Guidelines of Management of Solitary Thyroid Nodule

Essay
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Presented by

Wessam Abd El-Basset Saeed Mansour
M.B.B.CH.
Faculty of Medicine - Ain Shams University

Under supervision of

Prof. Dr. Osama Ali El-Atrash
Professor of General Surgery
Faculty of Medicine - Ain Shams University

Dr. Basem Helmy Abd El-Aziz El-Shayeb
Lecturer of General Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University

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List of Abbreviations

Abb.	Meaning
AACE	American Association of Clinical Endocrinologists
ATA	American Thyroid Association
ATC	Anaplastic thyroid cancer
CT	Computed tomography
DIT	Diiodotyrosine
DNA	DeoxyriboNucleic Acid
FDG	Fluorodeoxyglucose
FNAB	Fine needle aspiration biopsy
FNAC	Fine needle aspiration cytology
FTC	Follicular thyroid cancer
ILP	Interstitial laser photocoagulation
MEN	Multiple Endocrine Neoplasia
MIT	Monoiodotyrosine
MRI	Magnetic Resonance Imaging
MTC	Medullary thyroid cancer
NADPH	Nicotinamide Adenine Dinucleotide Phosphate Hydrogen
NPV	Negative predictive value
PEI	Percutaneous ethanol injection
PET	Positron emission tomography
PLA	Percutaneous laser ablation
PPV	Positive predictive value
PTC	Papillary thyroid cancer
RFA	Radiofrequency ablation

List of Abbreviations

Abb.	Meaning
RLN	Recurrent laryngeal nerve
STN	Solitary thyroid nodule
TBG	Thyroxin-binding globulin
TRH	Thyrotropin releasing hormone
TSH	Thyroid-stimulating hormone
TTR	Transthyretin
US	Ultrasonography
USG	Ultrasound guided

Abstract:

Introduction: The thyroid gland nodular disorders incidence has been on the rise in recent decades, that may be due to increase the risk factors, or due to the wider use of neck imaging. That gives an estimated prevalence of approximately 4-6% clinically detected which rises to within a range of 20% to 67% due to the wide use of U/S, and neck imaging techniques. A thyroid nodule is a discrete lesion within the thyroid gland that is palpably and/or sonographically distinct from the surrounding thyroid parenchyma. Thyroid nodules come to clinical attention when noted by the patient, by a physician during routine physical examination, or during a radiologic procedure.

Objectives: This work is aiming to discuss the most recent clinical guidelines of management of solitary thyroid nodule, and assess the treatment modalities according to different investigation results.

Data Sources: Medline databases (PubMed, Medscape, ScienceDirect. EMF-Portal) and all materials available in the Internet till 2017.

Study Selection: This search presented 63 articles. The Guidelines of Management of Solitary Thyroid Nodule.

Data Extraction: If the studies did not fulfill the inclusion criteria, they were excluded. Study quality assessment included whether ethical approval was gained, eligibility criteria specified, appropriate controls, and adequate information and defined assessment measures.

Data Synthesis: Comparisons were made by structured review with the results tabulated.

Conclusions: A positive result of malignancy on FNAB almost certainly needs surgery. Near-total or total thyroidectomy remains the cornerstone of primary treatment for most thyroid malignancies and it is recommended if any of the following are present: the primary thyroid carcinoma is more than 1–1.5 cm, multicentric, contralateral thyroid nodules, regional or distant metastases, patient has a personal history of radiation therapy to the head and neck, a first-degree family history of differentiated thyroid cancer, or if the age of the patient is over 40 or under 25 at the time of diagnosis. Increased extent of primary surgery may improve survival and reduce rate of recurrence for high-risk patients.

Key words: Thyroid-stimulating hormone, Transthyretin, Ultrasonography

INTRODUCTION

The thyroid gland nodular disorders incidence has been on the rise in recent decades, that may be due to increase the risk factors, or due to the wider use of neck imaging. That gives an estimated prevalence of approximately 4-6% clinically detected which rises to within a range of 20% to 67% due to the wide use of U/S, and neck imaging techniques ***(Kihara et al., 2013)***. A thyroid nodule is a discrete lesion within the thyroid gland that is palpably and/or sonographically distinct from the surrounding thyroid parenchyma**.** Thyroid nodules come to clinical attention when noted by the patient, by a physician during routine physical examination, or during a radiologic procedure ***(Cooper et al., 2006).***

Several disorders may be the cause of a thyroid nodule. The majority of thyroid nodules are asymptomatic, benign lesions, but 5-20% of thyroid nodules are true neoplasms ***(Keh et al., 2015)***. Their clinical importance is primarily related to the need to exclude a thyroid malignancy ***(Lin et al., 2005).*** Laboratory evaluation with a sensitive thyroid-stimulating hormone (TSH) test should be drawn on patients to determine those with thyrotoxicosis or hypothyroidism. Serum calcitonin should be measured in anyone with a family history of medullary thyroid carcinoma ***(Ross, 2008).***

Fine needle aspiration cytology (FNAC) has become the investigation of choice because of its safety, cost effectiveness, and accuracy. It is the most specific investigation to differentiate between benign and malignant nodules ***(Yang et al., 2007)***. Ultrasonography of thyroid is considered to be an efficient method to know whether a nodule is solid or cystic, and to detect its accurate size and location, and also acts as a guide for FNAC ***(Solbiati et al., 2001).***

Radio-isotope scanning depending upon the ability of the thyroid to take-up radioactive isotope, thyroid nodules are further classified into cold, warm, and hot ***(Meller and Becker, 2002)***. CT scanning and MRI have a limited role in the initial evaluation of STN. But their main indications include suspected tracheal involvement either by invasion or compression, extension into the mediastinum, or recurrent disease ***(Wu et al., 2011).***

The most recent guidelines of the American Association of Clinical Endocrinologists(AACE) recommendation is that most patients with benign biopsies can be followed without surgery and carefully monitored for changes in nodule size and symptoms, and repeat ultrasonography or FNA biopsy is indicated if the nodule becomes palpable or has findings suggestive of malignancy ***(Gharib et al., 2010)***.

According to AACE guidelines; the main indications for surgical treatment of thyroid nodules are malignancy. Also suspicious nodules with indeterminate cytology on FNA especially cold nodules on radio-isotope scanning should be surgically treated, but if they are toxic nodules they will require treatment with radioactive iodine ***(Gharib et al., 2010)***. Ablation by postoperative radioactive iodine (I-131) is done for high-risk patients. Postoperative thyroid replacement therapy is a common practice Following complete resection of thyroid cancer. The TSH concentration should be in the target range of 0.5 μU per mL (0.5 mU per L) ***(Gharib et al., 2010)***.

Aim of the Work

This work is aiming to discuss the most recent clinical guidelines of management of solitary thyroid nodule, and assess the treatment modalities according to different investigation results.

ANATOMY AND PHYSIOLOGY OF THE THYROID GLAND

Embryology of thyroid gland

The thyroid is the first endocrine gland to develop in the embryo. It begins to form During the fourth week of embryological development from a median endodermal thickening in the floor of the primordial pharynx at the junction between the first and second pharyngeal pouches. This thickening soon forms the thyroid primordium ***(Fancy et al., 2010).***

As the embryo and tongue grow, the developing thyroid gland descends in the neck, passing anterior to the developing hyoid bone and laryngeal cartilages. The proximal portion connecting the gland and the foramen cecum (thyroglossal duct) retracts and forms a solid fibrous stalk early in the fifth week. This thyroglossal duct ultimately atrophies, but any portion of it may persist to become the site of a thyroglossal duct cyst. The distal portion of this duct gives rise to the pyramidal lobe and levator superioris thyroideae in adults ***(Moore and Persaud, 2003)***.

At first the thyroid primordium is hollow spherical but it soon becomes solid and divides into right and left lobes connected by the isthmus of the thyroid gland which lies anterior to the developing 2nd and 3rd tracheal rings. By seven

weeks the thyroid assumes its definitive shape and reaches its final site in the neck ***(Moore and Persaud, 2003)***.

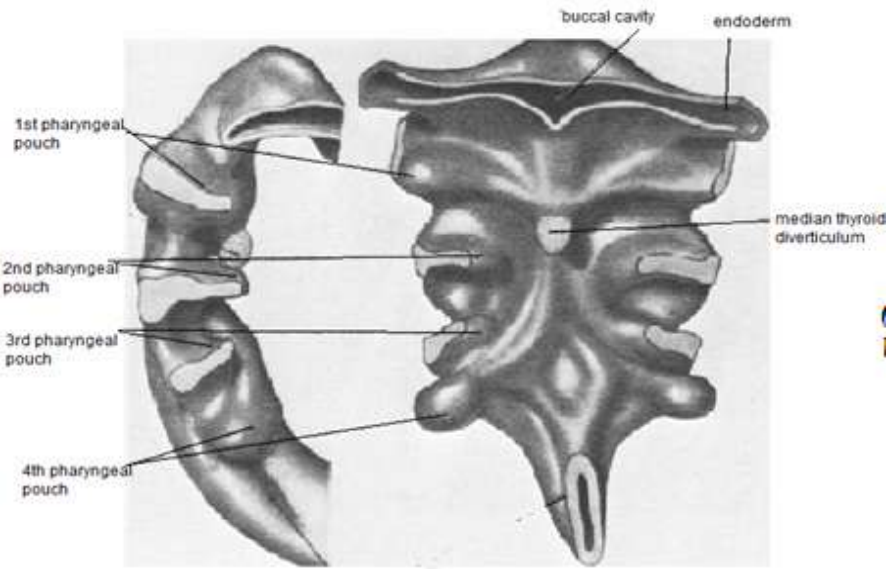

Figure (1): Embryological origin and development of thyroid gland ***(Mansberger, 1993).***

Thyroid Ectopia

During the course of the development of thyroid, part of the gland or the whole gland may fail to reach its final adult position. Ectopic thyroid tissue can be found at any level along the pathway of its embryological descent. In some patients accessory ectopic thyroid tissue may be found in the presence of thyroid gland in its normal anatomic position. This tissue may be functional; however, it is usually inadequate to maintain the normal function of the thyroid if the main gland is removed ***(Fancy et al., 2010).***

Ectopic thyroid tissue has been reported in oropharynx, infrathryoid region, mediastinum, larynx, trachea, and esophagus. Lingual thyroid is the most common site of ectopic thyroid. There is a higher incidence of ectopic lingual thyroid tissue in females with the female to male ratio of 3:1–7:1. About 70% of patients with lingual thyroid glands have no thyroid tissue in the neck and often may be mistaken for a thyroglossal duct cyst so it is essential to determine the main gland before removing it ***(Massine et al., 2001).***

Anatomy of thyroid gland

The thyroid gland is a butterfly-shaped organ located low down at the front of the neck anteriorly to the trachea at the level of the second and third tracheal rings and between the C5-T1 vertebrae. The gland is enclosed by an envelope of pretracheal fascia which is thickened posteriorly and attached to the cricoid cartilage and upper tracheal rings as suspensory ligament of Berry that is responsible for the gland moving up and down with larynx during swallowing ***(Khatawkar and Awati, 2015)***.

The thyroid gland is weighing about 25 g in adults and it consists of two pear shaped lobes connected by the isthmus in the midline and a pyramidal lobe often projects upwards from isthmus. The two thyroid lobes are placed at the anterolateral aspects of cervical trachea from oblique line of thyroid cartilage