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Role of Ultrasound in Assessment of Solitary Thyroid Nodule in a Tertiary Care Centre

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Abstract:
Background: *The importance of high frequency ultrasonography in detection of different types of thyroid nodules considering only the histopathological examination of the surgical specimens as the final diagnosis. The thyroid nodule is a discrete lesion that could be distinct radiologically and pathologically from thyroid parenchyma. It is considered the most common abnormality in the endocrine system. Using ultrasonography in thyroid nodule detection has raised the nodule prevalence to reach 67%. Seven to fifteen percent thyroid nodule are malignant.*
Objective: *The aim of this study was to determine thyroid nodule and identify their sonological patterns and categorize them according to TI-RADS classification system.*
Material and Methods: *The study was conducted at Department of Radio-Diagnosis, Medical College Kolkata. A total of 50 patients were enrolled in this study. Patients belonging to all age groups and both sexes attending the outpatient department of the dept. of Endocrinology, Otolaryngology and General Surgery, as well as inpatient were evaluated. The study was conducted during the period January 2021-August 2022.*
Results: *Fifty patients belonging to all age groups and both sexes are evaluated. Studied cases were 16 (29.0%) males and 34 (71.0%) females. The results were benign in 38 patients and malignant in 12 patients with different histopathological types.*
Conclusion: *High frequency ultrasound (US) is a very important tool to predict the malignant possibility during thyroid nodule evaluation.*
Keywords: *Ultrasound (US), Thyroid nodule, Benign and malignant.*

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I. Introduction

The term thyroid nodule refers to an abnormal growth of thyroid cells that form a lump within thyroid gland. Although the vast majority of thyroid nodules are benign, a small proportion of thyroid nodules do contain thyroid cancer. In order to diagnose and treat thyroid cancer at the earliest stage, most thyroid nodules need some type of evaluation. Because of recent advances in imaging technology high resolution ultrasonography has proved to be a diagnostic method in evaluation of thyroid nodules.
USG is ideal for thyroid imaging because

- Superficial site of the gland, that allows use of high frequency transducer yielding high resolutions and low expense.
- No risk of ionizing radiation.
- Non-invasive.
- No patient discomfort.
- Provides highly accurate information on physical characteristics of nodule reliably distinguishing solid nodule from those which are cystic, or of mixed echogenicity.
- Determines the size of nodules and monitors nodule growth.

II. Review of Literature

Ultrasound is the main diagnostic tool for imaging pathology of the thyroid gland. The TI-RADS classification allows the evaluation of a risk of malignancy in the case of thyroid nodules, indicating need to perform a puncture for histopathological study. TI-RADS proposed by Kwak et al., combined with evaluation for sonological features of malignant lymph nodes is a valuable, safe, widely available, and easily reproducible

imaging tool to stratify the risk of a thyroid lesion and helps in precluding unnecessary FNACs in a significant number of patients. TI-RADS features convincingly show comparable results in the interpretation of TI-RADS features more so, in the hand of radiologists experienced in thyroid imaging. Most of these TI-RADS classifications come from individual institutions and none has been widely adopted in the United States. Under the auspices of the ACR, a committee was organized to develop TI-RADS. The eventual goal is to provide practitioners with evidence-based recommendations for the management of thyroid nodules on the basis of a set of well-defined sonographic features or terms that can be applied to every lesion. Terms were chosen on the basis of demonstration of consistency with regard to performance in the diagnosis of thyroid cancer or, conversely, classifying a nodule as benign and avoiding follow-up.

III. Materials and Methods

Study Design:

The study was conducted at Department of Radio-Diagnosis, Medical College Kolkata. A total of 50 patients with nodular thyroid disease were examined with B-mode sonography. The study was conducted from 1st January 2021 to 31st august 2022. Patients belonging to all age groups and both sexes are evaluated.Ultrasonography was done in newly screened patients with thyroid nodules before any interventional procedure.

Inclusion criteria:

All patients with nodular thyroid diagnosed clinically.

Exclusion Criteria:

- Normal thyroid on HRUSG.
- Proved thyroid malignancy.
- Patient not willing to take part in the study.

Sample size:

Total 50 patients were chosen in simple random sampling method.

High frequency of ultrasonography of thyroid gland:

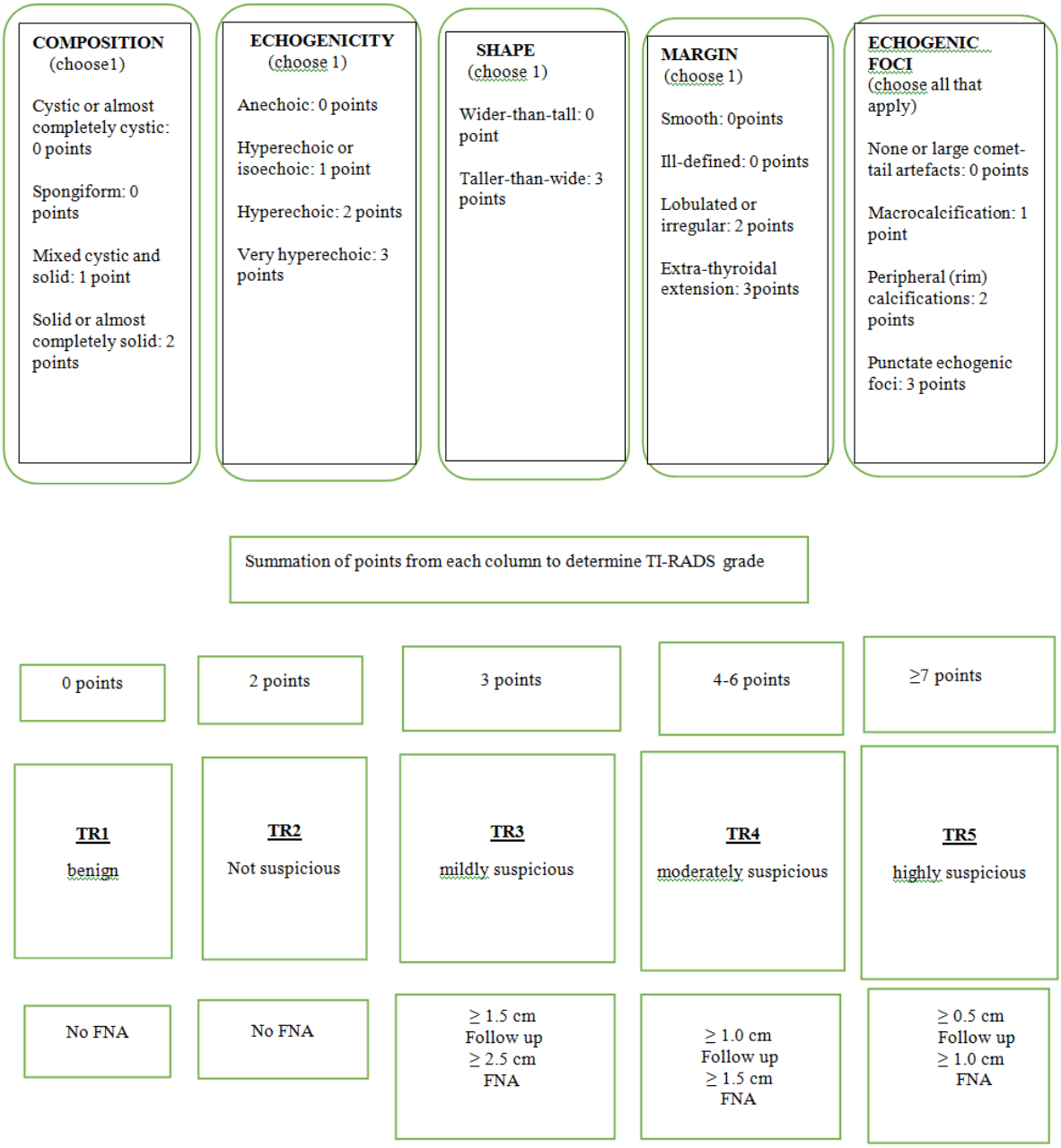
Thyroid gland assessment using high resolution ultrasound equipment using 7-15 MHz linear transducer in transverse and longitudinal planes with TI-RADS grading. Each TN was evaluated according to the site, size and shape.

The nodular features were classified for:

1. Shape: oval or round
2. Taller than wider (T>W) or wider than taller (W>T)
3. Echogenicity as isoechoic, hypoechoic, hyperechoic, or anechoic
4. Echotexture as solid, mixed, or cystic (if the cystic component occupied an area less than 25%, it was considered as solid, between 25-74% as mixed and 75-100% as cystic)
5. Presence of microcalcification and macrocalcification as “present” or “absent”
6. Presence of Halo as “present” or “absent”
7. Regularity of nodule margin as regular or irregular
8. Nodal vascularity: type I was absent vascularity, type II was mixed type (central and peripheral), and type III was central
9. Cervical lymph nodes: shape, size, and presence of hilum.

The nodule was suspicious for malignancy if it had two or more of suspicious malignant features of US (T>W, microcalcification, central vascularity, solid texture, hypoechogenecity, and irregular or ill-defined margins).

ACR TI-RADS

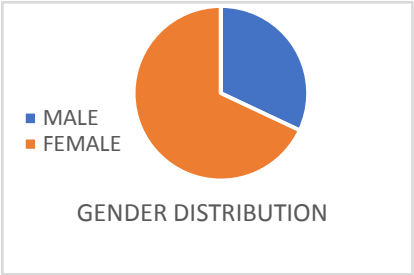


Ethical consideration:
The study was conducted after getting approval from Institutional Ethics Committee and other authority.Informed consent was taken from all participants.

IV. Results and analysis

Table 1: Gender distribution

SEX	NO. OF CASES	PERCENTAGES
MALE	16	32
FEMALE	34	68
TOTAL	50	100



From the above table and graph we see that the highest number of cases i.e., 68%, belonged to the female gender whereas only 32% of the total cases were males.

Table 2: Distribution of lesions among study population

Lesions		Frequency	Percentage
BENIGN	**Colloid goiter**	**16**	**32**
	Colloid cyst	**5**	**10**
	Colloid nodule	**2**	**4**
	Hashimoto thyroiditis	**6**	**12**
	Follicular adenoma	**1**	**2**
	Follicular lesion	**2**	**4**
	Adenomatoid goiter	**4**	**8**
	Benign follicular nodule	**2**	**4**
Total Benign		**38**	**76**
MALIGNANT	**Follicular CA**	**2**	**4**
	Follicular CA (Hurtle cell type)	**3**	**6**
	Papillary CA	**5**	**10**
	Papillary CA with cystic changes	**1**	**2**
	Anaplastic CA	**1**	**2**
Total Malignant		**12**	**24**

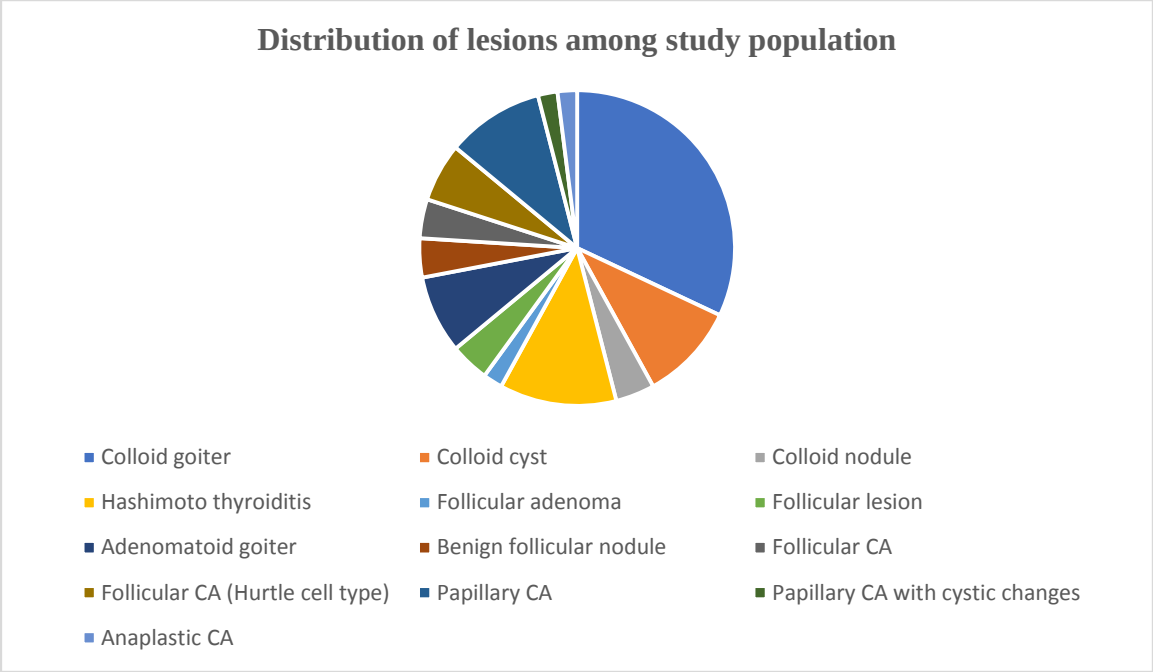
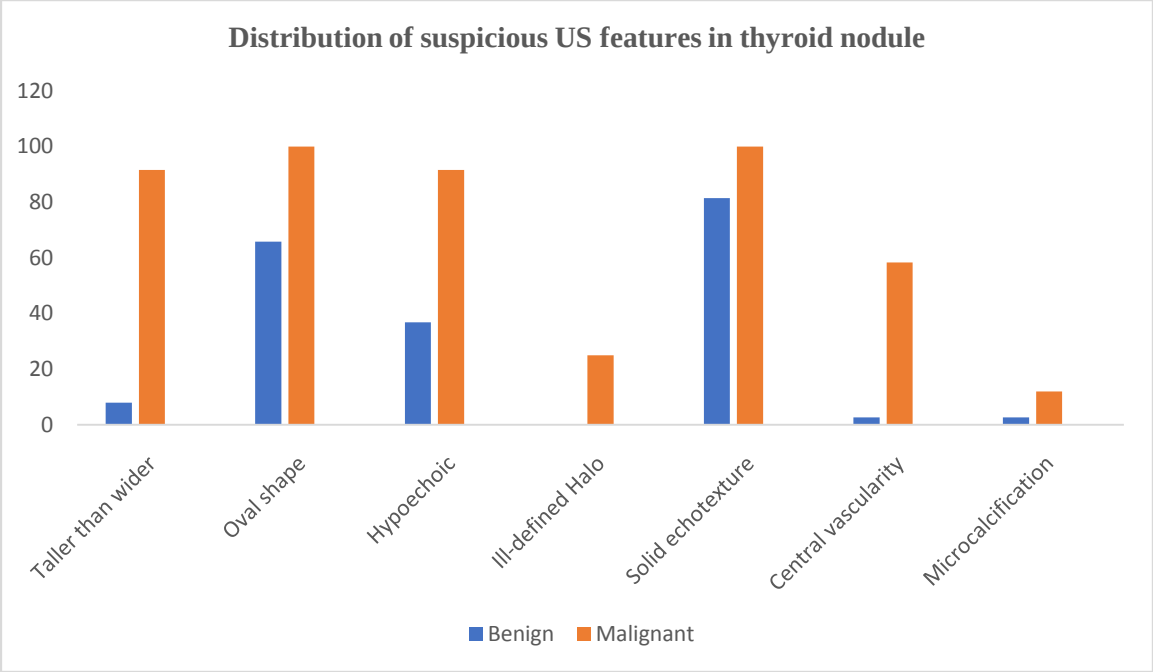


Table 3: Summarizes sensitivity, specificity, PPV, NPV, accuracy and P value of US finding of TN

Suspicious US findings	Benign (n=38)		Malignant (n=12)		Sensitivity	Specificity	PPV	NPV	Accuracy	P value
	n	%	n	%						
Taller than wider	3	7.9	11	91.6	91.3	91.10	83.2	96.2	91.0	0.001
Oval shape	25	65.8	12	100	100.0	34.2	38.9	100.0	51.0	0.020
Hypoechoic	14	36.8	11	91.6	91.6	60.7	50.6	90.5	70.0	0.001
Ill-defined halo	0	0	3	25	25.0	100.0	100.0	73.2	75.0	0.007
Solid echotexture	31	81.5	12	100	100.0	11.10	33.6	100.0	40.0	0.300
Central vascularity	1	2.6	7	58.3	58.3	96.5	87.8	79.4	81.0	0.001
Microcalcification	1	2.6	12	100	100.0	96.5	93.6	100.0	97.0	0.001



V. Discussion

With the use ultrasonography and the other modalities, the incidence of thyroid nodule was increased up to 67%. Most of the thyroid lumps are benign; malignancy is quite low (3-7%). It is well established that no single sonographic feature has adequate diagnostic accuracy in reliably discrimination between malignant nodules from benign ones. There are some suspicious ultrasonographic features of thyroid nodule, namely, taller than wider nodules, solid texture, microcalcification, intranodal vascularity, hypoechogenecity, and irregular margin with different statistical accuracy. The present study revealed that microcalcification is the best suspicious US thyroid feature that should be relied on during examination. The microcalcification represent Psammoma body that is very specific for thyroid carcinoma and especially, for thyroid cancer, and the microcalcification is considered malignant if it is present without posterior shadowing and if it is appeared in the solid part of TN. The calcification appears in the cystic part which it is considered the comet-tail artifact that is benign in nature. The second most appreciated feature is taller than wider nodule. Taller than wide shape in malignant thyroid nodules and a wider than tall shape in benign nodules is related to the ability of probe to compress the thyroid nodule during US examination. Since benign nodules and cystic nodules are softer and infiltrate less into the surrounding tissue, benign nodules are easily compressed than malignant nodules.

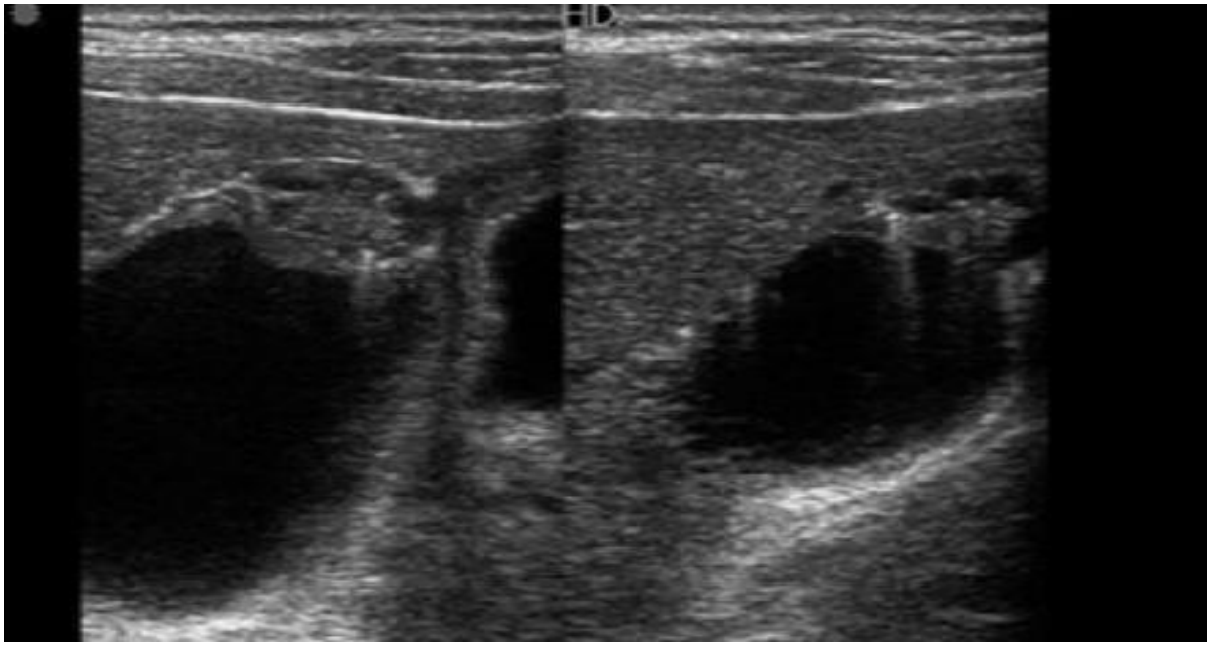
In this study, 38 lesions (76%) from 50 lesions were benign and 12 lesions (24%) were malignant. The sensitivity of ultrasound in detecting different types of thyroid nodules was 100.0% with specificity 94.12% and accuracy 96.0%.

VI. Conclusion

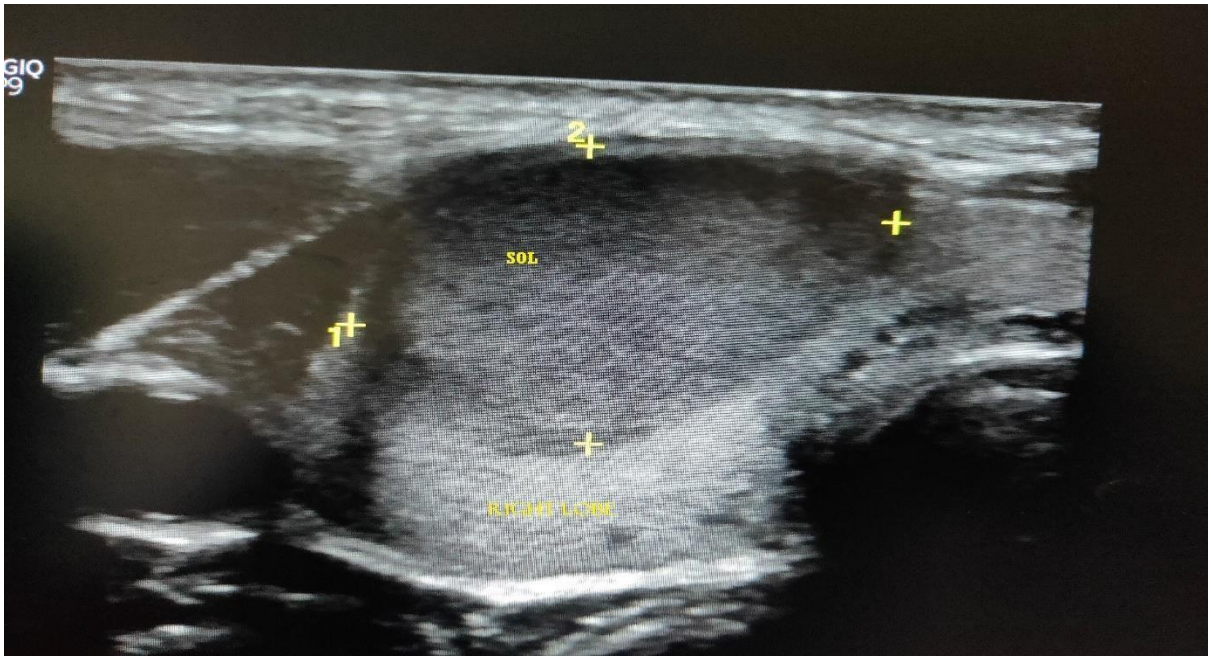
The purpose of the study was to detect the effectiveness of high-resolution ultrasonography using TI-RADS grading in the diagnosis of nodular thyroid disease. It has a importance in the successful management of thyroid nodules.

Imaging and cases

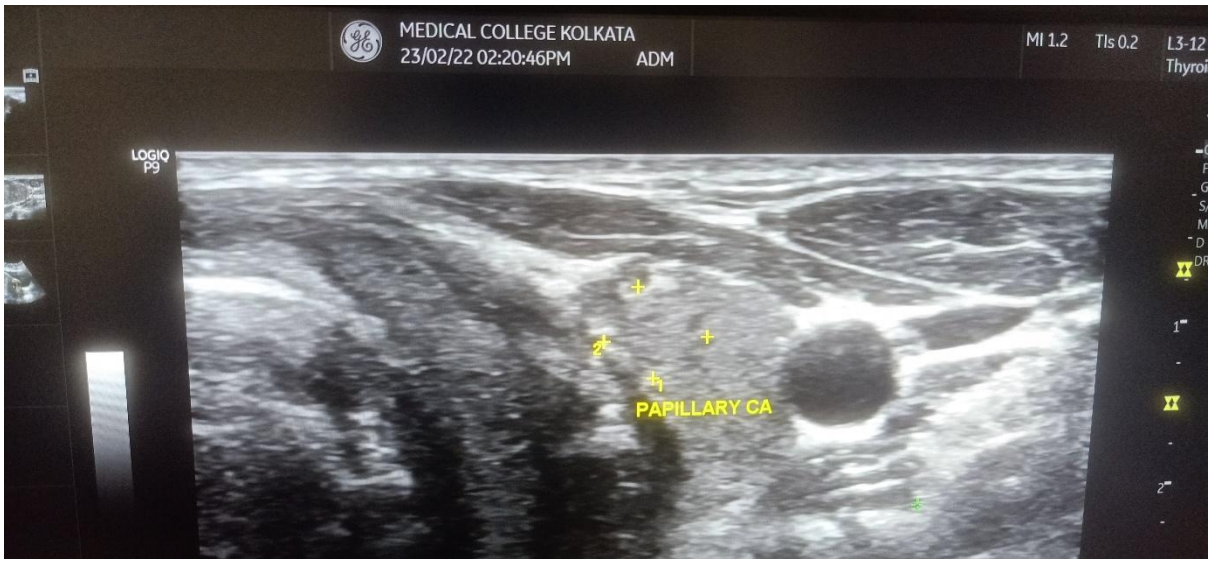
A well-defined, solid cystic, isoechoic, wider than taller, with smooth regular margin without internal calcific foci in right lobe of thyroid. TIRADS 2.Diagnosis= Colloid goiter



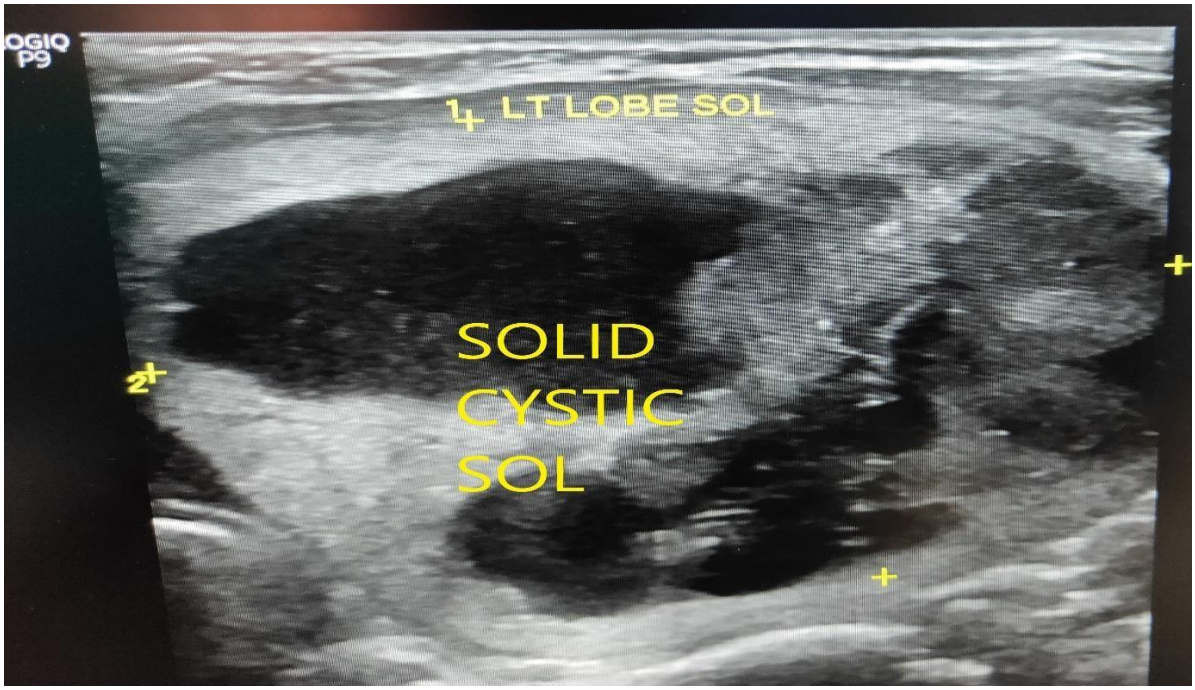
A well-defined anechoic cystic SOL, wider than taller, regular margin with comet tail artefact in left lobe of thyroid. TIRADS 1. Diagnosis= Colloid cyst



A well-defined, solid, wider than taller, hypoechoic without calcification with regular smooth margin lesion in right lobe. TIRADS 4. Diagnosis= Follicular neoplasm



A well-defined solid, hypoechoic, wider than taller with regular margin in left lobe of thyroid. TIRADS 4. Diagnosis= Papillary CA



A well-defined solid cystic (predominantly solid), wider than taller, iso-hypoechoic, irregular margin with microcalcification lesion in left lobe. TIRADS 5. Diagnosis= Anaplastic CA

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