeal nerve is immediately behind the artery, as the vessel approaches the pole; in thyroidectomies the artery is ligated right at the pole, not some distance from it, to avoid damge to the nerve.
***(McMinn, 1990**).*

2-The inferior thyroid artery

From the thyrocervical trunk, arches upwards medially behind the lower pole and divides outside the pretracheal fascia into four or five branches that pierce the fascia separtely to reach the lower pole of the gland.

The recurrent laryngeal nerve has a variable relationship to the artery but always lies behind the pretracheal fascia, and if this structure remains intact during thyroidectomy the nerve will not have been divided. It is close behined the fascia; however, and may be bruised or caught in a ligature; hence the preference of some but not all surgeons for ligating the inferior thyroid artery well lateral and a way from the gland before it begins to divide

into its terminal branches, (note that the inferior thyroid artery gives off esophageal and inferior laryngeal branches before its terminal distribution into the thyroid gland). ***(McMinn, 1990).***

These terminal branches are close to the recurrent laryngeal nerve and the inferior parathyroid gland. So, if the inferior thyroid artery is to be ligated this should be done at its transverse portion medial to carotid sheath to avoid injury of the previous structures. ***(Decker and Du Plessis, 1986).***

3- The thyroidea ima artery.

Enters the lower part of the isthmus in 3% of individuals. It springs from the brachiocephalic trunk or direct from the arch of aorta. ***(McMinn, 1990).***

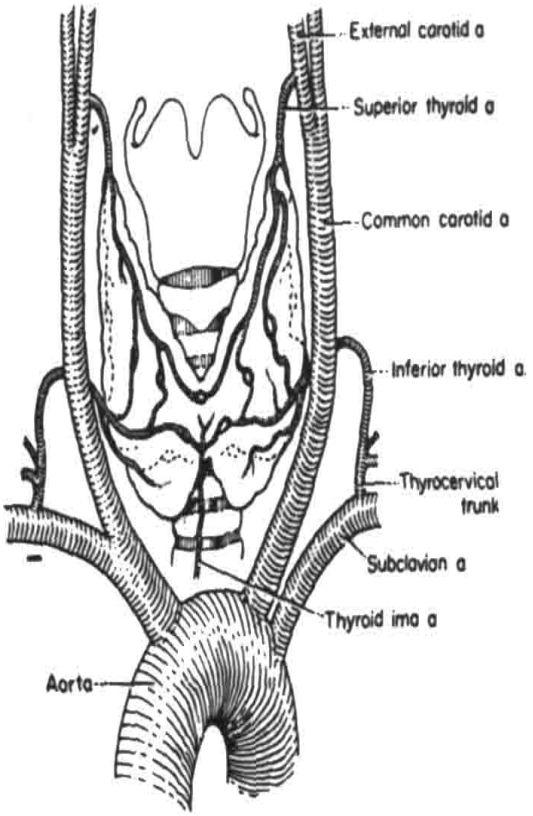

Fig 1: (The arterial supply to the thyroid gland).

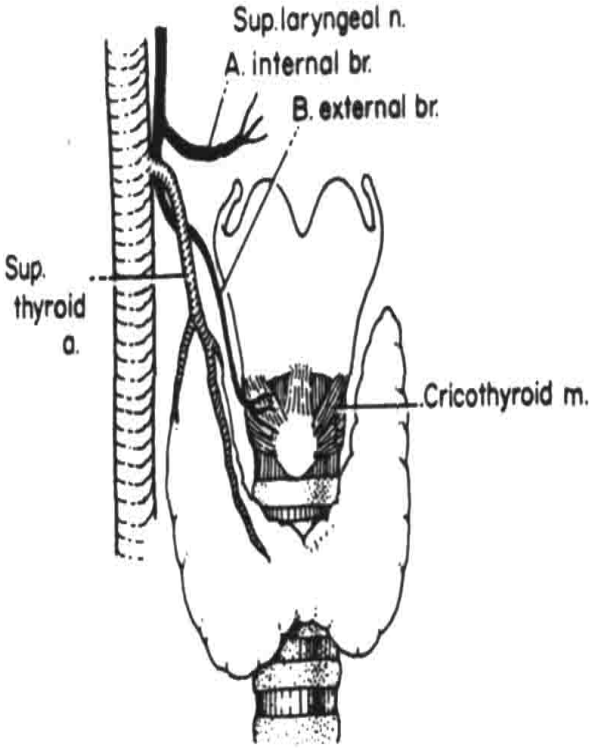

Fig 2: (Relations of the internal and external branches of the superior laryngeal nerve to the superior thyroid artery and the upper pole of the thyroid gland).

(Skandalakis et al., 1995).