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Correlation of Ultrasound Findings with Cytopathological Findings in Different Types of Thyroid Disorders in 120 Patients.

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ABSTRACT

Background: The disorders of thyroid glands are most common in female population compared to male population. Maximum numbers of patients were in the second to fifth decade. Patients of benign multinodular goitre formed the largest proportion of the cases in the study. The second most common lesion detected was solitary nodules. Ultrasound was able to detect an increase in gland size. Both micro-calcification and macro-calcification were easily detected by ultrasound study. Ultrasound was able to detect lymph node metastasis and cystic degeneration. High-resolution ultrasonography (USG) is the most sensitive imaging modality available for examination of the thyroid gland and associated abnormalities. Ultrasound scanning is non-invasive, widely available, less expensive, and does not use any ionizing radiation. Further, real time ultrasound imaging helps to guide diagnostic and therapeutic interventional procedures in cases of thyroid disease. **Methods:** All patients are examined in supine position with hyper extended neck, using a high frequency linear-array transducer (7-15 MHz) in Toshiba USG machine that provides adequate penetration and high resolution image. Scanning is done both in transverse and longitudinal planes. **Results:** Out of 120 patients, maximum number of patients were between the age of 20 to 50 years and 70% of patients were female but only 30% were males. Ultrasound can detect multiple nodules in 52 patients (43.33%) and single nodule in 20 patients (16.66%). **Conclusion:** Ultrasound was able to predict micro-calcifications in malignancies and the presence of macro-calcifications in benign nodules. This finding was of considerable importance for predicting malignancy in the nodules. Ultrasound was able to detect lymph node involvement in malignancies.

Keywords: Cytopathological Findings, Thyroid Disorders, Ultrasound.

INTRODUCTION

The thyroid gland is located in the anterior part of the neck with lateral lobes lying on either side of the trachea joined across by the isthmus. The pretracheal fascia binds the thyroid to the trachea and it moves with the trachea on swallowing.

Each lobe measures about 5cms long, its greatest transverse diameter and anterio-posterior extent being about 3cms and 2cms respectively. Thyroid size, shape and volume varies with age and sex. The limits of normal thyroid volume (excluding isthmus, unless its thickness is >3 mm) are 10-15 ml for females and 12-18 ml for males.

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The thyroid in Greek means a shield. Galen, around the year 199 A.D was the first person who named the thyroid. In the year 1543, Vesal first described the anatomy of thyroid gland. Each of the elongated lateral lobes of the thyroid consists of a superior and an inferior pole. In normal subject, the thyroid isthmus overlies the third tracheal ring.

Aims and Objectives:

To study the efficacy of ultrasonography in evaluating different thyroid disorders and clinically correlate with the findings of histopathological examination in patients referred for "USG Thyroid" coming to Radio-diagnosis Department, JNIMS, Imphal.

MATERIALS AND METHODS

All patients are examined in supine position with hyper extended neck, using a high frequency linear-array transducer (7-15 MHz) in Toshiba USG machine that provides adequate penetration and high resolution image. Scanning is done both in transverse and longitudinal planes. Real time imaging of thyroid lesions is performed using both gray-scale and color Doppler techniques. The imaging characteristics of a mass (viz. location, size, shape, margins, echogenicity, contents and vascular

pattern) should be identified. Fine needle aspiration (FNA) biopsy is suggested to the referring physician for clinical correlation and some patient have already done the investigation.

RESULTS

In the study, I have taken 120 patients with clinically suspected thyroid disorders.

Table 1: Age and sex distribution of the patients (n=120).

Age (Yrs)	Male	Female	Total	Percentage
11-20	4	0	4	3.33 %
21-30	8	8	16	13.3%
31-40	12	48	60	50%
41-50	4	24	28	23.3%
51-60	4	4	8	6.6%
Above 60	4	0	4	3.33%
Total	36	84	120	100.00%

Male -30%, **Female** – 70%.

The above table shows that out of 120 patients, maximum number of patients were between the age of 20 to 50 years and 70% of patients were female but only 30% were males. So thyroid disorders are common in female patients.

Table 2: Overview of various ultrasound findings in 120 patients.

Ultrasound findings	No of patients	Percentage
Normal gland size	24	20%
Increase in gland size	68	56.66%
Solitary nodule	20	16.6%
Multiple nodules	52	43.3%
Diffuse gland	8	6.6%
Micro calcification	12	10%
Hyperechoic nodule	8	16.6%
Hypoechoic nodule	40	33.33%
Macro calcification	16	13.33%
Iso echoicnodule	20	16.6%
Mix echoic texture/Heterogeneous nodule	12	10%
Cystic lesion of the gland	40	33.33%
Peripheral halo sign	12	10%
Associated lymph nodes	12	10%
Ectopic thyroid	-	-
Accessory	-	-
Distant metastasis	-	-

The above table shows that ultrasound can detect multiple nodules in 52 patients (43.33%) and single nodule in 20 patients (16.66%).

Table 3: Histopathological diagnosis in 120 patients.

Histopathological Findings	No of patients	Percentage
Multinodular goitre	48	40%
Hashimoto's Thyroiditis	8	6.6%
Adenoma	20	16.6%
Ectopic thyroid	4	3.33%
Accessory	4	3.33%
Papillary carcinoma	8	6.66%
Follicular carcinoma	4	3.33%
Medullary carcinoma	4	3.33%
Colloid cyst	16	13.3%
Colloid goitre	4	3.33%

The above table shows that maximum patients in the study were a case of multinodular goitre. So out of all thyroid disorders, multinodular goitre is the most common disorder detected. 48 patients (40%) were detected as multinodular goitre out of total number of 120 patients.

Screening test	Matched diagnosis		Unmatched diagnosis	
	No. of patients	Percentage	No. of patients	Percentage
Ultrasound	92	76.66%	28	23.33%

Total no. of patients = 120

Percentage of agreement between FNAC and ultrasound

Matched diagnosis = 92 patients

Percentage = 76% (Diagnostic efficacy of ultrasound study)

Unmatched = 28 patients

Percentage = 23.33%

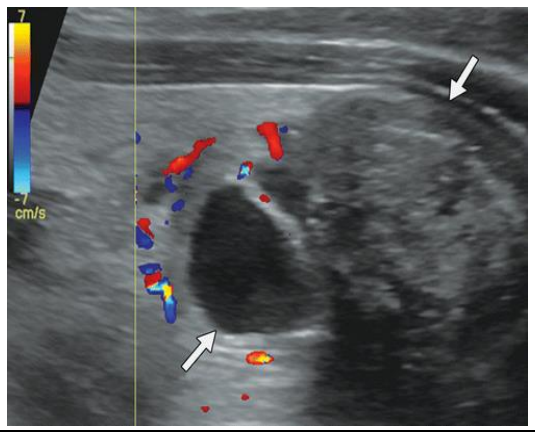

Figure 1: 52 years old women who presented with thyroid nodule which on sagittal color doppler USG image shows 2cm mixed cystic and solid nodule in lower pole of left thyroid lobe. This image shows lack of colour flow within the nodule.

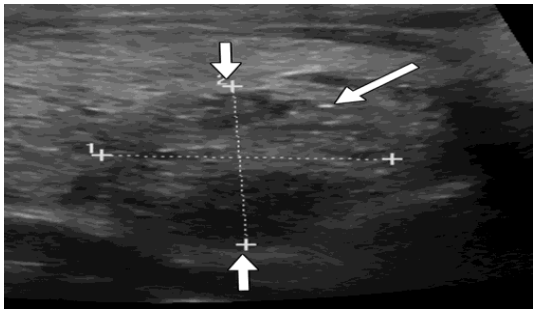

Figure 2: Transverse USG images shows 2 cm solid nodule in right lobe of thyroid in 50 years old women showing numerous punctuate echogenic foci in the nodule. Color doppler image revealed lack of flow in the nodule.

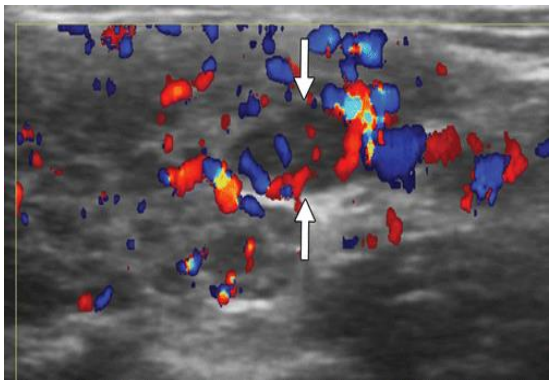

Figure 3: 35 year old woman showing colour Doppler flow within the 2cm solid nodule in lower pole of left thyroid with parenchyma heterogeneity.

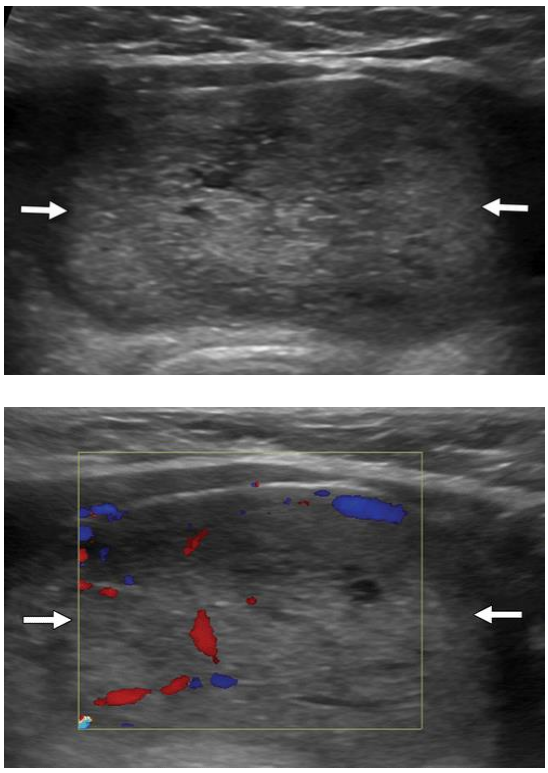

Figure 4: Transverse ultrasound image shows 3 x 2 cm solid nodule at thyroid isthmus.

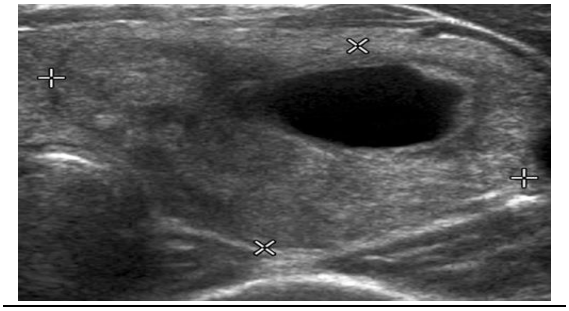

Figure 5: 32 year old women with thyroid nodule. Transverse USG image of thyroid show 4 cm well defined mixed solid and cystic nodule.

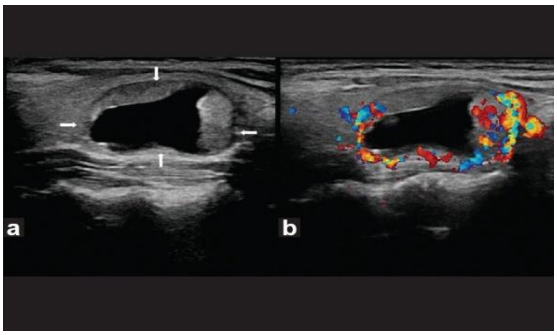

Figure 6: Transverse grey scale ultrasound and colour doppler show large intramural cyst s/o benign thyroid nodule.

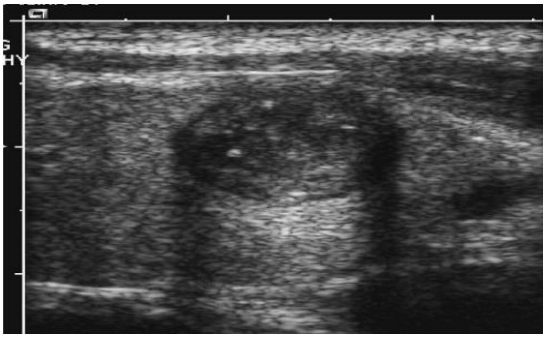

Figure 7: Thyroid gland showing well-defined hypoechoic nodule with few small echogenic foci s/o micro-calcification, it was proved to be Papillary Carcinoma by FNAC.

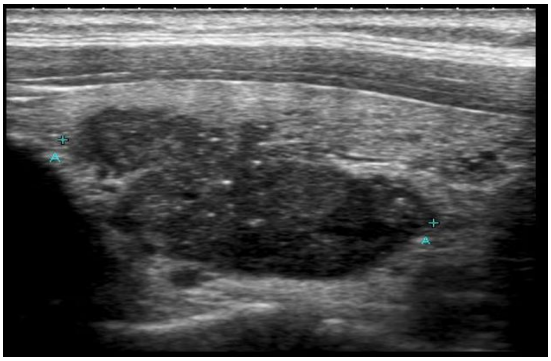

Figure 8: Thyroid gland showing a lobulated, hypoechoic mass lesion with echogenic foci s/o microcalcification on left lobe, proved to be Follicular Carcinoma after FNAC.

Figure 9: Thyroid gland showing a lobulated, hypoechoic mass lesion with echogenic foci s/o microcalcificationon the left lobe, FNAC proved it to be a case of Follicular Carcinoma.

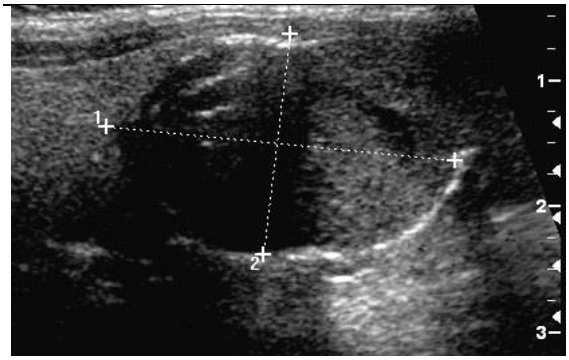

Figure 10: Thyroid gland showing a well-defined hypoechoic thyroid nodule.

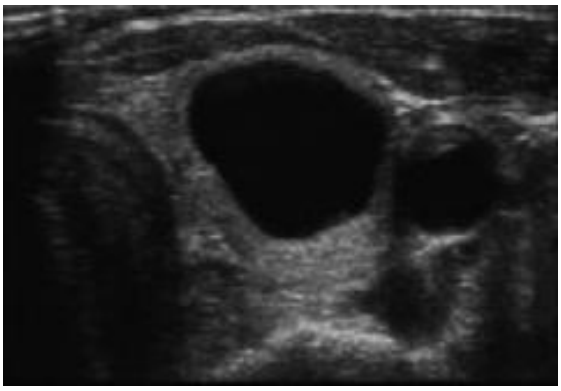

Figure 11: Thyroid gland showing a nodule with simple cyst in left lobe.

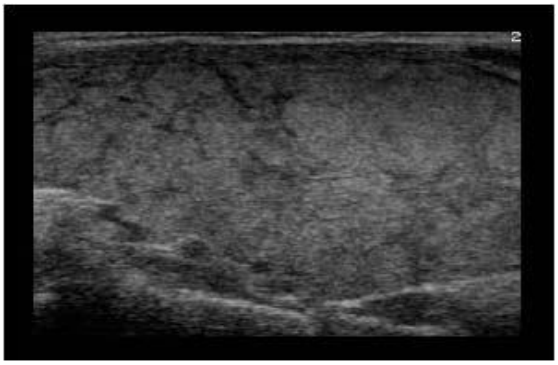

Figure 11: Thyroid gland showing diffusely enlarged thyroid gland with heterogeneous echotexture s/o thyroiditis.

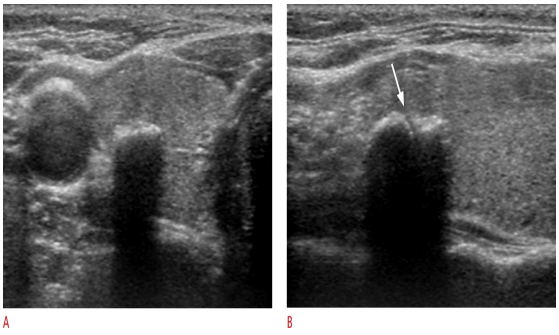

Figure 12: A and B-Thyroid gland showing macro calcification in the left lobe, which shows acoustic shadowing characteristic of a benign thyroid nodule.

DISCUSSION

A total of 120 patients with various thyroid disorders formed the study sample.

The female to male ratio in our study was 70% versus 30% i.e. 7:3 which is consistent with the findings of various workers.[1]

Maximum number of patients were in the second to fifth decade, (86.66%) which again coincides with the age distribution patterns as mentioned in the literature.[1]

Ultrasound

The most common ultrasound finding was the ability to detect the multiple nodules. This ability of ultrasound is in accordance with available data which states that 20-40% of the cases referred ultrasound for a single thyroid nodule will be found to be having multiple nodules.[2,3]

All the four patterns i.e. hypoechoic (33.33%) nodules, mixed echogenicity (10.00%) nodules and hyperechoic (13.33%) nodules and isoechoic nodules (16.66%) were found. the presence of cystic degeneration seen in our study is 33.33% of the cases. literature mentions this incidence to be around 30%.[4]

Thyroiditis

Total of 8 patients of thyroiditis were a part of our study sample. Histopathologically, they were proven to represent hashimoto's thyroiditis which is the most common form of thyroiditis.[5]

Ultrasound

There was an uniform increase in gland size. These findings on ultrasound are consistent with those reviewed in literature according to which the ultrasound appearance of hashimoto's thyroiditis is that of a diffuse glandular enlargement with irregular margins.[6]

In a study, all 12 cases of hashimoto's showed a gland which consisted of low level echoes with a decrease in the overall echogenecity of the gland.[7]

Adenomas of thyroid

15 cases of toxic adenomas were studied, out of which 12 cases were associated with thyrotoxicosis. This is substantiated by a literature, which according to Ingbar's classification states that toxic adenoma is a common cause of thyrotoxicosis associated with hyperthyroidism.[8]

Ectopic /thyroid gland

One case of sublingual ectopic thyroid were studied. According to the literature sublingual thyroid is a very common site for thyroid ectopia.

Ultrasound

Ultrasound showed absence of thyroid gland in normal position. However, ultrasound was unable to detect the ectopic site.

Thyroid carcinomas

A. Papillary carcinoma :

Out of total of 16 cases of thyroid carcinoma, papillary carcinoma constituted 8 cases (50%). Most of the cases detected were females. These findings are consistent with the reported incidence and sex predominance in the population which states that papillary and predominantly papillary (mixed papillary and follicular) thyroid carcinoma is the most common thyroid malignancy accounting for about 70% of the cases with female to male preponderance is about 3:1.[9]

Ultrasound

One case showed hypoechoic nodule with the cystic degeneration and the other case showed heterogeneous nodule with highly reflective foci of micro-calcification with minimal cystic areas. The ultrasound features are in accordance with the literature findings in different series. In one series 401 patients were studied out of which 77 cases of papillary carcinoma were studied, the most common ultrasound findings was the presence of solid hypoechoic nodules with cystic degeneration seen in 66 (77%) of the cases.[10]

The presence of micro-calcification has recently been established as reliable sign of malignancy. These are highly reflective foci often as small as 2 mm in diameter. In one series of 8 papillary carcinoma, micro-calcification was seen in 5 (62.5%).[11]

Ultrasound proved highly effective for detection, localization and delineation enlarge lymph nodes of neck. Cervical lymph node metastasis according to literature was present in about 20% of the patients at the time of presentation.[12]

b. Follicular carcinoma

In a total of 16 cases, only 4 case was diagnosed as follicular carcinoma by histopathological examination.

Ultrasound

Ultrasound showed solid hypoechoic pattern with no cystic component within it with irregular margins.

c. Medullary carcinoma

In the study 4 case were diagnosed by histopathology as medullary carcinoma.

Ultrasound shows a solid isoechoic lesion with micro-calcifications and posterior acoustic shadowing. The lesion shows irregular margins and no peripheral halo around it. A solid isoechoic lesion was seen in 3 cases. All the nodules had irregular margins and none had peripheral halo around it.[13]

The ability of ultrasound to detect small nodules makes it the procedure of choice in evaluating suspected intrinsic thyroid abnormalities compared to other modality like computed tomography.**[24]** the high-resolution sonography is the most accurate method of examination for demonstrating changes in the thyroid. Evaluation of the sonography is superior to all other kinds of investigations.[14]

Additional features of malignancy in a thyroid nodule disorganized internal colour flow, interval growth, lack of a halo, lobulated contour, infiltrated borders and cervical adenopathy.[15,16]

Papini et al. reported that the combination of solid echo-structure with hypoechogenic pattern has 87% sensitivity for thyroid cancer, albeit with low specificity and low positive predictive value.[17] In addition, micro-calcifications have also been extensively studied and described as one of the main predictors of papillary thyroid cancer.**[18]** Consistent with these findings, in the present study micro-calcifications were significantly associated with malignant cytology, but only for solid nodules. Irregular margins are another ultrasound feature which has proved to be highly specific for thyroid malignancy.[17]

CONCLUSION

Ultrasound was able to predict micro-calcifications in malignancies and the presence of macro-calcifications in benign nodules. This finding was of considerable importance for predicting malignancy in the nodules. Ultrasound was able to detect lymph node involvement in malignancies.

Ultrasound able to detect cystic degeneration. Though ultrasound could not predict with certainty, the presence of malignant or benign nodule, it was specific in predicting malignancies based on solitary nodules, echotexture, calcification and lymph node involvement. Ultrasound was able to predict with certainty the presence of a peripheral hypoechoic halo in both the cases of benign follicular adenoma .In all the cases of thyroiditis, ultrasound showed a hypoechoic diffuse gland with no evidence of a focal mass lesion. Overall, diagnostic efficacy of ultrasound is superior to all other kinds of investigations.

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