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Original Research Article

Comparison of TIRADS [Thyroid Imaging Reporting and Data System] with Histopathology in Evaluation of Thyroid Nodules

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Abstract

Background: A noninvasive method for the initial evaluation of thyroid nodules is ultrasonography (US). Malignant thyroid nodules can be distinguished well by Thyroid Imaging Reporting and Data System (TI-RADS). The purpose of the study was to evaluate the reliability of ACR TIRADS score in distinguishing between benign and malignant thyroid nodules using histopathology as the gold standard.

Materials and Methods: The prospective study was conducted on 50 patients referred to the Department of Radiodiagnosis at Viswabharathi General Hospital in Kurnool between 2021 and 2022. ACR-TIRADS categories were used to interpret patients with thyroid nodules. For these thyroid lesions, the patients had FNAC or biopsy. The risk of malignancy was estimated for each category and correlated with FNAC/Histopathology.

Results: We have studied 50 patients with thyroid nodules, Out of 50 lesions, 42 were found to be benign and 8 lesions were malignant. The risk of malignancy for ACR-TIRADS1, TIRADS2 and TIRADS 3 were 0%, TIRADS 4 and TIRADS 5 lesions had 80 %, and 100 % risk of malignancy respectively. The most common malignant pathology in our analysis was papillary carcinoma, whereas the most common benign entity was benign follicular lesion.

Conclusions: ACR TIRADS is more accurate in distinguishing benign from malignant thyroid nodules and more dependable in recommending thyroid nodules for FNAC. Unnecessary FNAC can be prevented by employing ACR-TIRADS.

Keyword: Thyroid nodules, ACR-TIRADS (American College of Radiology Thyroid Imaging Reporting and Data System), FNAC (fine needle aspiration cytology).

Introduction

Thyroid nodule (TN) is a common thyroid condition with a global frequency of 4-7% by palpation, 19-68% by ultrasonography, and 8-65% by autopsy pathologic examination [1,2]. This increase is considered to be connected to the identification of subclinical TNs and early detection by high-resolution ultrasonography [3,4]. There are two types of TN: benign and malignant. The majority of TN are benign, with less than 5- 10% being malignant [4]. The distinction between malignant and benign TN is critical in clinical

evaluation since treatment differs for each kind of nodule [5].

In recent years, FNAC has been the most successful method for assessing thyroid nodules, with a sensitivity of over 90% and a specificity of 75% [6]. Though FNAC is still essential for assessing thyroid nodules, it is somewhat stressful, incurs additional healthcare costs, and has a minimal risk of infection and bruising [7].

Based on certain characteristics, ultrasound can be used to distinguish benign from malignant nodules [5] Thyroid Imaging Reporting and Data System (TIRADS) was designed to increase the diagnostic sensitivity and specificity of ultrasound examination of TNs [8] Thyroid Imaging Reporting and Data Systems (ACR TI-RADS) is a 5-point categorization system created by the American College of Radiology to identify the risk of cancer in TN based on ultrasound parameters. This technology has primarily been used for 1 cm TN. This system assesses ultrasonography properties in five categories: composition, echogenicity, shape, margin, and echogenic foci; the total number of points assigned to the nodule determines its risk rating, which ranges from TI-RADS 1 (TR1) (benign) to TI-RADS 5 (TR5) (very suspicious) [9].

Ultrasound-guided FNAC is regarded the most precise approach for diagnosing thyroid cancer. However, due to the prevalence of benign thyroid nodules and the invasive nature of the procedure, biopsy is not always possible. Therefore, ultrasound serves a crucial role in distinguishing benign from malignant thyroid nodules, thereby preventing unnecessary invasive operations in benign thyroid nodules. This study is being conducted to determine the relationship between the TIRADS findings and TIRADS score in USG of thyroid nodule and the FNAC or Biopsy findings in predicting the risk of malignancy.

Materials and Methods

The present study was conducted in the department of Radio-diagnosis, Viswabharathi Medical College & General Hospital, Kurnool following Institutional ethics committee approval.

Study design: hospital based prospective cross-sectional study

Period of study: Between 2021 and 2022.

Sample size: 50 patients

Inclusion criteria:

All patients with palpable thyroid nodules or clinical suspicion of thyroid disease referred for an ultrasound of the neck.

Exclusion Criteria

1. Operated cases of Thyroid nodules/carcinoma.
2. Patients presently or previously on radiation therapy.
3. Patients who did not give consent

Methods

In all cases, a comprehensive medical history and physical examination were conducted based on the accompanying form. Prior to beginning the investigations, informed consent was obtained from the subjects. As part of the imaging evaluation, the patients were then exposed to ultrasonographic tests. Patients were followed up by documenting their examinations, FNAC/histopathological results, and treatment administered.

USG Evaluation: The ultrasound scans were conducted with a ESOATE M1 LAB X_5 ultrasonography equipment equipped with an L4-15 linear array transducer.

The patient was informed about the surgery and consent was obtained. Ultrasound of the thyroid performed with the patient supine and the neck slightly extended. On USG, nodules were examined for criteria such as composition, form, echogenicity, margins,

and echogenic foci, as defined by the ACR lexicon7 and classification system. According to ACR-TI-RADS criteria, points were awarded to each nodule's respective category.

FNAC was administered with a tiny hypodermic needle. The patient was positioned supine with his neck extended and supported by a pillow during the surgery. The neck was washed with spirit, then lidocaine was administered topically to the nodule's skin. FNAC was then conducted utilising a 23/25-gauge hypodermic needle and non-aspiration capillary action technique from the nodule. After observing material in the syringe and on the glass slides, the needle was extracted from the patient's neck. The slides are fixed with 95% ethyl alcohol and stained with modified PAP. The pathologist then compared the final report of the FNAC with the ultrasound characteristics of the nodule and classified it as benign or malignant.

Statistical analysis

The collected data were entered into a Microsoft Excel spreadsheet and analysed using SPSS.

Results

A total of 50 patients underwent ultrasonography for thyroid nodules and they subsequently went for FNAC during the study period between August 2021 and July 2022 The patient's age ranged between 35 and 70 years, 40 (80%) being female and 10 (20%) being male. (Fig 1). in our study the mean age of the study participants was 46 years.

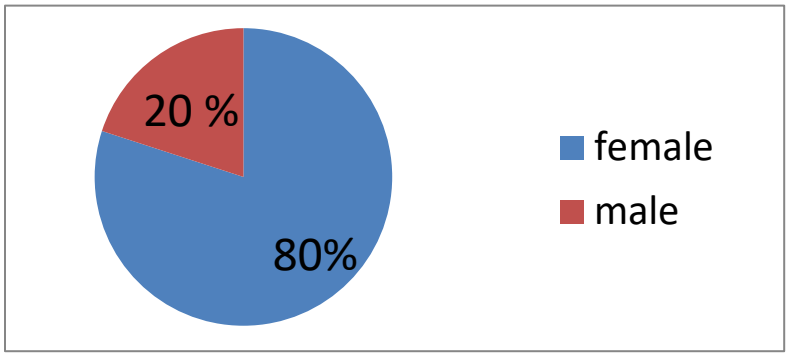

Figure 1: Sex distribution

Majority of the patients were in the >50 age group, accounting for 32% of the sample population. (Fig 2)

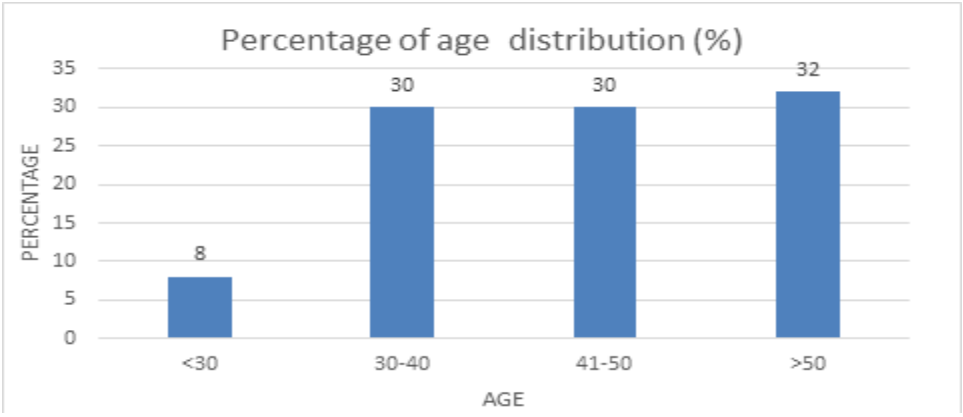

Figure 2: Percentage of age distribution

Of 50 cases of thyroid nodules, maximum of 23 cases (46 %) of the nodules were of TR 2, followed by 13 cases (26 %) being TR 1. There were 6 cases (12%) in TR 3, 5 (10%) in TR 4, and only 3 (6 %) in TR 5 category which was shown in the table below (Table 1).

Table 1: Distribution of thyroid nodules according to TIRADS SCORING system

TIRADS category	Total score	n	%
AC TIRADS (TR1) (benign)	0	13	26
AC TIRADS (TR2) (not suspicious)	2	23	46
AC TIRADS (TR3) (mildly suspicious)	3	6	12
AC TIRADS (TR4) (moderate suspicous)	4-6	5	10
AC TIRADS (TR5) (higly suspicious)	7 plus	3	6
Total		50	100

Of 50 cases of thyroid nodules, FNAC was performed in all the cases. FNAC reports showed more cases of non-neoplastic thyroid nodules than the neoplastic ones: 42 (84%) being non-neoplastic and the remaining 8 (16%) being neoplastic. Among 42 cases of non-neoplastic lesions, 26 cases were beingn follicular lesions. 7 cases were Lymphocytic thyroiditis, 6 cases were colloid cyst, 2 cases were Hashimotos thyroiditis, 1 case was Granulomatous thyroiditis. Among 8 cases of neoplastic lesions, 6 cases were reported as papillary carcinoma and remaining 2 cases were follicular carcinomas which was shown in the table below (Table 2)

Table 2: Cytopathological diagnosis of thyroid nodules

Cytopathological diagnosis	Benign	Malignant	n	%
Benign follicular lesions	26	-	26	52
Lymphocytic thyroiditis	7	-	7	14
Colloid cyst	6	-	6	12
Hashimotos thyroiditis	2	-	2	4
Granulomatous thyroiditis	1	-	1	2
Papillary carcinoma	-	6	6	12
Follicular carcinomas	-	2	2	4
total	42	8	50	100

The comparative study between TIRADS and cytopathological findings was done in all the 50 cases. 13 cases of TR 1 nodules, 22 cases of TR2 nodules, 6 cases of TR3 nodules & 1 case of TR4 turned to be benign. 4 cases of TR4 nodules & 4 cases of TR5 nodules were malignant which was shown in the table below (Table 3)

Table 3: Comparison of TIRADS with the cytopathological diagnosis

TIRADS score	Benign	Malignant	Total	Risk of Malignancy (%)
TR 1	13		13	0
TR 2	22		22	0
TR 3	6		6	0
TR 4	1	4	5	80
TR 5		4	4	100
	42	8	50	

Discussion

Thyroid nodules are quite prevalent and might be difficult to diagnose. Thyroid cancer incidence has more than doubled in the previous 30 years, most likely due to improved screening procedures. As a result, rapid diagnosis via a precisely designed screening strategy is critical for reducing mortality and morbidity.

Thyroid ultrasound is an important imaging technique in the evaluation of both benign and malignant thyroid nodules. Because no single sign on USG is sensitive enough to distinguish between benign and malignant lesions, Horvath *et al*. devised a grading system. Thyroid nodules are evaluated using the Thyroid Imaging Reporting and Data System (TIRADS).

In this study, we looked at the ultrasound characteristics of thyroid nodules according to ACR-TIRADS 2017 for 50 patients who had a neck ultrasound. 42 of the 50 nodules were benign, whereas the remaining eight were cancerous. In our study, the prevalence of cancer was 16%. Six of the eight malignant lesions found were papillary carcinomas and two were follicular carcinomas. As a result, the most prevalent thyroid cancer found was papillary carcinoma, as demonstrated by Razmpa *et al* (2002) [11], Papini *et al* (2002) [12], and Khoo *et al* (2002) [13].

This study had more females than males, with 40 (80%) females and 10 (20%) males. In a study of 90 patients with thyroid nodules, Bhatta *et al* [14] discovered that 72 (80%) were female and 18 (20%) were male. Devkota *et al* [15] discovered similar results in their study. 3 Similarly, Regmi *et al* [16] discovered that out of 54 cases, 50 (92.6%) were female and four (7.4%) were male.

About 46% of the 50 nodules classified based on ACR TI-RADS were TR2, followed by TR1 and TR3, and less than 10% were TR4 and TR5. TR2 was identified as the most prevalent group in an Indian study [17]. A French investigation [18] found a similar result to ours, with the majority of patients having TR3 nodules. Regardless of the discrepancies in TI-RADS classifications, the majority of nodules in these investigations were categorised as benign nodules.

Conclusion

We concluded that ACR TI-RADS is a suitable and non-invasive technique for evaluating thyroid nodules in everyday clinical practise. In a considerable proportion of individuals with benign thyroid lesions, this grading system can safely reduce the number of unnecessary biopsies. We recommend sonographic categorization of thyroid nodules using ACR TI-RADS create uniformity in reporting and easy guidance of appropriate biopsy.

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