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Original Research Paper

Radio-Diagnosis

ACCURACY OF ACR-TIRADS IN ROUTINE USG REPORTING

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ABSTRACT Nodules in the thyroid gland are very common. As per the American Thyroid Association (ATA), thyroid nodules are defined as "discrete lesions within the thyroid gland, radiologically distinct from the surrounding thyroid parenchyma". The incidence of thyroid cancer has been increasing worldwide in the last few decades (1). Papillary thyroid carcinoma attributes more than other histological subtypes of thyroid carcinoma (2,3). . The malignant nature of the nodule cannot be determined by physical examination and blood tests alone; hence specialized tests such as thyroid ultrasonography and fine needle biopsy are often required (4). **Objective:** To establish the accuracy of ACR-TIRADS classification system in the diagnosis of thyroid nodules in routine USG reporting and also to evaluate their Doppler characteristics. **Results & Conclusion:** To conclude the study, the proper stratification of the thyroid nodules on ultrasound-based TIRADS system helps us to determine the probability of a particular nodule being malignant with a certain level of confidence and appropriate measures for management of the nodule can be initiated, thus avoiding unnecessary FNA procedures. The addition of Color Doppler further strengthens the probability of a nodule being malignant and thus prompt action can be initiated by the referring clinician/surgeon.

KEYWORDS : thyroid nodule, ACR-TIRADS, Doppler, thyroid ultrasound

INTRODUCTION

Thyroid nodules can be found in up to 50% of healthy adults, however only a few of them are evident on physical examination. (5). Their prevalence rates largely depend on the identification method and also on the population studied.

The prevalence rates of thyroid nodules range from 2-6% by just palpation, 19-35% by using imaging modalities like high resolution ultrasonography and 8-65% in autopsy data (6).

Of all the imaging techniques, ultrasonography is highly accurate for the evaluation of thyroid nodules being cost-effective at the same time.

Till date many classification systems have been developed to utilize grey scale US and Color Doppler in order to differentiate benign from malignant thyroid nodules. Based on the footprints of BIRADS for breast nodule, a similar US-based thyroid risk stratification system namely thyroid imaging reporting and data system (TIRADS) has been proposed by the American College of Radiology which further aids in the effective management of the patient (7).

Therefore, the present study combines the Color Doppler study of thyroid nodules with the ultrasound features of the nodules on grey scale in predicting the malignant potential of the nodules.

Research plan

A. Institution: A tertiary care hospital in Central India.
B. Source: Department of ENT, Surgery.

Inclusion Criteria:

- All patients above 18 years of age with clinically suspicious thyroid lesions (palpable nodules) who will undergo subsequent fine needle aspiration cytology examination.
- All patients showing thyroid nodules on B-mode ultrasound who will undergo subsequent fine needle aspiration cytology examination.

Exclusion criteria:

- Patients not willing to participate in the study and not giving consent.
- Patients with clinically suspicious thyroid lesions but not showing evidence of nodules on B-mode ultrasound.
- Patients with diffuse thyroid disease.
- Patients with FNAC / biopsy proven nodules.

MATERIAL & METHODS

Ethical approval was waived off from the institutional ethical committee.

All the patients underwent high resolution duplex sonography using GE Logiq S8 US machine with a linear transducer and subsequent ultrasound guided fine needle aspiration cytology examination. All participants gave oral and written consent prior to inclusion. The nodules were classified based on the ACR-TIRADS classification system. The sensitivity of this classification system was then tested using FNAC as the gold standard.

OBSERVATION & RESULTS

The nodules were categorized based on the composition, echogenicity, shape, margins and echogenic foci within the nodule.

A total of 100 patients were included out of which 83 were females. These thyroid nodules are predominantly found in and around fourth–sixth decade. The patients in this age group amount to 59% of our study population. Most of the thyroid nodules come under TIRADS 1 and TIRADS 2 grades on ultrasound imaging, accounting for around 73% of the nodules picked up on ultrasound. Likewise, most of the nodules turned out to be Bethesda II on FNAC.

Out of the 100 nodules, 23 were categorized under TIRADS 1, 50 were classified under TIRADS 2, 7 were classified under TIRADS 3, 7 were classified under TIRADS 4 and 13 were classified under TIRADS 5. The nodules classified as Bethesda I and II were considered benign, and those nodules classified as Bethesda III–VI were considered malignant.

Out of the 23 TIRADS 1 nodules, none turned out to be malignant on FNAC. Out of the 50 TIRADS 2 nodules, only 2 nodules turned out to be malignant on FNAC. Among the 7 nodules labeled as TIRADS 3, 1 nodule turned out to be benign and 6 had inconclusive cytology reports even on repeat sampling. There were few nodules which appeared suspicious on ultrasound (25%) to be classified under TIRADS 4 and TIRADS 5 but turned out to be benign in Bethesda classification.

We calculated the diagnostic indices for USG vs FNAC and combined USG and Doppler vs FNAC (Sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and accuracy). TIRADS scores 3, 4 and 5 were considered positive for malignancy, while scores 1 and 2 were considered negative for malignancy. Data were analyzed by Chi-square test or Fisher's exact test for categorical variables of benign and malignant nodules ($P < 0.001$).

The zero percent risk of TIRADS 3 nodules was attributed to the inconclusive results even on repeated FNAC, hence we consider the risk of TIRADS 3 as inconclusive from our study.

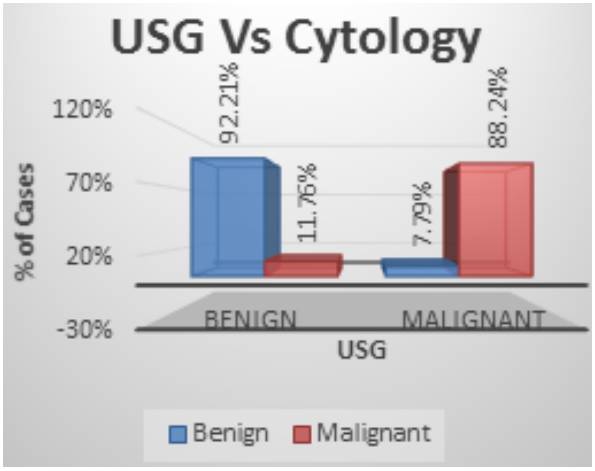

Table 1: Comparison of benign and malignant nodules in USG vs FNAC

Sensitivity	94.23%
Specificity	100%
NPV	82.35%
Diagnostic Accuracy	95.45%

Table2: Diagnostic indices of USG + Doppler vs FNAC

Sensitivity	88.2%
Specificity	92.2%
PPV	71.4%
NPV	97.3%
Diagnostic Accuracy	91.5%

Table 3: Diagnostic indices of USG vs FNAC

TIRADS	Horvath et al	Moifo et al	Kwak et al	Fernandez Sanchez	Sriniwas et al	Present study
TIRADS 1	0	0	0	0	0	0
TIRADS 2	0	0	0	0	0	4
TIRADS 3	3.4	2.2	1.7	2.2	0.64	0*
TIRADS 4	7-27	5.9-57.9	3.3-72.4	9.5-85	4.7-83.3	71.4
TIRADS 5	87	100	87.5	100	100	76.9

Table 4: comparison of the risk of malignancy (%) in different studies

CONCLUSIONS

To conclude the study, the proper stratification of the thyroid nodules on ultrasound-based TIRADS system helps us to determine the probability of a particular nodule being malignant with a certain level of confidence and appropriate measures for management of the nodule can be initiated, thus avoiding unnecessary FNA procedures. The addition of Color Doppler further strengthens the probability of a nodule being malignant and thus prompt action can be initiated by the referring clinician/surgeon.

The nodules with features like hypo echogenicity, punctate echogenic foci, taller than wider shape, ill-defined margins, solid composition and intranodular vascularity are highly suspicious of malignancy.

At the end of our study, none of the nodules classified under TIRADS 1 turned out to be malignant. Also, only 2 out of 50 TIRADS 2 nodules (4%) proved malignant on FNAC. Therefore, it can be safely assumed that FNA may be deferred at least in patients having TIRADS 1 and 2 nodule, which contribute to majority of newly detected cases and thereby avoiding unnecessary surgeries. The TIRADS 2 nodules carry a risk of approximately 4% in the present study and in case of clinically high suspicion, such nodules should be correlated with clinicopathological findings and followed up for increase in size.

2 out of total 17 (11.76%) malignant nodules were falsely labelled as benign based on US features alone. In spite of the high sensitivity and specificity, US cannot be a definitive diagnostic tool for malignant thyroid nodules. Therefore, in cases of very high suspicion, the definitive diagnostic techniques should always be sought for whenever the situation demands.

Thus, the ACR-TIRADS is a reliable stratification system which standardizes the evaluation of thyroid nodules on ultrasonography; the combined approach by grey scale US and Color Doppler further strengthens our findings and facilitates comprehension between different specialties.

In spite of the high sensitivity and diagnostic accuracy of ACR-TIRADS classification, FNAC or Biopsy still remains the definitive diagnostic tool for thyroid nodule evaluation. The stratification of thyroid nodules based on the ACR-TIRADS cannot completely replace the pathological evaluation and there is further scope for improvements and standardization in the imaging of thyroid nodules.

Limitations of the study

- The shorter duration of the study
- A relatively smaller sample size as compared to the prior similar studies.
- Inter-observer variation in cytology reporting.

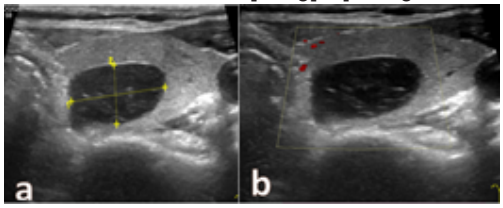

Figure 1: Grey scale US showing the nodule in the left lobe of thyroid gland with comet tail echogenic foci. On FNAC, adenomatoid nodule.

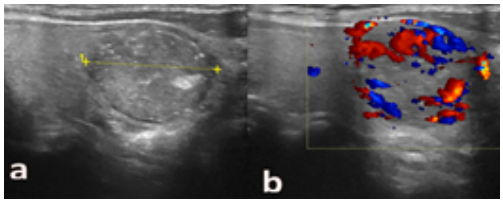

Figure 2 : Grey scale US showing the nodule in the left lobe

of thyroid gland (a), Color doppler showing intranodular vascularity (b). On FNAC, papillary carcinoma of thyroid gland.

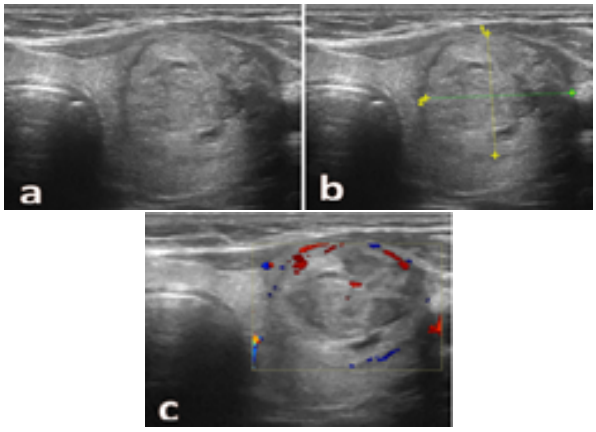

Figure 3: Grey scale US showing the nodule in the left lobe of thyroid gland (a, b), Color doppler showing predominantly peripheral vascularity (c). On FNAC, follicular neoplasm.

REFERENCES:

[1] Vargas-Uricoechea H, Herrera-Chaparro J, Meza-Cabrera I, Agredo-Delgado V. Thyroid cancer–South American experience, J. Thyroid Disord. Ther. 2015;4:182.
[2] Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. International journal of cancer. 2015 Mar 1;136(5):E359-86.
[3] Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries (vol 68, pg 394, 2018). Ca-a Cancer Journal for Clinicians. 2020 Jul 1;70(4):313-.
[4] TUTTLE RM. American Thyroid Association Thyroid Cancer Management Guidelines: utilising risk stratification to optimise patient care.
[5] Popli MB, Rastogi A, Bhalla PJ, Solanki Y. Utility of gray-scale ultrasound to differentiate benign from malignant thyroid nodules. The Indian journal of radiology & imaging. 2012 Jan;22(1):63.
[6] Dean DS, Gharib H. Epidemiology of thyroid nodules. Best practice & research Clinical endocrinology & metabolism. 2008 Dec 1;22(6):901-11.
[7] Tessler FN, Middleton WD, Grant EG, Hoang JK, Berland LL, Teefey SA, Cronan JJ, Beland MD, Desser TS, Frates MC, Hammers LW. ACR thyroid imaging, reporting and data system (TI-RADS): white paper of the ACR TI-RADS committee. Journal of the American college of radiology. 2017 May 1;14(5):587-95.