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COMPARATIVE EVALUATION OF THYROID IMAGING REPORTING AND DATA SYSTEM (TIRADS) USING ULTRASONOGRAPHY AND THE BETHESDA SYSTEM FOR REPORTING THYROID CYTOPATHOLOGY (TBSRTC) - A PROSPECTIVE STUDY

Pathology

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ABSTRACT

Thyroid lesions are commonly encountered in clinical practice worldwide. The accurate diagnosis of thyroid lesions depends on the clinical history, thyroid function tests (TFT), ultrasonography (USG) and FNAC (Fine Needle Aspiration Cytology). USG and FNAC are performed to stratify the thyroid lesions using TIRADS and TBSRTC respectively. It is desirable to stratify thyroid lesions so that the most appropriate treatment can be selected for all thyroid lesions.

KEYWORDS

TIRADS, TBSRTC, USG, FNAC.

INTRODUCTION

Thyroid lesions are very common in clinical practice and are seen in 8.5% of the world's population. Most of these lesions are benign and about 5–10% of them are malignant.[1] In India, according to GLOBOCAN 2022 data, there were 821,214 reported cases of thyroid cancer and 47,507 deaths attributed to the disease across all ages and sexes. Thyroid cancers have excellent prognosis if they are detected early and treated appropriately. Therefore, it is crucial to identify suitable tools to assess the malignancy risk in all patients with thyroid lesions.[2] It has been hypothesized that in the recent years, the higher thyroid cancer incidence is mostly due to improvement in detection rather than actual increase in frequency of the lesions. The two worldwide used standard Investigations in evaluation of various thyroid lesions are USG and FNAC. USG and FNAC should be done prior to surgery to stratify thyroid lesions into malignant and non-malignant so that only the suspicious lesions undergo surgery. Thyroid lesions are given different scores based on TIRADS (Thyroid Imaging Reporting and Data System) using USG and are categorized as per TBSRTC (The Bethesda System for Reporting Thyroid Cytopathology) on FNAC.

Tirads

The various sonographic features considered for characterizing thyroid lesions are echogenicity, internal composition, margins, calcifications and the shape of the lesion. TIRADS score is determined by considering all these criteria. Higher TIRADS score is associated with malignant thyroid lesion. The worldwide used thyroid malignancy risk stratification system is the American Thyroid Imaging Reporting and Data System (TIRADS).[3]

Tbsrtc

TBSRTC (The Bethesda System for Reporting Thyroid Cytopathology) is a standardized, category-based evaluation of thyroid FNAs to provide a uniform diagnostic terminology for pathologists across the globe and facilitate efficacious communication between cytopathologists, radiologists, surgeons, endocrinologists and other health care providers, hence facilitating sharing of data across the globe.[4]

Tbsrtc 2023 [5]

TBSRTC 2010 and 2017 had already established six diagnostic categories for reporting thyroid FNA and standardized the reporting system for the same. Built on the popularity of the previous two editions, the third edition (2023) provides a number of significant updates. The most important is assigning a single name for each diagnostic category, therefore discontinuing the terms that were previously in use like “unsatisfactory”, “FLUS” (follicular lesion of undetermined significance) and “suspicious for follicular neoplasm" from TBSRTC I, TBSRTC III and TBSRTC IV respectively.

TBSRTC 2023 categories are as follows: i) Non-Diagnostic. ii) Benign. iii) AUS (Atypia of undetermined significance). iv) Follicular neoplasm. v) Suspicious for malignancy. vi) Malignant.

Based on the data reported following the second edition, each category was assigned with risk of malignancy (ROM), which has been updated and revised in third edition. Together with the anticipated range of cancer risk, the third edition provides mean ROM for all the groups (table 1).

Table 1. DIAGNOSTIC CATEGORIES WITH IMPLIED RISK OF MALIGNANCY AND RECOMMENDED CLINICAL MANAGEMENT [5]

DIAGNOSTIC CATEGORY	RISK OF MALIGNANCY (Mean %)	USUAL MANAGEMENT
1.Non diagnostic	13 (5-20)	Repeat FNA with USG guidance
2. Benign	4 (2-7)	Clinical and sonographic follow-up
3. AUS	22 (13-30)	Repeat FNA, molecular testing or lobectomy or surveillance
4. Follicular Neoplasm	30 (23-24)	Molecular testing or diagnostic lobectomy
5. Suspicious For Malignancy	13 (5-20)	Molecular testing , lobectomy/ total thyroidectomy
6. Malignant	13 (5-20)	Lobectomy or near- total thyroidectomy

Aims And Objectives

Our study was conducted to analyse:

1. TIRADS score using USG in a thyroid swelling.
2. TBSRTC category using FNAC in the same thyroid swelling.
3. Comparative evaluation of the findings of TIRADS and TBSRTC

so obtained in the thyroid swelling.

MATERIALS AND METHODS

This prospective study was conducted in Department of pathology, Government Medical College, Amritsar, Punjab. A total of 50 patients were evaluated, irrespective of their age and sex, presenting with thyroid lesion in the Department of Medicine, Department of Surgery and Department of Radiodiagnosis, Guru Nanak Dev Hospital, Amritsar. The clearance was obtained from institutional ethical committee for the study. The patients were explained in their vernacular language about the procedure to be followed in the study and their written informed consent was taken.

Inclusion Criteria:

All the patients presenting with primary thyroid swelling as clinically diagnosed by physician or surgeon along with the TIRADS score given by the radiologist on USG.

Exclusion Criteria:

1. Any systemic disorder involving the thyroid gland like amyloidosis, any metastatic disease etc.
2. Any other causes of swelling neck like lymphadenopathy, other causes of cystic swellings in the neck etc.

Study Design: Prospective study.

Procedure:

1. Ultrasonography (USG).
2. USG guided and palpation guided FNAC.

Statistical Analysis:

The data was collected for the study, using a structured proforma. The data was gathered from the history, clinical examination and the investigation reports of the participants. Data was analyzed using SPSS 20 software (IBM Corporation, Armonk, NY, USA). The linear-weighted Kappa was calculated with 95% confidence interval (CI) along with the Z-test to study the strength of agreement between the results of two systems namely TIRADS and TBSRTC. The p value <0.05 was considered significant.

RESULTS

In our study the maximum number of patients belonged to the age range of 30-40 years, with a mean age of 41.56 ± 13.22 years. Females constituted 84% of the study population, with a female to male ratio of 5.2:1.

The distribution of thyroid lesions with respect to TIRADS and TBSRTC is shown in table 2.

Among the TIRADS scores obtained, TIRADS 3 (34%) was the most common. No patient was categorized as TIRADS 6. TIRADS 1 and 2 together constituted 44% of the sample, indicating that nearly half of the lesions were considered non-suspicious, TIRADS 3 (34%) formed the largest single group highlighting the mildly suspicious lesions which required a closer follow-up and TIRADS 4 and 5 together accounted for 22%, indicating the need for careful assessment and potential intervention.

Among the TBSRTC categories, TBSRTC II was the most common (68%). Lower TIRADS scores (1 to 3) were more associated with benign TBSRTC category (TBSRTC II) whereas higher TIRADS scores (4 and 5) were more associated with suspicious and malignant TBSRTC categories (V and VI).In our study, the linear-weighted kappa was 0.25 (95% confidence interval [CI], 0.13-0.38), indicating a fair correlation between the two systems. The calculated p-value was 0.0017 ($p<0.05$;significant). The maximum concordance was seen between TBSRTC II (benign) and TIRADS 3 (probably benign).

DISCUSSION

The majority of patients belonged to the age range of 30-40 years accounting for 16 (32%) patients. Mean age recorded was 41.56 ± 13.22. Grandhi B et al [6] in their study observed that age of the patients ranged from 20 to 80 years. The mean age incidence was 43.8 years. Regmi S et al [7] observed that age range of the patients varied from 17 to 88 years, mean age being 50.74±17.8 years.

It was observed that out of the total 50 patients, maximum number of patients were females, accounting for 42 (84%) patients in contrast to males, accounting for 8 (16%) patients. Our observations were similar with the ones made by Regmi S et al[7] and Vargas-Uricoechea H et al. [8]

The trend of female predominance in thyroid conditions is likely due to the higher frequency of autoimmune thyroid diseases and hormonal influences of estrogen and progesterone among females. As a result, women with these conditions visit physicians more often, increasing the likelihood of detecting thyroid nodules. [9,10]

We observed that majority of the patients were categorised as TBSRTC II on FNAC accounting for 34 patients in our study. Out of these 34 patients, 14 patients (41%) were scored as TIRADS 3 constituting the majority of the cases. Similar observations were made by Grandhi B et al.[6]

In our study, 13 patients were scored as TIRADS 2, out of which 10 patients were categorized as TBSRTC II and 3 patients as TBSRTC III. None of the patient was categorized as TBSRTC I, IV, V or VI i.e. none of them had malignant potential. Similar observations were made by Periakaruppan G et al [11] which observed that out of the total 117 nodules categorized as TIRADS 2, none turned out to be TBSRTC IV or higher. Vargas-Uricoechea H et al [8] also observed that none of the patients classified as TIRADS 2 were rated as Bethesda IV or V.

Table 2. DISTRIBUTION OF TIRADS WITH TBSRTC FOR THYROID LESIONS

TBSRTC Category	TIRADS 1	TIRADS 2	TIRADS 3	TIRADS 4	TIRADS 5	TIRADS 6	Total Patients
I	1	0	1	0	0	0	2
II	6	10	14	4	0	0	34
III	1	3	0	3	0	0	7
IV	0	0	1	1	2	0	4
V	0	0	1	1	0	0	2
VI	0	0	0	0	1	0	1
Total Patients	8	13	17	9	3	0	50

The highest concordance was observed between TBSRTC II and TIRADS 3. Grandhi B et al [6] also showed that maximum concordance was seen between TBSRTC II and TIRADS 3.

In our study we observed that all lesions did not show concordance between TIRADS and TBSRTC. Out of the 9 patients scored as TIRADS 4 (suspicious of malignancy), 4 patients were categorised as TBSRTC II (benign) on FNAC. Out of the total 13 patients scored as TIRADS 2 (benign), 3 were categorized as TBSRTC III (AUS).

Out of the total 8 patients scored as TIRADS 1 (normal thyroid gland), 1 patient was categorized as TBSRTC III (AUS). Out of the 17 patients scored as TIRADS 3 (probably benign), 1 patient was categorized as TBSRTC IV (follicular neoplasm) and 1 as TBSRTC V (suspicious of malignancy).

Other studies which noted discordance are as follows. Vargas-Uricoechea H et al[8] observed that 4 subjects classified as Bethesda II were classified as TIRADS 4 (2 subjects) and TIRADS 5 (2 subjects). Vargas-Uricoechea H et al [8] also stated that there was a need to develop study and monitoring protocols for cases classified as "discordant", particularly when extreme categories were identified like TIRADS 5-Bethesda II and TIRADS2-Bethesda V. Periakaruppan G et al[11] also noted that some nodules, initially classified as TIRADS 4 and TIRADS 5 based on suspicious ultrasound features, were benign according to Bethesda classification. Another recent study revealed that 7.3% of malignant nodules did not exhibit suspicious malignant features on ultrasound. [12] It is important to recognize that the presence or absence of a single specific feature on ultrasound does not reliably indicate the nodule's malignancy. Rather, a combination of at least two sonographic features is more accurate in distinguishing between benign and high-risk nodules for malignancy than relying on a single feature alone. [13,14]

CONCLUSIONS

Our study demonstrated a significant correlation between TIRADS and TBSRTC in evaluating thyroid lesions. The findings indicated that lower TIRADS scores corresponded more with benign category of TBSRTC, while higher TIRADS scores were more associated with suspicious and malignant TBSRTC categories. These observations

highlighted the importance of integrating ultrasonography (USG) and fine needle aspiration cytology (FNAC) along with meticulous clinical examination for accurate diagnosis and management of thyroid lesions. Thus, our study supported the use of TIRADS and TBSRTC as reliable tools in the clinical assessment of thyroid lesions, facilitating early detection of malignancy and its appropriate intervention.

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