

Correlation Study of Cytology and Radiology (Ultrasound) in Diagnosing Thyroid Nodules using BETHESDA and TIRADSLakshita Rohilla¹, Aditi Baghla², Anju Yadav³, Abhijit Garg⁴¹Postgraduate Resident, Department of Pathology, Maharaja Agrasen Medical College Agroha, Hisar, Haryana²Professor and Head, Department of Pathology, Maharaja Agrasen Medical College Agroha, Hisar, Haryana³Professor and Head, Department of Radiology, Maharaja Agrasen Medical College, Agroha, Hisar, Haryana⁴Post Graduate Resident, Department of Pathology, Maharaja Agrasen Medical College Agroha, Hisar, Haryana

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Abstract:

Introduction: Thyroid is afflicted by various pathologies ranging from diffuse enlargement to nodular lesions. Nodules in thyroid are of greatest concern as they may have an underlying malignancy. Ultrasound is considered an initial investigation in diagnosing thyroid nodules and cytology remains confirmatory. Due to lack of a standardized system for reporting, interpretation of cytology reports was difficult for clinicians. So for the provision of uniform diagnostic terminology a standardized category based evaluation was proposed as The Bethesda System of Reporting Thyroid Cytology (TBSRTC). The combination of TIRADS with TBSRTC together was found to have high sensitivity and specificity. Our study aims to analyse the diagnostic utility of TIRADS and TBSRTC in reporting thyroid cytology and to observe the concordance.

Result & Conclusion: The Sensitivity, Specificity, PPV and NPV were found out to be 83.33% and 87.5% 62.5% and 95.45% respectively. The test and the gold standard agree on 52 out of 60 having a diagnostic accuracy of 86.66%. Stratification of thyroid nodules according to TIRADS, can help in limiting the FNAC only on suspicious nodules, thus avoiding unnecessary aspiration. FNAC is a minimally invasive and inexpensive tool but such invasive procedure can be avoided for patients belonging to TIRADS I and II. FNAC as a confirmatory test should be performed in TIRADS III, IV, V nodules.

Keywords: Thyroid nodule, BETHESDA, TIRADS, Cytology, Radiology.

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Introduction

The thyroid is a butterfly shaped gland situated at the base of the neck. Thyroid is afflicted by various pathologies ranging from diffuse enlargement to nodular lesions. [1] Nodules in thyroid are of greatest concern as they may have an underlying malignancy. [2] Ultrasound is considered an initial investigation in diagnosing thyroid nodules and cytology remains confirmatory. [3]

Those who present with suspicious lesions are advised cytological investigation i.e. Fine Needle Aspiration Cytology (FNAC) which is an easily available screening test. [4] It can effectively categorize patients with neoplastic and non-neoplastic thyroid nodules as whether they require surgery or not. [5] Due to lack of a standardized system for reporting, interpretation of cytology reports was difficult for clinicians. So for the provision of uniform diagnostic terminology a

standardized category based evaluation was proposed as The Bethesda System of Reporting Thyroid Cytology (TBSRTC). The combination of TIRADS with TBSRTC together was found to have high sensitivity and specificity. [6] This atlas describes six diagnostic categories of lesions.

Nondiagnostic/Unsatisfactory is category (I), Benign is category (II), Atypical Follicular Lesion of Undetermined Significance AFLUS is categorized as category (III), Suspicious for Follicular Neoplasm comes under category (IV), suspicious for malignancy is classified as category (V) and malignant lesions come under category (VI). [7,8]

Similar studies have been conducted by Grandhi et al [9], Alshaikh et al [10], Biswas et al [11], Singaporewalla [12] et al and Tuladhar et al [13].

Aim of Study

The present study aims at classifying the thyroid nodules based on ultrasound and cytological features using TIRADS and BETHESDA system respectively and to compare the result and to correlate the findings of FNAC with that of ultrasound.

Materials and Method

The present study is a hospital based cross sectional study conducted in the Department of Pathology in collaboration with the Department of Radiodiagnosis and Imaging of Maharaja Agrasen Medical College, Agroha, Hisar, Haryana. The study spans over one year from December 2022 to December 2023.

Inclusion Criteria

1. Patients presenting with a palpable thyroid nodule.
2. Patients presenting with enlarged thyroid gland.
3. Patients giving consent for the study.

Exclusion Criteria

1. Scant aspirate.
2. Patients not giving consent for the procedure.
3. No TIRADS available.

4. Normal thyroid scans and biopsy proven cases of thyroid malignancy will not be included in this study.
5. Patients who will have persistent Bethesda I (Nondiagnostic after two attempts).

Method: Ultrasound of patients presenting with thyroid nodules is done using Vivid iQv204 ultrasound machine with high frequency probe 9L-RS probe (3-10 Megahertz). The patient is made to lie supine with neck slightly extended and high resolution ultrasound is done and thyroid nodules are staged according to TIRADS. The neck is then assessed for enlarged lymph nodes. FNAC is done under completely aseptic conditions, skin overlying is cleared using spirit swabs. A 10 ml disposable syringe with a 22 gauge needle is introduced into the lesion. Repeated light trauma is given and material is withdrawn by aspiration and spread on glass slides. Slides are then fixed in 95 % methanol in a coplin jar. After fixation slides are stained with Field stain and H&E stain and examined under the microscope for cytological features. Bethesda staging is done and results are obtained.

Observation

Table 1: Age Wise Distribution Of Cases

Age groups	Number of patients	Valid Percent
<30	19	31.7
31-40	15	25
41-50	17	28.3
51-60	7	11.7
>60	2	3.3
Total	60	100

In our study out of the total 60 cases, 19 cases were less than 30 years. This age group constituted majority of the cases. 15 cases were in the 31-40 age group, 17 in the 41-50 age group, 7 in 51-60 years, and only 2 cases were above 60 years of age. Out of 60 cases, there were predominantly females i.e. 51 were females and 9 were males. Females comprised 85% of the study subjects.

Table 2: Distribution of Cases According To TIRADS

TIRADS Score	Number of patients	Valid Percent
TIRADS I	1	1.7
TIRADS II	21	35.0
TIRADS III	22	36.6
TIRADS IV	10	16.66
TIRADS V	6	10.0
Total	60	100

All the 60 study cases presenting with thyroid nodules were subjected to ultrasonography and the radiological characters were assessed. The lesions were graded based on shape, margin, composition, echogenicity, and echogenic foci. The scores for each criteria were added and TIRADS was assigned. Of the total 60 study cases only 1 case was in Category I, 21 were in Category II, 22 in

Category III, 10 were in Category IV, and 6 in Category V. The thyroid nodules presenting as TIRADS I comprised 1.7% of our study subjects. The thyroid nodules with TIRADS II comprised 35.0% of cases, TIRADS III constituted 36.6% and TIRADS IV and V constituted 16.6% and 10.0% each.

Table 3: Distribution of cases according to BETHESDA

Bethesda Score	Number of patients	Valid Percent
BETHESDA I	1	1.7
BETHESDA II	47	78.33
BETHESDA III	2	3.33
BETHESDA IV	2	3.33
BETHESDA V	4	6.66
BETHESDA VI	4	6.66
Total	60	100

Following ultrasonography, fine needle aspiration of the thyroid nodule was done, and based on cytological characteristics each case was categorised into Bethesda categories. Of the 60 cases, only 1 case was in Category I, the majority i.e. 47 were in Category II, 2 were in Category III, 2 in Category IV, 4 in Category V, and 4 in Category VI.

Table 4: Distribution of cases as per diagnosis

	Diagnosis	Valid Percent
Adenomatous goitre	3	5
AUS	2	3.3
Colloid cyst	1	1.7
Colloid Goitre	15	25.0
Follicular neoplasm	1	1.7
Follicular Neoplasm (Hurthle cell type)	1	1.7
Lymphocytic Thyroiditis	25	41.7
Medullary Carcinoma	1	1.7
Nodular goitre	2	3.3
Papillary Carcinoma thyroid	3	5
Suspicious for malignancy	4	6.6
Thyroglossal cyst	1	1.7
Undiagnostic	1	1.7
Total	60	100

Of all the 60 cases majority were diagnosed as benign out of which 25 cases were of Lymphocytic thyroiditis which formed the bulk followed by Colloid Goitre (15 cases).

Table 5: Cross tabulation for BETHESDA and TIRADS

			Bethesda Score						Total
			BE-THES-DA I	BE-THES-DA II	BE-THES-DA III	BE-THES-DA IV	BE-THES-DA V	BE-THES-DA VI	
TI-RADS Score	TIRADS I	Count	0	1	0	0	0	0	1
		% of Total	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	1.7%
	TIRADS II	Count	0	21	0	0	0	0	21
		% of Total	0.0%	35.0%	0.0%	0.0%	0.0%	0.0%	35.0%
	TIRADS III	Count	1	19	1	0	1	0	22
		% of Total	1.7%	31.7%	1.7%	0.0%	1.7%	0.0%	36.7%
	TIRADS IV	Count	0	6	1	1	2	0	10
		% of Total	0.0%	10.0%	1.7%	1.7%	3.4%	0.0%	16.7%
	TIRADS V	Count	0	0	0	1	1	4	6
		% of Total	0.0%	0.0%	0.0%	1.7%	1.7%	6.8%	10%
	Total	Count	1	47	2	2	4	4	60
		% of Total	1.7%	78.33%	3.4%	3.4%	6.8%	6.8%	100.0%

Out of 22 cases in TIRADS III, 1 was found undiagnostic (TBSRTC I), 19 were benign (TBSRTC II), 1 showed atypia of undetermined significance (TBSRTCIII) and 1 was suspicious of malignancy (TBSRTC V). Out of 10 cases in TIRADS IV, 6 were benign (TBSRTC II), 1 was

categorised as TBSRTC III, 1 as Follicular neoplasm (TBSRTC IV) and 2 were suspicious for malignancy (TBSRTC V). Out of 6 cases in TIRADS VI, 1 was Follicular Neoplasm (TBSRTC IV), 1 was suspicious for malignancy (TBSRTC V), and 4 were found malignant (TBSRTC VI).

Table 6: Table Showing Statistical Variables

Sensitivity	83.33%
Specificity	87.5%
Positive Predictive Value	62.5%
Negative Predictive Value	95.45%
Screening Test	Ultrasound
Gold Standard	Fine Needle Aspiration Cytology
P Value	<0.001
Kappa Statistics	0.71

On evaluation and calculations considering ultrasound as screening test and FNAC as diagnostic gold standard, Sensitivity was 83.33%, Specificity was 87.5%, Positive Predictive Value (PPV) was 62.5%, Negative Predictive Value (NPV) was 95.45%.

Conclusion:

FNAC is a minimally invasive and inexpensive tool for detecting malignancies in thyroid nodules. But such invasive procedures like FNAC and Biopsies can be avoided for patients belonging to TIRADS I and II as they are neither cost effective nor advisable. Stratification of lesions according to TIRADS, can help in limiting the fine needle aspiration only on suspicious nodules, thus avoiding unnecessary aspiration of thyroid nodules. FNAC has been found to be the most useful line of investigation as compared to ultrasound, thyroid function test, thyroid scan, and serological tests in diagnosing suspicious thyroid nodules as it has good amount of accuracy. This has been demonstrated in various studies conducted. Similar results have been obtained in the present study which has shown a fairly good correlation of 86.66% on thyroid ultrasound reporting using the ACR TIRADS classification with the BETHESDA classification of thyroid nodules. It is further advisable that FNAC can be completely avoided in TIRADS I & II nodules. FNAC as a confirmatory test should be performed in TIRADS III, IV, V nodules.

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