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Original Research Paper

Radiodiagnosis

A STUDY ON EVALUATION OF THYROID NODULES BY ULTRASONOGRAPHY AND ITS CORRELATION WITH HISTOPATHOLOGICAL FINDINGS.

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ABSTRACT

BACKGROUND: Nodular disease of the thyroid is very common, while cancer is less common; a definite diagnosis of either is difficult to make. The general prevalence of thyroid nodules is very high. They are detectable in 5 % of the normal population on clinical examination, in over 48% on high- resolution ultrasound and in over 50% at autopsy.

AIM: The purpose of the study was to evaluate the clinically thyroid swelling by sonography and FNAC in various disorders of thyroid gland with histopathological correlation.

MATERIALS AND METHODS: The present study included 100 patients with clinically palpable thyroid swelling. The patients included in the study were subjected to gray scale and colour Doppler examination of the thyroid gland and fine needle aspiration cytology and histopathological examination.

RESULTS: Among the 100 patients examined 30 patients had malignant lesions and 70 patients had benign lesions on final histopathology. All the diagnosis made by ultra sound was compared with FNAC reports. The characteristics of malignant lesions on ultrasonography included ill-defined micro calcifications, lymphadenopathy and solid predominantly hypo echoic nodule.

CONCLUSION: Ultrasonography is valuable for identifying many malignant or potentially malignant thyroid nodules. Although there is some overlap between the ultra-sonography appearance of benign nodules and that of malignant nodules, certain ultrasonography features are helpful in differentiating between the two. FNAC can itself diagnose benign conditions and can also be helpful as an aid to ultrasonography features to suggest malignancy even though it can report malignancy of follicular variety.

KEYWORDS : High Resolution Ultra Sonography (HRUSG), Fine Needle Aspiration Cytology (FNAC), Thyroid Nodules, Benign, Malignant.

INTRODUCTION

Disorders of thyroid gland are amongst the most common endocrine and surgical problems encountered in clinical practice. The prevalence of thyroid nodules is about 3%-8% in the general population and is greater than 50% after age 65 years [1, 2]. The profile of thyroid disorders encountered in paediatric and adolescent age groups in India is similar to that seen in most parts of the world except for the prevalence of iodine deficiency disorders in certain endemic regions of this country.

Clinical presentation is most commonly for hypothyroidism, goitres and infrequently for hyperthyroidism [3]. Clinical surveys have shown that 5-10% of the general population have thyroid pathologies including nodular lesions in 2.5-3% of cases [4]. The prevalence of hyperthyroidism is 2% in females and 0.6 % in males, hypothyroidism 4.8 % and 0.9% and goitre 2.9% and 0.4% respectively. In both sexes the prevalence increased with age [5].

Thyroid sonography was first introduced in 1966-1967 [6]. It has been widely practiced since 1970 and is now one of the most popular radiological methods of diagnosing thyroid disease [7]. Sonography is commonly the first imaging modality after clinical examination. On the basis of the sonographic findings selection of additional imagining modalities including CT and MRI imaging can be applied more judiciously.

Fine needle aspiration cytology (FNAC) is now a well-established, first line, simple and quick screening test as well as the diagnostic tool for surgical and non-surgical goitres. Limitation of FNAC is mainly because of inadequate sampling, inexperience of the pathologist and overlapping cytological features [8]. Ultrasonography is an easily accessible, non-invasive way to image the thyroid gland and determine its pathology. It helps to pin point a possible thyroid abnormality at an early stage and includes the elements of differential diagnosis that result in subsequent thorough examination and timely treatment in appropriate cases. In addition to facilitating the diagnosis of clinically apparent nodules, the wide spread use of ultrasonography has resulted in uncovering a multitude of clinically inapparent thyroid nodules, while differentiating benign from malignant nodules.

The present study was aimed to determine the role of high resolution ultrasonography in the evaluation of lesions of the thyroid with FNAC correlation and compare with other studies.

MATERIAL AND METHODS

The present prospective and diagnostic study was conducted in the Department of Radiology in association with the Department of Pathology at this institute. This study includes a total of 100 patients (89 female and 11 male) of all age groups admitted in the hospital during the period of one year from October 2016 to September 2017 were included.

Inclusion criteria

All the patients referred to Radiology Department with symptoms of lump in anterior aspect of neck with or without symptoms of hyperthyroidism or hypothyroidism were included in the study, if they have met the following criteria.

- Patients with palpable lump without any symptoms.
- Patients with palpable lump associated with symptoms.
- Patients with non-palpable lesions in thyroid region detected by HRUSG.

Exclusion criteria

- Previously diagnosed cases of benign disease and thyroid malignancies.
- Cases undergoing treatment.
- Diagnosed cases of carcinoma thyroid on follow up for residual disease or recurrence.

Examination method

A brief history was taken and physical examination was carried out. Patients were subjected to high resolution ultrasonographic (HRUSG) examination and the suspected lesions were further subjected to fine needle aspiration cytology (FNAC) following informed verbal consent.

The ultrasound machine used was GE LOGIQ P5 with a 4 to 12 MHz linear probe. The acoustic power in the Doppler mode was limited to that recommended by the current U.S food and drug administration guidelines for thyroid scanning.

Technique of USG neck

As the thyroid gland is located superficially high resolution real time ultrasonography can demonstrate normal thyroid anatomy and pathological conditions with remarkable clarity. High frequency transducers (7.5-15.0 MHz) currently provide both deep ultrasound penetration up to 5 cm and high definition images with a resolution of 0.7 -1.0 mm. Linear array transducers are preferred to sector transducers because of wider near field of view.

Technique of FNAC of thyroid lesion

The swelling was accessed with 23G needle attached to a 10 cc disposable syringe after cleaning and draping the patient. The material was aspirated from the swelling and two smears were made. First slide was air dried and second was fixed wet in ether. Air dried smear was stained with MGG stain, while ether fixed smear was stained with H&E.

Statistical methods

Fisher's exact test was used and also sensitivity, specificity, positive predictive value (PPV) negative predictive value (NPV) were calculated from the data correlating sonographic and FNAC characteristics.

RESULTS

In the present study, out of 100 patients 89 were female and 11 were male. Out of 100 lesions, 68 (64 were benign and 4 were malignant) were hyperechoic, 27 (9 were benign and 18 were malignant) were hypoechoic and 3 were isoechoic and 2 were anechoic.

If hypoechoic nature of the lesion is considered as an independent factor in identifying malignancy in a thyroid lesion, it could detect malignancy with a sensitivity, specificity, positive predictive value, negative predictive value of 72%, 88% 67% and 90% respectively.

Out of 100 lesions seen at HRUSG, 70 lesions (65 benign, 5 malignant were diagnosed by FNAC). Remaining 30 lesions (20 malignant, 10 benign) were ill-defined on HRUSG. If ill-defined borders of the lesion were considered as an independent factor indicative of malignancy, it could detect a malignant lesion with sensitivity, specificity, positive and negative predictive value of 80%, 87%, 67% and 93% respectively.

Out of 100 lesions seen at HRUSG, 70 lesions (65 benign, 5 malignant.) showed macrocalcifications, 27 lesions (17 malignant, 10 benign) showed microcalcifications. If microcalcification was considered as an independent factor identifying malignant lesion, it could detect malignancy with sensitivity, specificity positive predictive value and negative predictive value of 68%, 87%, 63% and 89% respectively.

Out of 100 lesions seen at HRUSG, 67 lesions (63 benign, 4 turned out to be malignant.) showed peripheral vascularity, 28 lesions (12 benign, 16 malignant) showed central vascularity. If central vascularity was considered as an independent factor for malignancy, it would detect malignancy with a sensitivity, specificity, positive predictive value and negativei d e n t i f y i n g a thyroid malignancy. The individual predictive value of 64%, 84%, 57% and 88%variables considered by several authors were respectively.same as those considered in the present study and they showed variable correlations with the Out of 100 lesions seen at HRUSG, 66 lesionssensitivities.

(62 begin, 4 turned out to be malignant) showed A/T ratio less than one, 34 lesions (13 benign 21The sensitivity rate for malignancy on HRUSG malignant) showed A/T ratio more than one. Ifin the study by Won-Jin Moon, et al. were as A/T ratio more than one was considered as anfollows hypoechoic nature (87%), ill-defined independent factor for malignancy, it wouldmargins (48%), microcalcifications (44%), and detect malignancy with a sensitivity, specificity,A/T ratio more than one (40%) [11]. The positive predictive value and negative predictivepresence of microcalcifications was the least value of 84%, 83%, 62% and 94% respectively.sensitive variable in predicting malignancy in the above three studies while sensitivity was Out of 100 cases seen at HRUSG, number of significantly lower in the studies by both Mary cases identified as benign in USG was 70 out ofC. Frates, et al. and Enrido Papini, et al. which 61 were benign and 9 turned out to becompared to our study as perTable – 1. malignant in FNAC. Number of cases identified as malignant in USG was 30 out of which 16The present study on comparison with the study were malignant and 14 turned out be benign inmade by Mary C. Frates, et al. showed highest FNAC. The overall sensitivity, specificity,c o r r e l a t i o n w i t h hypoechogenicity of the nodule positive value and negative predictive value ofand with central vascularity. It also showed ultrasonography in identifying a malignantlowest correlation with the sonographic lesion were 64%, 87% respectively. Hence USGfeatures A/T ratio more than one while irregular is good at ruling out a malignancy lesion, thusmargins and central vascularity showed variable playing a role in management.correlation [12] as perTable – 1.

DISCUSSION

In the study by Enrido Papini, et al., sensitivity rates for malignancy on HRUSG were as follows High resolution ultrasound has become the first in decreasing order hypoechoic nature (87%), line imaging modality for evaluation of the ill-defined Margins (77%), central vascularity thyroid gland due to excellent visualization of the (75%), and microcalcifications (29%) [10]. In thyroid parenchyma. It is highly sensitive in present study, irregular margins and central detective small nodules, calcification, septations vascularity Showed highest correlation.The and cysts as well as in guiding fine needle study by Enrido Papini, et al. has not considered aspiration biopsies. Thyroid nodules are very A/T ratiomore than one which showed the common andmay be observed at ultra-highest sensitivity to predict malignancy in our sonography (US) in 50% of the adult population study while hypoechogenicity of nodule was [9]. The most common cause of benign thyroid more sensitive in their study as perTable – 1.

nodules is nodular hyperplasia although less than 7% of thyroid nodules are malignant [10]. The Several US features have been found to be present study was done to study the role of high associated with An increased risk of thyroid resolution ultrasonography in the evaluation ofcancer including presence of calcifications, hypo- thyroid lesions in correlation with FNAC of the echogenicity, irregular margins, predominantly same lesions.

solid composition and intranodular vascularity The present study when comparedwith otherhowerthesensitivities,s p e c i f i c i t i e s and negative and positive predictive values for these studies in the literature showed similar trends in criteriaare e x t r e m e l y variable from study to study and no US feature has both a high sensitivity and a high positive predictive value for thyroid cancer while the combination of factors improves the positive predictive value of US to some extent in diagnosing a malignant lesion [13].

Table – 1: Comparison of present study with other workers [10, 11, 12].

Variables	Mary C. Frates, et al. [12]	Enrido Papini, et al. [10]	Won-Jin moon, et al. [11]	Present study
Hypoechoic nodule	26.5-87.1	87%	87%	72%
Irregular margins	17.4-77.5	77%	48%	80%
Central vascularity	54.3-74.2	75%	-	64%
Microcalcifications	26.1- 59.1%	29%	44%	68%
A/T more than one	32.7	-	40%	84%

CONCLUSION

HRUSG is extremely useful in showing whether the palpable mass is within thyroid or adjacent to the thyroid. Highest incidence of thyroid disease was in the population age group of 20-50 years. Majority of patients were female and of the 100 patients, 70 lesions were benign and 30 lesions were malignant. The sensitivity of the lesion on sonography correlated with malignancy on FNAC as follows: Hypo echoic 72%, ill- defined border 80%, micro calcification 68%, central vascularity 64% and A/T ratio 84%. From this study out of 100 cases seen at HRUSG followed by FNAC correlation the overall sensitivity, specificity, positive predictive value and negative predictive value of ultrasonography in identifying a malignant lesion was 64%, 81%, 3% and 87% respectively. This study showed that HRUSG due to its excellent resolution is very sensitive in detecting the confines of lesion to the thyroid and local invasion in to nearby structures. HRUSG is also hly significant in detecting cervical lymph nodes associated withthyroid lesions a characterizing them as benign or malignant. Hence USG is good at ruling out a malignant lesion thus playing a role in management.

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