

High Resolution Ultrasound Evaluation of Thyroid Pathologies with Cytological Correlation – Our Experience

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Abstract:

Introduction: Different disorders affecting thyroid gland may present with similar signs and symptoms clinically. Commonest sign is being a visible neck swelling. In such cases as well as clinically suspected lesions of the thyroid gland, ultrasonography is well-established, reliable, cheap and modality of choice for the initial characterization of the thyroid lesions.

Materials and Methods: A prospective study was conducted on patients with thyroid problems, presenting at Department of Radiology and Imageology, Bhaskar Medical College & Hospital for ultrasound imaging. 223 patients were included in the study period of October 2016 to December 2018. All Patients with suspected thyroid lesions sent for sonography were included in our study. Patients diagnosed with thyroglossal cyst, undergoing treatment for thyroid abnormalities, diagnosed before as thyroid malignancy were excluded from the study. Patients were evaluated by HRUSG using GE machine Logiq 9 using 12 MHZ linear probe. Findings of HRUSG, FNAC, Final diagnosis & patient details were entered into excel sheet. Statistical analysis was done in the form of numbers, percentages and histograms.

Results: A total number of 223 patients were assessed in our study and various epidemiological parameters such as age, sex, USG findings, and prevalence of different types of thyroid disorders, USG findings of benign and malignant lesions, correlation of USG & FNAC were assessed. Thyroid disorders patients were predominantly noticed in the age group of 31-40 years, i.e., 68 (30.4%) out of 223 patients followed by 21-30 years, i.e., 60 (26.9%) out of 223 patients. Youngest patient is an 8 year old female child and oldest 75 years male patient.

Conclusion: HRUSG provides real-time guidance for FNAC of suspicious nodules and lesions with increased vascularity. Sonologic diagnosis correlates well with FNAC. But, it is difficult to reliably differentiate hashimoto's thyroiditis and focal lymphocytic thyroiditis from MNG when large nodules are present. However, taking into account several sonologic features, especially three or more features improves sensitivity and accuracy in diagnosis.

Key Words: HRUSG, FNAC, malignant thyroid nodules.

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I. Introduction

Different disorders affecting thyroid gland may present with similar signs and symptoms clinically. Commonest sign is being a visible neck swelling. In such cases as well as clinically suspected lesions of the thyroid gland, ultrasonography is well-established, reliable, cheap and modality of choice for the initial characterization of the thyroid lesions.¹

High resolution of ultrasound images helps to discover large number of thyroid nodules, and the use of color flow aids to identify multiple blood vessels within and adjacent to thyroid.²

Fine needle aspiration cytology (FNAC) and Fine needle aspiration biopsy are well-established diagnostic techniques and aid to ascertain the sonographically diagnosed thyroid lesions and to differentiate benign thyroid nodules from malignant.³

Sonographic features of various thyroid lesions:

Multinodular Goitre: The benign nodules in MNG are usually iso to hyperechoic with a surrounding hypoechoic halo. Less frequently hypoechoic, honey-comb or sponge-like pattern is seen. If colloid material is present within the cystic areas it is seen as echogenic foci with comet tail artifacts. These nodules may show peripheral/egg shell calcifications and there may be coarse calcifications with acoustic shadowing scattered peripheral the gland. Color Doppler shows peripheral vascularity. In case of hyperfunctioning nodules central vascularity is seen.⁵

Thyroiditis: The most common type of thyroiditis is chronic autoimmune lymphocytic thyroiditis or hashimoto's thyroiditis.

The typical sonographic appearance is of diffuse, coarsened parenchymal echotexture more hypoechoic than normal.

Multiple, discrete hypoechoic micro nodules 1-6 mm in diameter are highly suggestive of chronic thyroiditis. This micronodulation is a highly sensitive sign with a positive predictive value of 94.7%. Histologically these represent lobules of thyroid parenchyma infiltrated by lymphocytes and plasma cells.

These micronodules are surrounded by multiple linear echogenic fibrous septations that give rise to pseudolobulated appearance. Both benign and malignant nodules may co-exist. FNA is often necessary. Also, there is increased incidence of B-cell malignant lymphoma. Vascularity is normal or decreased in most patients. Occasionally, hypervascularity similar to "thyroid inferno" of grave's disease occurs. Cervical lymphadenopathy is often present, mostly near the lower pole of thyroid gland.

Grave's Disease:

Most common in middle aged females. Parenchyma is diffusely hypoechoic and fairly homogenous. Colour Doppler often demonstrates a hypervascular pattern referred to as "thyroid inferno".

Sub acute lymphocytic thyroiditis (SLT):

Heterogenous hypoechoic parenchyma is seen with small nodules, and markedly increased vascularity. Differentiating features from grave's disease which also shows increased vascularity and thyrotoxicosis are

1. Younger age group in SLT
2. Thyroid typically average sized in SLT while in grave's it is markedly enlarged.
3. Heterogenous parenchyma in LST and rather homogenous parenchyma in Grave's disease.
4. Most of the patients with SLT have reactive cervical lymphadenopathy involving L VI (pretracheal) lymphnodes.

Subacute granulomatous Thyroiditis:

De Quervain's also manifests with thyrotoxicosis. It is a reactionary post viral disease. Initially, hypoechoic areas with irregular poorly defined margins, especially in sub capsular region are seen. Vascularity is reduced. Later pseudonodules are seen in the central region of the gland.

Adenoma:

The benign follicular adenoma is a true thyroid neoplasm, characterized by compression of adjacent tissues and fibrous encapsulation.

Sonographically adenomas are usually solid masses that may be hyperechoic, isoechoic or hypo echoic. They often have a thick, smooth hypoechoic halo.

Carcinoma:

Sonographically, 90% show hypoechoic nodules. Micro calcifications which appear as tiny punctuate hyperchoic foci with or without acoustic shadowing. Diffuse micro calcifications without any discrete nodules also may be seen. Disorganized, hypervascularity is seen in 90% of cases. Metastatic cervical lymphnodes may also reveal micro calcifications. The involved lymphnodes are usually located in the caudal half of deep jugular chain. Cystic changes may be seen in the thyroid lesions as well as nodal metastasis.

Follicular carcinoma:

USG features similar to Adenoma may be seen. The presence of irregular tumor margins, thick irregular halo and chaotic arrangement of internal blood vessels on color Doppler study strongly suggests malignancy.⁶

II. Aim Of The Study

The aim of this study is to ascertain different morphological patterns by High Resolution Ultrasound in clinically suspected lesion of thyroid gland and to correlate with FNAC findings.

III. Materials And Methods

A Prospective study was conducted on patients with thyroid problems, presenting at Department of Radiology and Imageology, Bhaskar Medical College & Hospital for ultrasound imaging. 223 patients were included in the study period of October 2016 to December 2018.

All Patients with suspected thyroid lesions sent for sonography were included in our study. Patients diagnosed with thyroglossal cyst, undergoing treatment for thyroid abnormalities, diagnosed before as thyroid malignancy were excluded from the study.

Patients were evaluated by HRUSG using GE machine Logiq 9 using 12 MHZ linear probe.

Findings of HRUSG, FNAC, Final diagnosis & patient details were entered into excel sheet. Statistical analysis was done in the form of numbers, percentages and histograms.

IV. Results

A total number of 223 patients were assessed in our study and various epidemiological parameters such as age, sex, USG findings, and prevalence of different types of thyroid disorders, USG findings of benign and malignant lesions, correlation of USG & FNAC were assessed.

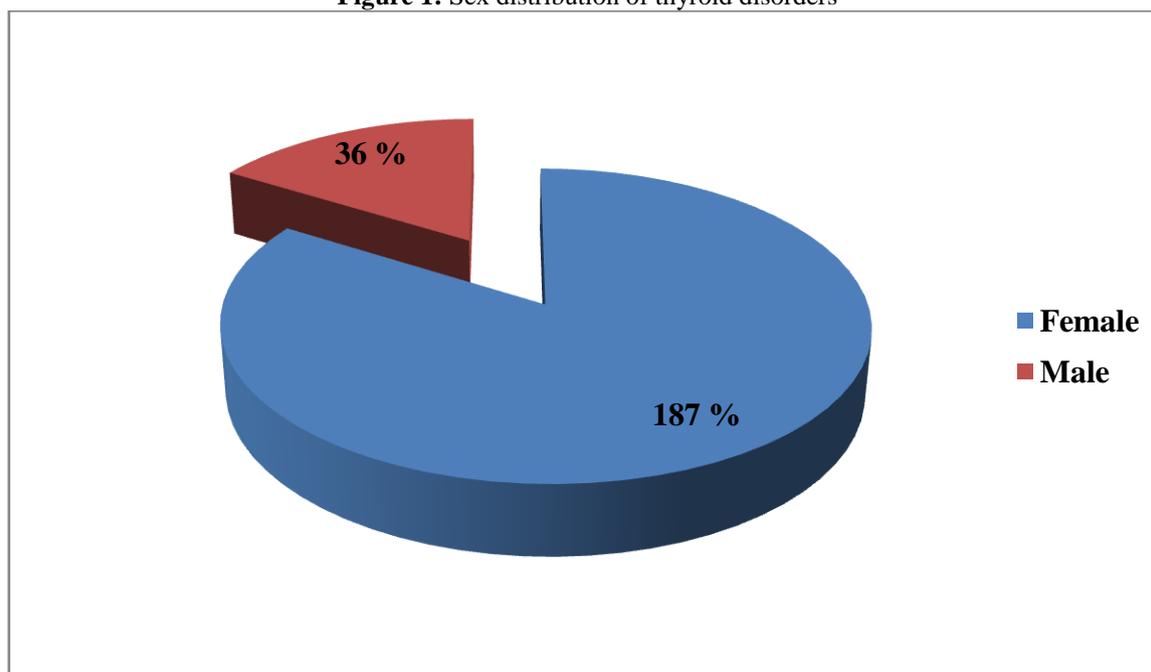
Thyroid disorders patients were predominantly noticed in the age group of 31-40 years, i.e., 68 (30.4%) out of 223 patients followed by 21-30 years, i.e., 60 (26.9%) out of 223 patients. Youngest patient is an 8 year old female child and oldest 75 years male patient (Table 1)

Table 1: Age distribution of patients with thyroid disorders

| Age in years | No. of patients | Percentage |
|--------------|-----------------|------------|
| <10 years | 3 | 1.3% |
| 11-20 years | 21 | 9.4% |
| 21-30 years | 60 | 26.9% |
| 31-40 years | 68 | 30.4% |
| 41-50 years | 25 | 11.2% |
| >50 years | 46 | 20.6% |
| Total | 223 | 100 |

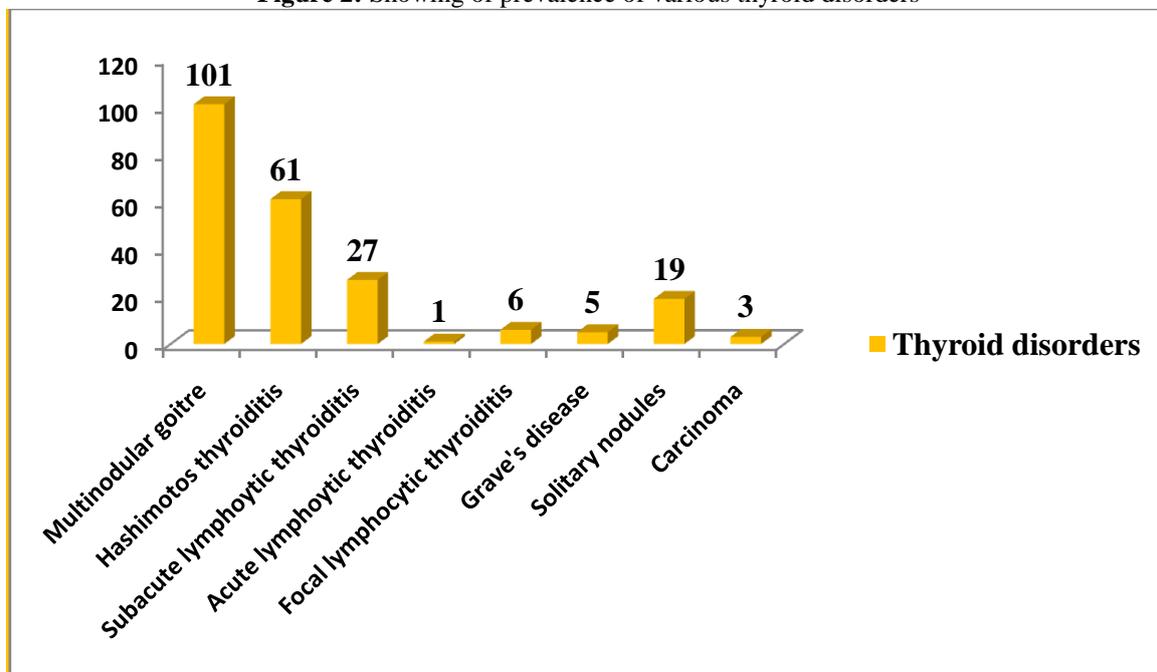
Female preponderance noted. 187 out of 223 patients were females (83.88%) and remaining 36 were males (16.1%) (Fig 1).

Figure 1: Sex distribution of thyroid disorders



Multinodular goitre patients (45.2%) were predominantly observed among thyroid disorders, Out of 101 MNG, 81 (80.1%) cases had cystic and colloid changes. 61 patients had thyroiditis, was 27.3%. 27(12.1%) patients were diagnosed with sub acute lymphocytic thyroiditis, whereas acute and focal lymphocytic thyroiditis diagnosed among 1 (0.44%) and 6 (2.6%) patients respectively, 5 patients had grave’s disease (2.2%), 19 (8.5%) patients had solitary nodules and remaining 3 patients had carcinoma (1.3%)(Fig 2).

Figure 2: Showing of prevalence of various thyroid disorders



Out of 19 solitary nodules, 10 were follicular adenoma, 3 were colloid cyst and 6 were mixed both solid and cystic masses. Among 3 cases of carcinoma, 2 were diagnosed by FNAC followed by excisional nodal biopsy as papillary carcinoma and 1 as follicular carcinoma by FNAC followed by HPE of thyroidectomy specimen.

Table 2: Assessment of statistical significance between USG and FNAC in the form

| Thyroid lesion | No. of USG cases correlated with final diagnosis | No. of FNAC cases correlated with final diagnosis |
|----------------------------------|--|---|
| Multinodular goiter | 97 | 101 |
| Hashimoto's thyroiditis | 61 | 61 |
| Subacute Lymphocytic thyroiditis | 26 | 27 |
| Acute lymphocytic thyroiditis | 1 | 1 |
| Focal lymphocytic thyroiditis | 6 | 6 |
| Grave's disease | 5 | 5 |
| Solitary nodules | 19 | 19 |
| Carcinoma | 3 | 3 |



Figure 3: Enlarged and heterogeneous right lobe of thyroid with micro calcifications - Papillary Carcinoma



Figure 4: Enlarged and rounded right cervical L. N showing loss of hilum and microcalcifications - metastasis from Papillary carcinoma thyroid

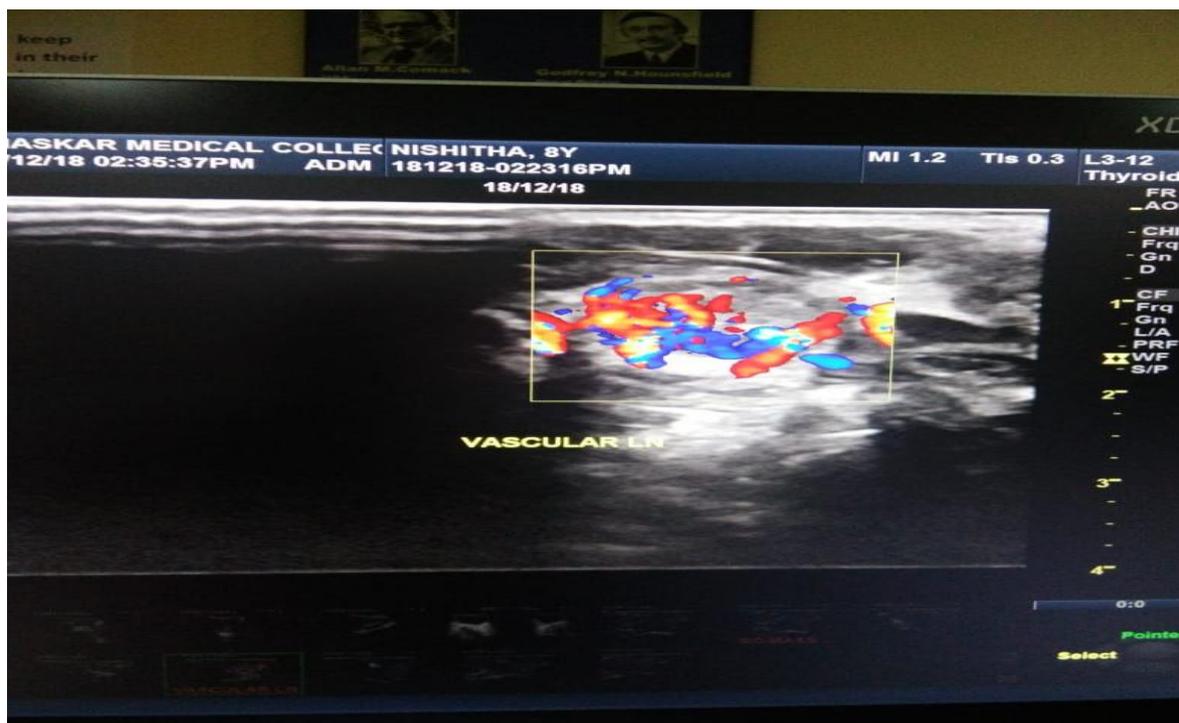


Figure 5: Chaotic increased vascularity in metastatic lymph node

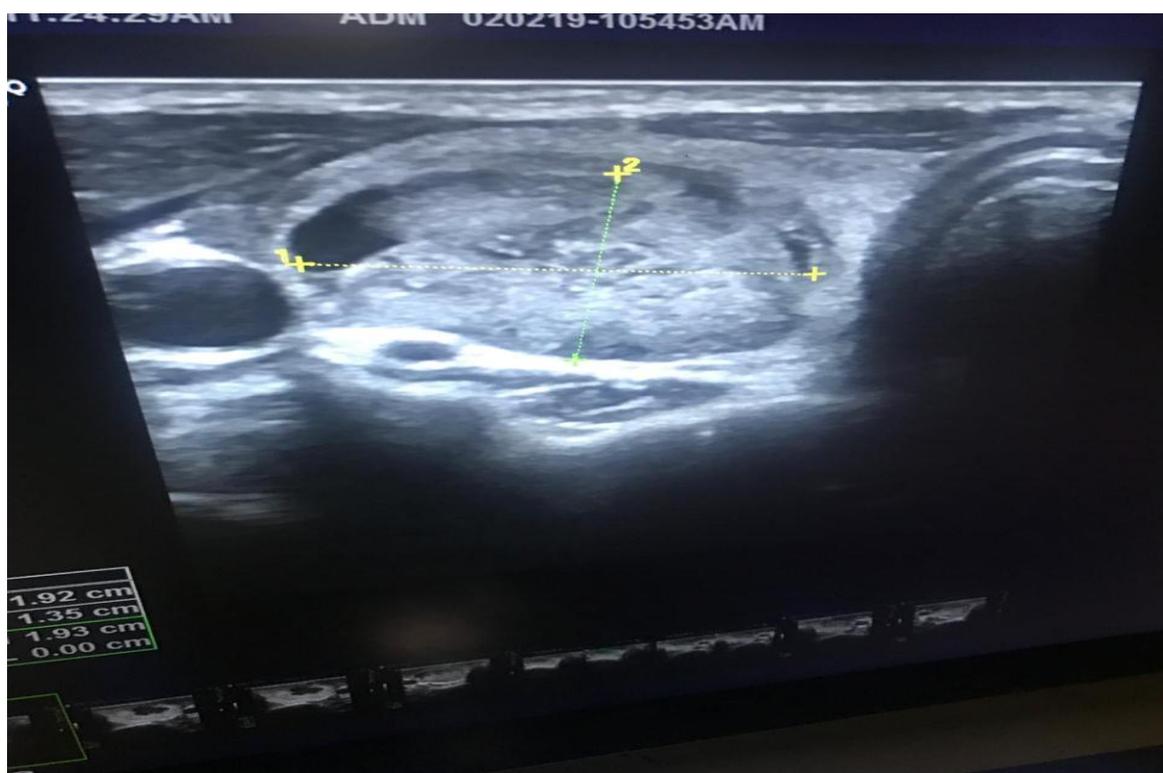


Figure 6: Benign nodule - Adenomatous nodule (colloid nodule) with eccentric cystic changes and smooth margined isoechoic solid component

V. Discussion

Multinodular goitre patients (45.2%) were predominantly observed among thyroid disorders, Out of 101 MNG, 81 (80.1%) cases had cystic and colloid changes. Next common pathology detected in our study is Hashimoto's thyroiditis (61 cases -). Most of the cases were seen in 30-50 years age group. Only 2 were male patients. Most common sonologic feature noted is diffusely hypoechoic pattern with echogenic septations and

hypervascularity infers appearance similar to Grave's disease noticed in 5 patients. 2 patients had micro calcifications.⁷

Morocci et al demonstrated that thyroid hypoechogenicity is not specific for Hashimoto's thyroiditis but may also be seen in Grave's disease or sub acute thyroiditis. This has been confirmed in our study, moderate to severe hypoechogenicity can predict thyroid autoimmune disorders, even without clinical suspicious.⁸

Kim et al found 92.1% specificity and 87.7% sensitivity for sonography in determination of asymptomatic cases of diffuse thyroid disease.⁹

In our study, 3 cases diagnosed as MNG on sonography turned out to be Hashimoto's thyroiditis on FNAC. Another case of MNG revealed features of focal lymphocytic thyroiditis on cytology.

Ultrasound features of Hashimoto's thyroiditis can be variable depending on the severity and phase of the disease. When large nodules are present it is referred to as nodular hashimoto's thyroiditis.

In a study by P.Pishdad et al they have concluded that because of low sensitivity of sonography, differentiation between Grave's disease and Hashimoto's thyroiditis is not possible but due to high specificity it can differentiate normal thyroid from Grave's disease or hashimoto's thyroiditis. It is suggested that if thyroiditis or Grave's disease is defined by sonography it should be further confirmed by clinical laboratory data.¹⁰

Tabur et al found that sonography has high specificity (90%) in thyroiditis.

VI. Conclusion

HRUSG is a highly preferable sensitive initial imaging modality for accurate morphological characterization of thyroid lesions, for diagnosis and follow-up of high prevalence thyroid diseases.

Color and spectral Doppler imaging helps in differentiating normal from increased vascularity of thyroiditis, peripheral vascularity of benign nodules from central vascularity of malignant nodules and also the abnormal vascularity of malignant lymph nodes.

HRUSG provides real-time guidance for FNAC of suspicious nodules and lesions with increased vascularity. Sonologic diagnosis correlates well with FNAC. But, it is difficult to reliably differentiate hashimoto's thyroiditis and focal lymphocytic thyroiditis from MNG when large nodules are present. However, taking into account several sonologic features, especially three or more features improves sensitivity and accuracy in diagnosis.

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