ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 11 | November - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ULTRASOUND-BASED TIRADS AND PATHOLOGICAL CORRELATION BY FNAC (BETHESDA SYSTEM).

Radiodiagnosis

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ABSTRACT

PURPOSE: To classify the thyroid nodules into Thyroid Imaging Reporting And Data System (TIRADS) category based on suspicious ultrasound features, To compare the suspicious ultrasound features with the pathological findings and to analyse the risk of malignancy.

MATERIALS AND METHODS: The present study was a prospective observational study which was conducted on 50 patients in the department of radiology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru for a period of one year January 2020 to December 2020 who are referred to radiology department for evaluation of thyroid nodules. Scans are performed using Philips affinity 70G ULTRASOUND MACHINE.

RESULTS: Risk of malignancy for TIRADS category 2,3,4 and 5 was 0, 2, 62.5, 100% respectively and with 83.3% sensitivity, 89.5% specificity, 71.4% PPV, and 94.4% NPV in this study.

CONCLUSION: The probability of a particular nodule being malignant can be effectively inferred from the ultrasound-based TIRADS system with a certain level of confidence. Considering our results and other literature reviews, it be can be safely assumed that FNAC can be at least deferred in patients having TIRADS 2 nodules, which contribute to majority of newly detected cases. In our experience, there is a remarkable correlation exists between TIRADS ultrasound classification and cytology, especially for benign nodules.

KEYWORDS

Thyroid nodules, TIRADS, BETHESDA, Malignancy.

INTRODUCTION:

Nodules in the thyroid are sometimes identified by just palpation, the prevalence rate ranges from 4 to 7%[1,2] Whereas by using the imaging modalities such as the high-resolution ultrasonogram, it ranges from 20 to 76% in the adult population.The nodules discovered with radiographic studies are called "thyroid incidentalomas."[2,3]

The main concern for the evaluation of thyroid nodules is the possibility of malignancy.The average prevalence of malignancy rates across the world in thyroid nodules, as evaluated by invasive procedure ranges from 4.0 to 6.5%.[4,5]Due to the abundant use of ultrasound, the increased access to cytology analysis through fine-needle aspiration cytology (FNAC) guided by ultrasound and with the recent advances in functional imaging modalities such as 18 FDG-PET imaging, the incidental diagnoses of thyroid nodules are increasing.Studies have proposed that, even though incidence of discovery of thyroid nodules during 18 FDG-PET imaging is few (1–2%), the malignant potential may be as high as 27%, these nodules warrant immediate evaluation.[6]

Thyroid nodules:

The American Thyroid Association defined thyroid nodules as "discrete lesions within the thyroid gland, radiologically distinct from surrounding thyroid parenchyma."[7].The gender disparity is perhaps explained by the hormonal influences of both estrogen and progesterone, as increasing nodule size and new nodule development have been demonstrated to be related to pregnancy and multiparity.[8].

AIM OF THE STUDY:

To classify the thyroid nodules into Thyroid Imaging Reporting And Data System (TIRADS) category based on suspicious ultrasound features, To compare the suspicious ultrasound features with the pathological findings and to analyse the risk of malignancy.

MATERIALS AND METHODS:

The present study was a prospective observational study which was conducted on 50 patients in the department of radiology, Alluri Sitarama Raju Academy of Medical Sciences, Eluru for a period of one year January 2020 to December 2020 who are referred to radiology department for evaluation of thyroid nodules. Scans are performed using Philips affinity 70G ULTRASOUND MACHINE.

Patients are placed in supine position with hyperextension of neck which can be achieved by placing a pillow underneath the shoulders. Scanning fields includes the central neck from lower border of mandible to sternal notch, including bilateral cervical nodal chains.

A careful evaluation of following parameters was performed on all thyroid nodules: echogenicity of nodules, microcalcifications within nodules, colour doppler flow imaging of nodules and lesions are classified according to TIRADS system which were compared to pathological results based on Bethesda classification.

INCLUSION CRITERIA:

Patients who have thyroid nodule in B-mode ultrasound and are scheduled to get an FNAC done are included in this study.

EXCLUSION CRITERIA:

Normal thyroid scan (TIRADS 1) and proven case of thyroid malignancy (TIRADS 6) were not included in this study.

OBSERVATIONS AND RESULTS:

- A total of 50 patients were included in this study, out of which 38 were females. These thyroid nodules are predominantly found in and around third–sixth decade of life, amount to 35 patients of our study population.
- Most of the thyroid nodules mostly come under TIRADS 2 and TIRADS 3 classifications on ultrasound imaging, accounting for around 72% of the nodules picked up on ultrasound.
- Likewise, most of the nodules (approximately 70%) turn out to be Bethesda I and II on invasive tests. 3 out of 50 nodules (6%) were detected and proven to be malignant by postoperative studies.
- In our study, 50 thyroid nodules which were scheduled to get an FNAC done were initially assessed using ultrasound and TIRADS scoring was given for each case.
- The cases which were already a proven case of malignancy (TIRADS 6) were not included in this study.Out of the 50 nodules, 26 were categorized under TIRADS 2, 10 were classified under TIRADS 3, 8 were classified under TIRADS 4, and 6 were classified under TIRADS 5.
- The nodules classified as Bethesda I and II were considered benign, and those nodules classified as Bethesda IV–VI were considered malignant. The results we obtained have been tabulated.

Table 1:

		FNAC (Bethesda)					
TIRADS	Results	I	II	III	IV	V	VI
	2	1	24	1	-	-	-
	3	1	6	1	2	-	-
	4	1	2	-	1	3	1
	5	-	-	-	2	3	1

- There were few nodules which appeared suspicious on ultrasound to be classified under TIRADS 4 turned out to be benign in Bethesda classification.
- Sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and accuracy were also calculated based on histopathological results. TIRADS scores 4 and 5 were considered positive for malignancy, while scores 1–3 were considered negative for malignancy.
- Cross-tabulation of TIRADS and Bethesda was prepared.

Table: 2

FNAC (Bethesda) Results		
Malignancy	**Positive**	**Negative**
Positive	10	4
Negative	2	34

- **We derived at 83.3% sensitivity, 89.5% specificity, 71.4% PPV, and 94.4% NPV for our study.**
- Significant association was noticed between TIRADS and Bethesda system of classification ($P < 0.001$).
- **On comparing TIRADS result with Bethesda system of classification, the risk of malignancy for TIRADS 2, TIRADS 3, TIRADS 4, and TIRADS 5 was 0, 2, 62.5, 100% respectively.**
- The risk of malignancy for patients classified TIRADS 4 was estimated at 31.2 times the risk for those rated as 3. The risk of malignancy for patients classified TIRADS 5 was estimated at 50 times the risk for those rated as 3.
- FNAC results - Adenomatoid nodule, colloid nodule, lymphocytic thyroiditis, papillary and follicular carcinoma of thyroid contributed 42, 35, 12, 4, and 1%, respectively.Six percent of the nodules were found to be unsatisfactory for evaluation even in repeated FNACs mainly due to cystic nature of the nodules.

DISCUSSION:

Ultrasound of thyroid should be performed in the initial assessment of the gland and the nodule. Since the prevalence of thyroid nodule is very high, patients for whom FNAC should be recommended is still controversial.

FNAC is a useful and inexpensive tool for detecting malignancy of thyroid, but it is a minimally invasive procedure. Performing such test in all thyroid nodules is neither cost effective nor advisable, thus it is important to select the cases according to their malignancy risk.

The TIRADS system of classification desires to correlate sonographic features to cytological classification.

One of the recent studies revealed the fact that 7.3% of malignant nodules did not have suspicious malignant features on ultrasound.[9]

Some of the sonographic features gradually increase the risk of malignancy in a nodule. The sonological features included in our study are echogenicity, microcalcifications, taller than wider shape, presence of suspicious lymph node, irregular margins, and peripheral halo.

It should be understood that not the presence or the absence of a single particular feature on ultrasound was associated with the nodule's malignancy. It must always be remembered that an amalgam of at least two of the sonological features are more accurate in differentiating a benign nodule and a high-risk nodule for malignancy than just one of these sonological feature alone.[1011]

Among the classifications proposed from all over the world and their comparision with our study is tabulated as follows.

Table: 3

Percentage of malignancy risk				
STUDY	TIRADS 2	TIRADS 3	TIRADS 4	TIRADS 5
OUR STUDY	0	2	62.5	100
Kwak et al.[12]	2	1.7	3.3-72.4	87.5
Moifo et al[13]	0	2.2	5.9-57.9	100
Anuradha et al.[14] **(In PPV)**	6.6	32	36, 64, 59 (4A, 4B, 4C)	91
Srinivas et al.[15]	0	0.64	4.7, 66.6, 83.3 (4A, 4B, 4C)	100

Our results are within the range suggested by Kwak et al., Moifo et al., and two other studies based on Indian population.

CONCLUSION:

In conclusion, if the nodules are properly classified on ultrasound, the probability of a particular nodule being malignant can be inferred from the ultrasound-based TIRADS system with a certain level of confidence and appropriate measures for management of the nodule can be initiated, thus avoiding unnecessary FNA procedures.

At the end of our study, none of the nodules classified under TIRADS 2 turned out to be malignant; therefore, it can be safely assumed that FNA may be deferred at least in patients having TIRADS 2 nodule, which contribute to majority of newly detected cases and thereby avoiding unnecessary surgeries.

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