Recent Trends in the Management of Thyroid Nodules

Essay
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List of Abbreviation

AD	Anno Domino (Christian calendar concepts)
AFTN	Autonomously Functioning Thyroid Nodules
AIT	Autoimmune thyroiditis
AJCC	American Joint Committee on Cancer
ATA	American Thyroid Association
ATC	Anaplastic Thyroid Carcinoma
ATD	Anti-Thyroid Drugs
BRAF	gene responsible for synthesis of a protein called B-Raf
CEA	Carcinoembryonic Antigen
CLND	Central Lymph Node Dissection
CN	Cranial Nerve
CNB	Core Needle Biobsy
Ct	Calcitonin
CT	Computed Tomography
DTC	Differentiated Thyroid Carcinoma
EBRT	External Beam Radiation Therapy
ETE	Extrathyroidal Extension
^{18}FDG-PET	18F-fluorodeoxyglucose Positron Emission Tomography
FLUS/AUS	Follicular lesion of undetermined significance/Atypia of undetermined significance
FNA	Fine Needle Aspiration
FNAC	Fine Needle Aspiration Cytology
FN/SFN	Follicular or oncocytic neoplasm/Suspicious for follicular or oncocytic neoplasm
FTC	Follicular Thyroid Carcinoma
Gy	Gray (measure of dose of irradiation)
HCC	Hürthle Cell Carcinoma
H&E	Hematoxylin & Eosin stain
HIFU	High-intensity Focused US
I	Iodine
ILP	Interstitial Laser Photocoagulation

List of Abbreviation

KSTR	Korean Society of Thyroid Radiology
MAPK	Mitogen-Activated Protein Kinase
MEN	Multiple Endocrine Neoplasia
MIFC	Minimally Invasive Follicular Carcinoma
MITS	Minimal Invasive Thyroid Surgery
MIVAT	Minimally Invasive Video-Assisted Thyroidectomy
MNG	Multi Nodular Goiter
MRI	magnetic resonance imaging
MRSA	Methicillin Resistant Staph Aureus
MTC	Medullary Thyroid Carcinoma
MWA	Microwave Ablation
PDTC	Poorly Differentiated Thyroid Carcinoma
PEAT	Percutaneous Ethanol Ablation Therapy
PET	Positron Emission Tomography
PET/CT	Positron Emission Tomography/ Computed Tomography
PTC	Papillary Thyroid Carcinoma
PTGs	Parathyroid glands
RAI	Radio Active Iodine
RAT	Robotic Axillary Thyroidectomy
RET	Receptor Tyrosine Kinase
RFA	Radiofrequency Ablation
RFT	Robotic Facelift Thyroidectomy
RLN	Recurrent Laryngeal Nerve
SAT	Subacute Thyroiditis
SMC	Suspicious for malignant cells
SPECT	single photon emission computed tomography
Tc	Technetium
Tg	Thyroglobulin
TPO-Ab	thyroid peroxidase antibodies
TSH	Thyroid Stimulating Hormone
TT	Total Thyroidectomy

US	Ultra Sound
WHO	World Health Organization
XRT	External Beam Radiation

Abstract

Thyroid nodules are common and are commonly benign. The reported prevalence of nodular thyroid disease depends on the population studied and the methods used to detect nodules. Numerous studies suggest a prevalence of 2-6% with palpation, 19-35% with ultrasound, and 8-65% in autopsy data. Roughly 5% of thyroid nodules are malignant. Pathologically, thyroid nodules are classifiable into 5 types with distinct histologic features: hyperplastic, neoplastic, colloid, cystic and thyroid nodules. Diagnostic tests can determine if a thyroid nodule is benign or malignant (cancerous); this information can help to guide treatment decisions. There are several diagnostic tests; (Thyroid stimulating hormone estimation, Thyroid ultrasound, Fine needle aspiration … etc.). The appropriate treatment for a thyroid nodule will depend upon the type of nodule. Benign nodules can usually be monitored over time. Surgery is the best treatment for thyroid nodules that are: cancerous (malignant), suspected to be cancerous and noncancerous (benign) but large enough to cause problems with breathing or swallowing.

Key words: **Thyroid, Nodules, Management, Benign, Malignant, FNAC.**

Introduction

Thyroid surgery has had an illustrious past. Its probable beginning was with Albucasis when he recorded his experience of removal of a large goiter in 952 AD. Although there have been earlier reports of similar surgeries, their validity has not been warranted. Thereafter, it passed through a series of crests and troughs over the ages as its proponents and opponents held sway in the medical field over different periods of time. **(Sarkar et al., 2015)**

At one point of history, thyroid surgery was considered such a dreaded operation with a definite grim outcome that surgeons were fearful in performing it at all. However, surgeons like Theodor Billroth and his pupil Theodor Kocher ventured into this surgical domain and mastered it, thereby popularising it and allaying all fears about a dreaded outcome. Thyroid surgery has travelled a long way since then, and now, attempts are being made to perform the surgery in a way so as to make it minimally invasive. **(Sarkar et al., 2015)**

A thyroid nodule is a general term used to describe any mass or growth within the thyroid gland that is distinct from the surrounding thyroid tissue. A solitary nodule is a single nodule that is radiologically distinct from the surrounding thyroid parenchyma, while a multinodular thyroid is one in which there are multiple nodules that are distinct from each other and the surrounding thyroid tissue. **(Erovic et al., 2013)**

A dominant nodule within a multinodular goiter should be evaluated as a solitary nodule **(Aimel et al., 2010).**

Nonpalpable nodules detected on US or other anatomic imaging studies are termed incidentally discovered nodules or

"incidentalomas". Non-palpable nodules have the same risk of malignancy as do sonographically confirmed palpable nodules of the same size. **(Haugen et al., 2016).**

Thyroid nodules that produce thyroid hormone in an uncontrolled manner are referred to as autonomous nodules, “hot” nodules, or “toxic” nodules. If the nodule is filled with fluid or blood, it is called a thyroid cyst or hemorrhagic cyst. **(Erovic et al., 2013)**

Nodular disorders of the thyroid gland are relatively common among adults living in the USA, with an overall prevalence of about 4–7% in the general population. Most thyroid nodules are benign hyperplastic lesions, but 5–20% of thyroid nodules are true neoplasms **(Goldfarb et al., 2011).**

Thyroid nodules are found in about 1.5% of children and adolescents. They are more common in women, and this predisposition exists across all age groups. The prevalence of thyroid nodules within a given population depends on a variety of factors that include age, sex, diet, iodine deficiency, and therapeutic and environmental radiation exposure. **(Elsabah and Mohamed, 2012)**

The clinical importance of thyroid nodules rests with the need to exclude thyroid cancer, which occurs in 7–15% depending on age, sex, radiation exposure history, family history, and other factors. **(Haugen et al., 2016)**

Thyroid neoplasms are benign or malignant tumors of the thyroid gland. Benign thyroid neoplasms include follicular and Hurthle cell adenomas. Malignant thyroid nodules are classified by the types of malignant cells they contain: papillary, follicular,

medullary, or poorly differentiated (anaplastic) cells. **(Erovic et al., 2013)**

AIM OF THE WORK

The aim of the essay is to spotlight the recent trends in diagnosis and treatment of thyroid nodules regarding evidence based studies, investigational trials and recent standards in management.

Pathogenesis of thyroid nodules

❖ Etiology of Thyroid Nodules and Risk for Malignancy:

The histological nature of thyroid nodules reveals in the vast majority either a cystic or solid adenoma or a colloid nodule, both of which represent various stages of nodule formation and degeneration within a nodular thyroid gland (Table 1). Indeed, 30% of nodules show a mixture of solid and cystic components, with pure thin-walled cysts being very rare. Graves' disease and chronic lymphocytic Hashimoto's thyroiditis can give rise to nodules, as may subacute de Quervain's thyroiditis or an infection. **(Procopiou and Meier, 2012)**

Less than 5% of palpable thyroid nodules are malignant. The risk of a concomitant thyroid cancer within a longstanding multinodular gland has been well investigated and is similar to that in a solitary thyroid nodule, i.e., less than 5%. **(Procopiou and Meier, 2012)**

Over 80% of the thyroid malignancies are papillary cancers, followed by follicular cancer (15%) and the rare anaplastic carcinoma (<2%) and poorly differentiated thyroid cancer (<1%), -respectively. Among the nonepithelial thyroid cancers, thyroid medullary carcinoma ranks first (<5%) with other cancers being even less frequent (thyroid lymphoma, metastatic cancers, squamous cell thyroid cancer). **(Procopiou and Meier, 2012)**