

Original Research Article


# Evaluation of thyroid lesions with gray scale ultrasound/ color doppler imaging and fine needle aspiration cytology correlation

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## Abstract

**Background:** Thyroid gland is afflicted by various pathologies ranging from diffuse enlargement (goitre) to nodular lesions, thyroiditis, and malignancy. Presently high resolution ultrasound with color Doppler is the primary imaging modality of choice in morphological evaluation of thyroid gland. It is used to define the nature of the lesion, whether solid or cystic, to differentiate thyroid from extra thyroidal masses, to assess the size of nodule in patients who are under observation or therapy, to monitor patient who are at increased risk of thyroid malignancy especially those with radiation exposure or having a family history, to detect recurrence of thyroid malignancy after surgery and in interventional procedure like guiding in FNAC.

**Materials and methods:** Study was carried out using standard 5-12 MHz frequency probe with grey scale and color Doppler spectrum to evaluate and analysis of different thyroid nodules and taking Ultrasound guided fine needle aspiration cytology and correlate histopathologically.

**Results:** Majority of patients belonged to middle age group between 21-60 years with mean age of 38.2 years. Colloid goitre was most common presentation on ultrasound and it showed wide spectrum of appearance, majority being nodular with anechoic echotexture. Malignant lesions of thyroid were usually hypoechoic, though all hypoechoic lesions were not malignant. (Sensitivity of 75%, specificity of 81.48%, PPV of 37.5% and NPV 95.65%). The most sensitive sign for picking up malignancy on USG were Intralesional vascularity; absent halo sign and regional lymph node

involvement (sensitivity of 100%) the most specific signs were invasion of adjacent tissue (specificity of 92.59%), Lymphadenopathy (85.18%) and hypoechotexture (81.48%). A combination of signs aid in prediction of malignancy and in guidance for site of FNAC. The most useful combination of sign proved to be Invasion to adjacent tissue, Lymphadenopathy, absent halo, hypoechogenicity, microcalcification and Intralesional vascularity on color flow imaging.

**Conclusion:** The ultrasonographic findings in thyroiditis were usually hetroechogenicity and coarse calcification with diffuse vascularity on color flow imaging. The addition of color flow imaging to gray scale ultrasound had increased the overall sensitivity for diagnosis of thyroiditis (96.87%) and was also highly specific (89.70%).

## Key words

Thyroid swelling, Malignant thyroid nodule, Benign thyroid nodule, Color Doppler assessment of thyroid lesions, FNAC thyroid lesions.

## Introduction

The thyroid gland is affected by a wide spectrum of pathological entities, including benign and malignant lesions. Palpation is the only clinical relevant method of examination of thyroid gland, and it is notoriously insensitive.

Previously, imaging required Scintiscanning to provide a map of those areas of the thyroid gland that accumulate and process radioactive iodine. It was the chief method for determination of pathology of thyroid gland, before surgical and medical treatment was instituted. Its main drawbacks were: Exposure to radio isotopes, inability to differentiate if a cold nodule was solid or cystic, poorer sensitivity of detection of small lesions.

Although Scintiscanning remains of primary importance in patients who are hypothyroid or for detection of iodine avid tissue after thyroidectomy for cancer, Ultrasonography has replaced it for a majority of patients, who require graphic representation of regional anatomy because of its high resolution, small expense, simplicity and it depicts the internal structure of the thyroid gland and the regional anatomy and pathology without using ionizing radiation or iodine containing contrast medium [1, 2]. It's the most common and most useful way to image the thyroid gland and its pathology, as recognized in guidelines for managing thyroid disorders published by the American thyroid Association

[3]. A technique has been reported that helps the clinician to interpret thyroid scintigrams of goitres and functioning nodules by assembling Scintiscans and sonograms side-by-side as one composite image [4].

Thyroid gland is afflicted by various pathologies ranging from diffuse enlargement (goitre) to nodular lesions, thyroiditis, and malignancy. Presently high resolution ultrasound with color Doppler [5, 6] is the primary imaging modality of choice in morphological evaluation of thyroid gland. It is used to define the nature of the lesion, whether solid or cystic, to differentiate thyroid from extra thyroidal masses, assessment of blood flow pattern in and around lesion, to differentiate between benign and malignant thyroid nodule, invasion in nearby structures, to identify additional nodular lesions or enlarged lymph nodes when only one is palpated clinically, to assess the size of nodule in patients who are under observation or therapy, to monitor patient who are at increased risk of thyroid malignancy especially those with radiation exposure or having a family history, to detect recurrence of thyroid malignancy after surgery and in interventional procedure like guiding in FNAC.

On clinical examination, it may not be obvious to find the origin of a mass in the neck - it could be arising from thyroid, enlarged lymph nodes, salivary glands or may be congenital lesion with bronchial cleft cyst. So ultrasound is required to

come to a definite conclusion, thereby delineating the anatomic origin of the lesion. There is a striking difference found clinically and at autopsy. Approximately 50% of normal gland show one or more nodules at autopsy.

High resolution ultrasound with Doppler is the most commonly employed method for evaluating thyroid gland and is an important tool for knowing the morphology of the gland [7]. It aids in differential diagnosis and it must be integrated into patient management and correlated precisely with other data.

### Aim and objectives

- To evaluate the radiological appearance and vascular pattern in different thyroid lesions.
- To evaluate the sensitivity and specificity of gray scale ultrasound and color flow imaging in diagnosis of thyroid lesions.
- Radiological findings correlation with histopathology by fine needle aspiration technique.

### Materials and methods

#### Study area

The study was carried out in the Department of Radiodiagnosis, S.B.K.S. Medical Institute and Research Centre, Waghodia, Vadodara.

#### Study design

- Type of the study: An Observational, Descriptive Hospital Based Study.
- Sample size: 40 patients.

#### Selection of subject

##### Inclusion criteria

- Only those patients who were willing to participate in study were included.
- Patients with known case of thyroid swelling were included.
- Patients referred to the Radiology Department for evaluation of diffuse enlargement of thyroid gland, having symptoms due to compression or

symptoms related to abnormal thyroid function test were included in this study.

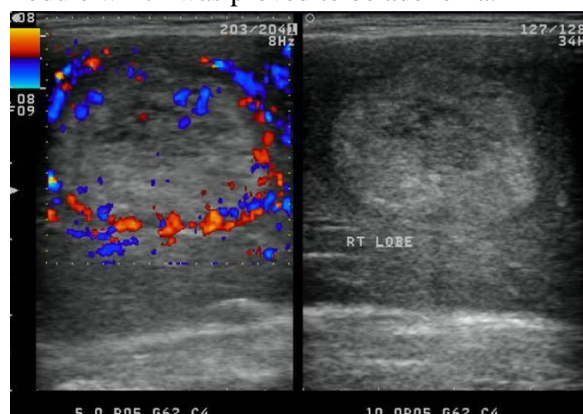
##### Exclusion criteria

- All patients unwilling for study were excluded from this study.

##### Study protocol

- 40 Patients were investigated by using GE Logiq P-9 ultrasound equipment with standard linear probe with 5-12 MHz frequency.
- 24 gauge spinal needle and 10 ml syringe for proper suction used for FNAC which was done under all aseptic precautions after taking informed consent (**Case – 1 to Case – 5**).

**Case – 1:** Sonography of thyroid shows a large, solid, echogenic, nodule with a hypoechoic halo around the lesion, in the right lobe. The lesion is solitary and has a rim of vessels s/o benign nodule which was proved to be adenoma.

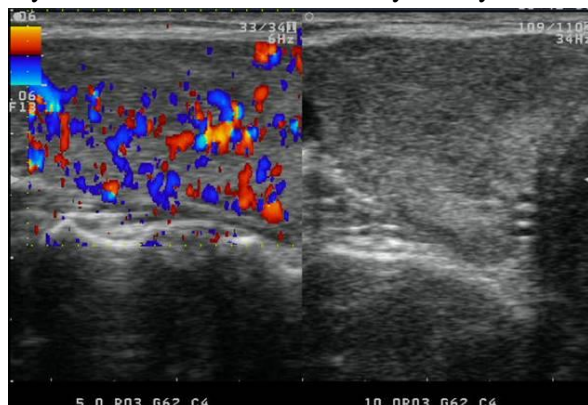


### Results and Discussion

A total 40 patients with thyroid swelling were studied. 27 patients were females, 13 were males (ratio = 2:1). Majority of patients belonged to middle age group between 21-60 years with mean age of 38.2 years.

Ultrasound was used for FNAC guidance especially for small nodules. Ultrasound was valuable in appreciating the nature of lesion whether cystic or solid, echogenicity of lesion and peripheral halo.

**Case - 2:** Ultrasonography shows enlargement and hypoechoic echotexture of right lobe of thyroid with increased vascularity s/o thyroiditis.

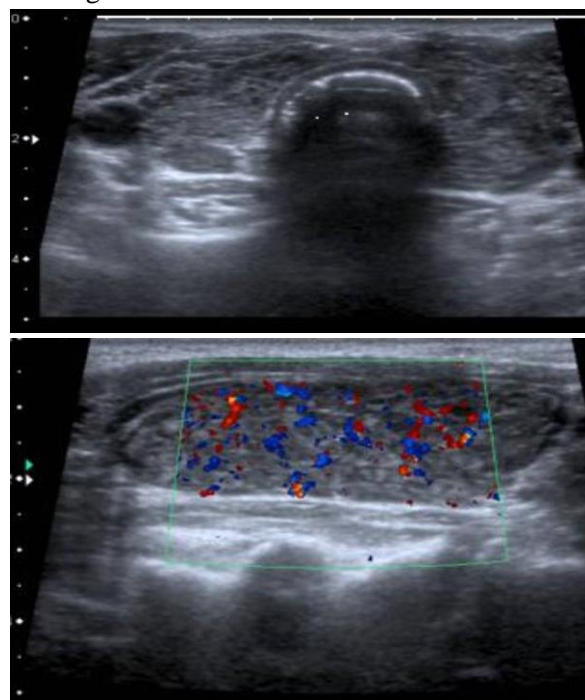
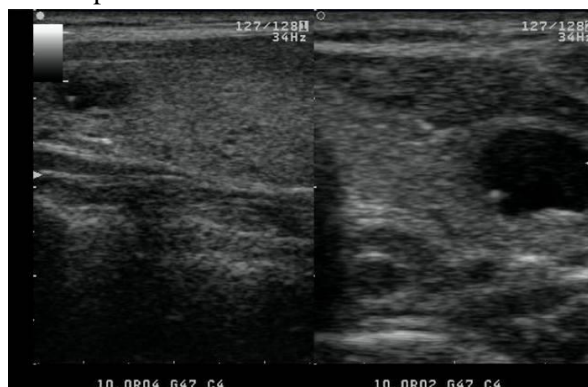


anechoic echotexture. Ultrasound with Doppler showed reliably differentiate between benign and malignant lesions of thyroid gland.

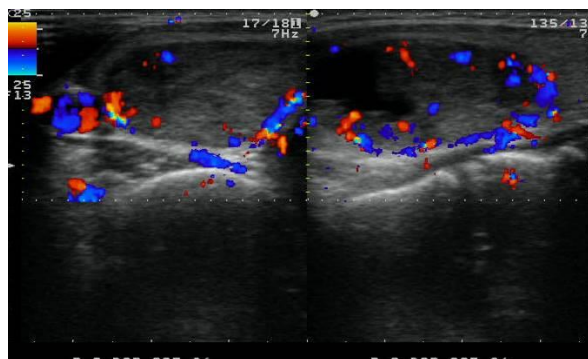
Malignant lesions of thyroid were usually hypoechoic, though all hypoechoic lesions were not malignant. (Sensitivity of 75%, specificity of 81.48%, PPV of 37.5% and NPV 95.65%).

**Case - 5:** (a) Ultrasound reveals - hypoechoic thyroid gland with coarse or "micronodular" echotexture of the gland. (b) Color Doppler imaging reveals augmentation of the vascularity of the gland.

**Case - 3:** Ultrasonography on sagittal view shows a cystic lesion with internal echoes and distal comet tail artifact s/o colloid cyst. On FNAC proved to be the same.



**Case - 4:** USG with doppler shows predominantly isoechoic nodule with cystic area and peripheral vascularity in right lobe of thyroid suggestive of benign nodule. On FNAC proved to be adenoma.



The most sensitive sign for picking up malignancy on USG were Intralesional vascularity; absent halo sign and regional lymph node involvement (sensitivity of 100%) the most specific signs were invasion of adjacent tissue (specificity of 92.59%), Lymphadenopathy (85.18%) and hypoechoic texture (81.48%).

A combination of signs aid in prediction of malignancy and in guidance for site of FNAC. The most useful combination of sign proved to be Invasion to adjacent tissue, Lymphadenopathy, absent halo, hypoechoic texture, microcalcification and Intralesional vascularity on color flow imaging.

Colloid goitre was most common presentation on ultrasound and it showed wide spectrum of appearance, majority being nodular with



Benign adenomas were usually hyperechoic nodules with presence of halo and perinodular vascularity on color flow imaging. We found 8 cases of follicular adenomas. All 8 showed perinodular vascular pattern with positive halo sign but the positive predictive value of this signs proved to be only 57.14% and 19.75% respectively. Though Ultrasonographic signs can help in evaluation of benign adenomatous nodules, Biopsy was required for definitive diagnosis (as FNAC was having limited role in

differentiating benign from malignant counterpart of follicular type.

The ultrasonographic findings in thyroiditis were usually hetroechogenicity and coarse calcification with diffuse vascularity on color flow imaging. The addition of color flow imaging to gray scale ultrasound has increased the overall sensitivity for diagnosis of thyroiditis (96.87%) and is also highly specific (89.70%) (Table – 1, 2, 3).

**Table – 1:** Age and sex distribution in study.

Age (Years)	Male	Female	Total	Percentage
0-20	01	03	04	10%
21-30	01	08	09	22.5%
31-40	04	06	10	25%
41-60	06	08	14	35%
61+	01	02	03	7.5%
	<b>13</b>	<b>27</b>	<b>40</b>	<b>100%</b>

**Table – 2:** Provisional diagnosis using ultrasonography and color Doppler.

Classification	No. of cases	Percentage
<b>Nodular diseases</b>		
Hyper plastic nodules	2	5%
Non goitrous		
Adenomas	05	12.5%
Carcinomas	3	7.5%
<b>Diffuse disorders</b>		
Thyroiditis	12	30%
Colloid	18	45%
<b>Total</b>	<b>40</b>	<b>100%</b>

**Table – 3:** Diagnosis by histopathology.

Classification	Number of cases	Percentage
<b>Nodular diseases</b>		
Hyper plastic nodules	1	2.5%
<b>Non goitrous</b>		
Adenomas	06	15%
Carcinomas	2	5%
Inflammatory cells	1	2.5%
<b>Diffuse disorders</b>		
Thyroiditis	13	32.5%
Colloid diffuse	16	40%
RBC'S only	2	5%
<b>Total</b>	<b>40</b>	<b>100%</b>

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