

# Evaluation of Abnormalities of Thyroid Gland by High Resolution Ultrasound and Color Doppler Imaging along with Cytological Correlation

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## Abstract

**Background:** Thyroid lesions are a common finding in the general population, esp. in iodine deficiency areas such as in our country. Thyroid disorders like thyroid neoplasm still pose a major problem in both developing and developed countries. Nodular abnormality of thyroid represents a significant problem worldwide, the incidence of nodular thyroid disease is on the rise owing to the association of childhood irradiation with increased incidence of both thyroid nodularity and carcinoma. In western countries approximately 5% and in iodine-deficient countries approximately 25% of the general populations have thyroid nodules. Although most of them are benign, 5-10% was malignant.

**Materials and Methods:** Random selection of patient of all age groups from various OPDs will be done. Patients referred to us having a palpable thyroid mass or neck swelling or presenting with clinical symptoms suggesting thyroid dysfunction, regardless of age, and sex will be included in the study.

**Results:** This study highlight the usefulness of ultrasonography in the evaluation of the palpable thyroid masses as an adjunct to clinical examination. Ultrasound has added advantage of being safe, non-invasive, rapid. Reliable, acceptable economical and probable imaging modality without hazard of radiation. It can also guide interventional procedures like cyst aspiration and fine needle biopsy. It has also capability to detect small non-palpable thyroid masses (<1 cm in diameter).

**Conclusion:** Ultrasonography is 100% effective in diagnosing a thyroid lesion whether solid. Cystic or mixed. It can help to differentiate a malignant lesion from benign masses, with some limitation. Hence, it can be used as a valuable adjunct to clinical examination and should be offered to all patients presenting with palpable thyroid masses.

**Key words:** Color Doppler, Cytology, Imaging, Thyroid gland, Ultrasound

## INTRODUCTION

Thyroid lesions are a common finding in the general population, esp. in iodine deficiency areas such as in our country. Thyroid disorders like thyroid neoplasm still pose a major problem in both developing and developed countries. Nodular abnormality of thyroid represents a significant problem worldwide, the incidence of nodular thyroid disease

is on the rise owing to the association of childhood irradiation with increased incidence of both thyroid nodularity and carcinoma. In western countries approximately 5% and in iodine-deficient countries approximately 25% of the general populations have thyroid nodules. Although most of them are benign, 5-10% was malignant.

Sonography has become the method that is most commonly employed. The ultrasound examination of the thyroid should always include the entire neck, looking for abnormal lymph nodes, enlarged parathyroid glands, and abnormal masses. Both lobes must be scanned individually in the transverse and longitudinal planes.<sup>1</sup> Its use has resulted in early and accurate detection of various thyroid disorders. This is of immense help in timely management and prevention of complications.

### Access this article online



www.ijss-sn.com

Month of Submission : 07-2016

Month of Peer Review : 08-2016

Month of Acceptance : 09-2016

Month of Publishing : 09-2016

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Now sonography has largely replaced it for the majority of the patient, who require a graphic representation of the regional anatomy because of its higher resolution, superior correlation of true thyroid dimensions with the image, smaller expense, greater simplicity, and lack of need for radioisotope administration.

Color Doppler sonography is used in thyroid vascular study. Dynamic information such as velocity and direction of blood flow as well as degree of vascularity of organ can be revealed by color Doppler studies. Doppler (color and power) evaluation will be done for a good diagnosis because the thyroid is a highly vascular organ, and the vascularization changes during pathological diffuse or nodular processes.<sup>2</sup> The risk of malignancy in a euthyroid patient with a solitary thyroid nodule is estimated to be 5-10% with a range of 3.4-29%.<sup>3-8</sup>

Ultrasound vascular study is a noninvasive and low-cost method and is very reliable in the differential diagnosis of cold thyroid nodule; the best ultrasonographic modality is power Doppler. The majority of cold nodule will demonstrate a peripheral rim of color flow and no internal color flow with color Doppler sonography. A large number of hot nodules will demonstrate internal color flow. The vascular network of the thyroid nodules will distinguish the rare malignant nodules from the high amount of benign ones.<sup>9</sup>

The lymph nodes number and location will be evaluated by screening all the compartments of the anterior and lateral cervical region, along with their diameters and ratio, their shape, structure, and echogenicity.<sup>10</sup> Pathological lymph nodes can be inflammatory or metastatic, and they display some characteristic features.<sup>11,12</sup>

Fine needle aspiration cytology (FNAC) is inexpensive and easy to perform and widely available and will be done as an initial investigation for a thyroid nodule. Ultrasound guided FNAC will be done.<sup>10-14</sup>

- Impalpable or poorly palpable nodules (<2 cm)
- Non-diagnostic or failed previous conventional FNAC.

### Aims and Objectives

1. To study a common thyroid disorder in our setup.
2. Evaluating the accuracy of ultrasound in diagnosing thyroid disorders.
3. To evaluating the important sonological parameters in various thyroid disease.
4. To differentiate between solid, cystic and mixed nodule.
5. To differentiate between benign and malignant thyroid lesions.
6. To evaluate vascular nature of various thyroid lesion using color Doppler.

7. The role of color Doppler in distinguishing benign for malignant thyroid nodules.
8. Comparison of clinical, ultrasound color Doppler and FNAC findings.

## MATERIALS AND METHODS

This is a prospective study of patient presenting with various thyroid anomalies evaluated sonographically and findings correlated with fine needle aspiration cytology and is to be conducted in Department of Radiodiagnosis, N.S.C.B. Medical College, Jabalpur, Madhya Pradesh, India.

### Criteria for Pt. Selection

Patients referred to us having a palpable thyroid mass or neck swelling or presenting with clinical symptoms suggesting thyroid dysfunction, regardless of age and sex will be included in the study.

The most common clinical symptom will be swelling in front of neck, which moves up with deglutition. There will be systemic symptoms, such as pain and fever in thyroiditis weight loss and palpitation in hyperthyroidism, weight gain and hoarseness of voice in hypothyroidism and rapid increase in size with weight loss in malignancies. In nodular goiter patients will be usually euthyroid. The nodules will be palpable and sometimes visible.

Technical consideration:

1. Color Doppler ultrasound unit
  - a. Siemens-Sonoline 0-50
  - b. Logic 3 Expert<sup>z</sup> Ay 15 CUK-GE
2. High-frequency linear array ultrasound transducer with a range 8, 12, 14 MHz.

Linear array transducer will be preferred to sector transducer because of wider near field of view and the capability to combine high-frequency gray scale and color Doppler images.

Doppler settings will be standardized to compare the vascularity of thyroid pathologies among different patients and to ensure intra-individual consistency.

Observations will be recorded in the pro forma and hard copy of imaging mode.

### Technique of Scanning

Examination will be laterally extended to include the region of carotid artery and jugular vein to identify enlarged jugular chain of lymph nodes, superiorly to visualize submandibular adenopathy and inferiorly to define any pathological supraclavicular lymph nodes.

## RESULTS

In this study, the age of the patient ranged from 13 years to 70 years. Table 1 shows the distribution of patients among various age groups. The majority of the patients were in the age group of 40-50 years. The sex wise distribution of cases with thyroid diseases. Females are more commonly affected than male. Ratio between male and female is 8.32 in our study (Table 1).

The clinical diagnosis in this study, out of 40 cases, 10 (25%) were of goiter, 6 (15%) were of neck swelling, 16 (40%) cases were of colloid goiter, 2 (5%) cases were of hyperthyroidism, 2 (5%) cases were of multinodular goiter, 2 (5%) cases of cystic thyroid nodule, and 1 (2.5%) case of nodular goiter and toxic thyroid nodule (Table 1). The involvement of lobe of thyroid. Out of 40 cases, 22 (55%) cases involved both lobe of thyroid 11 (27.5%) cases involved right lobe and 7 (17.5%) involved left lobe (Table 1). The number of lesion on USG. Out of 40 cases, 16 (40%) were having single lesion, 3 (7.5%) were having two lesion, 7 (17.5%) were having diffusely enlarged gland, and 14 (35%) were having multiple lesion (Table 1). The internal content of lesion, out of 40 cases, 2 (5%) cases were purely cystic, 29 (72.5%) were having mixed solid and cystic component and 9 (22.5%) cases were having mixed solid and cystic with comet tail artifact (Table 1).

The echogenicity of lesion, out of 40 cases, 3 (15%) cases were anechoic lesion, 6 (15%) cases were hyperechoic lesion, and 28 (70%) cases were hypoechoic or mixed (Table 1). The presence of halo around the lesion, out of 40 cases, 1 (2.5%) case shows the presence of thick incomplete halo and 39 (97.5%) cases the halo is absent

**Table 1: Distribution of patients among various age groups**

Variables	Number of cases (%)
Age	
<20	2 (5.0)
20-29	5 (12.5)
30-39	8 (20.0)
40-49	14 (35.0)
50-59	9 (22.5)
60-69	2 (5.0)
Sex	
Male	8 (20.0)
Female	32 (80.0)
Presenting complaints	
Neck swelling	39 (97.5)
Throat pain	1 (2.5)
Clinical diagnosis	
Goiter	10 (25.0)
Neck swelling	6 (15.0)
Colloid goiter	16 (40.0)
Hyperthyroidism	2 (5.0)

(Contd...)

**Table 1: (Continued)**

Variables	Number of cases (%)
Multi nodular goiter	2 (5.0)
Cystic thyroid nodule	2 (5.0)
Nodular goiter	1 (2.5)
Toxic thyroid nodule	1 (2.5)
Thyroid lobe	
Both lobe	22 (55.0)
Left lobe	7 (17.5)
Right lobe	11 (27.5)
Number of lesion	
One	16 (40)
Two	3 (7.5)
Diffuse	7 (17.5)
Multiple	14 (35.0)
Internal contents	
Purely cystic	2 (5.0)
Mixed solid and cystic	29 (72.5)
Mixed solid and cystic with comet tail artifact	9 (22.5)
Echogenicity	
Anechoic	3 (7.5)
Hyperechoic	6 (15.0)
Hypoechoic/mixed	28 (70.0)
Halo	
Thick incomplete halo	1 (2.5)
Absent halo	39 (97.5)
Margin	
Well defined	31 (77.5)
Poorly defined	9 (22.5)
Calcification	
Eggshell	4 (10.0)
Coarse	2 (5.0)
Microcalcification	5 (12.5)
No calcification	29 (72.5)
Lymph node	
Absent	37 (92.5)
Present	3 (7.5)
Color Doppler index	
RI	
<0.75	37 (92.5)
>0.75	3 (7.5)
Power Doppler pattern	
Zero	0 (0.0)
Type I	14 (35.0)
Type II	21 (52.5)
Type III	2 (5.0)
Type IV	3 (7.5)
Sonographic diagnosis	
Thyroiditis	6 (15.0)
Colloid goiter	26 (65.0)
Diffuse hyperplasia of gland	2 (5.0)
Malignant thyroid mass	3 (7.5)
Hemorrhagic cyst	2 (5.0)
Follicular adenoma	1 (2.5)
Cytological findings	
Inflammatory lesion of thyroid	5 (12.5)
Colloid goiter	27 (67.5)
Benign follicular neoplasia	1 (2.5)
Follicular carcinoma	2 (5.0)
Colloid goiter with cystic degeneration	1 (2.5)
Hemorrhagic cyst	1 (2.5)
Papillary carcinoma thyroid	1 (2.5)
Graves' disease	1 (2.5)
Follicular adenoma	1 (2.5)

RI: Resistive index

(Table 1). The margin of lesion, out of 40 cases, 31 (77.5%) cases were having well-defined margins and 9 (22.5%) cases were having poorly defined margin (Table 1). Out of 40 cases, 4 (10%) cases having eggshell calcification, 2 (5%) cases having coarse calcification, 5 (12.5%) cases having microcalcification, and 29 (72.5%) cases calcification is absent (Table 1). Out of 40 cases in 37 (92.5%) cases, there is no involvement of lymph node and 3 (7.5%) cases having involvement of lymph node (Table 1).

Out of 40 cases, 10 (25%) cases were clinically diagnosed as goiter. Out of this 10 cases on USG, 2 (20%) were diagnosed as thyroiditis (6%) were diagnosed as colloid goiter and 1 (10%) case was diagnosed as diffuse hyperplasia of gland and malignant thyroid mass. Out of 40 cases, 6 (15%) cases were clinically diagnosed as neck swelling. Out of this 6 cases on USG, 3 (50%) were diagnosed as thyroiditis 1 case was diagnosed as diffuse hyperplasia of gland 2 (33%) case were diagnosed as malignant thyroid mass. Out of 40 cases, 16 (40%) cases were clinically diagnosed as colloid goiter all of them were diagnosed as colloid goiter on USG. Out of 40 cases, 2 (5%) cases were clinically diagnosed as hyperthyroidism, out of these 2 cases, 1 (50%) case was diagnosed as thyroiditis on USG and 1 (50%) case was diagnosed as colloid goiter on USG. Out of 40 cases, 2 (5%) cases were clinically diagnosed as multinodular goiter which was diagnosed as colloid goiter as on USG. Out of 40 cases, 2 (5%) cases were clinically diagnosed as cystic thyroid nodule which was as diagnosed as hemorrhagic cyst on USG. Out of 40 cases, 1 (2.5%) case was clinically diagnosed as nodular goiter which was diagnosed as colloid goiter on USG. Out of 40 cases, 1 case was clinically diagnosed as toxic thyroid nodule which was diagnosed as follicular adenoma on USG (Table 2).

The out of 40 cases in 37 (92.5%) cases having RI value  $<0.75$  and in 3 (7.5%) cases having RI value  $>0.75$  (Table 1).

The patients have Type 2 pattern and 1. Pattern zero corresponding to no flow was not observed in any case. Type 1 pattern in which there is only peripheral flow is seen in 14(35%) nodules. Type 2 pattern having peripheral and central component of flow with peripheral component predominating is seen in 21 (52.5%) patients. Type 3 pattern with central component predominating over peripheral is seen in 2 (5%) patients. Only 3 (7.5%) has type 4 pattern which has only central flow (Table 1). Out of 40 cases, 6 (15%) cases were sonographically diagnosed as thyroiditis, 26 (65%) cases were diagnosed as colloid goiter, 2 (5%) cases were diagnosed as diffuse hyperplasia of gland, 3 (7.5%) cases were diagnosed as malignant thyroid mass, 2 (5%) cases were diagnosed as hemorrhagic cyst, and 1 (2.5%) case was diagnosed as follicular adenoma (Table 1). Out of 40 cases, 5 (12.5%)

cases were cytologically diagnosed as inflammatory lesion of thyroid, 27 (67.5%) cases were diagnosed as colloid goiter, 1 (5%) case was diagnosed as follicular carcinoma, 1 (2.5%) case was diagnosed as colloid goiter with cystic degeneration, 1 (2.5%) case was diagnosed as hemorrhagic cyst, 1 (2.5%) case was diagnosed as papillary carcinoma thyroid, 1 (2.5%) case was diagnosed as Graves' disease, 1 (2.5%) case was diagnosed as follicular adenoma (Table 1).

The comparative study between b mode and FNAC. Out of 40 cases, 6 (15%) cases were diagnosed as thyroiditis on USG, 5 (12.5%) cases were correctly proved by FNAC, and 1 (2.5%) case was diagnosed as follicular adenoma. Out of 40 cases on USG, 2 (5%) cases were diagnosed as diffuse hyperplasia of gland and 1 (2.5%) case was diagnosed as benign follicular neoplasia, and 1 (2.5%) as Graves' disease on FNAC. 3 N(7.5%) cases of malignant thyroid mass were diagnosed on USG, 1 (2.5%) was diagnosed as papillary carcinoma, and 2 (5%) cases were diagnosed as hemorrhagic on USG 1 (2.5%) was correctly proved by FNAC and 1 (2.5%) was diagnosed as colloid goiter with cystic degeneration and 26 (65%) cases were diagnosed as colloid goiter ass of them were correctly proved by FNAC (Table 3).

## DISCUSSION

Thyroid diseases are not uncommon in clinical practice and many of them present itself as thyroid nodule. Clinical biochemical imaging and histological assessment must be closely coordinated in patient with thyroid diseases for confirmation of diagnosis present study have been done in the Department of Radiodiagnosis, N. S. C. B. Medical College, Jabalpur, with title Evaluation of Abnormalities of Thyroid Gland By High Resolution Ultrasound and Color Doppler Imaging Along with Cytological Correlation.

This study included 40 patient of thyroid diseases referred from Department of Surgery, General Medicine, ENT, etc., for ultrasonographic evaluation.

In our study, we have taken 40 cases of the study group. In this study, we found the majority of case between 4<sup>th</sup> and 5<sup>th</sup> decade and above age group. Yokozawa *et al.*<sup>15</sup> reported their experience with 678 patients of benign thyroid nodule by USG and FNAC they reported mean age of  $52.2 + 11.9$  years which was higher than what was observed in our study. In present series out of 40 patient, 32 were female and rest 8 were male Solbiati *et al.* in their study of 401 patient found that 71.3% were females and 28% were males. Khurana *et al.*<sup>16</sup> reported their experience with 119 patients out of which 100 (84%) were females and 19 (16%) males.



**Table 2: Clinical diagnosis**

Clinical diagnosis	Sonography diagnosis					
	Thyroiditis	Colloid goiter	Diffuse hyperplasia of gland	Malignant thyroid mass	Hemorrhagic cyst	Follicular adenoma
Goiter	2	6	1	1	0	0
	33.3	23.1	50.0	33.3	0.0	0.0
Neck swelling	3	0	1	2	0	0
	50.0	0.0	50.0	66.7	0.0	0.0
Colloid goiter	0	16	0	0	0	0
	0.0	61.5	0.0	0.0	0.0	0.0
Hyperthyroidism	1	1	0	0	0	0
	16.7	3.8	0.0	0.0	0.0	0.0
Multi nodular goiter	0	2	0	0	0	0
	0.0	7.7	0.0	0.0	0.0	0.0
Cystic thyroid nodule	0	0	0	0	2	0
	0.0	0.0	0.0	0.0	100.0	0.0
Nodular goiter	0	1	0	0	0	0
	0.0	3.8	0.0	0.0	0.0	0.0
Toxic thyroid nodule	0	0	0	0	0	1
	0.0	0.0	0.0	0.0	0.0	100.0

**Table 3: Cytological findings**

Cytological findings	Sonography diagnosis					
	Thyroiditis	Colloid goiter	Diffuse hyperplasia of gland	Malignant thyroid mass	Hemorrhagic cyst	Follicular adenoma
Inflammatory lesion of thyroid	4	1	0	0	0	0
	66.7	3.8	0.0	0.0	0.0	0.0
Colloid goiter	2	25	0	0	0	0
	33.3	96.2	0.0	0.0	0.0	0.0
Benign follicular neoplasia	0	0	1	0	0	0
	0.0	0.0	50.0	0.0	0.0	0.0
Follicular carcinoma	0	0	0	2	0	0
	0.0	0.0	0.0	66.7	0.0	0.0
Colloid goiter with cystic degeneration	0	0	0	0	1	0
	0.0	0.0	0.0	0.0	50.0	0.0
Hemorrhagic cyst	0	0	0	0	1	0
	0.0	0.0	0.0	0.0	50.0	0.0
Papillary carcinoma thyroid	0	0	0	1	0	0
	0.0	0.0	0.0	33.3	0.0	0.0
Graves' disease	0	0	1	0	0	0
	0.0	0	50.0	0.0	0.0	0.0
Follicular adenoma	0	0	0	0	0	1
	0.0	0.0	0.0	0.0	0.0	100.0

In our study, we found the majority of patients 39 of neck swelling and only 1 patient of throat pain. In this study, one thing is coming out major complaints of patient is neck swelling. In our study, out of 40 patients, we found 10 (25%) patients of goiter, 6 (15%) patients of neck swelling, 16 (40%) patients of colloid goiter 2 (5%) patients of hyperthyroidism, 2 (5%) patients of multinodular goiter, 2 (5%) patients of cystic thyroid nodule. and 1-1 patients of nodular goiter and toxic thyroid nodule.

About 26 cases were echographically diagnosed as colloid goiter and 1 case of colloid goiter with cystic degeneration all of them were proved by FNAC. All of them showing

perinodular color flow pattern with RI <0.75. Solbiati *et al.*<sup>17</sup>(1985) found 26(6%) cystic nodules out of 401 cases. All these lesions were goiter and no malignancy was found. Cox *et al.*,<sup>18</sup> in 1,991, found 16 cystic nodules out of 68 patients in which were benign and 1 was malignant. In our study group out of 40 cases, we found 3 (7.5%) cases of anechoic lesion, 6 (15%) cases of hyperechoic lesion, 28 (70%) cases of hypoechoic, and 4 mixed variety of lesion. Takashima *et al.*<sup>19</sup> found that tissue echogenicity is the most useful criteria in making a sonographic diagnosis and that hypoechoic lesion have the highest incidence of malignancy. Papini *et al.*<sup>20</sup> in their study concluded that hypoechoic lesion have a sensitivity of 87% in detecting malignant lesion.

Out of 40 cases, we found only 1 case of thick in complete halo and in rest of 39 cases there is no evidence of halo seen. Summariá Vmirk *et al.*<sup>21</sup> in their study of 78 patient found absent halo sign 18/22 carcinoma and in 16/56 benign nodules with a sensitivity of 82% and 71%, respectively.

Out of 40 cases, we found 31 (77.5%) regular margin and in rest of 9 (22.5%) margin are irregular. Andrej Lyshchik *et al.*<sup>22</sup> in their study comprising 103 patients found that the most reliable diagnostic criteria for malignancy is irregular out line with a sensitivity and specificity of 69.6% and 86.4%, respectively.

In our study out of 40 cases, we found eggshell calcification in 3 cases coarse calcification in 2 cases and micro calcification in 5 cases and rest of 30 cases there is absence of calcification. Takashimas *et al.*<sup>19</sup> studied 201 patients with USG to clarify the role of microcalcification in diagnosis of thyroid of tumors and found that sensitivity specificity and positive predictive value of microcalcification was 36%, 93%, 70%, respectively. Papini *et al.*<sup>20</sup> found that at us cancers presented with irregular margins in 77.4% with relative risk of 16.83%.

Out of 40 cases, we found in 37 (97.5%) there is no evidence of lymphadenopathy seen and in rest of 3 (7.5%) cases lymph node present.

On USG diagnosis, out of 40 cases, we found 6 (15%) cases of thyroiditis, 26 (26%) case of colloid goiter, 2 (5%) cases of diffuse hyperplasia of gland, 3 (7.5%) cases of malignant thyroid mass, 2 (5%) cases of hemorrhagic cyst, and 1 case of follicular adenoma.

On cytological examination, out of 40 cases, we found 5 (12.5%) cases of inflammatory lesion of thyroid, 27 cases of colloid goiter, 1 case of benign follicular neoplasia, and 2 case of follicular carcinoma, and case of colloid goiter with cystic degeneration, and 11 case of hemorrhagic cyst and papillary carcinoma Graves' disease and follicular adenoma.

In our study, power Doppler pattern was classified in to 5 sub types. Type zero with no flow at all was not observed in any thyroid nodules. Benign nodules predominantly shows type 2 and type 1 pattern with only 2 nodules showing type 3 pattern. Malignant nodules showed predominantly type 4 pattern. No benign nodule showed type 4 pattern this series shows that type 4 pattern are highly sensitive and specific in detection of malignant thyroid nodule.

De Nicola *et al.*<sup>23</sup> evaluated thyroid nodules and found sensitivity and specificity of type 3 and type 4 pattern in the detection of malignancy were 80% and 89%, respectively.

Miyakawa *et al.*<sup>24</sup> concluded that power Doppler findings have a sensitivity and specificity of 87% and 92%, respectively.

Chammas *et al.*<sup>25</sup> in their study found that power duplex Doppler facilitates screening of thyroid nodules at high risk for malignancy with elevated sensitivity (92.3%) and specificity (88%).

In color Doppler examination, we found 3(7.5%) cases of increased RI value more than .75 and rest of 37 case < 0.75.

Holden found mean RI value of 0.76 in cart in adenoma, and 0.57 in colloid nodule. Cerbone *et al.* RI of greater than 0.75 in 18 of 21 carcinomas and benign nodules. Denicola *et al.* found mean Rivalue carcinomas and 0.60 in benign nodule.

## CONCLUSION

The thyroid lesion was examination by 6-12 MHz electronically focussed linear transducer with patient in supine position with direct contact method.

In our series, age ranges from 13 to 70 years major age group affected in between 40 and 50 years.

Male and female ratio in our study was 1:4 females were found to be affected more than males.

Out of 40 cases, 2 cases were diagnosed as purely cystic, 25 cases were diagnosed as mixed solid and cystic and 9 cases were diagnosed as mixed solid with comet tail artifact which were proved by FNAC examination. Diagnostic accuracy in this series was 100%.

A. Cystic lesion were then grouped under various histologic types depending upon echographic finding in the light of history and physical examination which shows over yield in diagnosis of cystic lesion was 94.4%. 26 cases were echographically diagnosed as colloid goiter and 1 case of colloid goiter with cystic degeneration all of them were proved by FNAC. All of them showing perinodular color flow pattern with RI < 0.75.

2 cases were echographically diagnosed as hemorrhagic cyst 1 of them were proved to be hemorrhagic cyst and 1 case was falsely diagnosed as hemorrhagic cyst due to false interpretation latter on proved to be colloid goiter with cystic degeneration, and malignant lesion. 6 cases were diagnosed as thyroiditis 5 of them found to be correct by FNAC 1 case was turned out to be Graves' disease. All of them showing RI value < 0.75 on color Doppler examination.

Three cases were diagnosed as malignant thyroid mass 1 of them was diagnosed as papillary carcinoma by FNAC showing RI > 0.75 on color Doppler examination and 2 of them was diagnosed as follicular neoplasm by FNAC 4 showing RI > 0.75 1 case were diagnosed as follicular adenoma was correct proved by FNAC with RI value <0.75 on color Doppler examination.

Hypoechoic halo was frequently present in benign lesion than malignant cases were having irregular or incomplete hypoechoic halo. In many cases it was absent. The role of high resolution ultrasonography in the diagnosis of palpable thyroid masses has been assessed in our study and results were encouraging. Sonography attains 100% accuracy in differentiating solid, cystic and complex masses and it provides a diagnostic accuracy in 91% cases in term of tissue characterization.

This study highlights the usefulness of ultrasonography in the evaluation of the palpable thyroid masses as an adjunct to clinical examination. Ultrasound has added advantage of being safe, noninvasive, rapid. Reliable, acceptable economical and probable imaging modality without hazard of radiation. It can also guide interventional procedures like cyst aspiration and fine needle biopsy. It has also capability to detect small non palpable thyroid masses (<1 cm in diameter).

Thus in conclusion ultrasonography is 100% effective in diagnosing a thyroid lesion whether solid. Cystic or mixed.

Although tissue characterization is not always possible by the ultrasound, it can help to differentiate a malignant lesion from benign masses with some limitation. Hence, it can be used as valuable adjunct to clinical examination and should be offered to all patients presenting with palpable thyroid masses.

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**How to cite this article:** Solanki AS, Sharma S. Evaluation of Abnormalities of Thyroid Gland by High Resolution Ultrasound and Color Doppler Imaging along with Cytological Correlation. *Int J Sci Stud* 2016;4(6):181-187.

**Source of Support:** Nil, **Conflict of Interest:** None declared.