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Clinical Profile of Patients with Thyroid Nodules Subjected for Ultrasonography

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Abstract

Background: Hashimoto's thyroiditis cannot be distinguished from those of multinodular goitre (MNG). Basically the thyroid is enlarged bilaterally with an uneven parenchymal pattern mainly showing decrease in the normal echogenicity. The ultrasound appearance of Hashimoto's thytoiditis is that of a diffuse glandular enlargement with irregular lobulated margins. There is a generalised decrease in parenchymal reflectivity with a typical lobulated pattern due to highly reflective fibrous bands which separate the echo poor areas. **Subjects and Methods:** Based on the inclusion and exclusion criteria, 80 cases of thyroid lesions diagnosed by ultrasound were included in the study. The ultrasonography and ultrasound elastography examination was done in the department of Radiology .These 80 cases which were found to have thyroid lesion on ultrasound were subjected to FNAC for confirmation of ultrasound finding and establishment of final diagnosis. **Results:** Study showed no vascularity (TYPE1) and (TYPE2) peripheral vascularity in 100% of benign nodules, none of the malignant nodules showed type 1 and 2 vascularity. 95.2% of benign nodules showed TYPE 3 vascularity and 4.76% of cases were malignant. **Conclusion:** 40% of the benign nodules showed intra nodular vascularity (TYPE4) and 60% of the cases were malignant.

Keywords: Thyroid Nodules, Ultrasonography, Hashimoto's Thyroiditis.

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Introduction

This disease commonly mimics other thyroid diseases causing both thyrotoxicosis and hypothyroidism. The thyroid may be diffusely enlarged, nodular or non-palpable. The thyroiditis may easily be confused with Grave's disease, multinodular goitre or an autonomously hyper functioning nodule. Certain forms of thyroiditis present as asymptomatic nodules and are difficult to distinguish from thyroid carcinoma. Conversely one clinical presentation of papillary thyroid carcinoma with diffuse goitre and antithyroid antibodies so mimics Hashimoto's thyroditis that it has been termed pseudothyroiditis.[1]

The typical appearance by sonography of an acute infection is enlargement of the gland which might be either focal or diffuse and hypoechogenicity on the basis of edema. In children a pyriform sinus fistulous communication with the thyroid may result in acute inflammation of the thyroid particularly noticed on the left side34. A diffuse sonolucent appearance of the thyroid is highly suggestive of inflammatory disease.[2]

Subacute thyroiditis in the active phase produces areas of hypoechogenicity in the gland, which disappears with remission and resolution of the clinical symptoms of pain and swelling.[3,6]

There is the presence of multiple hypoechoic areas in the thyroid with atrophy of the thyroid gland over time.[3]

A study done reported that 7 out of 36 patients with sub-acute thyroiditis showed persistent sonolucent areas when re-examined after a mean interval of 4 years. This indicated that patients who have recovered from sub-acute thyroiditis do not necessary have normal appearing thyroids on ultrasound examination.[4]

Seen by ultrasound patients with autoimmune thyroiditis shows a dramatic loss of the normal homogenous hyperechogenicity of the thyroid gland. The ultrasound characteristics of Hashimoto's thyroiditis cannot be distinguished from those of multinodular goitre (MNG). Basically the thyroid is enlarged bilaterally with an uneven parenchymal pattern mainly showing decrease in the normal echogenicity. The ultrasound appearance of Hashimoto's thytoiditis is that of a diffuse glandular enlargement with irregular lobulated margins. There is a generalised decrease in parenchymal reflectivity with a typical lobulated pattern due to highly reflective fibrous bands which separate the echo poor areas. In a study conducted, the thyroid gland was evaluated in 550 patients. Of these 12 patients had the clinical diagnosis of Hashimoto's thyroiditis with subsequent surgical or pathological proof. In all twelve cases the echo pattern was always diffusely abnormal and consisted of multiple small low level echoes with decrease in the overall echogenicity of the gland. Discrete nodules were detected in 6 cases. Glandular enlargement was present in 9 cases. According to this study it is always difficult to differentiate between Hashimoto's thyroiditis

and MNG by ultrasound. The only differentiating point on ultrasound is the appearance of the non-nodular thyroid parenchyma which is always abnormal in Hashimoto's disease and can be normal in nodular goitre.[5]

Adenomas are composed of glandular epithelium and are histologically nearly all follicular although occasionally an adenoma will be papillary. Follicular adenomas are further sub-classified by decreasing frequency into fetal (micro-follicular); colloid (simple or macrofollicular); embryonal (trabecular or atypical) and hurthle (oxyphil cell). Adenomas are well-circumscribed, encapsulated lesions and are the most common of all thyroid neoplasms. In a group of patients studied it was found that 43% of cystic lesions were adenomas6. Toxic adenomas are generally solitary nodules which might be indistinguishable from nodular goitre. Thyrotoxicosis may be caused by an autonomously functioning thyroid nodule (hot nodule) but not all of such nodules cause thyroxicosis. Larger nodules (> 2.5 to 3.0 cm) are more likely to cause thyrotoxicosis.[7]

Focal thyroid hyperplasia is typified by the thyroid adenoma. On ultrasound these adenomas are usually hypoechoic or isoechoic and less commonly hyperechoic. Cystic components frequently develop from necrosis or haemorrhage and eventually some of these lesions become purely cystic. The typical thyroid adenoma has an hypoechoic rim around it which by sonography is vascular. The typical follicular adenoma is of the same reflectivity as the normal gland with a regular and complete peripheral halo. 25% of the nodules may have a cystic component which is usually accumulated colloid, central degeneration and or haemorrhage. In one series 79 follicular adenomas were studied. 64 showed decreased echogenicity relative to the normal thyroid gland; 10 demonstrated increased echogenicity and five were of the same echogenicity as the rest of the gland. A halo sign was seen in 43 of these adenomas.[8]

The follicular adenoma nodules are commonly seen between 1 and 4 cm in diameter. They may be surrounded by an incomplete fibrous capsule. Secondary changes such as fibrosis, dystrophic calcification, haemorrhage and necrosis are common.[9]

In one series 7 cases of adenomas were studied. Sonographic features present in nearly all the cases included a well-defined sonolucent rim or halo (5 cases) and varying degrees of internal cystic change within the nodule (6 cases). In one study, of the 16 follicular adenomas studied all of them on ultrasound showed a solid element. Whereas cystic components were seen in follicular cystadenoma and colloid adenomas.[10]

The cystic changes within the adenomas can be easily distinguished from a solitary simple cyst because it has a perfectly regular outline, returning no echoes from the midline.

In one very large series of over 200 patients, the solitary hyper echoic ultrasound pattern was the most frequent, seen in 66% of the adenomas and the halo in about 60% of these lesions. Calcification of adenomas is the common ring like calcification around the periphery of the nodule producing posterior shadowing from the anterior margin and is quite specific for adenoma.

Subjects and Methods

Based on the inclusion and exclusion criteria, 80 cases of thyroid lesions diagnosed by ultrasound were included in the study. The ultrasonography and ultrasound elastography examination was done in the department of Radiology

These 80 cases which were found to have thyroid lesion on ultrasound were subjected to FNAC for confirmation of ultrasound finding and establishment of final diagnosis.

Following inclusion and exclusion criteria were used for selection of cases for the present study.

Inclusion criteria:

Patients who presenting in the department of radiodiagnosis with a thyroid mass on ultrasonography and which are subsequently confirmed by FNAC will be included in the study

Exclusion criteria:

Patients who refused FNAC whom the final confirmatory diagnosis could not be established will be excluded

Results

In our study total of 54 females and 6 males found to have thyroid disease

out of these 1.6% of the people were between 11 to 20 ,21 to 30 age group were 20 %,31 to 40 were about 23.3%,41 to 51 age group were 21.6%,51 to 60 were 15%,between 61 to 70 were 16.6%,and between 71 to 80 were about 1.6%

Table 1: Age and sex wise distribution of thyroid nodules

Age	Male		Female		Total	
	NO	%	NO	%	NO	%
11 to 20	0	0	1	1.6	1	1.6
21 to 30	1	1.6	11	18.33	12	20
31 to 40	0	0	14	23.33	14	23.33
41 to 50	1	1.6	12	20	13	21.66
51 to 60	1	1.6	8	13.33	9	15
61 to 70	2	3.33	8	13.33	10	16.66
71 to 80	1	1.6	0	0	1	1.6
Total	6	9.91	54	90.09	60	100

Table 2: Duration of the swelling

Duration	No Of Cases	Percentage
0 – 6 Months	22	36.66
7 – 1 Year	16	26.66
1.1 – 2 Years	14	23.33
> 2 Years	8	13.33
Total	60	100

Table 3: Overview of Various FNAC /Histopathology Findings

Disease	No Of Cases	Percentage
Mng	24	40
Solitary Colloid Nodules	16	26.6
Colloid Cyst	4	6.66
De Quervain's Thyroiditis	3	5
Follicular Adenoma	9	15
Malignancy	4	6.66
Total	60	100

Study showed no vascularity (TYPE1) and (TYPE2)

peripheral vascularity in 100% of benign nodules, none of the malignant nodules showed type 1 and 2 vascularity
95.2% of benign nodules showed TYPE 3 vascularity and 4.76% of cases were malignant.
40% of the benign nodules showed intra nodular vascularity (TYPE4) and 60% of the cases were malignant

Table 4: Vascular distribution in thyroid nodules

Vascularity	Benign No Of Cases	%Age	Malignant No Of Cases	%Age	Total
No Vascularity (Type1)	6	100	0	0	6
Peripheral (Type2)	28	100	0	0	28
Both (Type3)	20	95.2	1	4.76	21
Intranodular (Type4)	2	40	3	60	5
Total	56	92	4	8	60

Discussion

Thyroid nodular disease is characterized by the presence of one or more palpable or nonpalpable nodules within the substance of the thyroid gland. A thyroid nodule is defined as a discrete lesion within the thyroid gland that is distinguishable from the adjacent parenchyma at USG11
As thyroid problems are much more common in women than men, this is probably the reason for the increased incidence found in women.
In our study total of 54(90%) females and 6 (10%) males found to have thyroid disease
out of these 1.6% of the people were between 11 to 20 ,21 to 30 age group were 20 %,31 to 40 were about 23.3%,41 to 50 age group were 21.6%,51 to 60 were 15%,between 61 to 70 were 16.6%,and between 71 to 80 were about 1.6%.
In our study out of 60 cases 22 (36.66%) had swellings with duration range of about 0 to 6 months, 16(26.66%) had duration of 7 months to 1 year, 14(23.33%) had duration of about 1.1 to 2 years, 8(13.33%) cases had swelling duration of more than 2 years.
Our study showed Our study showed 100% of the hyperechoic nodules were benign, 75% hypoechoic nodules were benign and 25% hypoechoic nodules were malignant, 100% isoechoic nodules were benign and 100% of anechoic nodules were benign.
Bonavita et al studied Pattern recognition of benign nodules by ultrasound have revealed that most malignancies demonstrate a hypoechoic nodule, yet most hypoechoic nodules are benign in view of the high prevalence of benign lesions.[12]
In our series also, most of the malignant nodules were hypoechoic in appearance, though the majority of the hypoechoic nodules were benign . In contrast, none of the malignant nodules were found to be purely hyperechoic or anechoic. Kim et al. defined a markedly hypoechoic nodule as one that is hypoechoic to the strap muscles anterior to the thyroid gland.[13]
Our experience shows that calcification occurs more commonly in both nodules. Out of total 60 nodules, 23 (46%) showed calcification .Out of these 20 (83.33%) showed macrocalcification and 3 (16.6%) cases had microcalcification. Microcalcifications are seen sonographically as multiple punctate bright echoes that are less than 2 mm in size, with or without acoustic shadowing. As categorized by Kim et al among the macrocalcifications were solitary calcifications (hyperechoic foci, >2 mm linear or round structures within the nodule or encircling less than 1/3rd of the nodule's margin), eggshell calcification (curvilinear hyperechoic shadow that extends along the margin of the nodule for more than 1/3rd of its circumference), and the not-otherwise-specified (NOS) variety (comprising the rest).[14] Micro calcifications were found to be a highly specific USG feature of malignant thyroid nodules, with a sensitivity of 100%.
Our study showed that when nodules showed Type 1 or Type 2 vascularity on doppler
100% the cases were benign, none of the nodules were malignant.
When the nodule showed Type 3 vascularity on doppler20 (95.2%) of cases were benign and 4.76% were malignant.
When the nodules showed Type 4 vascularity on Doppler, out of these 40% of the cases were benign and 60% were malignant.
Thus type 4 or intanodular vascularity good indicator for malignancy.
Shimamoto K. et al (Nov. 1998): Studied the usefulness of ultrasound sonography for pre-operative staging of thyroid papillary carcinoma in 77 patients who later underwent total thyroidectomy. Results: In 63 cases (81.8%) Tumor (T) categories were estimated accurately, sensitivity in depicting tumour extension into surrounding muscles in 77.8%. Whereas invasion into esophagus and trachea 28.5% and 42.9% respectively. In 37 cases (48.1%) Node (N) categories were underestimated. The sensitivity in the detection of the regional lymphnodal metastases was 36.7%. They concluded that: Ultrasonography was useful for pre-operative investigation of thyroid papillary carcinoma, but several limitations existed especially in extra capsular invasion to deep locations and regional lymphnode metastases.[15]
K. Eita AK et al., (May 1999): By prospective ultrasound study of 171 patients revealed thyroid abnormalities are more frequent in young adults (22 – 40 years) (67.4%). Out of them women are 83%. Diffuse goiters were 76.3%, most were multi nodular and heterogenous forms with necrosis or haemorrhage. Nodular goiters are mostly cystic with septations (51.9%).
Kasagi K and Shimarsu A. et al., (Aug 1990): Sonographic and scintigraphic findings of thyroid gland correlated in goiter associated with Acromegaly. They concluded that long term stimulation by growth hormone and insulin like growth factor 1 of thyroid follicular cells might be responsible for thyroid enlargement and presence of functioning lesions.[9]
Kimoto et al (1999): They have performed ultrasound guided aspiration biopsy following mass screening for thyroid tumours to avoid unnecessary surgery. Mass screening carried out from 1993 to 1996 revealed 444 women with goiter, 322 of whom had diffuse goiter and 122 had nodular goiter. All of these patients underwent

ultrasound examination the results of which determined 169 patients should undergo ultrasound guided FNAB to confirm accurate diagnosis of thyroid tumour. Histological examination after surgical resection 12 of 322 patients of diffuse goitre (3.7%) and 23 of 122 patients of nodular goitre (18.9%) had malignant tumours. Among 61 thyroid tumours surgically verified, ultrasound guided FNAB yields sensitivity rate of 93%, specificity 81% and accuracy rate 90%.[16]

Franke D. et al (Dec 1999): Studied sonographic evaluation of goitre in a iodine deficiency area in the ivory coast. Overall prevalence rates of goitre 64.7% in females and 53.3% in males. In children (6 – 15 years) 62% regardless of sex. Frequency of cysts and calcifications did not correlate with sex.

Yamada H. et al., (Jan 2000): In this study ultrasonography is performed in patients who come for thyroid cancer screening. 78 patients with thyroid cancers found by ultrasonography were operated on from 1989 to 1998. 287 patients with thyroid cancers found by other methods were operated on during the same period. The age of the patients in the screening group was younger than that of the contrast group. In the screening group 41 patients (52.6%) had small thyroid cancers, a higher rate than in the contrast group. Invasion of surrounding organs by the primary cancer were observed in 1 patient (1.3%) in screening group a rate of invasion that was statistically lower than that in the contrast group.[17,18]

Conclusion

Ultrasound is the cost effective modality of imaging and also the investigation of choice in thyroid diseases.

Ultrasound is very accurate in assessing the morphological structure of the gland along with the gland size.

It helps us to know clearly whether the lesion is solitary or multiple. It helps to clearly differentiate between solid and cystic lesions.

The diffuse heterogenous echotexture of the gland with characteristic hypoechoic nodules clearly helps us in diagnosing Hashimotos thyroiditis

In addition, ultrasound is very useful to differentiate benign lesions from malignant thyroid lesions in most of the cases.

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