ULTRASOUND FINDINGS OF A THYROID NODULE: A CROSS-SECTIONAL STUDY

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ABSTRACT

BACKGROUND

Thyroid diseases are one of the commonest endocrine disorders, some manifest in the form of a thyroid nodule. The ultrasonography is a non-invasive sensitive diagnostic in assessing thyroid nodule size and number. In this connection, we studied the spectrum of ultrasound findings of thyroid nodules in patients and correlated with clinical records.

METHODS

200 thyroid nodules in women who underwent sonography were included. The indications for thyroid sonography were a nonspecific abnormality in 17% and visible and palpable abnormality in remaining 83%. All patients were examined with high frequency, 7.5-10.0 MHz probe. Ultrasound examination of a thyroid nodule in these patients was carried out by high frequency 7.5-10.0 MHz probe. It includes diameter, echogenicity (Hyper, Hypo, Iso and An echo), composition (Cystic, Solid, Mixed), microcalcifications (Presence and Absence), Borders (Irregular and Regular) and Halo (Presence and Absence). Ultrasound of nodule margins suggestive of malignancy guidelines was adapted from Lew et al. Guidelines.

RESULTS

Benign and malignant lesions on thyroid ultrasonography were 90% and 10% respectively, whereas they were 91.5% and 8.5% histopathologically. Sensitivity is 91%, specificity is 8.5%, positive predictive value is 50%, and negative predictive value is 47%.

CONCLUSION

Even though thyroid sonography is one of the accepted radiological methods of diagnosing thyroid disease; in our study, results concluded that the ultrasound findings are being equivocal in the diagnosis of benign and malignant lesions of a thyroid nodule.

KEYWORDS

Ultrasound thyroid, Clinical, Histopathological, Sensitivity, Specificity.

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INTRODUCTION: Thyroid diseases are the commonest endocrine disorders in India; it has been estimated that about 42 million people in India suffer from thyroid diseases.(1) Thyroid nodules have been defined by the American Thyroid Association (ATA) as "Discrete lesions within the thyroid gland, radiologically distinct from surrounding thyroid parenchyma".(2) Thyroid nodules are clinically important for several reasons. They may cause thyroid dysfunction, malignant potential and sometimes can cause compressive symptoms. Therefore, it should be distinguishable from the adjacent thyroid tissue either on palpation or radiologically. Thyroid nodules are four times more common in women than men and their frequency increases with age and low iodine intake.(3) However, thyroid palpation has been found to be inadequate for evaluation of mild thyroid enlargement.

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Prevalence of thyroid nodules in adults is 4–8% by palpation, up to 67% by ultrasound, and fifty percent at autopsy with a noticeably higher incidence in iodine-deficient provinces.(4-6)

Most of these nodules are benign; the impact of malignancy is quite low, 3-7%.(7-9) Overall, thyroid cancer is a relatively uncommon malignancy which constitutes about 0.5% of all malignancies. However, imaging plays an important role in patients' management.(10) Thyroid FNA biopsy is the most reliable, safe, and cost-effective diagnostic tool used in the evaluation of thyroid nodules.(11-14) Nevertheless, FNAC has multiple drawbacks inherent in the procedure itself including the technique employed and the experience of the physician performing the aspiration.(15-17) The ultrasonography (USG) is the non-invasive and is highly sensitive in assessing nodule size and number.

The cost-effectiveness of USG in solving patient-specific clinical problems has not been formally tested and when used judiciously, helps to answer important clinical questions in specific patients and presently, US is considered useful in the following conditions like to evaluate the anatomic features of thyroid nodules, to assist in fine needle aspiration (FNA) of thyroid nodules and cervical lymph nodes to monitor nodular thyroid disease.(18) The high-frequency

transducers may detect lesions as small as 2 to 3 mm, which raises the question of which thyroid nodules are clinically relevant for further evaluation.[19] USG thyroid can discern if the palpable abnormality is indeed a thyroid nodule. Ultrasound assessments of the nodule size, position and type help in differentiating benign and malignant lesions.[20-21]

To this reason, we studied the spectrum of ultrasound findings of thyroid nodules in patients and correlated with clinical records.

METHODS: This study was conducted from August 2014 to February 2016. Institutional Ethics approved study protocol. A total of 200 females with either suspected or confirmed thyroid nodules of >1 cm and who underwent sonography were included.

Ultrasound Examination Technique: Ultrasound examination of the thyroid must always include a detailed examination of the neck for any cervical lymphadenopathy since metastatic cervical lymph nodes are frequently seen in thyroid cancers and may affect the surgical management and prognosis of patients. Ultrasound examination of a thyroid nodule in these patients was carried out by high frequency 7.5-10.0 MHz probe. It includes diameter, echogenicity (Hyper, Hypo, Iso and An Echo), composition (Cystic, Solid, Mixed), microcalcifications (Presence and Absence), Borders (Irregular and Regular) and Halo (Presence and Absence). Ultrasound of nodule margins, suggestive of malignancy guidelines was adapted from Lew et al. guidelines.[21] A fine needle aspiration (FNA) biopsy was suggested to the referring physician if required.[22-23]

STATISTICAL ANALYSIS: Data was presented as a mean standard deviation, actual numbers, and percentages. Preliminary statistics was performed by using Microsoft Excel after data cleaning and data mining.

RESULTS: The women mean age was 47 ± 5 years. The indications for thyroid sonography were a nonspecific abnormality in 17% and visible and palpable abnormality in remaining 83%. Benign and malignant lesions on thyroid ultrasonography were 90% and 10% respectively, whereas they were 91.5% and 8.5% histopathological (Table-1). Sensitivity is 91%, specificity is 8.5%, positive predictive value is 50%, the negative predictive value is 47%. (Table-2) In our study, microcalcifications, solid nodule taller than wide, irregular borders and increased blood flow within the nodule were reliable in the identification of thyroid cancer.

	Mixed		**Solid**		**Total**	
Echogenicity	N	%	n	%	n	%
Hyper	36	25.90	8	13.11	44	22.00
Hypo	32	23.02	20	32.79	52	26.00
Iso	71	51.08	33	54.10	104	52.00
Total	**139**	**100**	**61**	**100**	**200**	**100**
Margins						
Irregular	71	51.08	33	54.10	104	52.00
Regular	68	48.92	28	45.90	96	48.00
Total	**139**	**100**	**61**	**100**	**200**	**100**
Halos						
No	60	43.17	36	59.02	96	48.00
Yes	79	56.83	25	40.98	104	52.00
Total	**139**	**100**	**61**	**100**	**200**	**100**
Calcification						
No	66	47.48	36	59.02	102	51.00
Yes	73	52.52	25	40.98	98	49.00
Total	**139**	**100**	**61**	**100**	**200**	**100**
Diameters						
AP	54	38.85	17	27.87	71	35.50
Axial	40	28.78	25	40.98	65	32.50
Longitudinal	45	32.37	19	31.15	64	32.00
Total	**139**	**100**	**61**	**100**	**200**	**100**
Radiological Diagnosis						
Benign	126	91	55	90	181	90
Malignant	13	9	6	10	19	10
Clinical Diagnosis						
Benign	133	97	52	86	183	91.5
Malignant	6	3	9	14	17	8.5
Total	**139**	**100**	**61**	**100**	**200**	**100**

Table 1: Correlation of Ultrasound and Clinical Diagnosis

Data Analysed	**Radiological**	**Clinical**	**Total**
Benign	181	183	364
Malignant	19	17	36
Total	**200**	**200**	**400**
Sensitivity		0.91	
95% Confidence Interval		0.86 to 0.94	
Specificity		0.085	
95% Confidence Interval		0.050 to 0.13	
Positive Predictive Value		0.50	
95% Confidence Interval		0.44 to 0.55	
Negative Predictive Value		0.47	
95% Confidence Interval		0.30 to 0.65	

Table 2: Sensitivity and Specificity Analysis

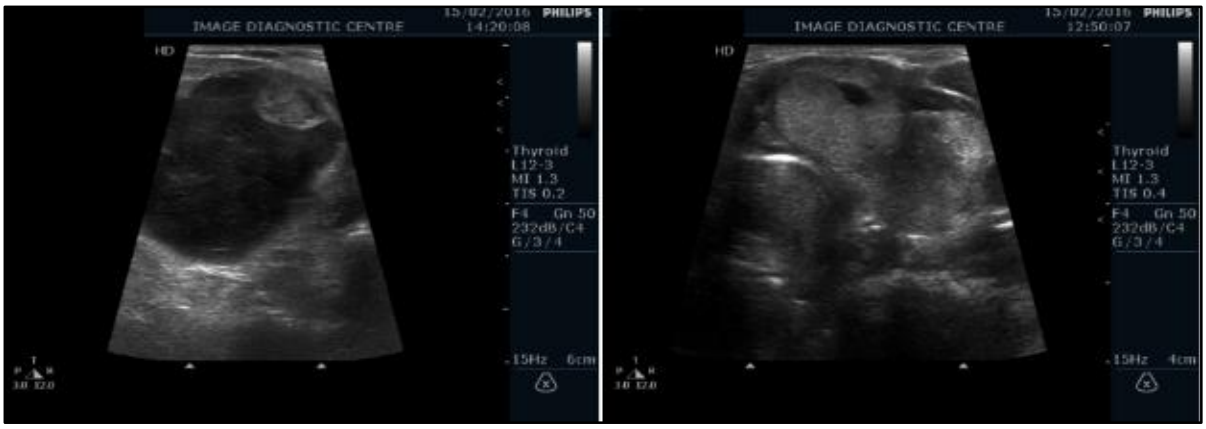

Figure 1 & 2

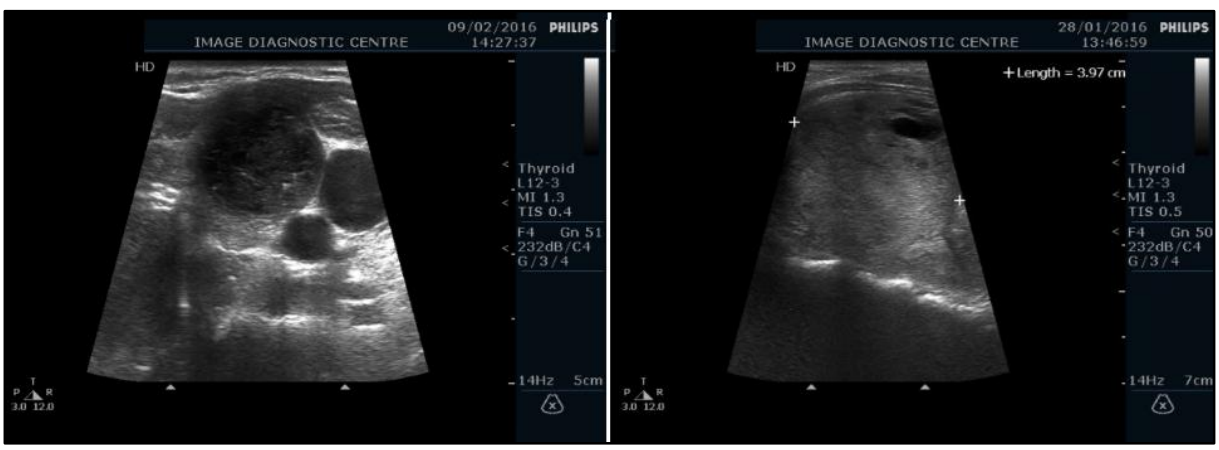

Figure 3 & 4

Figure 5

DISCUSSION: Thyroid gland USG is used to study hardness/elasticity of the thyroid nodule to differentiate malignant from benign lesions.[24] The major limitation of thyroid-USG is it cannot assess the lesions which are not surrounded by adequate normal tissue.[25,26] The rate of diagnosis of thyroid cancer has doubled in the past 30 years despite no tangible decreases in mortality rates.[27] The prevalence of thyroid nodules found using palpation is approximately 5%, but an estimated 50% of unselected populations have nodules that can be discovered at ultrasonography.[28] With the advent of thyroid-USG techniques for assessment of nodule, it can be detected in as many as 67% of the normal population and incidence of thyroid nodules is very high on USG, ranging from 50% to 70%. Thyroid cancer accounts for less than 7% cases.[23,29,30] Several studies supported the advantage of ultrasound of thyroid to avoid the unnecessary use of invasive procedures.[31-34]

We evaluated the spectrum of ultrasound findings of thyroid nodules of our patients to predict which nodules are more likely to be cancerous. We found that the positive predictive value is 50%, the negative predictive value is 47%. Leenhardt et al. reported that a nodule with hypoechogenicity has a moderate positive predictive value (up to 63%) for malignancy with 75% sensitivity and 83% specificity.[35]

In one study, microcalcification, nodule size greater than 2 cm, and solid form correlated well with malignancy. In contrast, in other studies, coarse calcifications, taller than wide, irregular borders and increased blood flow within the nodule were predictive of malignancy.[23,36,37] A study has reported that spongiform configuration, cyst with a colloid clot, giraffe pattern, and diffuse hyperechogenicity were predictive of the benignity of lesions and obviated the number of unnecessary biopsy procedures by 60%.[38]

In our study, microcalcifications, solid nodule taller than wide, irregular borders and increased blood flow within the nodule were reliable in the identification of thyroid cancer. Positive predictive value is 50%; the negative predictive value is 47%. Ultrasound findings are being equivocal in the diagnosis of benign and malignant lesions of a thyroid nodule. There is a possibility of overlap in ultrasound appearance of between benign and malignant nodules; few ultrasound features are helpful in differentiating between these two.[13,39]

Combinations of clinical and ultrasound characteristics studies were found to be promising prediction models for thyroid malignancies.[40] However, K. T. Wong and Anil T. Ahuja.[10] in their study concluded that ultrasound, in most cases, cannot accurately distinguish a benign from the malignant follicular lesion. The suspicion of malignancy is raised if the nodule is ill-defined, hypoechoic, has a thick irregular capsule and chaotic intranodular vascularity.

LIMITATIONS OF THE STUDY: We did not attempt to correlate our results with the type of histopathological findings.

CONCLUSION: Even though recent advances in thyroid sonography have improved the diagnostic accuracy in a thyroid nodule; in our study, results concluded that the ultrasound findings are being equivocal in the diagnosis of benign and malignant lesions of a thyroid nodule.

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