Original Article

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Evaluation on Thyroid Nodule Malignancy by Ultrasound Findings: A Teaching Hospital Based Study

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Abstract

Background: Thyroid nodule is a common clinical problem and the incidence of thyroid nodules has increased with the recently increasing use of thyroid ultrasonography in India. **Subjects and Methods:** The study included total 186 cases among which 184 were females and 02 were males. Patients with diagnosed thyroid nodules of more than 1 cm and who underwent ultrasonography were included.**Results:** From all nodules, 22.65%) were single and 76.34% were multiple nodules; 60 nodules (32.25%) were solid and 126 (67.74%) cystic. Concerning echogenicity, 44 nodules (23.65%) were Hypo-echo and 35 nodules (18.8%) Hyper-echo. 179 nodules (96.23%) had a regular edge. 65 nodules (34.9%) had without Halo. 140 nodules (75.2%) were larger than 15mm. According to histopathology results, the benign nodules were 88.7% and malignant cases were 11.3%.**Conclusion:** Based on the result of this study, thyroid nodule size must not be considered as a criterion for malignancy and thyroid nodules of any size must be suspected as malignant. Important criteria for malignancy include irregular edges, being Solid hypoechogenicity and being a single nodule respectively.

Keywords: Thyroid nodules, Ultrasound, Fine-Needle Aspiration, Benign and Malignancy.

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Introduction

A thyroid nodule is a discrete lesion within the normal thyroid. Thyroid nodules are very common findings in the adult population, especially in women.[1] 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.[2] 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 iodinedeficient provinces.[3-5] Thyroid nodules have been defined by the American Thyroid Association (ATA) as "discrete lesions within the thyroid gland, radiologically distinct from surrounding thyroid parenchyma.[6] "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.[7] Indeed, as compared with FNA, thyroid US has been the crucial diagnosis method of thyroid nodules as the advantage of being a noninvasive procedure and giving immediate information. Yet the clinical importance of thyroid nodules lies in the detection of malignancy, the great majority of nodules are benign, less than 5% of them being malignant.[8,9] For the small sample sizes many studies are limited to analysis the association between the ultrasound imaging characteristics of thyroid nodules and the risk of thyroid cancer.[10-12] This ascertainment bias will overestimate the risk of cancer associated with the accuracy of ultrasound imaging. This study was aimed to determine the ultrasound imaging findings of thyroid nodules in patients and correlate it with clinical records to develop a standardized diagnosis sys¬tem for interpreting thyroid ultrasound imaging.

Subjects and Methods

This present study was carried out in the Department of Radiology, Nimra Institute of Medical Sciences, Nimra Nagar, Ibrahimpatnam, Jupudi, Vijayawada, krishna District, Andhra Pradesh, India during the period from 2015 to 2016. The study included total 186 cases among which 184 were females and 02 were males. Patients with diagnosed 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.13 A fine needle aspiration (FNA) biopsy was recommended to the referring physician is required.[14,15] The study was approved by the ethical Committee of Nimra Institute of Medical Sciences. All participants provided informed written consent to participate in it.

Results &Discussion

In this study 186 patients were examined; 184 patients (98.9%) were females and the (1.07%) were males. Their mean age was 34.6±24.02 years. None of the patients had a history of neck irradiation in childhood. Only one of the patients with benign nodule had the history of papillary carcinoma among family members (sister of the patient). From all nodules, 22.65%) were single and 76.34% were multiple nodules; 60 nodules (32.25%) were solid and 126 (67.74%) cystic. Concerning echogenicity, 44 nodules (23.65%) were Hypo-echo and 35 nodules (18.8%) Hyper-echo. 179 nodules (96.23%) had a regular edge. 65 nodules (34.9%) had without Halo. 140 nodules (75.2%) were larger than 15mm. According to histopathology results, the benign nodules were 88.7% and malignant cases were 11.3%. Summary of FNAC and Histopathology given in [Table2]. Prehand information of nature of disease alters the treatment options greatly. In thyroid, benign nodules require partial thyroidectomy or lobectomy, whereas malignant disease demand extensive surgery, i.e., total thyroidectomy, neck dissection followed by radio iodine ablation and lifetime dependency on thyroxine supplement. In thyroid disease, this benefit of prehand knowledge of pathology is granted by FNAC which is a well establish technique for pre-operative assessment of thyroid nodules.[16] The FNAC is cost-effective, less traumatic, less invasive, and easily performed procedure.[17] FNAC is a useful tool in the diagnosis in thyroid nodules if a suspicion of cancer exists. It has reduced the need of imaging and surgery and increased the yield of cancer in patients who come for surgery.[18] After surgery and pathology, 21 cases (10.2%) were reported malignant while 19 cases (9.1%) were confirmed malignant in FNAC. All of these nodes were papillary thyroid carcinoma. There was no significant relationship between sex and malignancy (p=1). Most of malignant nodules were single nodules (p=0.0001) and solid (p<0.0001). Most malignancies had irregular edges (p=0.15) and calcifications (p=0.02). There was no significant relationship between malignancy and nodule size of larger than 15mm (p=0.395). Compared with surgery, FNA sensitivity and specificity were calculated as 85.7% and 99.4%, respectively.

Table 1: Comparing malignant and benign nodules based on various characterstics and ultrasound features.

Individual or group features		benign (Sum=167)	malignant (Sum=19)	Odd ratios (Confidence interval of 95%)	P-value
Sex	Male	2	0		1
	Female	165	19		
Age range	<15	1	2		
	15-35	22	3		
	35-55	64	6		
	>55	80	8		
No. of nodules	Single nodule	32	12	7.23{2.63-19.83}	0.0001*
	Multi nodule	135	7		
TSH level	Normal	124	10		
	Hypothyroidism	16	5		
	Hyperthyroidism	27	4		
Nodule type	Solid	43	17	24.51{5.43-110.48}	<0.0001*
	Cystic and mixed	124	2		
Echogenicity	Hypo	36	8		
	Hyper	33	2		
	iso	98	9		
Margins	irregular	5	2	3.81{0.686-21.16}	0.152
	Regular	162	17		
Halo	Without halo	47	18	45.95{5.96-354.06}	<0.0001*
	With halo	120	1		
Nodule size	Larger than 15 mm	126	14	0.911{0.30-2.68}	1
	Smaller than 15 mm	41	5		
Calcification	With calcification	37	9	3.16{1.19-8.35}	0.02*
	Without calcification	130	10		

Fisher test was used for comparison. (* The difference was statistically significant.)

In this study the prevalence of malignant nodules was 10.2%. Compared with surgery, FNA sensitivity and

specificity for diagnosis of nodules were 85.7% and 99.4%, respectively. Being a single nodule, being solid, being hypo-echo, having irregular edges or calcification were the appropriate characteristics for differentiating malignant from benign nodules while the nodule size did not have appropriate differential value. In other studies, the prevalence of malignancy has been different. From all, 3.6% to 9.9% of all thyroid nodules have been reported malignant.[19-22] In my study the prevalence of malignancy was about the approximately same. In most studies, age and sex were not associated with malignancy.[23-25] In addition in most studies the sensitivity and specificity of FNA have been better than surgery; hence using FNA together with sonography can be very efficient even for small nodules.[23,26] FNA had high sensitivity and specificity in our study.

Table 2: Nature of thyroid nodules in FNAC and histopathology

Thyroid nodules	FNAC	Percentage (%)	Histopathology	Percentage (%)
Benign	167	89.8	165	88.7
Malignant	19	10.2	21	11.3

Table 3: Summary of FNAC and Histopathology

FNAC Findings	Histopathology Findings	
	Malignancy Present	Malignancy Absent
Malignancy Positive	18 (10.8%) (True Positive)	1 (1.07%) (False Positive)
Malignancy Negative	3 (1.07%) (False Negative)	164 (88.7%) (True Negative)

Some studies have been conducted to assess sonography parameters in differentiating malignant from benign thyroid nodules; the results have been inconsistent, and it is still controversial.[19,27] In a study in US, sonographic features failed to differentiate benign and malignant thyroid nodules and fineneedle aspiration was recommended for all cases.[19] In some studies sonography had been unable to differentiate malignant and benign cases and FNA is recommended for all thyroid nodules regardless palpability.[28,29] In a study, none of sonography characteristics, except calcification, was able to differentiate benign and malignant thyroid nodes.[19] However, there are studies in favor of the usefulness of sonography markers in differentiating malignant from benign nodules. In a study, having a single nodule, irregular edges, and micro-calcification increased the chance of malignancy 3.6, 5.4 and 39 times, respectively.[23] In Taneri et al study30, having multi nodules was associated with malignancy, while in Ugurlu et al,[23] study having a single nodule or two nodules increased the chance of malignancy and in Cappelli et al,[35] study being solid and hypo-echo were associated with malignancy. However in another study hypoechoechogenicity was not associated with malignancy.[23] Unclear edges, irregular shape, being solid and hypoechoechogenicity can increase the chance of malignancy.[27,31,32] In another study, a greater percentage of malignant nodules had irregular edges and hypoechoechogenicity.[29] In Moon et al,[33] study irregular shape was not associated with malignancy but there was higher percentage of hypoechoechogenicity in malignant nodes. Some studies were in favor of sonography markers for differentiating malignant and benign cases, however none of them can prove the malignancy decisively.

This present study showed that the smallness of nodule cannot eliminate the chance of malignancy and it is required for all nodules of any size to be investigated further. As mentioned in other studies, there is no difference regarding malignancy between nodulessmaller or larger than 10 mm.[34]Cappelli et al,[35] study showed that considering thyroid tumors of larger than 10mm resulted in not detecting 19% of malignancies. Other studies have also questioned using exact sizes for suspecting malignant nodules.[19,24] In a study it is recommended to do FNA even for 5mm nodules.28 In another study, nodes larger than 10mm did not increase the chance of malignancy.[23] Therefore, it seems that the thyroid nodule size is not a good indicator for future actions, such as FNA or surgery, and malignancy must be suspected in nodules of any size. Our study also had limitations. One of its limitations was the small sample size; therefore it was not possible to use logistic regression analysis. It is recommended to conduct a similar study with larger sample size in order to identify the malignancy markers more accurately. Finally, since a single investigator interpreted the US findings, interobserver variability in the interpretation of the sponge-like appearance and US characteristics was not evaluated.

Conclusion

In conclusion, Based on the result of this study, thyroid nodule size must not be considered as a criterion for malignancy and thyroid nodules of any size must be suspected as malignant. Important criteria for malignancy include irregular edges, being Solid hypoechogenicity and being a single nodule respectively. However, the presence of calcifications in the nodule by US indicates a higher risk of malignancy and should prompt the clinician to evaluate the nodule further with repeat FNA.

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