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ORIGINAL RESEARCH ARTICLE

An Analytical Study of Thyroid Nodules by Ultrasonography findings

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Abstract:
Introduction: 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.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 system for interpreting thyroid ultrasound imaging.
Methods: This Retrospective Analytical study involveddata of 200 of the randomly selected patients (candidates / study subjects) who seek care for Thyroid Nodules between Aug 2009 to Nov 2009 were retrospectively identified.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.[14,15] All participants provided informed written consent to participate in it.Patients with diagnosed thyroid nodules of more than 1 cm and who underwent ultrasonography were included.
Results: From all nodules, 21.50% were single and 78.5% were multiple nodules; 53 nodules (26.5%) were solid and 157 (78.5%) cystic. Concerning echogenicity, 46 nodules (23%) were Hypo-echo , 44 nodules (22%) were Hyper-echo & rest were Iso echoic. 192 nodules (96.0%) had a regular edge. 59 nodules (29.5%) were without Halo. 157 nodules (78.5%) were larger than 15mm. According to histopathology results, the benign nodules were 92% and malignant cases were 08%
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.

Key Word : USG , Thyroid Nodules , Malignant , Benign , Single Nodule

1 | 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 crucialdiagnosis method of thyroid nodules as the advantage of being a non-invasive 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 system for interpreting thyroid ultrasound imaging.

2 | METHEDOLOGY

This Retrospective Analytical study involved Prior Consent from Hospital Authorities / Medical Superintendents of the Local Randomly selected Secondary&Tertiary care hospitals having Surgical facilities and a Radiodiagnosis , to see the records of the patients from Medical Records Department (MRD).

The study was conducted within ethical standards. The Patients who were attending OPDs or admitted in randomly selected hospitals including Our Teaching Hospital in the city were selected for the study. Randomization was done using computer tables in selecting data. All Patients underwent standard clinical examinations, routine biochemical and haematological investigations with Ultrasonography. Medical record numbers were used to generate the data for analysis.

For the purpose of the present study, data of 200 of the randomly selected patients (candidates / study subjects) who seek care for Thyroid Nodulesbetween Aug 2009 to Nov 2009 were retrospectively identified.

Patients with diagnosed thyroid nodules of more than 1 cm and who underwent ultrasonography were included. UltrasoundExamination 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] All participants provided informed written consent to participate in it.

A total of 200 patients (180 females and 20 males) who fulfilled the inclusion criteria were chosen as samples by simple random sampling technique. The data was collected into parts. Demographic variables, Clinical Variables.Statistical analysis was conducted using Statistical Package for Social Sciences-20. Mean, percentage, and standard deviation were used to explain the demographic variables, Clinical variables and Fisher test was used for comparison.

3 | RESULTS

In this study 200 patients were examined; 178 patients (89%) were females and the (11%) were males. Their mean age was 36.4±21.07 years. None of the patients had a history of neck irradiation in childhood.

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

Individual or group Features		benign (Sum=186)	malignant (Sum=14)	Odd ratios (Confidence interval of 95%)	P-value
Sex	Male	22	0		1
	Female	178	14		
Agerange	<15	0	0		
	15-35	22	01		
	35-55	64	04		
	>55	80	09		
No.ofnodules	Singlenodule	32	11	7.48{2.73-18.53}	0.0001*
	Multinodule	154	03		
	Normal	141	09		
	Hypothyroidism	21	03		
	Hyperthyroidism	24	02		
Noduletype	Solid	42	11	23.71{5.43-110.48}	<0.0001*
	Cysticandmixed	144	03		
Echogenicity	Hypo	40	06		
	Hyper	42	02		
	Iso	104	06		
Margins	➢ Irregular	06	02	3.81{0.686-20.26}	0.162
	Regular	180	12		
Halo	Withouthalo	46	13	45.73 {5.96-326.36}	<0.0001*
	Withhalo	140	01		
Nodulesize	Larger than15mm	146	11	0.711{0.30-2.68}	1
	Smallerthan15mm	40	04		
Calcification	Withcalcification	46	07	3.16{1.19-8.35}	0.02*
	Withoutcalcification	140	07		

Table 1 shows from all nodules, 21.50% were single and 78.5% were multiple nodules;
53 nodules (26.5%) were solid and 157(78.5%) cystic. Concerning echogenicity, 46 nodules(23%) were Hypo-echo , 44 nodules (22%) were Hyper-echo& rest were Iso echoic. 192 nodules (96.0%) had a regular edge. 59 nodules (29.5%) were without Halo. 157 nodules (78.5%) were larger than 15mm.
According to histopathology results, the benign nodules were 92% and malignant cases were 08%. Summary of FNAC and Histopathology given in Table2.

Table 2: Nature of thyroid nodules in FNAC and histopathology

Thyroidnodules	FNAC	Percentage (%)	Histopathology	Percentage (%)
Benign	186	93	184	92
Malignant	14	07	16	08

Pre-hand 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 pre-hand 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, 16 cases were reported malignant while 14 cases 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 84.8% and 98.7%, respectively.

4 | DISCUSSION

In this study the prevalence of malignant nodules was08%. Compared with surgery, FNA sensitivity & Specificity were 84.8% and 98.7%, 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.

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 study [30], 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.[27-30] In another study, a greater percentage of malignant nodules had irregular edges and hypoechoechogenicity.[29] Some studies were in favour of sonography markers for differentiating malignant and benign cases, however none of them can prove the malignancy decisively.[25-30]

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 nodules smaller or larger than 10 mm.[34]Cappelli et al,[16] 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.

5 | 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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7 | REFERENCES

[1]. Welker MJ, Orlov D. Thyroid nodules. Am Fam Physician 2003;67(3):559–566.
[2]. Cooper DS. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19(11):1167– 1214.
[3]. Mazzaferri EL. Management of a solitary thyroid nodule. N Engl J Med 1993;328(8):553–559.
[4]. Wiest PW, Hartshorne MF, Inskip PD, et al. Thyroid palpation versus high-resolution thyroid ultrasonography in the detection of nodules. J Ultrasound Med 1998;17(8):487–496.
[5]. Cronan JJ. Thyroid nodules: is it time to turn off the US machines? Radiology 2008;247(3):602–604.
[6]. Mortensen JD, Woolner LB, Bennett WA. Gross and microscopic findings in clinically normal thyroid glands. J ClinEndocrinolMetab 1955;15(10):1270–1280.
[7]. Frates MC, Benson CB, Doubilet PM, Kun¬reuther E, Contreras M, Cibas ES, Orcutt J, Moore FJ, Larsen PR, Marqusee E and Alexan¬der EK. Prevalence and distribution of carci¬noma in patients with solitary and multiple thyroid nodules on sonography. J ClinEndocri¬nolMetab 2006; 91: 3411-3417.
[8]. Iannuccilli JD, Cronan JJ and Monchik JM. Risk for malignancy of thyroid nodules as assessed by sonographic criteria: the need for biopsy. J Ultrasound Med 2004; 23: 1455-1464.
[9]. Lew JI, Rodgers SE, Solorzano CC. Developments in the use of ultrasound for thyroid câncer. Current Opinion in Oncology 2010;22(1):11–16.

[10]. Baskin HJ. Ultrasound of thyroid nodules. In: Baskin HJ, editor. Thyroid ultrasound and ultrasound-guided FNA biopsy. Boston: Kluwer Academic Publisher 2007;P-71-86.
[11]. Moon WJ, Jung SL, Lee JH, et al. Benign and malignant thyroid nodules: US differentiation–retrospective multicenter study. Radiology 2008;247(3):762-770.
[12]. Tabaqchali MA, Hanson JM, Johnson SJ, Wadehra V, Lennard TW, Proud G. Thyroid aspiration cytology in Newcastel: s sox year cytology/histology correlation study. Ann R CollSurgEngl 2000;82(3):149–55.
[13]. Safirullah, Mumtaz N, Khan A. Role of Fine Needle Aspiration Cytology (FNAC) in the diagnosis of thyroid. J Postgrad Med Inst 2004;18(2):196–201.
[14]. Ramsden J, Watkinson JC. Thyroid cancers. Scott-Brown's Otorhinolaryngology, Head and Neck Sugery. 7th edition, vol 2, Hodder Arnold, 2008:2663–701.
[15]. Iannuccilli JD, Cronan JJ, Monchik JM. Risk for malignancy of thyroid nodules as assessed by sonographic criteria: the need for biopsy. J Ultrasound Med. 2004;23(11):1455-1464.
[16]. Cappelli C, Castellano M, Pirola I, Gandossi E, De Martino E, Cumetti D, et al. Thyroid nodule shape suggests malignancy. Eur J Endocrinol. 2006;155(1):27-31.
[17]. Lin JD, Chao TC, Huang BY, Chen ST, Chang HY, Hsueh C.
[18]. Thyroid cancer in the thyroid nodules evaluated by ultrasonography and fine-needle aspiration cytology. Thyroid. 2005;15(7):708-717.
[19]. Ugurlu S, Caglar E, Yesim TE, Tanrikulu E, Can G, Kadioglu P. Evaluation of thyroid nodules in Turkish population. Intern Med. 2008;47(4):205-209.
[20]. Baier ND, Hahn PF, Gervais DA, Samir A, Halpern EF, Mueller PR, et al. Fine-needle aspiration biopsy of thyroid nodules: experience in a cohort of 944 patients. AJR Am J Roentgenol. 2009;193(4):1175- 1179.
[21]. Mazeh H, Beglaibter N, Prus D, Ariel I, Freund HR. Cytohistologic correlation of thyroid nodules. Am J Surg. 2007;194(2):161-163.
[22]. Kim DW, Lee EJ, Kim SH, Kim TH, Lee SH, Kim DH, et al. Ultrasound-guided fine-needle aspiration biopsy of thyroid nodules: comparison in efficacy according to nodule size. Thyroid. 2009;19(1):27-31.
[23]. Koike E, Noguchi S, Yamashita H, Murakami T, Ohshima A, Kawamoto H. Ultrasonographic characteristics of thyroid nodules: prediction of malignancy. Arch Surg. 2001;136(3):334-337.
[24]. Kovacevic DO, Skurla MS. Sonographic diagnosis of thyroid nodules: correlation with the results of sonographically guided fine- needle aspiration biopsy. J Clin Ultrasound. 2007;35(2):63-67.
[25]. Kim EK, Park CS, Chung WY, Oh KK, Kim DI, Lee JT, et al. New sonographic criteria for recommending fine-needle aspiration biopsy of nonpalpable solid nodules of the thyroid. AJR Am J Roentgenol. 2002;178(3):687-691.
[26]. Taneri F, Kurukahvecioglu O, Ege B, Yilmaz U, Tekin E, Cifter C, et al. Prospective analysis of 518 cases with thyroidectomy in Turkey. EndocrRegul. 2005;39(3):85-90.
[27]. Popowicz B, Klencki M, Lewinski A, Slowinska-Klencka D. The usefulness of sonographic features in selection of thyroid nodules for biopsy in relation to the nodule's size. Eur J Endocrinol. 2009;161(1):103-111.
[28]. Algin O, Algin E, Gokalp G, Ocakoglu G, Erdogan C, Saraydaroglu O, et al. Role of duplex power Doppler ultrasound in differentiation between malignant and benign thyroid nodules. Korean J Radiol. 2010;11(6):594-602.
[29]. Moon WJ, Jung SL, Lee JH, Na DG, Baek JH, Lee YH, et al. Benign and malignant thyroid nodules: US differentiation-- multicenter retrospective study. Radiology. 2008;247(3):762-770.
[30]. Papini E, Guglielmi R, Bianchini A, Crescenzi A, Taccogna S, Nardi F, et al. Risk of malignancy in nonpalpable thyroid nodules: predictive value of ultrasound and color-Doppler features. J ClinEndocrinolMetab. 2002;87(5):1941-1946