Original Research Article

Evaluation of correlation between ultrasonography and FNAC of thyroid nodules

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Abstract

Back ground: 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 single 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 follicular variety.

Key words

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 introduces in 1966-1967 [6]. It has been widely practiced since the 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 applies 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, in experience of the pathologist and over lapping cytological features [8]. Ultrasonography is an easily accessible, non-invasive way to image the thyroid gland and 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 result in uncovering a multitude of clinically unapparent thyroid nodules, while differentiating majority of them which are 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 o\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 and Department of Surgery MNR Medical College and Hospital, Sangareddy. This study includes a total of 100 patients (89 female and 11 male) of all age groups admitted in surgical wards during the period October 2011 to September 2013 were included.

Inclusion criteria

All the patients referred to Radiology Department in MNR hospital 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 ultra-sonographic (HRUSG) examination and the suspected lesions are further subjected to fine needle aspiration cytology following informed verbal consent.

The Ultra sound 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

The thyroid gland was located superficially and hence 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 uncured with 23 G needle attached to a 10 cc disposable syringe after cleaning and draping the patient. The material was aspirated from the swelling and two smears are 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

Fishers exact test was used and also sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated from the data tabulated 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 hyper echoic, 27 (9 were benign and 18 were malignant) were hypo echoic and 3 were iso echoic and 2 were anechoic.

If hypo echoic 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 well defined out of which as diagnosed by FNAC. 30 lesions (20 malignant, 10 benign) were ill defined of which. 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 macro calcifications, 27 lesions (17 malignant, 10 benign) showed micro calcifications. If micro calcification was considered as an in dependent 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 negative predictive value of 64%, 84%, 57% and 88% respectively.

Out of 100 lesions seen at HRUSG, 66 lesions (62 begin, 4 turned out to be malignant) showed A/T ratio less than one, 34 lesions (13 benign 21 malignant) showed A/T ratio more than one. If A/T ratio more than one was considered as an independent factor for malignancy, it would detect malignancy with a sensitivity, specificity, positive predictive value and negative predictive value of 84%, 83%, 62% and 94% respectively.

Out of 100 cases seen at HRUSG, Number of cases identified as benign in USG was 70 out of which 61 were benign and 9 turned out to be malignant in FNAC. Number of cases identified as malignant in USG was 30 out of which 16 were malignant and 14 turned out be benign in FNAC. The overall sensitivity, specificity, positive value and negative predictive value of ultra-sonography in identifying a malignant lesion were 64%, 87% respectively. Hence USG is good at ruling out a malignancy lesion, thus playing a role in management.

Discussion

High resolution ultrasound has become the first line imaging modality for evaluation of the thyroid gland due to excellent visualization of the thyroid parenchyma. It is highly sensitive in detective small nodules, calcification, septations and cysts as well as in guiding fine needle aspiration biopsies. Thyroid nodules are very common and may be observed at ultra-sonography (US) in 50% of the adult population [9]. The most common cause of benign thyroid nodules is nodular hyperplasia although less than 7% of thyroid nodules are malignant [10]. The present study was done to study the role of high resolution ultrasonography in the evaluation of thyroid lesions in correlation with FNAC of the same lesions.

The present study when compared with other studies in the literature showed similar trends in

identifying a thyroid malignancy. The individual variables considered by several authors were same as those considered in the present study and they showed variable correlations with the sensitivities.

The sensitivity rate for malignancy on HRUSG in the study by Won-Jin Moon, et al. were as follows hypo echoic nature (87%), ill-defined margins (48%), micro calcifications (44%), and A/T ratio more than one (40%) [11]. The presence of micro calcifications was the least sensitive variable in predicting malignancy in the above three studies while sensitivity was significantly lower in the studies by both Mary C. Frates, et al. and Enrido papini, et al. compared to our study as per **Table – 1**.

The present study on comparison with the study made by Mary C. Frateset, et al. showed highest correlation with hypo echogenicity of the nodule and with central vascularity. It also showed lowest concentration with the sonographic features A/T ratio more than one while irregular margins and central vascularity showed variable correlation [12] as per **Table – 1**.

In the study by Enrido papini, et al., sensitivity rates for malignancy on HRUSG were as follows in decreasing order hypo echoic nature (87%), ill-defined margins (77%), central vascularity (75%), and micro calcifications (29%) [10]. In present study, irregular margins and central vascularity showed highest correlation. The study by Enrido Papini, et al. has not considered A/T ratio more than one which showed the highest sensitivity to predict malignancy in our study while hypo echogenicity of nodule was more sensitive in their study **Table – 1**.

Several US features have been found to be associated with an increased risk of thyroid cancer including presence of calcifications, hypo echogenicity, irregular margins, predominantly solid composition and intra nodular vascularity however the sensitivities, specificities and negative and positive predictive values for these criteria are extremely 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	M.C. Frateset, 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%
Micro calcifications	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 the 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%, 53% 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 highly significant in detecting cervical lymph nodes associated with thyroid 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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