

Assessment Of Malignant Risk Potential of Thyroid Nodules Using Ultrasound Thyroid Imaging Reporting and Data System (Tirads) Criteria with Correlation By Fine Needle Aspiration Cytology (Fnac)

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Abstract: Nearly two third of the population show nodules in high resolution ultrasound of thyroid. Most of the nodules are benign. Less than 10% of nodules are malignant. The reporting of such nodules is vague, subjective and does not guide the clinician for the next step. To standardize the reporting, the concept of thyroid imaging reporting and data system (TIRADS) was first developed in 2009, on the lines of popular Breast Imaging Reporting And Data System (BIRADS). The present study aims to objectively stratify the thyroid nodules based on key ultrasound features into various risk groups and compare the ultrasound features of suspicious nodules with their Fine Needle Aspiration Cytology (FNAC) results.

The study was carried out on 100 patients in Department of radio-diagnosis, Maharajah's institute of medical sciences, Nellimarla with using Phillips affinity 70 HD machine . Duration of 1 year from Febraury 2022 to January 2023.

Out of 100 cases , TIRADS 3 -70 cases, TIRADS 4a -6 cases, TIRADS 4b -20 cases, TIRADS 5-4cases . Ultrasound has an established accuracy in determining malignancy risk of thyroid nodules.

IndexTerms: Thyroid nodules ,Reporting, Thyroid imaging reporting and data system (TIRADS), fine needle aspiration cytology (FNAC).

I. INTRODUCTION.

Thyroid nodule is defined as a focal well-defined area of altered echogenicity within thyroid gland that is radiologically distinct from surrounding normal thyroid parenchyma.[1]. In India, thyroid nodules are seen in about 8.5% of the population.[2] An increase in the incidence of thyroid carcinoma has been noted in the recent decades due to markedly improved USG surveillance and USG-guided FNAC of thyroid nodules. Majority of thyroid nodules are benign, but malignancy is found in approximately 5–15% of cases, high risk features like age, sex, radiation exposure history, family history, and other factors warrants further evaluation.[3,4,5]. Despite their low prevalence in men, nodules are more aggressive with higher risk of malignancy.[6]

Evaluation of a patient with thyroid nodule requires detailed history and imaging. High resolution ultrasonography (USG) is the first line investigations in clinically detected thyroid nodules who are biochemically euthyroid. Thyroid imaging recording and data system (TIRADS) is a risk stratification system for classifying thyroid nodules similar to BIRADS scoring for breast lesions. It was first proposed by Horvath et al.[7] in the year of 2009 with modified recommendation from Kwak JY et al.[8] Recently, thyroid nodules have been classified into 5 TIRADS categories based on 5 descriptors (composition, echogenicity, shape, margin, echogenic foci/calcification). Each descriptor gives a point, adding all points of all descriptors a numerical value is calculated which gives the TIRADS score. Sonographic findings suggestive of malignancy are solid nodules, hypoechogenicity, irregular margins, microcalcifications, and a shape taller than wide on a transverse view.

Fine needle aspiration cytology (FNAC) is considered as an essential tool in providing a rational approach to the clinical management of thyroid nodules and determines the correct surgical procedure when surgery is needed. Similar to other clinical tests in medicine, it is expected that thyroid FNA should demonstrate high degree of sensitivity and specificity. Therefore, it is prudent that thyroid FNA reporting should be close to uniform among pathologists to give the path for rational management strategies and avoid confusion among clinicians.[9,10] Studies have been done worldwide regarding stratification of risks of malignancy in subjects with thyroid nodule by ultrasound and cytological examination. Kwak et al.[8] have proposed a TIRADS score by retrospective analysis of thyroid nodules in ultrasound and FNA, using five ultrasound criteria that can be used during thyroid evaluation. This article describes that a malignancy risk of[11] 0% is expected for TIRADS 2, 1.7% for TIRADS 3, a risk of 3.3–72.4% for TIRADS 4, and of 87.5% for TIRADS 5. Srinivas et al.[12] also concluded that the risk of malignancy for TIRADS categories 1, 2, 3, 4A, 4B, 4C, and 5 was 0, 0, 0.64, 4.76, 66.67, 83.33, and 100%, respectively.

II. Human shoulder is the most mobile joint in the body. This

III. mobility provides the upper extremity with tremendous range

IV. of motion. This wide range of motion also makes the shoulder

V. joint unstable and prone to injury, both acute and repetitive

II. MATERIALS AND METHOLOGY

This is a hospital based prospective study among 100 patients referred to the Department of radio-diagnosis, Maharajah's institute of medical sciences, Nellimarla with using Phillips affinity 70 HD machine . A structured format containing the patient details, clinical history, physical examination & investigations who meet the inclusion criteria were prepared and patients were subjected to ultrasound using Phillips affinity 70 HD machine.

III . PROTOCOL:

Ultrasound using Phillips affinity 70 HD machine.

No specific preparation was advised for the study.

The patients referred to radiology department for the ultrasonogram of thyroid gland for the evaluation of thyroid nodules were analysed by their primary thyroid complaints, the relevant positive and negative histories and proper clinical examination of thyroid gland. Appropriate cases have been selected after evaluation of clinical case details and diligently applying the inclusion and exclusion criteria.

Inclusion criteria:

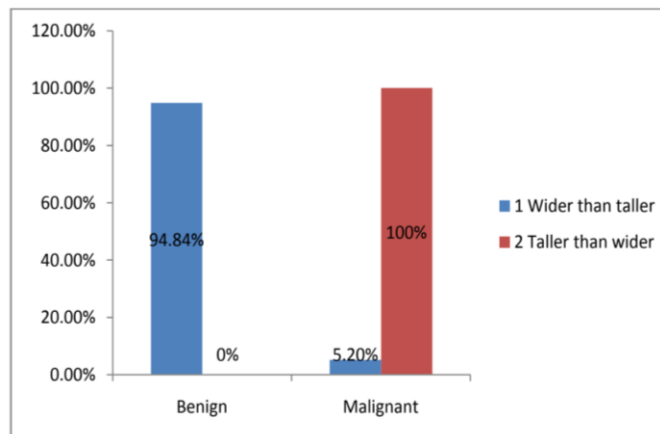
• Patients (of any age group, and both sex) came to the hospital with primary thyroid related complaints and referred to the radiology department for ultrasonography of thyroid gland for the evaluation of thyroid nodules were included in this study.

Exclusion Criteria

1. Patients with secondary thyroid related disorders like drug / radiation induced hypo / hyper thyroidism.
2. Systemic or central nervous system related secondary thyroid involvement.
3. Pregnant women.
4. Patients not capable of giving consent (psychiatric patients)
5. Patients not willing to participate in the study (who refused to give the consent)
6. Patients willing for ultrasonography of thyroid but not willing for ultrasound guided fine needle aspiration cytology.

IV. RESULTS**TABLE 1: Number of thyroid nodules depending upon the Shape**

S.No	Shape	Benign	Malignant
1	Wider than taller	92	5
2	Taller than wider	0	3

**CHART I SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING UPON THE SHAPE****TABLE 2 : NUMBER OF THYROID NODULES DEPENDING UPON ECHOGENICITY**

S.no	Echogenicity	Benign	Malignant
1	Iso/Hyperechogenicity	86	0
2	Hypoechogenicity	6	2
3	Marked Hypoechogenicity	0	6

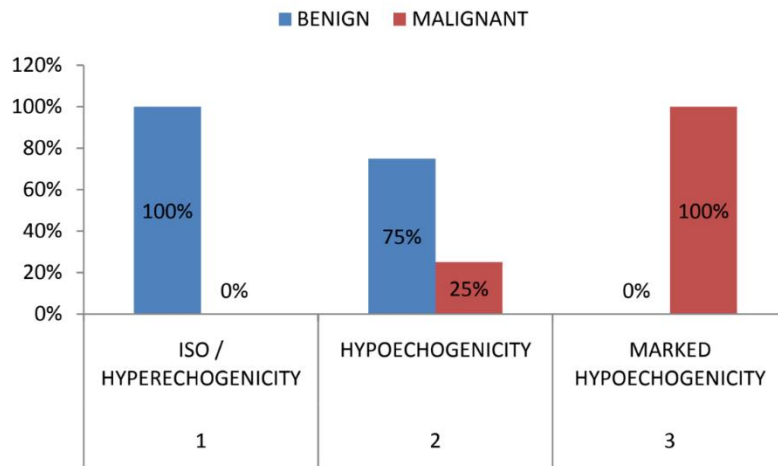


CHART II SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING UPON ECHOGENICITY

TABLE 3 : NUMBER OF THYROID NODULES DEPENDING UPON CONTENT

S.no	Content	Benign	Malignant
1	Solid	43	8
2	Mixed (solid and cystic)	49	0

CHART III : SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING ON

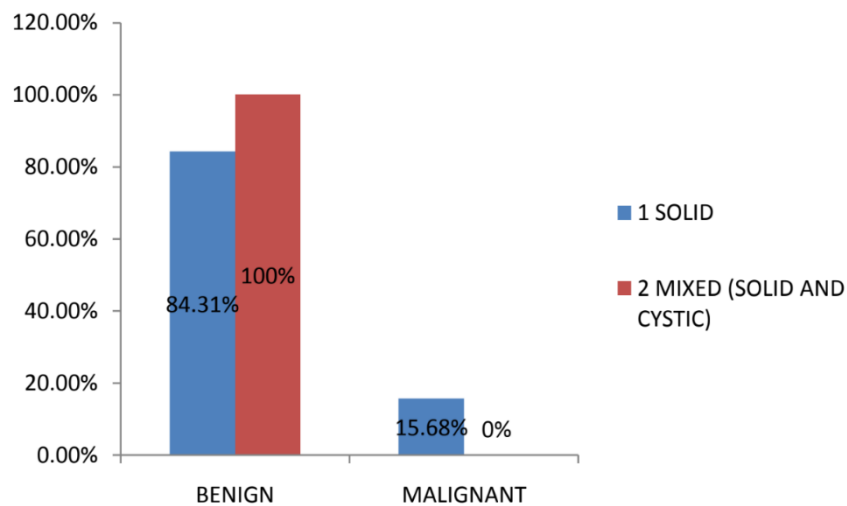


TABLE: 4. NUMBER OF THYROID NODULES DEPENDING UPON CALCIFICATION

S.no	CALCIFICATIONS	Benign	Malignant
1	NO CALCIFICATION	86	2
2	MACROCALCIFICATION	5	0
3	MICROCALCIFICATION	1	6

CHART IV SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING UPON CALCIFICATION

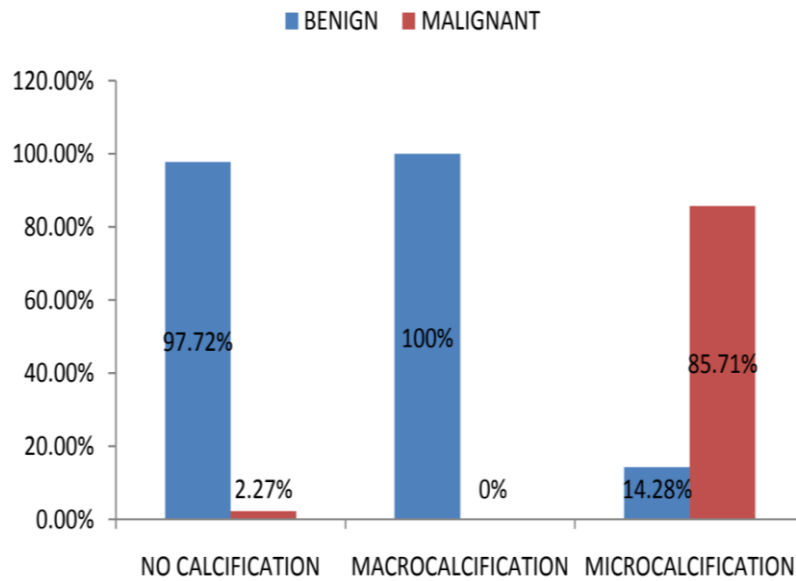


TABLE 5 : NUMBER OF THYROID NODULES DEPENDING UPON THE MARGIN

S.no	MARGIN	Benign	Malignant
1	SMOOTH	69	1
2	IRREGULAR	23	3
3	MICROLOBULATED	0	4

CHART V SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING UPON MARGIN

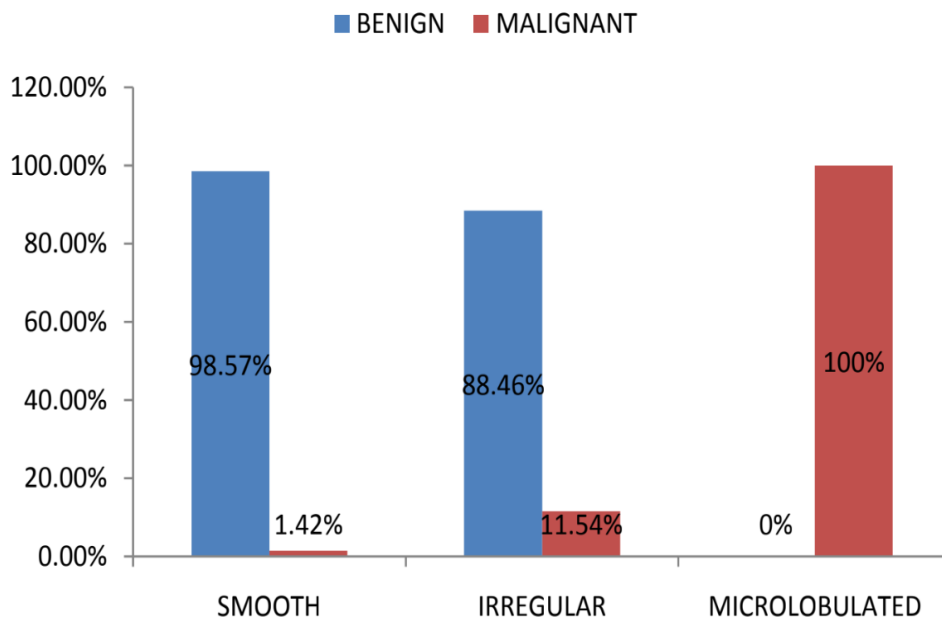


TABLE 6 :NUMBER OF THYROID NODULES DEPENDING UPON TIRADS CATEGORY

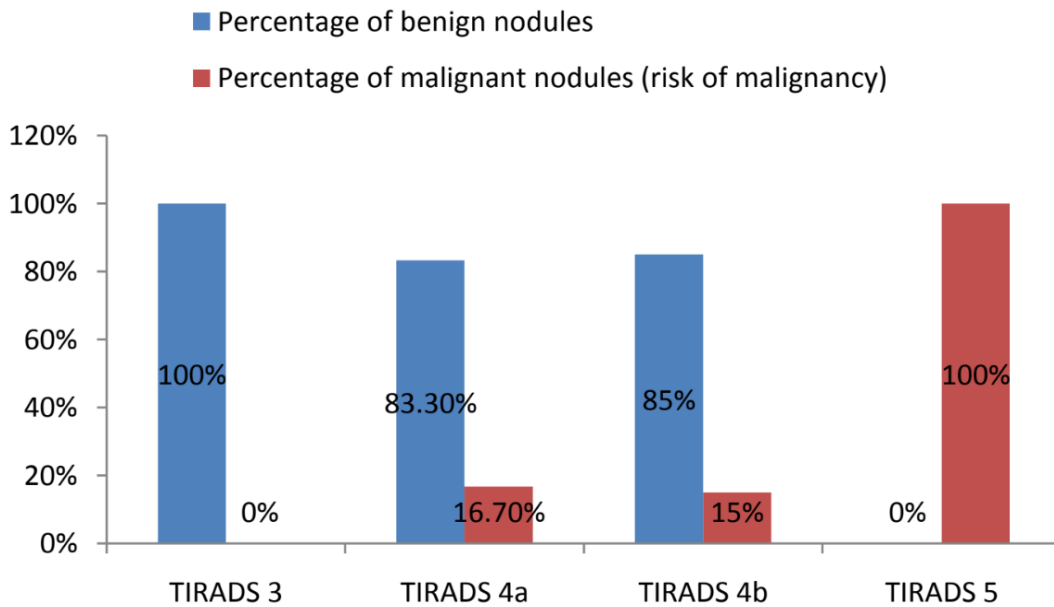
S.no	TIRADS category	Benign	Malignant	Total
1	TIRADS 3	70	0	70
2	TIRADS 4a	5	1	6
3	TIRADS 4b	17	3	20
4	TIRADS 5	0	4	4

TABLE 7 : NUMBER OF THYROID NODULES DEPENDING UPON TIRADS CATEGORY

S.no	TIRADS category	Percentage of benign nodules	Percentage of malignant nodules (risk of malignancy)
1	TIRADS 3	100%	0%
2	TIRADS 4a	83.3%	16.7%
3	TIRADS 4b	85%	15%

4	TIRADS 5	0%	100%
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CHART VI SHOWING THE PERCENTAGE OF THYROID NODULES DEPENDING UPON TIRADS CATEGORY



VI. REPRESENTATIVE CASES

1. 45 years old male patient came with complaints of swelling in front of the neck for two months. Ultrasound showed solitary thyroid nodule with following findings:

- Wider than taller shape.
- Iso Echogenicity
- Solid Content
- No Calcification
- Smooth Margin

TIRADS Category: 3



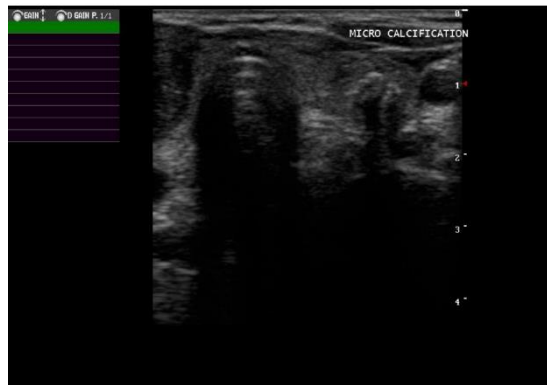
Ultrasound image of colloid goitre

FNAC report of the above mentioned nodule is Colloid goitre.

2. 44 years old female patient presented with complaints of neck swelling for 6 months. Ultrasonography of thyroid nodule showed the following findings:

- Taller than wider shape
- 2. Solid Content
- 3. Marked Hypoechogenicity
- 4. Microcalcification
- 5. Smooth Margins.

TIRADS Category: 5.



Ultrasound image of Papillary Thyroid Carcinoma

FNAC report of the above nodule is Papillary Thyroid Carcinoma.

3.55years old female patient came with the complaints of swelling in front of the neck for 2 months. Ultrasound of solitary thyroid nodule showed following findings:

- 1. Wider than taller shape**
- 2. Solid Content.**
- 3. Marked Hypoechoigeniity**
- 4. No Calcification**
- 5. Smooth Margin**

TIRADS category: 4B

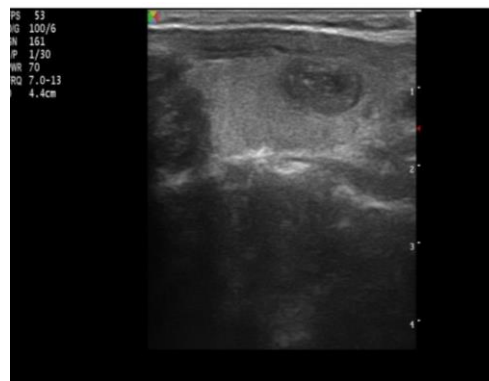


Figure showing ultrasound image of Follicular Thyroid Carcinoma

DISCUSSION:

The study was carried at maharajahs institute of medical sciences, Nellimarla in the department of radio-diagnosis during February 2022 to January 2023. 100 people were taken into the study with primary thyroid complaints. The patients were analysed by ultrasonography and fine needle aspiration cytology.

In which 71 (71%) males and 29 (29%) females, the mean age of the patients was 47 years (Range 21-72 years). In which TIRADS 3 lesions are 70, TIRADS 4a are 6, TIRADS 4b are 20 and TIRADS 5 are 4. Wider than taller lesions are 97 and Taller than wider lesions are 3.

Ultrasonographically 86 thyroid nodules showed either iso echogenicity or Hyper echogenicity, 4 nodules showed hypo echogenicity and the remaining 6 nodules demonstrated marked hypo echogenicity. All the 86 nodules which had iso or hyperechogenicity on USG have demonstrated benignity on FNAC.

Among the 8 nodules which had hypoechoogenicity 6 nodules were benign and 2 were malignant on FNAC. All the nodules which showed marked hypoechoogenicity were malignant.

Ultrasonographically 51 nodules were solid in nature and 49 nodules demonstrated mixed content (solid and cystic). Out of 51 nodules which were solid in nature 43 nodules were benign and 8 nodules were malignant on FNAC. So the nodules which have solid content have 84.3% chances of benignity and 15.7% chances of malignancy and the nodules which have mixed content have 100% chances of benignity.

Out of the 100 nodules analysed 88 nodules had no calcification, 5 had macrocalcification and 7 had microcalcification. The nodules which had no calcification have 97.7% chances of benignity (81 nodules were benign on FNAC) and 2.3% chances of malignancy (2 nodules were malignant on FNAC). The nodules which had macrocalcification have 100% probability of benignity (all 5 nodules had benign character on FNAC). The nodules which have microcalcification have 85.7% chances of malignancy (6 nodules were malignant on FNAC) and 14.3% chances of benignity (1 nodule was benign on FNAC).

Among the 100 nodules 70 nodules had smooth margin, 26 nodules had irregular margin and 4 nodules had microlobulated margin on USG. The nodules which had smooth margin on USG have 98.6% chances of benignity.

VII. CONCLUSION:

In conclusion high resolution ultrasound is an accurate technique to assess the morphology of thyroid nodules. Describing the findings using standard lexicon and categorizing using TIRADS achieves the following.

- i. It ensures objectivity in reporting.
- ii. Malignant lesions are identified with high accuracy
- iii. It aids in clinical decision making.
- iv. It prevents unnecessary FNACs.
- v. This avoids unnecessary patient discomfort, cost and wastage of resources

VIII. REFERENCES

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