

Diagnosis of Malignancy for Thyroid Nodule by Ultrasound Findings: A Cross Sectional Study.

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ABSTRACT

Background: Thyroid diseases are, debatably, among the commonest endocrine disorders worldwide. According to a projection from various studies on thyroid disease including thyroid nodules, it has been estimated that about 42 million people in India suffer from thyroid diseases. The ultrasonography is a non-invasive sensitive diagnostic in assessing thyroid nodule size and number. This study aimed to determine the ultrasound findings of thyroid nodules in patients and correlate it with clinical records. **Methods:** This was a cross-sectional study conducted at teerthanker Mahavir medical college and research centre. In these patients, high frequency 7.5-10.0 MHz probe was used for Ultrasound examination of a thyroid nodule. 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). From Lew et al. guidelines ultrasound of nodule margins, suggestive of malignancy guidelines was adopted. A fine needle aspiration (FNA) biopsy was recommended to the referring physician is required. **Results:** Benign and malignant lesions were recorded in 88.9% and 11.1% patients respectively. On the other hand, histopathological findings revealed that 90.9% and 9.1% as benign and malignant correspondingly. In the present study, sensitivity, specificity and positive predictive values were 91%, 8.5% and 50% respectively. Whereas, the negative predictive value was 47%. **Conclusion:** Findings of the current study suggest that radiological evidences are reliable enough for the diagnosis of the benign and malignant thyroid tumours. However, studies on larger populations are warranted to establish guideline for the radiological diagnosis of thyroid tumours.

Keywords: Thyroid nodules, benign, malignant, sensitivity.

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INTRODUCTION

Thyroid diseases are, debatably, among the commonest endocrine disorders worldwide. India too, is no exception. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases.^[1] Thyroid nodules are common, their prevalence being chiefly dependent on the identification technique. The estimated prevalence by palpation alone ranges from 4% to 7%, up to 67% by ultrasound, and fifty percent at autopsy with a noticeably higher incidence in iodine-deficient provinces.^[4-6] 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 and, rarely, compressive symptoms, but they are primarily important because

of the need to exclude thyroid cancer. Therefore, it should be distinguishable from the adjacent thyroid tissue either on palpation or radiologically. Thyroid nodules are 4 times more common in women than men and their frequency increases with age and low iodine intake.^[3] The gender disparity is perhaps explained by the hormonal influences of both estrogen and progesterone, as increasing nodule size and new nodule development have been demonstrated to be related to pregnancy and multiparity. Most of these nodules are benign; the impact of malignancy is quite low. The reported prevalence of malignancy in thyroid nodules evaluated by biopsy ranges from 4.0% to 6.5% and is largely independent of the nodule size Overall,^[7-9] 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 In patients who have thyroid nodule, fine needle aspiration biopsy (FNAB) is a useful tool for the diagnosis of thyroid cancer.^[11-14] It should be noted that FNAB is an invasive procedure and, in addition to the possibility of errors in sampling and analysis, this

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method is not cost effective for studying of all nodules and the experience of the physician performing the aspiration is also important.^[15-17] Ultrasonography is the imaging study of choice for thyroid nodules. 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, to assist in fine needle aspiration (FNA) of thyroid nodules and cervical lymph nodes to monitor nodular thyroid disease.^[18] In addition to assessing the size and characteristics of the nodule, to evaluate the anatomic features of thyroid nodules ultrasonography also provides guidance for diagnostic procedures such as FNAB. These days, the utilization of brightness-mode may detect lesions as small as 2 to 3 mm, which raises the question of which thyroid nodules are clinically relevant for advance 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] In comprehensive terms, ultrasound has a major role in studying thyroid nodules. This study aimed to determine the ultrasound findings of thyroid nodules in patients and correlate it with clinical records.

MATERIALS & METHODS

This was a cross-sectional study conducted at Teerthanker Mahaveer medical college and research centre, Moradabad and was carried out from September 2015 to March 2017. The study plan was reviewed and approved by the university ethical committee, and an informed consent was obtained from every patient. This study comprises of a total of 209 females with either suspected or confirmed

thyroid nodules of more than 1 cm and who underwent ultrasonography were included.

Ultrasound Examination Technique: A detailed examination of the neck for any cervical lymphadenopathy should always be carried out in the ultrasound examination of thyroid since metastatic cervical lymph nodes are commonly seen in thyroid cancers and may have an effect on the surgical management and prognosis of patients. In these patients, high frequency 7.5-10.0 MHz probe was used for Ultrasound examination of a thyroid nodule. 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). From Lew et al. guidelines ultrasound of nodule margins, suggestive of malignancy guidelines was adopted.^[21] A fine needle aspiration (FNA) biopsy was recommended to the referring physician is required.^[22-23]

RESULTS

All the participating women had an average age of 46.8 ± 5.8 years. Out of all the study participants 18% thyroid sonography were done due to non-specific indications. Rest 82% thyroid sonography were done due to visible and palpable abnormalities. Further, [Table 1] shows that benign and malignant lesions were recorded in 88.9% and 11.1% patients respectively. On the other hand, histopathological findings revealed that 90.9% and 9.1% as benign and malignant correspondingly. In the present study, sensitivity, specificity and positive predictive values were 91%, 8.5% and 50% respectively. Whereas, the negative predictive value was 47%. [Table 2] In the current study, microcalcifications, solid nodule taller than wide, irregular borders and increased blood flow within the nodule were reliable in the identification of thyroid cancer.

Table 1: Comparison according to various characteristics.

Echogenesity	Mixed		Solid		Total	
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
Hypo	37	25.8 %	9	13.6%	46	22%
Hyper	33	23 %	22	33.3%	55	26.3%
Euthy	73	51 %	35	53%	108	51.6%
Total	143	100%	66	100%	209	100%
Margins						
Irregular	73	51%	35	53%	108	51.6%
Regular	70	49%	31	47%	101	48.4%
Total	143	100%	66	100%	209	100%
Halos						
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
No	62	43.4 %	38	57.7%	100	47.9%
Yes	81	56.6 %	28	42.3%	109	52.1%
Total	143	100%	66	100%	209	100%
Calcification						
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
No	68	47.5%	38	57.7%	106	50.7%
Yes	75	52.5%	28	42.3%	103	49.3%

Total	143	100%	66	100%	209	100%
Diameters						
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
AP	56	39.2%	19	28.7%	75	35.8%
Axial	42	29.4%	27	40.9%	69	33.1%
Longitudinal	45	31.4%	20	30.4%	65	31.1%
Total	143	100%	66	100%	209	100%
Radiological diagnosis						
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
Benign	127	88.8 %	59	89.3%	186	88.9%
Malignant	16	11.2 %	7	11.7%	23	11.1%
Total	143	100%	66	100%	209	100%
Clinical diagnosis						
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
Benign	130	90.9 %	60	90.9%	190	90.9%
Malignant	13	9.1 %	6	9.1%	19	9.1%
Total	143	100%	66	100%	209	100%

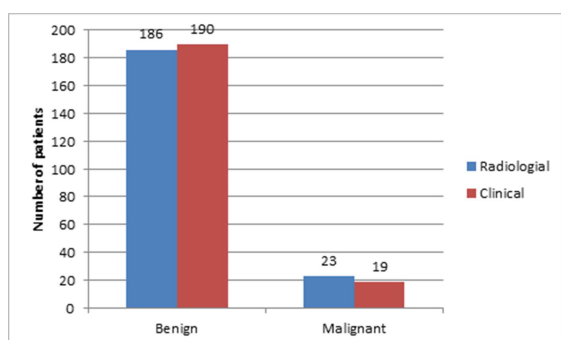


Figure 1: distribution according to radiological and clinical diagnosis.

Table 2: Sensitivity and specificity analysis.

Sensitivity	0.91
95% confidence interval	0.86 – 0.94
Specificity	0.085
95% confidence interval	0.05 – 0.13
Positive predictive value	0.5
95% confidence interval	0.44 – 0.55
Negative predictive value	0.47
95% confidence interval	0.33 – 0.65

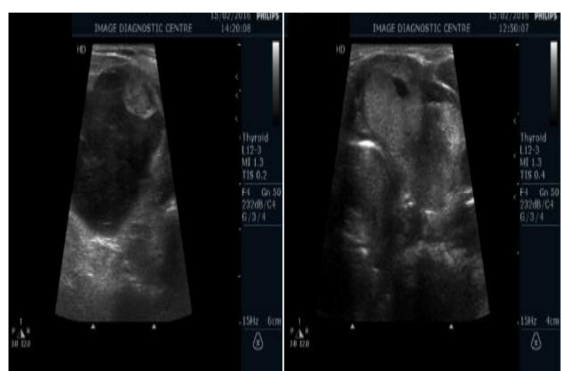


Figure 2 & 3: Nodules of thyroid.

DISCUSSION

Benign and malignant thyroid nodules of thyroid gland can be differentiated according to their consistency like hardness/ elasticity by using sonography.^[24] However, USG can not differentiate the lesions which are not surrounded by normal

tissue.^[24,25] Despite a significant increase in earlier stage diagnosis of thyroid cancer there is no decrease in mortality due to this disease.^[27]

Studies have suggested that there are more than 5% prevalence of thyroid nodules; whereas, investigators have shown more than 50 % of randomly selected population showed nodules in thyroid gland during ultrasonography.^[26-28] Further, various studies have shown that incidence of thyroid nodules as revealed by ultrasonography is significantly high i.e. more than 67%. However, among them less than 7% cases of thyroid nodules belong to malignant nature.^[23,29,30] An innumerable studies suggested that unnecessary invasive procedures can be avoided by using ultrasonography for the diagnosis of nodes of thyroids.^[31-34]

Findings of the present study showed that the positive predictive value was 50% while the negative predictive value was 47%. These findings are very similar to the previous study of Leenhardt L et al as they observed that a nodule with hypoechogenicity has a moderate positive predictive value (up to 63%) for malignancy with 75% sensitivity and 83% specificity.^[35]

In addition, Moon WJ et al,^[23] recorded in their study that nodular size more than 2cm along with solid consistency is positively correlated to malignancy. Contrast to this few other studies suggested that coarse calcifications, taller than wide, irregular borders and increased blood flow within the nodule were predictive of malignancy.^[36,37]

Farahiti J recorded in their study that various pattern as shown in sonography like diffuse hyperechogenicity, cyst with a colloid clot, spongiform configuration and giraffe pattern were belong to benign tumours. Moreover, they observed that unnecessary biopsy procedures was applied more than 60% of such cases.^[38]

Findings of the current study suggest that taller than wider solid nodules, micro calcification, irregular borders with increased blood flow in the nodule were independently identification markers for thyroid cancer. Ultrasound findings are being equivocal in the diagnosis of benign thyroid nodes and malignant 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] Various studies suggested for the modelling of thyroid malignancy prediction ultrasound characteristics along with clinical findings may be conclusive.^[39,40] However, there are studies which conclude that ultrasonography can not 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.

CONCLUSION

Findings of the current study suggest that radiological evidences are reliable enough for the diagnosis of the benign and malignant thyroid tumours. However, studies on larger populations are warranted to establish guideline for the radiological diagnosis of thyroid tumours.

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