AVOIDANCE OF The EXTERNAL LARYNGEAL NERVE Injury DURING THYROIDECTOMY

Essay

Submitted in Partial Fulfilment of master degree in General Surgery.

By

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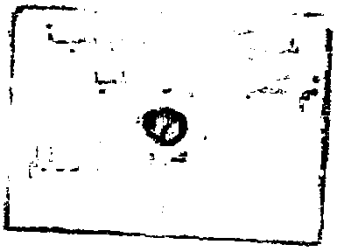

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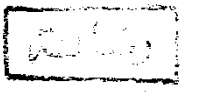

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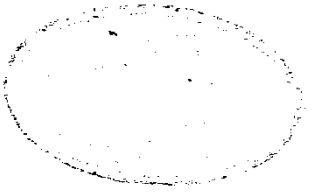

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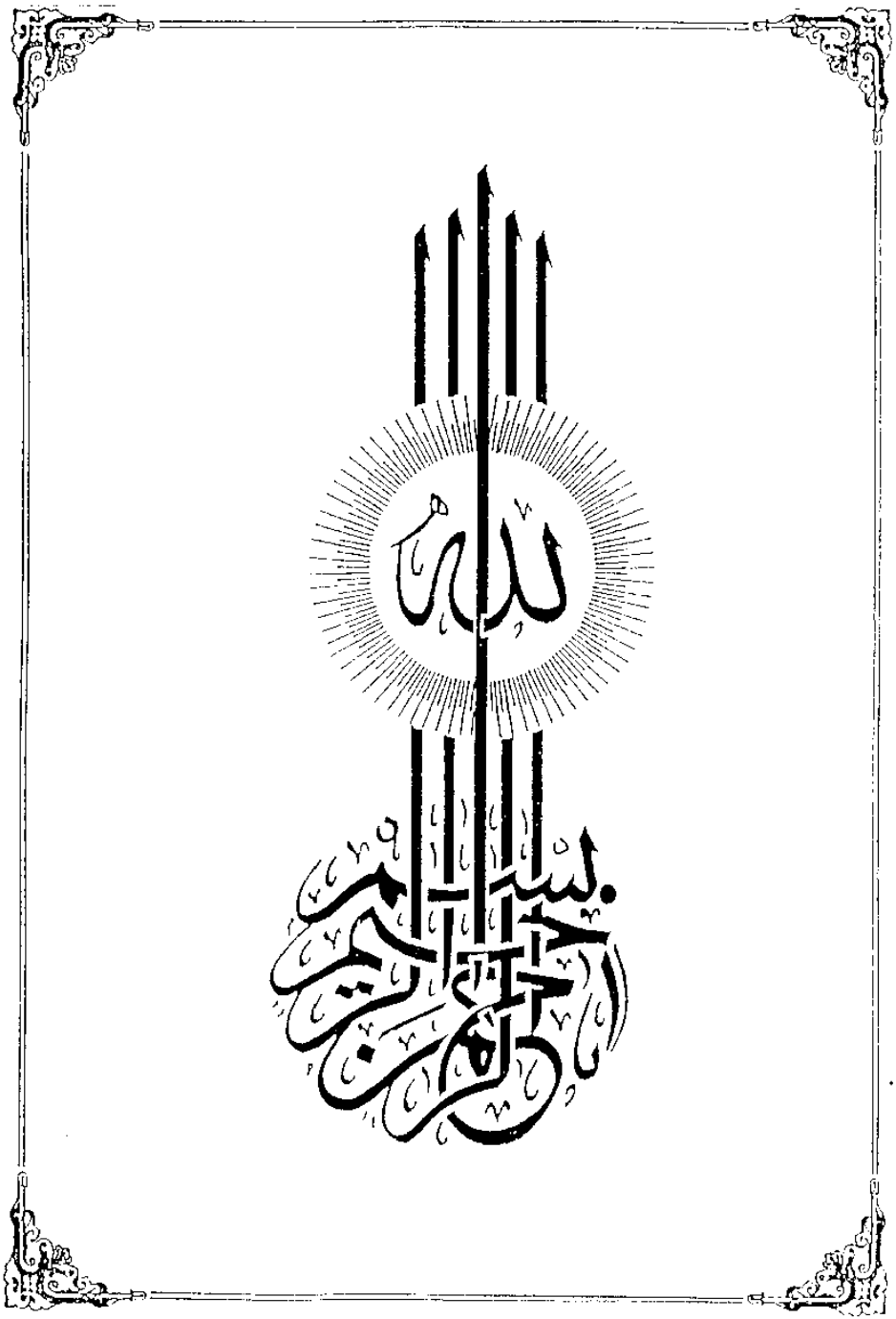

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INTRODUCTION

The most Frequent complication of thyroid surgery are lesions of the parathyroid gland and recurrent laryngeal nerve . However, the external branch of the superior laryngeal nerve (EBSLN) is also at risk during operations on the superior thyroid pole . This nerve is the only motor supply to the cricothyroid muscle (Arnold, 1961) , which acts together with the thyroarytenoid muscle in order to increase the tension of the ipsilateral vocal fold complete lesion of the external laryngeal nerve impair the production of the high tones and alter the speaking fundamental frequency, especially in women and professional singers . (Hirano, 1988) .

The external branch of the superior laryngeal nerve, a branch of the vagus nerve, innervates the cricothyroid muscle, tensing the vocal cord. The importance of preserving the external branch of the superior laryngeal nerve during thyroidectomy was dramatically demonstrated in 1935. When the famous opera soprano, Almelita Galli-Curci, sustained injury to a superior laryngeal nerve during thyroidectomy for an enlarging goitre . This complication ended her glorious career . (Eisele and Goldstone, 1991) .

The few studies that have examined the incidence of superior laryngeal

nerve injury as it relates to thyroidectomy have used laryngoscopy as the means of making the diagnosis . (Kark. et al., 1984) . This type of evaluation can be difficult. (Ward et al., 1977) . Fiberoptic stroboscopic laryngoscopy aids in this diagnosis by allowing the best visual evaluation of laryngeal function and vocal cord movements . The vocal cord on the involved side is usually bowed and at a lower level than the contralateral vocal cord . In addition, the anterior larynx is slightly rotated to the contralateral side due to the action of the intact contralateral cricothyroid muscle. (Eisele and Goldstone, 1991) .

Surgeons routinely do not identify the external laryngeal nerve and the sequelae of transecting the nerve are usually overlooked by the patient. Interuption of the nerve results in paralysis of the ipsilateral cricothyroid muscle Leading to : hoarseness, decreased pitch or volume, weakness, loss of range, or huskiness of voice . (Kambic et al. , 1984) .

The course of the external laryngeal nerve is variable, and consequently mass ligation of the vessels at the top of the upper pole of the thyroid will damage it in a high proportion . To minimise this serious complication this

nerve should be identified and protected . (Kark, et al. , 1984) .

Techniques of thyroidectomy have stressed on careful dissection and individual ligation of the superior thyroid vessels near the capsule of the superior pole of the gland, so as to avoid injury to the external branch of the superior laryngeal nerve . (Lore., 1983) .

Some authors advocated routine identification of the superior laryngeal nerve. (Friedman and Toriumi, 1986) . This nerve is most commonly located outside the capsule of the thyroid gland, but is intimately related to the branches of the superior thyroid artery in approximately 21% of cases . (Moosman and DeWeese, 1968) .

The most accurate test for the assessment of superior laryngeal nerve paralysis is laryngeal electromyography. Electromyography is not routinely performed, but can give valuable additional information regarding cricothyroid muscle function . (Miller and Rosenfield, 1984) .

AIM OF WORK

Evaluation of the protection of the external branch of the superior laryngeal nerve, by careful dissection and individual ligation of the superior thyroid vessels during throidectomy and operations on the superior thyroid pole, and also study the validity of the intraoperative identification by using nerve stimulator for preventing iatrogenic lesions .

EMBRYOLOGY OF THE THYROID GLAND

Embryology of the thyroid gland

Normal development :

The thyroid gland is the earlist glandular structure to appear . Even an embryo 2mm. long (six somites) shows an external bulge on the ventral floor of its fore-gut that indicates the site of thyroid origin. (Arey, 1974) .

The thyroid gland begins during the third week as an endodermal thickening in the midline of the floor of the pharynx between the tuberculum impar and the copula . Later this thickening becomes a diverticulum that grows inferiorly into the underlying mesenchyme and is called the thyro-glossal duct. As development continues, the duct elongates and its distal end becomes bilobed. Soon the duct becomes a solid cord of cells, and as a result of epithelial proliferation the bilobed terminal swelling expand to form the thyroid gland . The thyroid gland now migrates inferiorly in the neck and passes either anterior to, or through, the developing body of the hyoid bone, or posterior to it . By the seventh week, it reaches its final position in relation to the larynx and trachea . Meanwhile the solid cord connecting the thyroid

gland to the tongue fragments and disappear . The site of origin of the thyroglossal duct on the tongue remains as a pit called the foramen ceacum. The thyroid gland may now be divided into a small median isthmus and tow large lateral lobes . (Snell. , 1975) .

As with most developing glands, differentiation of the epithelial follicles of the thyroid is dependent upon a specific inductive interaction with the surrounding mesenchyme . Only after arriving in its definitive location, relatively late in development, does the thyroid primordium undergo its final characteristic histogenetic changes . (Patten and Carlson , 1974) .

By the end of the fourth month the conversion into thyroid follicles ends, thereafter new follicles arise only by the budding and subdivision of these already present . A capsule and vascular stroma differentiate from the local mesenchyme . (Arey , 1974) .

The developing thyroid meets and accommodates tissue from the ultimobranchial bodies, which develop from branchial pouches at the 5 to 6 weeks stage . The final coalesing occurs when the foetus is approximately 9weeks old,and the ultimobranchial cells - C cells or para-follicular

cells-reside within the basement membrane of follicles and form approximately 10 per cent of the adult thyroid . A 7 to 10 weeks of fetal development follicles containing colloid become visible, and the gland is able to accumulate iodine and probably begins to release thyroid hormone . From this time also the foetus sectretes thyrotropin - stimulating hormone (TSH), to which the developing thyroid is sensitive . (Sabiston , 1991) .

Clacitonin is secreted by the para-follicular or " C-cells " which are distinct from follicular cells of the thyroid being derived from neural crest rather than endoderm . This explains why medullary carcinomas are associated with pheochromocytomas and other tumours with a commen cell origin . (Jamieson and Kay's , 1988) .

Congenital anomalies :

- ***Persistent remenants of the thyroglossal duct*** :

Thyroglossal cysts and fistulas are conditions associated with a persistent

thyroglossal duct . The fistula may lie anterior or posterior to the hyoid bone or pass through the body of the hyoid bone . The cyst itself can occur anywhere from the foramen coecum to the suprasternal notch .

(Sabiston, 1991) .

The pyramidal lobe , an upward extension of the thyroid isthmus , is a residue of the thyroglossal duct . (Jamieson and Kay's , 1988) .

Persistent portions of the thyroglossal stalk give rise to accessory thyroids. (Arey , 1974) .

- ***Ectopic thyroid Tissues*** :

Ectopic thyroid tissue may lie anywhere along the line of descent and may, in rare instances, be the only thyroid tissue present . An occasional site for this anomaly is in the base of the tongue . Ectopic thyroid tissue can be identified by isotope scanning . (Lee McGregor , 1986) .

Abnormalities in embryogenic development cause a number of midline abnormalities . Proximity to the heart and aorta in the early phase of development explains why lobules of glandular tissue may remain adherent to

the aorta and its branches and why migration of thyroid tissue into the anterior mediastinum is not infrequent . Substernal goitre may develop in this location and often is continuous with the cervical thyroid . Rarely, posterior mediastinal thyroid tissue is found, and from it may arise large goitres of the posterior mediastinum that are usually not continuous with the cervical thyroid gland . The entire gland may rarely descent into the thorax .

(Sabiston, 1991) .

- ***Agenesis*** :

Complete or almost complete absence of the thyroid is said to occur in 1 of 10,000 live births and causes the infant to become a cretin . (Sabiston, 1991)

Total agenesis of one thyroid lobe may occur . This is rare but can be clinically important, leading to confusion in diagnosis, especially in toxic glands, when it could be diagnosed as a secreting nodule.

(Lee McGregor, 1986) .