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Updates in Management of Thyroid Carcinoma

Essay

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Rania Eissa

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LIST OF ABBREVIATIONS

AGES : Age, Grade, Extent & Size.

AJCC: American Joint Committee on Cancer.

AMES: Age, metastasis, Extent & Size.

Ck: Cytokeratin.

CT: Computerized Tomography.

DTC: Differentiated Thyroid Carcinoma.

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EBSLN: External Branch of Superior Laryngeal Nerve.

EGF: Epidermal Growth Factor.

EGFr: Epidermal Growth Factor receptor.

EORTC: European organization for Research & Treatment of Cancer.

FA: Follicular Adenoma.

FGF: Fibroblast Growth Factor.

FNAC: Fine Needle Aspiration Cytology.

FTC: Follicular Thyroid Carcinoma.

HCC: Hürthle Cell Carcinoma .

IGF-I: Insulin like Growth Factor I .

MACIS: Metastasis, Age, Completeness of resection, Invision & Size.

MEN I: Multiple endocrine neoplasia syndrome type I.

MEN II: Multiple endocrine neoplasia syndrome type II.

MEN: Multiple endocrine neoplasia syndrome.

MIVA: Micro - Invasive Video Assisted.

MRI: Magnetic Resonance Imaging.

MTC: Medullary Thyroid Carcinoma.

OSU: Ohio State University.

P IV: Fourth branchial pouch.

P V: Fifth branchial pouch.

PET: Positron Emission Tomography.

PTC: Papillary Thyroid Carcinoma.

PTC: Papillary Thyroid Carcinoma.

rhTSH: Recombinant hormone Thyroid Stimulating Hormone.

RLN: Recurrent Laryngeal Nerve.

TBS: Total Body Scan.

Tg: Thyroglobulin.

TNM: Tumor, Nodes & metastasis.

TSH: Thyroid Stimulating Hormone.

WBS: Whole Body Scan.

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INTRODUCTION

Thyroid cancer , an uncommon disease, accounts for only about 1 percent of new cancers diagnosed each year. In contrast , benign thyroid nodules are common, with 5 to10 percent of women having one or more palpable lumps in the thyroid . The challenge facing the clinician is therefore to distinguish the small proportion of patients with thyroid cancer from the larger number with benign, nodular enlargement of the gland. Opinions differ widely as to how best (and most cost effectively) to examine patients with thyroid enlargement in whom the diagnosis of thyroid cancer is a possibility **(Wartofsky and Totowa;2000).**

Most patients are 25 to 65 years of age when first diagnosed; women are more affected than men **(Al-Zaher et al;2008).**

From the 1940s to 1960s, external, low-dose radiation to the head and neck during infancy and childhood was used to treat many benign diseases. This type of therapy has been shown to predispose persons to thyroid cancer . The younger the patient was at time of exposure, the higher the risk of developing cancer. Another cause may be due to high-dose irradiation to the head and neck. Patients with Hodgkin lymphoma treated with mantlefield irradiation have an increased risk of developing thyroid cancer, although hypothyroidism is more likely **(Hu et al;2008).**

Most often the first symptom of thyroid cancer is a nodule in the thyroid region of the neck. However, many adults have small nodules in their thyroids , but typically under 5% of these nodules are found to be malignant . Sometimes the first sign is an enlarged lymph node . Later

symptoms that can be present are pain in the anterior region of the neck and changes in voice. Thyroid cancer is usually found in an euthyroid patient , but symptoms of hyperthyroidism or hypothyroidism may be associated with a large or metastatic well-differentiated tumor . Nodules are of particular concern when they are found in those under the age of 20. The presentation of benign nodules at this age is less likely, and thus the potential for malignancy is far greater **(Hu et al;2008).**

After a nodule is found during a physical examination, a referral to an endocrinologist, a thyroidologist or otolaryngologist may occur. Most commonly an ultrasound is performed to confirm the presence of a nodule , and assess the status of the whole gland Measurement of thyroid stimulating hormone and anti-thyroid antibodies will help to decide if there is a functional thyroid disease such as Hashimoto's thyroiditis present , a known cause of a benign nodular goiter **(Bennedbaek et al;2000).**

One approach used to determine whether the nodule is malignant or not is the fine needle biopsy (FNB), which some have described as the most cost-effective, sensitive and accurate test **(Ravetto et al;2000).**

New imaging techniques , including octreotide scanning and positron-emission tomography with fluorodeoxyglucose F 18, have an emerging role in both staging and follow-up of thyroid tumors. The cost-effective application of these techniques in the context of parallel technical advances in computed tomography (C T) and magnetic resonance imaging (MRI) is a challenge to all who are involved in the long -term follow -up of patients with thyroid cancer . A further new

development is the availability of recombinant human thyroid-stimulating hormone (TSH) and its emerging, but hotly debated, role as an adjunct in radioiodine imaging and treatment of thyroid tumors, as compared with the usual reliance on endogenous TSH secretion induced by thyroid-hormone withdrawal. This new agent, which may be especially useful in stimulating levels of thyroglobulin in the blood, may make more invasive techniques in routine follow -up unnecessary **(McDougall and Berry;2006).**

If the nodule is benign , patients may receive thyroxine therapy to suppress thyroid -stimulating hormone and should be reevaluated in 6 months . If the nodule is malignant or has indeterminate cytologic features , it may require surgery. Common surgeries include lobectomy, thyroidectomy , and tracheostomy . Radioactive Iodine-131 is used in patients with papillary or follicular thyroid cancer for ablation of residual thyroid tissue after surgery and for the treatment of thyroid cancer . Patients with medullary, anaplastic, and most Hurthle cell cancers do not benefit from this therapy . External irradiation may be used when the cancer is unresectable , when it recurs after resection, or to relieve pain from bone metastasis **(Hu et al;2008).**

AIM OF THE ESSAY

This essay aims to discuss the new updates in the diagnosis and treatment of thyroid carcinoma including the updates in medical, radiological and surgical modalities.

SURGICAL ANATOMY AND EMBRYOLOGY OF THE THYROID GLAND

Thyroid Embryology and Developmental Abnormalities:

The thyroid gland has a double origin from the primitive pharynx and the neural crest. The main body of the thyroid gland is derived from epithelial cells of the endoderm of the primitive pharynx. These cells will form the greater portion of the follicular elements of the thyroid tissue. They arise as a diverticulum from the midline of the pharyngeal floor as a bilobed, encapsulated structure that descends in the midline of the neck, with further development, this diverticulum remains attached to the buccal cavity by a narrow tract "the thyroglossal duct". Its distal end may become the pyramidal lobe ***(Le Doumin et al., 1990).***

The neural crest is the source of the para follicular cells, or C cells which secrete calcitonin ***(Pearse et al., 1997).***

These C cells migrate from the neural crest of the ultimobranchial bodies of the fourth branchial pouch (PIV) and the fifth branchial pouch (PV). The incorporation of the fifth pouch with the fourth pouch leads to the formation of the caudal pharyngeal complex, which includes not only the ultimobranchial bodies (lateral thyroids) but also the parathyroid glands arising from the endoderm of the PIV***(Mann et al., 1995).***

When the C cells become neoplastic, the result is medullary carcinoma of the thyroid. An understanding of this embryology explains why medullary carcinoma usually is located in the upper poles of the thyroid and virtually never in the isthmus or pyramidal lobe ***(Livolsi, 2003).***

The thyroid gland forms follicles by the end of the tenth week of gestation and concentrates iodine and produces colloid by the end of the twelfth week ***(Livolsi, 2003).***

Anomalies:

The thyroglossal duct may persist or may differentiate into thyroid tissue at any level. Normally, the epithelium of the thyroglossal duct disappears. Occasionally, the epithelium and the duct may form thyroglossal cysts or fistulas, which usually present above the hyoid bone but may occur at any site along the duct between the base of the tongue and the suprasternal notch. These are essentially midline structures. Because the duct passes through or anterior or posterior to the hyoid bone, excision of the midsection of the hyoid bone is necessary for complete excision of the entire cyst and thyroglossal duct up to the foramen caecum ***(Henry, 2005).***

Midline ectopic thyroid rests are the result of failure or incomplete descent of thyroglossal duct and of abnormal development of its epithelium. The most common example is the pyramidal lobe, which extends upward from the isthmus or from either lateral lobe in about 30%

of patients. It may be considerably enlarged in patients with endemic goiters and in Graves' disease.

In the later cases, it may be the cause of recurrent hyperthyroidism ***(Henry, 2005).***

Lingual thyroid results from complete failure of descent of thyroglossal duct. Located at the base of the tongue. May be the only functioning tissue and may be the cause of lingual goiter; symptoms depend on its size ***(Henry, 2005).***

Other midline ectopic thyroid rests of the thyroglossal duct may be found below or above the hyoid bone. Usually asymptomatic, they are demonstrated on radioiodine scanning after total thyroidectomy.

Carcinomas may rarely arise in median ectopic tissue, about 1% of thyroglossal cysts contain papillary thyroid cancers and approximately 25% of patients with thyroglossal duct papillary cancer have papillary cancer elsewhere within the thyroid gland. Occasionally squamous cell carcinomas develop in thyroglossal duct cysts ***(Henry, 2005).***

Aberrant thyroid tissue has also been found lateral or inferior to the main body of the thyroid gland in the superior, anterior mediastinum, in the periaortic region and the pericardium. It's the result of the displacement of thyroid rests into the mediastinum by the descent of the heart and great vessels, tumors arising from these remnants usually can't be removed by cervicotomy and require a sternum splitting incision ***(Henry,2005).***