International Journal of Biotechnology and Clinical Medicine ISSN 2583-4665
Vol.2, No.4, Oct - Dec 2023, pp. 05~07

A MINI REVIEW ON THYROID NODULES

M. Nasrin[1], G. Jayalakshmi[1*]
[1]Department of Microbiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry - 605502, India.

Article Info

Article history:

Received October 25th, 2023
Revised November 12th, 2023
Accepted December 9th, 2023

Keyword:

Thyroid
Extrinsic aging
Intrinsic aging
Drug discovery
Geriatric dermatoses

ABSTRACT

The majority of patients will exhibit a sizable detectable lump in the front part of the neck, or a chance lump is discovered during imaging examinations conducted for unrelated purposes. The majority of thyroid nodules do not exhibit any symptoms, and the majority of individuals with thyroid nodules have normal thyroid function, with less than 1% of nodules leading to thyroid illness. Certain individuals may experience neck pressure or pain, especially in cases of spontaneous bleeding. While the majority of thyroid nodules are harmless and not clinically relevant, approximately 4 to 6.5 percent of cases involve nodules that are caused by thyroid cancer. This review explores the assessment and treatment of thyroid nodules and emphasizes the need of interprofessional team members working together to deliver efficient care and improve patient outcomes.

Corresponding Author:

Dr. G. Jayalakshmi,
Department of Microbiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry - 605502, India.
Email: jayalakshmi.2k15@gmail.com

How to Cite:

Nasrin M and Jayalakshmi G. A mini review on thyroid nodules. IJBTCM. 2023; Volume 2 (Issue 4): Page 05-07.

1. INTRODUCTION

The thyroid gland is a highly vascular endocrine gland located in the lower neck, spanning from the fifth cervical to the first thoracic vertebra. The thyroid gland is a centrally located organ composed of two lobes, joined by a thin isthmus in the front [1]. The gland weighs about 25g and the lobes of the thyroid are conical with each lobe 5 cm in craniocaudal dimension, 3 cm in transverse dimension and 2 cm in anteroposterior dimension and isthmus measuring 1.25 cm transversely. The thyroid gland occasionally has a pyramidal lobe which is more often in left arising fromthe isthmus and connects to thehyoid bone [2]. The internal carotid arteries and internal jugular veins are located posterolateralto thyroid lobe and strap muscles of neck located anteriorly [3].

2. ANATOMY OF THYROID

The thyroid gland receives blood supply via the superior and inferior thyroid arteries, as well as, on occasion, a little branch of the brachiocephalic trunk or the arch of the aorta called a contributing arteria thyroidea ima. Both the inferior thyroid artery and the superior thyroid artery originate from the external carotid artery and the first segment of the subclavian artery, respectively, via the thyrocervical trunk. There is a great deal of surgical significance in the very varied interaction between the inferior thyroid artery and the recurrent laryngeal nerve [4–6].

The internal jugular vein is the last destination for the drainage of the thyroid gland, which occurs via the superior, middle, and inferior thyroid veins. The superior, middle, and inferior cervical sympathetic ganglia feed the thyroid gland with nerve impulses [7,8].

3. NOVEL DIAGNOSIS METHODS IN THYROID NODULES

The gland is composed of multiple septations which are connective tissue and extend into gland thus resulting in formation of lobules. The functional unit of thyroidgland is follicles. The follicles has a central core of colloid and is surrounded by a layer of epithelial cells which rest on a basal lamina membrane. This central core contains inactive form iodinated glycoprotein [9]. The epithelial cells which form the lining of the follicle is stimulated by

thyroid stimulating hormone (TSH) which in turn helps conversion of inactive colloid to active forms of T3 and T4 [10,11].
C cells are the other cells in the thyroid gland which produce thyrocalcitonin which inhibit bone resorption and recover calcium from renal tubules thus lowering theblood calcium level and regulated calcium homeostasis. The thyroid gland pathology is broadly divided into focal lesions and diffuse disease [12–14]. Diffuse disease of thyroid can be due to infection or infiltrative disorders including autoimmune diseases. The thyroid nodules are described as nodules which are discrete within the thyroid gland, however radiologically distinct from the surrounding parenchyma [15–17].

4. THYROID NODULES AND THERAPEUTICS

The papillary carcinoma is the most commonest form of thyroid malignancy and thishas its common nature because of its association with radiation exposure [(14)]. Nodules can either be cystic, solid or mixed solid and cystic in nature. The nodules which are completely cystic are usually benign [18]. Spongiform nodules or spongiform with cystic spaces are also usually benign in nature. The mixed nodulewith partial cystic component is categorized further based upon the solid part of the nodule upon whether if the nodule is smooth or not, whereas if the nodule is solid and not appearing smooth with additional features of hypo echogenicity and echogenic focimalignancy is to suspected [19].
The thyroid nodule is evaluated on the basis of the five ultrasound features andfollowed up in cases of TIRADS 1 and TIRADS 2 grades and in case the lesion is mildly suspicious and belong to TIRADS 3 then a decision on fine needle aspiration cytology is done and TIRADS 4 and TIRADS 5 lesions have found to be moderately and highly suspicious respectively, followed by FNAC and surgical excision in cases of malignancy [20]. The thyroid nodules which are asymptomatic are usually detected incidentally during screening programs or while imaging of thyroid gland is done for other conditions and detection of such nodule the management becomes a day to daychallenge [21]. The thyroid gland is assessed by physical examination i.e. palpation which wasfound insensitive when alone but combined with high resolution ultrasonography, the nodules less than one cm would not be missed and helpful in early detection of nodules [9] [22]. Ultrasound of the thyroid gland plays an important role in stratification of the nodule and fine needle aspiration cytology was performed when the nodule were suspicious and together with the TIRADS system and BETHESDA system for reporting thyroid cytopathology and comparing the grades thus precluding the numberof unnecessary FNAC of the nodule [23]. When a nodule is present in the thyroid gland and a grading is given to the nodule followed by fine needle aspiration and a provisional diagnosis is attained for the nodule with the sensitivity, specificity and positive predictive value were 80%, 86.6%and 87% in a study, however the misdiagnosed lesions were malignant thus reliability of FNAC alone can cannot exclude the lesion as benign [24,25]. The thyroid nodule is assessed by various grading system among radiologist, endocrinologist and pathologist but however to attain a final diagnosis on the nodule the surgical excision with histopathological evidence is mandatory and considered as gold standard [26,27].

5. CONCLUSION

The ultrasound-based TIRADS method may reliably assess the likelihood of a certain nodule becoming malignant provided the nodules are appropriately categorized on ultrasound. The positive predictive value of TIRADS in stratifying a risk for malignancy in a nodule for category 1,2,3,4 and 5 were 14.3%, 15%, 0%, 66.7% and 100% respectively. Many studies have shown the USG characteristics of thyroid nodules using TI-RADS system. But our study was based on the hypothesis that USG based risk stratification of nodules is accurate and hence unnecessary invasive procedure like FNAC/biopsy can be avoided in cases of a benign nodule and thus pave a way for better patient care. Further studies with larger sample size and follow up are required to prove this hypothesis which can reduce the patients cost, avoid unnecessary invasion and to prevent complications.

FUNDING

Nil

ETHICAL APPROVAL

Nil

COMPETING INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Doneley B. Avian medicine and surgery in practice: companion and aviary birds. CRC press; 2018.
[2] Musleh AH, Al-Samarrae A-JJ, Al-Rawi SA. Anatomical, Histological, Hormonal, And Ultrasonography Study Of Neonate Thyroid Gland. Tikrit J Pure Sci 2019;24:7–12.
[3] Thiriet M. Anatomy of the ventilatory apparatus. Anat. Physiol. Circ. Vent. Syst., Springer; 2014, p. 73–155.
[4] Jarvis JF, Nell AMH. The brachiocephalic artery in the dog with special reference to the arterial supply of the esophagus. Anat Rec 1963;145:1–5.
[5] Branca JJ V, Lascialfari Bruschi A, Pilia AM, Carrino D, Guarnieri G, Gulisano M, et al. The Thyroid Gland: A Revision Study on Its Vascularization and Surgical Implications. Medicina (B Aires) 2022;58:137.
[6] Osborn AG. Diagnostic cerebral angiography. Lippincott Williams & Wilkins; 1999.
[7] Puvanendran M, Harris A. Anatomy as applied to transoral surgery. Scott-Brown's Otorhinolaryngol. Head Neck Surg., CRC Press; 2018, p. 425–34.
[8] McDougall IR. Thyroid structure, development and developmental abnormalities. Thyroid Dis. Clin. Pract., Springer; 1992, p. 1–11.
[9] Khurana A. Diagnostic accuracy of Acoustic Radiation Force Impulse (ARFI) in differentiating benign from malignant thyroid nodules in patients with solitary thyroid nodules and comparison with histopathology 2014.
[10] Mishra AK, Agarwal A, Parameswaran R, Singh KR. Endocrine Surgery: A South Asian Perspective. CRC Press; 2022.
[11] Baker CR, Reese G, Teo JTH. Rapid Surgery. vol. 14. John Wiley & Sons; 2010.
[12] Raisz LG, Au WYW, Simmons H, Mandelstam P. Calcitonin in human serum: Detection by tissue culture bioassay in medullary carcinoma of the thyroid and other disorders. Arch Intern Med 1972;129:889–93.
[13] KO S, CO O, O EO. The importance of mineral elements for humans, domestic animals and plants-A review. African J Food Sci 2010;4:200–22.
[14] Aranda-Osorio G. Effect of vitamin D_3 on calcium homeostatis of beef steers. National Library of Canada= Bibliothèque nationale du Canada, Ottawa; 2004.
[15] Paes FM, Kalkanis DG, Sideras PA, Serafini AN. FDG PET/CT of extranodal involvement in non-Hodgkin lymphoma and Hodgkin disease. Radiographics 2010;30:269–91.
[16] Huang C, Doshi AH, Lekperic S, Lo G. Thyroid ultrasound imaging. Endocr. Surg., CRC Press; 2017, p. 67–85.
[17] Sakr MF. Hashimoto's disease. Thyroid Dis., Springer; 2020, p. 71–132.
[18] Lawrence Jr W, Kaplan BJ. Diagnosis and management of patients with thyroid nodules. J Surg Oncol 2002;80:157–70.
[19] Andrioli M, Carzaniga C, Persani L. Standardized ultrasound report for thyroid nodules: the endocrinologist's viewpoint. Eur Thyroid J 2013;2:37–48.
[20] Leni D, Seminati D, Fior D, Vacirca F, Capitoli G, Cazzaniga L, et al. Diagnostic performances of the ACR-TIRADS system in thyroid nodules triage: A prospective single center study. Cancers (Basel) 2021;13:2230.
[21] Hughes K, Eastman C. Goitre: Causes, investigation and management. Aust Fam Physician 2012;41:572–6.
[22] Lansford CD, Teknos TN. Evaluation of the thyroid nodule. Cancer Control 2006;13:89–98.
[23] Huang S, Meng N, Pan M, Yu B, Liu J, Deng K, et al. Diagnostic performances of the KWAK-TIRADS classification, elasticity score, and Bethesda System for Reporting Thyroid Cytopathology of TI-RADS category 4 thyroid nodules. Int J Clin Exp Pathol 2020;13:1159.
[24] De D, Dutta S, Tarafdar S, Kar SS, Das U, Basu K, et al. Comparison between sonographic features and fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. Indian J Endocrinol Metab 2020;24:349.
[25] Swamy GG, Singh A, Ahuja JM, Satyanarayana N. Accuracy of fine needle aspiration cytology in the diagnosis of palpable head and neck masses in a tertiary health care center. J Coll Med Sci 2010;6:19–25.
[26] Xu J-M, Xu H-X, Xu X-H, Liu C, Zhang Y-F, Guo L-H, et al. Solid hypo-echoic thyroid nodules on ultrasound: the diagnostic value of acoustic radiation force impulse elastography. Ultrasound Med Biol 2014;40:2020–30.
[27] Zhou H, Jin Y, Dai L, Zhang M, Qiu Y, Tian J, et al. Differential diagnosis of benign and malignant thyroid nodules using deep learning radiomics of thyroid ultrasound images. Eur J Radiol 2020;127:108992.