ASSESSMENT AND COMPARISON OF THYROID DISEASES BY SONOGRAPHY AND HISTOPATHOLOGY

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ABSTRACT: AIM & OBJECTIVE: To differentiate between solid, cystic and mixed nodular & differentiate between benign and malignant thyroid lesion & role of color doppler in distinguishing benign for malignant thyroid nodules & Comparison of clinical, ultrasound color doppler and FNAC findings. **MATERIAL AND METHODS:** Random selection of patient of all age groups was done. They presented with sign and symptoms suggestive of thyroid disorders. 60 patients underwent sonography of thyroid with grey scale and doppler evaluation. **OBSERVATION:** There were 49 females and 11 males of the total 60 positive cases. Out of total 60 thyroid nodules 26.53% were cystic, 42.85% were solid and 30.61% were mixed in Echotexture. Most of the thyroid nodules (91.84%) have resistive index less than 0.75 with only 8.16% having RI over 0.75. Velocity is less than 50 cm/s in majority of thyroid nodules with 32.65% having V max greater than 50 cm/s. **CONCLUSION:** High resolution ultrasonography is highly sensitive in diagnosing thyroid disorders. Color Doppler acts as an important adjunct to B-mode in increasing the accuracy. Females are more common affected than males. Most common age group affected is between 20-40 years. Nodular involvement of thyroid is more common than diffuse. Micro calcification has highest specificity for malignancy on B-Mode. Resistive index >0.75 cm/s in majority of neoplastic nodules whereas Velocity in adenomas is > 50 cm/s.

KEYWORDS: Thyroid, Nodule, Vascularity.

INTRODUCTION: Thyroid lesions are a common finding in the general population, esp. in iodine deficiency areas such as in our country. With the more radical use of iodized salt and other measures the incidence of earlier common disorders like goiter, congenital hypothyroidism etc. has dropped dramatically but still these are quite common in developing countries. "Himalaya's goiter Belt" is World's Biggest Goiter Belt.

Other thyroid disorders like thyroid neoplasm still pose a major problem in both developing and developed countries. Nodular abnormality of thyroid represent a significant problem all over the world.

AIMS & OBJECTIVES:

1. To evaluating the important sonological parameters in various thyroid disease.
2. To differentiate between solid, cystic and mixed nodular.
3. To differentiate between benign and malignant thyroid lesions.
4. To evaluate vascular nature of various thyroid lesion using colour doppler.
5. Comparison of clinical, ultrasound colour Doppler and FNAC findings.

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MATERIAL AND METHODS:

Patient Selection & Clinical Presentation: Random selection of patient of all age groups was done. They presented with sign and symptoms suggestive of thyroid disorders

The study was done in department of Radiodiagnosis, G.R. Medical College and J.A. Group of Hospitals, Gwalior. 60 patients underwent sonography of the thyroid.

OBSERVATIONS: The present study includes 60 positive patients referred to The Department of Radiodiagnosis for sonographic examination of the thyroid gland.

Sex	No. of Cases	Percentage
Male	11	18%
Female	49	82%
Total	60	100%

TABLE 1: SEX RATIO OF THYROID DISORDERS

The male to female ratio in our study 1:4.45

Pattern of Involvement	No. of Cases	Percentage
Diffuse	11	18%
Nodular	49	82%
Total	60	100%

TABLE 2: PATTERN OF INVOLVEMENT OF THYROID DISORDERS

Thyroid disorders are predominantly nodular with ratio of diffuse to nodular being 1:4.45.

Echotexture Pattern	No. of Cases	Percentage
Cystic	13	26.53%
Solid	21	42.85%
Mixed	15	30.61%
Total	49	100

TABLE 3: INCIDENCE OF DIFFERENT ECHOTEXTURE PATTERN IN THYROID NODULES

Out of total 82 thyroid nodules 26.53% were cystic, 42.85% were solid and 30.61% were mixed in Echotexture.

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B-Mode Findings	No. of Cases N-49	Percentage
ECHOGENESITY		
Hypoechoic/Echofree	20	40.81%
Isoechoic	17	34.69%
Hyperechoic	12	24.49%
A) HALO		
Thin & Complete	34	69.39%
Thick & Incomplete	15	30.61%
B) MARGINS		
Regular	37	75.61%
Irregular	12	24.39%
C) CALCIFICATION		
Microcalcification	3	6.12%
Coarse Or Egg Shell	12	24.48%
TABLE 4: INCIDENCE OF DIFFERENT B-MODE FINDINGS IN THYROID NODULES		

Out of the total 49 nodules 17 were Isoechoic, 12 Hyperechoic and 20 Hypoechoic. 34 patients have thin and complete halo around the nodule whereas 15 patients has thick, incomplete or absent halo. Margins of the nodule were regular in 37 cases whereas it was Irregular in 12 cases.

All the patients didn't show calcification. Only 3 patients have Micro calcification whereas 12 patients have evidence of coarse eggshell calcification.

Thyroid Pathologies	B-Mode	FNAC	False Positive	False Negative	Sensitivity
Thyroglossal cyst	2	2	-	-	100%
Simple Goitre	5	5	-	-	100%
Solitary Thyroid Nodule	2	4	-	2	50%
Multinodular Goitre	25	27	3	5	75%
Adenoma	11	11	3	3	78.95%
Carcinoma	8	6	2	1	88%
Hashimoto's Thyroiditis	4	5	-	1	80%
Graves' disease	3	2	1	0	100%
Total	60	60	10	13	83%
TABLE 5: COMPARISON OF B-MODE DIAGNOSIS WITH FNAC					

Overall sensitivity and specificity of B-Mode in diagnosing thyroid pathologies is 83% each.

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Ultrasound Findings	Benign		Malignant	
	N	%	N	%
ECHOGENECITY				
Hypoechoic	10	20.40%	4	8.16%
Isoechoic	17	34.69%	1	2.04%
Hyperechoic	16	32.65%	1	2.04%
HALO				
Thin & Complete	33	67.34%	2	4.08%
Thick & Incomplete	10	20.40%	4	8.16%
MARGINS				
Regular	36	73.46%	1	2.04%
Irregular	7	14.28%	5	10.20%
CALCIFICATION				
Microcalcification	1	2.04%	3	6.12%
Coarse or Egg Shell	10	20.4%	1	2.04%
POWER DOPPLER PATTERN				
Type I & II	39	79.59%	1	2.04%
Type III & IV	4	8.16%	5	10.20%
RESISTIVE INDEX (RI)				
<0.75	42	85.71%	2	4.08%
>0.75	1	2.04%	4	8.16%
VELOCITY (V max)				
< 50 cm/s	32	65.30%	1	2.04%
> 50 cm/s	11	22.44%	5	10.20%
TABLE 6: B-MODE & COLOUR DOPPLER FEATURES IN BENIGN & MALIGNANT THYROID NODULES				

In our study most of the malignant lesions are Hypoechoic with thick incomplete halo, irregular margins, microcalcification, type III & IV power Doppler pattern, resistive index >0.75 and peak velocity >50 cm/s.

Most of the benign lesions are Isoechoic or Hyperechoic with thin complete peripheral halo, regular margins, coarse or eggshell calcification, type I & II PD pattern, resistive index <0.75 and peak velocity <50 cm/s.

DISCUSSION: The introduction of high-resolution ultrasonography had made it possible to detect many non-palpable nodules in the thyroid. The incidence of such lesions in the general population appears to be high approximately 10-40%.

In the present series out of 60 patients 49 were females and 11 were males. There is predominant involvement of thyroid gland in females with F: M ratio of 4.45:1.

Amodio F et al¹ reported female to male ratio of 4:1 in their study of 74 Graves' disease patients.

In our series most of the patients were found to be in the age group of 20-40 years with mean age 28 years. Youngest patient was a female of 11 years, which was diagnosed as thyroglossal cyst

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and oldest, was a male of 75 years having Anaplastic carcinoma. Our findings are in concordance with Tamotsu Yokozawa et al.²

In our study out of 69 patient 49 patient's have nodular thyroid disease and 11 have diffuse thyroid disease. Nodular involvement of thyroid is more common than diffuse involvement, which was also observed in another study by Brander A et al.³

Out of the total 11 cases of diffuse involvement, volume enlargement was a feature of all except one. Heterogeneity with coarse Echotexture and fibrous bands were seen in 9/11 cases. Micronodulations was present in only 3 cases. On the basis of these B/mode findings out of 18, 2 patients of each of Grave's, 3 patients of Hashimoto's Thyroiditis and 5 patient of simple goitre were diagnosed.

When the same patients were subjected to Color Doppler imaging and velocity calculated in inferior thyroid artery 8 patients showed velocity < 50 cm/s and 3 patients showed very high velocity >50 cm/s (50-150 cm/s). On the basis of these findings 2 patients diagnosed as Grave's on B-Mode were ascribed the diagnosis of Hashimoto's

Thyroiditis, which was later confirmed by FNAC. Velocity in patients of Grave's disease is very high & this criterion can be used to differentiate between Hashimoto and Grave's disease. Our finding correlates with that of Caruso G et al.⁴

In our study micronodules as a feature of Hashimoto's Thyroiditis is highly predictive. Our finding correlates with that of Yeh et al.⁵

Sonography is been used to differentiate between solid, cystic and mixed thyroid nodules since its inception. Our accuracy was 100% in this respect. Our findings are in concordance with Andre V Harle et al.⁶

In our study 29 ((60%) thyroid nodules were either Isoechoic or Hyperechoic and 20 (40%) nodules were Hypoechoic. 4/6 malignant nodules were Hypoechoic, the remaining two were one Hyperechoic and other Isoechoic. Whereas only 10/43 (20.4%) benign nodules were Hypoechoic. Hypoechogenicity as a criterion for malignancy has a reasonable sensitivity. (Andrej Lyshchik et al).⁷

In our study out of 49 nodules thin & regular halo was seen in 33 benign nodules and 2 malignant nodules. Whereas thick & incomplete or absence of halo was observed in 18 benign and 6 malignant nodules.

From our observation we can say that thick and incomplete halo is more commonly associated with malignant nodules. Andrej Lyshchik et al⁷ reported similar results.

Microcalcification was present in 4 patients out of which 3 were malignant and only 1 benign. Whereas 11 patients had either coarse or egg shell calcification out which 10 were benign and only one malignant.

David A.K. et al⁸ concluded that malignant lesions have evidence of micro calcification in 37% cases.

Benign nodules predominantly showed type II & I pattern with only 2/43 nodules showing type III pattern. Malignant nodules showed predominantly type III pattern with only 1/9 showing other pattern type IV. (De Nicola et al.⁹)

SUMMARY AND CONCLUSION: High resolution ultrasonography is highly sensitive in diagnosing thyroid disorders. Color Doppler acts as an important adjunct to B-mode in increasing the accuracy. In our study we concluded that:

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- Females are more common affected than males.
- Most common age group affected is between 20-40 years.
- Nodular involvement of thyroid is more common than diffuse.
- Small Hypoechoic 1-6 mm micro nodules are highly predictive of Hashimoto's Thyroiditis.
- Peak systolic velocity in inferior thyroid artery can be used to distinguish Grave's from hashimoto's Thyroiditis. Velocity is <50 cm/s in Hashimoto's Thyroiditis and around 150 cm/s in Grave's disease.
- Non-neoplastic nodules are more commonly Hyperechoic or Isoechoic whereas carcinomas are usually Hypoechoic. Adenoma can present with variable echogenicity.
- Non-neoplastic nodules and adenomas usually present with regular margins whereas irregular margin is more a feature of carcinoma.
- Adenomas and non-neoplastic nodules are more commonly associated with thin and complete halo. Halo is thick, incomplete or absent in most of the carcinoma.
- Microcalcification has highest specificity for malignancy on B-Mode.
- Coarse and eggshell calcification is highly predictive of benignity.
- Power Doppler pattern III & IV has high sensitivity and specificity in detection of malignant thyroid nodules. Non-neoplastic nodules and adenoma predominantly show type II & I power Doppler pattern.

The goal of imaging should be to avoid extensive and costly evaluation in the most patients with benign disease without missing the minority of patients with thyroid cancer. High-resolution ultrasonography has proved high sensitivity in the detection of very small nodular lesions of the thyroid. Its specificity in definition of benign from malignant nature is being greatly improved by the new vascular pattern and velocimetric parameters using pulsed and power Doppler.

In this study we found no single criteria that could distinguish benign from malignant thyroid nodules with 100% reliability. FNAC still offers the highest accuracy. Thyroid sonography is most useful in the differentiation between definitely benign nodules from suspicious which can then be subjected to further evaluation by FNAC.

Figure 1: Diffuse Thyroid Enlargement

Figure 2: Increased Thyroid Vascularity

Figure 3: Iso/Hypo Echoic Nodule

Figure 3: Iso/Hypo Echoic Nodule with Peripheral Vascularity

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