Original Article

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Ultrasound Findings on Thyroid Nodule Malignancy

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Abstract

Background: Thyroid nodules are a common clinical concern, and the frequency of thyroid nodules has risen as the use of thyroid ultrasonography in India has increased. **Subjects and Methods:** The overall number of cases in the research was 174, including 171 females and three men. Patients with more than 1 cm thyroid nodules who underwent ultrasonography were included in the study. Technique for Ultrasound Examination: Because metastatic cervical lymph nodes are regularly observed in thyroid malignancies and can affect surgical therapy and prognosis, a thorough evaluation of the neck for any cervical lymphadenopathy should always be included in the ultrasound assessment of the thyroid. **Results:** None of the patients had been exposed to neck irradiation as a youngster. Only one of the individuals with a benign lesion had a family history of papillary cancer (sister of the patient). There were 17.7% single nodules and 82.3 percent multiple nodules among all nodules; 40 (25.3%) solid nodules and 118 (74.7%) cystic nodules were found. There were 31 hypo-echo nodules (19.6%) and 32 hyper-echo nodules (20.6%) in terms of echogenicity. A regular edge was seen in 154 nodules (97.5%). Without Halo, 42 nodules (26.6%) were found. A total of 120 nodules (75.9%) were greater than 15mm. According to histopathological findings, benign nodules made up 89.7% of the total, whereas malignant nodules made up 10.3%. Table 2 shows a summary of FNAC and histopathology. **Conclusion:** Thyroid nodule size should not be used as a criterion for malignancy, and all thyroid nodules should be suspected of being malignant. Irregular edges, solid hypoechogenicity, and being a solitary nodule are all important markers for malignancy.

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

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Introduction:

Fujimoto performed the first ultrasound (USG) for thyroid nodules in 1967;[1] since then, significant breakthroughs in thyroid ultrasonography have been made, including real-time grayscale imaging and colour Doppler studies. However, no USG findings can be used to distinguish between benign and malignant tumors. A thyroid nodule is a tiny lesion that develops within the normal thyroid gland. Thyroid nodules are a highly common discovery in adults, particularly in women.[2] Thyroid disease affects around 42 million individuals in India, according to estimates based on several studies.[3] Thyroid nodules are widespread, and their prevalence is largely determined by the method used to detect them. By palpation alone, the estimated prevalence ranges from 4% to 7%, up to 67 percent by ultrasound, and 50% at autopsy, with a markedly greater occurrence in iodine-deficient districts.[4–7] Thyroid nodules are ”discrete lesions inside the thyroid gland, radiologically different from surrounding thyroid parenchyma,” according to the American Thyroid Association (ATA). Thyroid nodules are essential clinically for a variety of reasons. They can induce thyroid malfunction and, in rare cases, compressive symptoms, but they’re most important for ruling out thyroid malignancy. As a result, it should be palpable and radiologically identifiable from neighbouring thyroid tissue. Thyroid nodules are four times more common in women than in males, and their prevalence rises with age and a lack of iodine.[8] Indeed, when compared to FNA, thyroid US has been the most important tool for diagnosing thyroid nodules because it is a noninvasive procedure that provides quick results. The clinical significance of thyroid nodules, however, is in the detection of cancer; the vast majority of nodules are benign, with just around 5% of them being malignant.[9,10] Many studies are confined to analysing the relationship between the ultrasound imaging properties of thyroid nodules and the risk of thyroid cancer due to small sample sizes.[11–13] The risk of cancer related with the accuracy of ultrasound imaging will be overestimated as a result of this ascertainment bias. The goal of this study was to determine the ultrasound imaging findings of thyroid nodules in patients and

link them with clinical records in order to build a standardised thyroid ultrasound imaging diagnosis system.

Subjects and Methods

The current study was conducted from September, 2018 to August, 2019 in the Department of Radiology, World College of Medical Sciences Research and Hospital, Jhajjar, Haryana, India. The overall number of cases in the research was 174, including 171 females and three men. Patients with more than 1 cm thyroid nodules who underwent ultrasonography were included in the study. Technique for Ultrasound Examination: Because metastatic cervical lymph nodes are regularly observed in thyroid malignancies and can affect surgical therapy and prognosis, a thorough evaluation of the neck for any cervical lymphadenopathy should always be included in the ultrasound assessment of the thyroid. Ultrasound evaluation of a thyroid nodule was performed on these patients using a high frequency 7.5-10.0 MHz probe. Diameter, echogenicity (Hyper, Hypo, Iso, and an Echo), composition (Cystic, Solid, Mixed), microcalcifications (Presence and Absence), Borders (Irregular and Regular), and Halo are all factors to consider (Presence and Absence). Ultrasound of nodule margins, indicative of malignancy recommendations were adapted from Lew et al.[14] The referring physician was advised to do a fine needle aspiration (FNA) biopsy.[15,16] The study was authorised by the World College of Medical Sciences Research and Hospital's ethical committee. To take part in it, all participants gave written informed consent.

Results

A total of 174 individuals were investigated in this study, with 171 (98.9%) being females and 03 (1.07%) being males. They were 35.2842.8 years old on average. None of the patients had been exposed to neck irradiation as a youngster. Only one of the individuals with a benign lesion had a family history of papillary cancer (sister of the patient). There were 17.7% single nodules and 82.3 percent multiple nodules among all nodules; 40 (25.3%) solid nodules and 118 (74.7%) cystic nodules were found. There were 31 hypo-echo nodules (19.6%) and 32 hyper-echo nodules (20.6%) in terms of echogenicity. A regular edge was seen in 154 nodules (97.5%). Without Halo, 42 nodules (26.6%) were found. A total of 120 nodules (75.9%) were greater than 15mm. According to histopathological findings, benign nodules made up 89.7% of the total, whereas malignant nodules made up 10.3%. Table 2 shows a summary of FNAC and histopathology.

Discussion

The therapy options are drastically altered when the aetiology of the disease is known ahead of time. Benign nodules in the thyroid require a partial thyroidectomy or lobectomy, whereas malignant illness necessitates significant surgery, such as a whole thyroidectomy, neck dissection, radio iodine ablation, and a lifetime of thyroxine supplementation. FNAC, a well-established procedure for pre-operative examination of thyroid nodules, provides this benefit of prior knowledge of pathology in thyroid illness.[17]

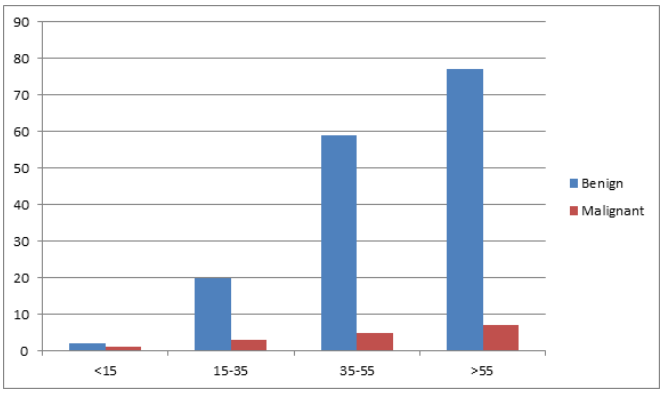

Figure 1: Distribution of patients according to age group.

The FNAC is a low-cost, less stressful, less invasive, and simple technique.[18] If there is a suspicion of malignancy in a thyroid nodule, FNAC can help with the diagnosis. It has reduced the requirement for imaging and surgery while also increasing the cancer yield in patients undergoing surgery.[19] 18 instances (10.3 percent) were declared malignant after surgery and pathology, whereas 16 cases (9.2%) were confirmed malignant with FNAC. Papillary thyroid cancer was found in all of these nodes.

There was no statistically significant link between sex and cancer (p=2). Single nodules (p=0.001) and solid nodules (p0.001) made up the majority of malignant nodules. The majority of tumours showed uneven margins and calcifications (p=0.04). Malignancy and nodule size more than 15mm did not have a significant connection (p=0.52). FNA sensitivity and specificity were calculated to be 82.4 percent and 92.6 percent, respectively, when compared to surgery. Malignant nodules were found to be 9.7% of the time in this investigation. FNA sensitivity and specificity for diagnosing nodules were 82.4 percent and 92.6 percent, respectively, when compared to surgery.

The suitable features for distinguishing malignant from benign nodules included being a single nodule, being solid, being hypo-echo, having uneven edges, or calcification, but the nodule size did not have an appropriate differential value. The frequency of malignancy has varied in several research. Malignant thyroid nodules account for 3.6 percent to 9.9 percent of all thyroid nodules.[20–23] Malignancy was found to be nearly the same in both of my studies. Age and sex were

Table 1: Compares the characteristics and ultrasonography findings of malignant and benign nodules:

Individual or group features		benign (Sum=158)	malignant (Sum=16)	Odd ratios (confidence interval of 95%)	P-value
Sex	Male	3	0		2.0
	Female	171	19		
Age range	<15	2	1		
	15-35	20	3		
	35-55	59	5		
	>55	77	7		
No. of nodules	Single nodule	28(17.7%)	10(62.5%)		0.001*
	Multi nodule	130(82.3%)	6(37.5%)		
TSH level	Normal	120(75.9%)	9(5.7%)		
	Hypothyroidism	13(8.2%)	4(2.5%)		
	Hyperthyroidism	25(15.8%)	3(1.9%)		
Nodule type	Solid	40(25.3%)	14(87.5%)	25.56{5.42-	<0.001*
	Cystic and mixed	118(74.7%)	2(12.5%)		
Echogenicity	Hypo	31(19.6%)	6(37.5%)		
	Hyper	32(20.6%)	2(12.5%)		
	iso	95(60.1%)	8(50.0%)		
Margins	irregular	4(2.5%)	2(12.5%)	3.62{0.685-	0.16
	Regular	154(97.5%)	14(87.5%)		
Halo	Without halo	42(26.6%)	15(93.8%)	44.94{5.94-	<0.001*
	With halo	116(73.4%)	1(6.3%)		
Nodule size	Larger than 15 mm	120(75.9%)	12(75.0%)		2.0
	Smaller than 15 mm	38(24.1%)	4(25.0%)		
Calcification	With calcification	34(21.5%)	7(43.8%)	3.17{1.19-8.34}	0.04*
	Without calcification	124(78.5%)	9(5.7%)		

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

Table 2: Nature of thyroid nodules in FNAC and histopathology:

Thyroid nodules	FNAC	Percentage (%)	Histopathology	Percentage (%)
Benign	158	90.8	156	89.7
Malignant	16	9.2	18	10.3

Table 3: Summary of FNAC and Histopathology:

FNAC Findings	Histopathology Findings	
	Malignancy Present	Malignancy Absent
Malignancy Positive	14 (True Positive)	2 (False Positive)
Malignancy Negative	2 (False Negative)	156 (True Negative)

not linked to cancer in the majority of investigations.[24–26]

Furthermore, FNA has been shown in most trials to have higher sensitivity and specificity than surgery; thus, employing FNA in conjunction with sonography can be quite effective, especially for small nodules.[24,27] In our research, FNA has a high sensitivity and specificity.

Some research have been carried out to evaluate sonography parameters in discriminating malignant from benign thyroid nodules; nevertheless, the results have been inconsistent, and the topic is still debatable.[28] Sonographic features failed to distinguish benign from malignant thyroid nodules in a research conducted in the United States, and fine needle aspiration was indicated in all cases.

Because sonography has been unable to distinguish between malignant and benign thyroid nodules in some investigations, FNA is indicated for all thyroid nodules, regardless of palpability.[29,30] Except for calcification, none of the sonography characteristics could distinguish between benign and malignant thyroid nodules in a research. There are, however, studies that support the use of sonography markers to distinguish between malignant and benign nodules. A single nodule, uneven margins, and micro-calcification all elevated the risk of cancer by 3.6, 5.4, and 39 times, respectively, according to a study.[24]

Having many nodules was linked to cancer in Taneri et al study,[31] whereas having a single or two nodules was linked to malignancy in Ugurlu et al study,[24] and being solid and hypoecho were linked to malignancy in Cappelli et al study.[32] Hypoechoechogenicity, on the other hand, was not linked to cancer in another investigation. Uneven edges, uneven shapes, solidity, and hypoechoechogenicity can all raise the risk of cancer.[33] In another investigation, uneven margins and hypoechoechogenicity were found in a higher percentage of malignant nodules.[30]

In a research by Moon et al,[34] irregular shape was not linked to malignancy, although malignant nodes had a higher percentage of hypoechoechogenicity. Some studies support the use of sonography markers to distinguish between malignant and benign instances, however none of them can definitively prove malignancy.

The results of this study suggest that the size of a nodule does not rule out the possibility of malignancy, and that all nodules of any size should be explored further. There is no difference in malignancy between nodules smaller than 10 mm and nodules larger than 10 mm, according to other research.[35] According to a research by Cappelli et al,[36] thyroid tumours larger than 10mm resulted in 19% of malignancies not being detected. Other research have questioned whether or not accurate sizes should be used for suspected malignant tumors.[20,25] FNA is indicated even for 5mm nodules, according to a study.[29] Another study found that nodes larger than 10mm did not raise the risk of cancer.[24]

As a result, the size of a thyroid nodule does not appear to be a strong predictor of future actions, such as FNA or surgery, and cancer must be suspected in nodules of any size. Our research had certain drawbacks as well. The tiny sample size was one of its drawbacks, therefore logistic regression analysis was not viable. It is suggested that a bigger sample size be used in a comparable study to better identify the malignancy indicators. Finally, because the US data were interpreted by a single investigator, there was no evaluation of interobserver variability in the interpretation of the sponge-like appearance and US characteristics.

Conclusion

Consequently, based on the findings of this study, thyroid nodule size should not be used as a criterion for malignancy, and all thyroid nodules should be suspected of being malignant. Irregular edges, solid hypoechogenicity, and being a solitary nodule are all important markers for malignancy. The presence of calcifications in the nodule by US, on the other hand, suggests a higher risk of malignancy and should encourage the doctor to perform another FNA on the nodule.

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