ASSSESSMENT 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.
MATERIAL AND METHODS:
**Patient Selection & Clinical Presentation:** Random selection of patient of all age groups was done. They presented with signs and symptoms suggestive of thyroid disorders.

The study was done in the 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.
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.
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 al 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.
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. Hypoechoogenicity 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:
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.
BIBLIOGRAPHY:

1. Amodio F, Di Martino S, Esposito S et al. Role of flowmetric analysis and of color Doppler ultrasonography with contrast media in the different phases and follow up of Graves’ disease. Radiol Med (Torino). 2001 Oct; 102(4): 233-7.
2. Tamotsu Yokazawa Shajifukawa et al. Thyroid cancer detected by Ultrasound Guided FNAB. World J Surgery 1994; 20L 848-853.
3. Brander A, Vilkinoski P, Nickels J et al. Thyroid gland: US screening in middle-aged women with no previous thyroid disease. Radiology 1989; 737: 507-510.
4. Caruso G, Attard M, Caronia A, Lagalla R et al. Colour Doppler measurement of blood flow in the inferior thyroid artery in patients with autoimmune thyroid diseases. Eur J Radiol. 2000 Oct; 36(1): 5-10.
5. Toma P, Guastalla PP, Carini C et al. Collo (The Neck). In Fariello G, Perale R, Perri G, et al (eds.): Echographia Pediatrica. Milan, Ambrosiana, 1992, pp 139-162.
6. Andrej Van Harle et al. The thyroid nodule. Annals of Internal Medicine 1982; 96; 221-232.
7. Andrej Lyschik, Valentina Drozd et al. Diagnosis of thyroid cancer in Children: value of Gray-Scale and power Doppler US. Radiology 2005; 235: 604-613.
8. David AK, Waters, Ahuja AJ et al. Role of ultrasound in the management of thyroid nodule surgery. AJR 1992; 164: 654-657.
9. De Nicola H, Szejnfeld J, Logullo AF et al. Flow pattern and vascular resistive index as predictor of malignancy risk in thyroid follicular neoplasms. J Ultrasound Med. 2005 July; 24(7): 897-904.
ORIGINAL ARTICLE

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