ORIGINAL RESEARCH PAPER

Radiology

A PROSPECTIVE COMPARATIVE STUDY IN ULTRASOUND IMAGING OF THYROD LESIONS- DIAGNOSTIC TIRADS & ULTRASOUND BASED CLASSIFICATION SYSTEM VS HISTOPATHOLOGICAL FINDINGS

KEY WORDS:

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ABSTRACT

Purpose: To compare between a Diagnostic TIRADS and thyroid ultrasound classification system proposed by Kim et al and to determine its efficiency in identifying between benign and malignant and neoplastic from non neoplastic lesions. **Materials and methodology:** Consecutive subjects attending endocrinology / surgery OPD and undergoing ultrasound screening for thyroid lesions and subsequently undergoing histopathological examination (FNAC/ biopsy/ excision) were selectively identified and invited to participate in the study. Thyroid lesions were then classified based on TIRADS and ultrasound based classification system and followed up afterwards for histopathological reports. About 20 patients were screened using e- saote (mylab) machine using 12.5 MHz linear array transducer Histopathological examination was done by Biopsy, excision, FNAC ultrasound guidance or otherwise **Results:** Using Statistical Package for Social sciences (SPSS) and students- t test; sensitivity, specificity and P values were found out **Conclusion:** Diagnostic TIRADS is reliable, efficient, easier and simpler than other classification system for identifying between neoplastic with non-neoplastic lesions and benign with malignant lesions.

Introduction

The Knowledge of the imaging appearances of the thyroid gland is important for appropriate identification and diagnosis of lesions of the thyroid. Ultrasonography (US) is the important modality for initial characterization of a thyroid nodule

Radiologists who interpret thyroid ultrasonography (US) images frequently face the dilemma of how to report nodules, which are extremely common and overwhelmingly benign (1) Ultrasonography (US) is the commonly used imaging modality for characterization of these nodules. The knowledge of US characteristics that increase the likelihood of malignancy in a thyroid nodule or the characteristic finding of benign nodules is important. Appropriate USG guided biopsy or FNAC technique and careful cytologic analysis are crucial for making the diagnosis.

FNAB is indicated based on the clinical and radiological features. Core biopsy is done when the FNAB is indeterminate or non diagnostic.

AIM :

The study was done to assess the diagnostic reliability of the ACR TIRADS classification system in differentiating benign and malignant thyroid lesions to use it for risk stratification, thereby identifying most clinically significant malignancies while reducing the number of biopsies performed on benign nodules.

MATERIALS AND METHODS :

The Study was a hospital based observational study , was done in department of Radiodignosis in Madras medical college between January 2019 to January 2020. The patiens who were undergoing Thyroid nodule FNAC, who were older than 18 years and who gave consent to participate in the study were included. The nodule with FNAC results that were interpreted as malignant or benign were included.

Patients will be screened using e- saote machine using 12.5 MHz linear array transducer Histopathological examination were done by Biopsy, excision, FNAC ultrasound guidance or otherwise .

All the nodules were assessed for echogenicity, composition ,margins, echogenic foci and the size of the nodules. When there are multiple nodules the features of four nodules were assessed.

The composition was categorised as solid or almost entirely solid, mixed solid and cystic, spongiform and entirely cystic. The margin was categorised as entirely smooth, lobulated or irregular .Illdefined echogenic foci were categorised as macroclcification (calcifications with shadowing), peripheral calcification (complete / partial) punctuate echogenic foci (tiny bright reflectors with out shadowing) or non shadowing small foci with comet tail artefact.

The echogenicity was assessed in the solid non calcified portions of the nodule and was categorised as hyper echoic, isoechoic, mildly hypoechoic nodule or moderate to markedly hypoechoic. The nodule that were less echogenic than strap muscles were included as moderate to markedly hypoechoic nodules.The nodules that were less echogenic than thyroid parenchyma but that were more echogenic than strap muscles were considered a mildly echogenic nodules. Each nodule was then assigned as ACR TI – RADS category on the basis of the point total obtained. They are assessed as high,intermediate, low or very low suspicion category or benign.

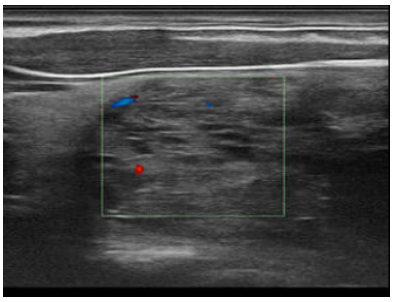
Nodule composition is either predominantly cystic (75%–100% cystic), mixed cystic and solid (26%–74% cystic), or predominantly solid (0%–25% cystic) . Hypervascularity within the central aspect of a nodule is more suggestive of a malignant process than is peripheral hypervascularity, which is most commonly associated with benign inflammatory processes.

Once the nodules were categorised , an assessement was made as to whether that system recommends FNA or Follow up on the basis of size thresholds.

ACR TI-RADS recommends measuring a nodule's longest axis and the largest dimension perpendicular to the longest axis on a transverse (axial) image and the largest craniocaudal dimension on a sagittal image. These measurements usually lie parallel or perpendicular to the sound beam, but they will be angled if the nodule is obliquely oriented.

The lympnodes are assessed when they are enlarged for the echogenicity, loss of hilum, microcalcification, cystic changes and internal flow.

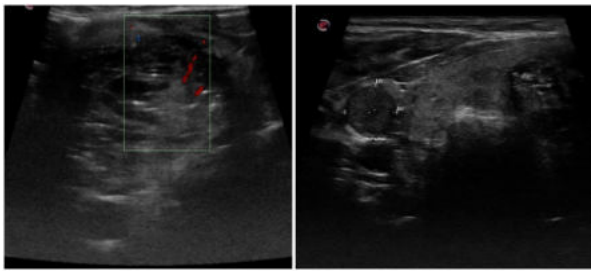
Case-1



Well defined spongiform hypoechoic wider than tall lesion with peripheral and central vascularity was found in right lobe of thyroid in a patient complaining of neck swelling since 1 year.

ACR TI- RADS score- 2 Ultrasound classification system as possibly malimgnant PE proven as colloid nodule with cystic degeneration

Case-2



welldefined hypoechoic wider than taller lesion with central and peripheral vascularity and punctuate echogenic foci inside was noted in a patient complaining of painless progressive neck swelling over a period of 6 months in left lobe. Right lobe of same patient showed well defined hypoechoic taller than wider lesion with peripheral and central vascularity, isthmus showed irregular hypoechoic lesion with punctuate calcification

ACR TIRADS score- 7
Ultrasound classification system as malignant lesion
HPE proven papillary carcinoma

DISCUSSION:

Thyroid nodules occur in up to 50% of adults, whereas palpable thyroid nodules occur in only 3% - 7% (1,7). Malignancy occurs in 5%–7% of all thy-roid nodules with a female predilection of 2–3:1, respectively . In general, the probability of malignancy in a nodule is higher for men and for patients under 15 years or over 45 years of age. Mortality from thyroid cancer increases when the patient is over 45 years old (8).

There are several recently published guidelines for determining whether a nodule should undergo US-guided fine-needle aspiration biopsy (FNAB) on the basis of its US and clinical features.

TIRADS, proposed by Horvath et al.,[6] is a classification system based on ultrasound features. In 2017, the Thyroid Imaging Reporting and Data System (TI-RADS) Committee of the American College of Radiology (ACR) published a white paper that presented a new risk-stratification system for classifying thyroid nodules on the basis of their appearance at ultrasonography (US).

In ACR TI-RADS, points in five feature categories are summed to determine a risk level from TR1 to TR5. Recommendations for biopsy or US follow-up are based on the nodule's ACR TI-RADS level and its maximum diameter.

The American College of Radiology (ACR) Thyroid Imaging Reporting and Data System (TI-RADS) aims to provide an easy-to-apply method for practitioners to determine management (2). ACR TI-RADS is founded on the evaluation of US features in five categories- Composition, echogenicity, shape, margin, and echogenic foci in which each feature is assigned 0–3 points.

ACR TI-RADS recommends formally reporting up to four thyroid nodules with the highest point totals.

In conjunction with the nodule's maximum diameter, the TR level determines whether to recommend a fine-needle aspiration (FNA) biopsy, a follow-up US examination, or no further action. ACR TI-RADS borrows from the American Thyroid Association guidelines and defines clinically important growth as a 20% increase in at least two nodule dimensions and a minimal increase of 2 mm, or a 50% or greater increase in volume (3).

As with guidelines from professional groups such as the American Thyroid Association and the Korean Society of Thyroid Radiology, the threshold size for recommending FNA decreases as the US features become more malignant appearing (3,4).

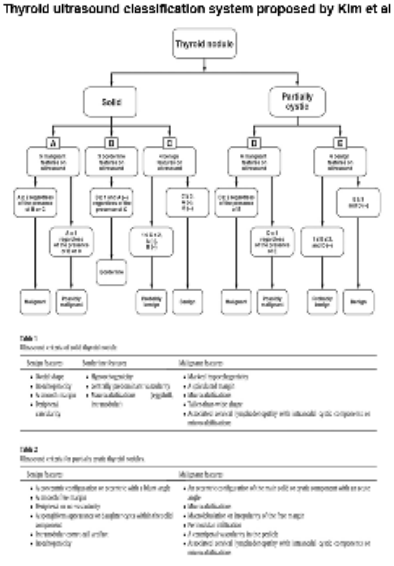
Because the threshold diameters for mildly and moderately suspicious nodules (TR3 and TR4) are larger than in other systems, adherence to ACR TI-RADS will result in fewer biopsies of benign nodules. Inevitably, however, it will also result in fewer biopsies of malignant nodules, which is why ACR TI-RADS recommends follow-up for some nodules that do not meet size criteria for FNA.

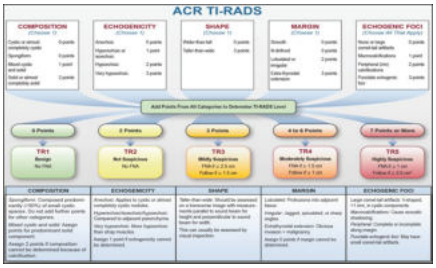
Horvath et al. have offered ten sonological patterns to be analyzed during the ultrasound examination and nodule classification from TIRADS 2–6 (category 4 divided into 4A and 4B).[7] They estimated a risk of malignancy of 0% in TIRADS 2, 3.4% in TIRADS 3, 10–80% in TIRADS 4, and 87% in TIRADS 5.

Kwak et al. proposed a TIRADS classification by retrospective analysis of thyroid nodules in ultrasound and FNA, using five sonological criteria that can be added during thyroid evaluation.[8] This article describes that a malignancy risk of 0% is expected for TIRADS 2, 1.7% for TIRADS 3, a risk of 3.3–72.4% for TIRADS 4, and of 87.5% for TIRADS 5.

Ultrasound classification system the thyroid nodules are classified into benign, probably benign, borderline, probably malignant, malignant.

Thyroid ultrasound classification system proposed by Kim et al





Results :

The total number of clinically suspected cases studied were 50 among which the nodules were absent in USG examination in 10 cases. These 10 cases were excluded. The remaining Total number of cases included were 40. Histopathology proven Malignant cases were 4 cases.

ACR TIRADS -
TR 1 - 20
TR 2 - 8
TR 3 -5
TR 4 -3
TR5 - 4

Ultrasound based classification system-
Benign-20
Possibly benign - 2
Borderline-1
Possibly malignant-6
Malignant-1

Using Statistical Package for Social sciences (SPSS) and students- t test; sensitivity, specificity and P values were found out.

TIRADS 1 cases include 20 cases
TIRADS 5 were 4 cases and TIRADS 3 were 3 cases,
According to USG based clssiffication system the malignant cases were 1 and possibly malignant were 8.The benign cases were 27.

For diagnosing malignant lesion -
ACR TI-RADS- Sensitivity -1 Specificity- 0.899

Ultrasound classification system
Sensitivity-1 Specificity -0.815

Conclusion

1.Diagnostic ACR TIRADS is reliable, efficient, easier and simpler than other classification system for identifying between benign with malignant and neoplastic with non neoplastic lesions.
2.The ACR TI-RADS risk-stratification system allows clinicians to determine whether thyroid nodules require biopsy, follow-up or no further action based on their US appearance.

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