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Application of ultrasound in the evaluation of types of thyroid nodules: A hospital based prospective study

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Abstract
Background: Ultrasound (USG) can be used to diagnose thyroid nodules. The present study aimed to evaluate the role of USG in the diagnosis of thyroid nodules.
Materials and Methods: This study was conducted in Department of Radio diagnosis, RMMCH. Study period was one year. 50 patients were selected based on the inclusion and exclusion criteria. Selected patients were explained study procedure and inform consent was obtained. All the patients were subjected to USG neck for the evaluation of type of thyroid nodules.
Results: Thyroid nodule size increases in malignant compared to benign. In benign maximum cases were well defined margins. 28 showed solid echo structure. 21 in benign and 4 in malignant showed heteroechoic echogenisity.
Conclusion: This study results conclude that ultrasound is more useful in the detection of type of thyroid nodule with size and other features.

Keywords: nodule, thyroid, benign, malignant, ultrasound, texture, size

Introduction
Thyroid nodules are most common can be identified in regular clinical practice. They can be discovered by physical examination and also with use of various imagining procedures. They are very important primarily because of malignant potential. For this reason early diagnosis always plays major role to prevent the disease progression [1, 2]. Fujimoto in 1967 was performed ultrasound first time in the diagnosis of thyroid nodules. As years goes many new and advanced procedures have developed in the ultrasonography of thyroid like real-time gray scale imaging and color Doppler [3], One of the major use of USG findings are diagnostic to differentiate benign from malignant lesions [4, 5]. Many findings such as hypoechoic lesions, margins and type of calcification have shown association with malignant nodules [6, 7]. The present study aimed to identify thyroid nodules for benign or malignant and other characteristics.

Materials and Methods
Study settings: This study was conducted in Department of Radio diagnosis, RMMCH. Study period was one year.

Inclusion criteria
- Thyroid nodules
- Nodule size more than 1 cm
- Not undergone any thyroid surgery recent years

Exclusion criteria
- On thyroid hormone replacement therapy
- Any congenital thyroid disorders
- On radioactive iodine therapy
- Patient not willing to sign on inform consent

Procedure
The study population was selected who are coming to Department of Radio diagnosis, RMMCH. All the patients selected on the basis of inclusion and exclusion criteria. A total of 50 patients selected for the study. The patients were explained detail study procedure and then subjected to USG of thyroid gland. The thyroid nodules were classified as solid when the entire nodule was solid without any cystic foci. Cystic when the entire nodule was cystic without any solid areas. Echogenicity was defined as hypoechoic, isoechoic, or hyperechoic comparing the echogenicity of the thyroid nodule with the normal thyroid gland. Heterogeneous echogenicity was noted when the same nodule showed mixed echoes [8, 9]. Margins were classified as ill-defined when more than 50% of its border is not clearly demarcated. Microcalcification was defined as fine calcification of size 1 mm or less, single or in groups. Macrocalcifications were larger calcific foci and were classified as eggshell calcification (peripheral calcification), coarse calcification, and nodular calcification. The presence of any vascularity was defined as any color Doppler signal pickup in the nodule or periphery of the nodule [10].

Statistical analysis
The data was expressed in number and percentage, mean and standard deviation. Statistical Package for Social Sciences (SPSS 16.0) version used for analysis. Chi-square test applied to find the significant between the observations. p value less than 0.05 ($p<0.05$) considered statistically significant at 95% confidence interval.

Results
The age of the patients ranges form 30-65 years and the mean age of patients is 42.63±2.67. Males were more (n=39) than females (n=11) (Graph-1). The mean nodule size is more in malignant (39.17) than benign (28.26). 17 had more than 30 mm in benign and 4 in malignant of nodule size (Table-1). 34 in benign showed well defined margins and 7 in malignant showed ill-defined margin. 28 in

benign and 9 in malignant showed solid echo texture (Table-2). In benign and malignant maximum patients showed heteroechoic echogenecity. 30 in benign and 5 in malignant showed macrocalcification in thyroid nodules. 38 in benign and 7 in malignant had no microcalcification (Table-3).

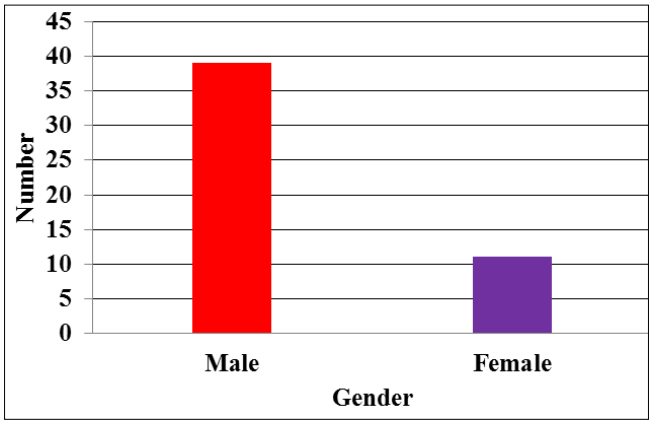

Fig 1: distribution of patients based on the gender

Table 1: Distribution of thyroid nodules based on the size

Observation	Benign (n=40)	Malignant (n=10)
Size (MEAN±SD)	28.26±7.56	39.17±12.89*
Size>30 mm	17	4*

(*p<0.05 significant compared Benign with Malignant)

Table 2: Distribution of thyroid nodules based on morphological characteristics

Morphological characteristics	Benign (n=40)	Malignant (n=10)
Margins		
Well defined	34	3
Ill defined	6	7
Echo texture		
Solid	28	9
Cystic	12	1
Echogenicity		
Hypoechoic	8	4
Isoechoic	4	2
Hyperechoic	7	0
Heteroechoic	21	4

Table 3: Distribution of thyroid nodules based on the calcification

Calcification	Benign (n=40)	Malignant (n=10)
Macrocalcification		
Present	30	5
Coarse	3	3
Egg shell	6	2
Nodular	1	0
Microcalcification		
Present	2	3
Absent	38	7

Discussion

Thyroid USG diagnosis is commonly misperceived as being unable to differentiate benign and malignant nodules. None of the single USG findings have been able to accurately differentiate between benign and malignant this is the one of the major drawback of USC. The findings of USG such as microcalcification, illdefined margin, markedly hypoechoic echotexture, and solid internal consistency are associated with malignant lesions. The application of these findings is used in the diagnosis of goiter. This study showed solid lesions are associated with malignancy. It also proved by various studies done previously [11, 12]. Solid type of lesions are also considered to be associated with malignancy; however, in this study the association was not seen [13, 14]. In the present study also showed similar observations. In this study it was obsrved that hypoechoic nodules and illdefined margins were seen more frequently in malignant lesion in this study. These factors have been established as independent predictors of malignant than benign [15, 16]. In one study results showed that echogenicity not have any significant difference between benign and malignant nodules. In this study benign cases showed similar observations compared malignant. In some studied proved that calcification, especially coarse and rim calcifications and microcalcification is a predictors of malignancy [17].

Conclusion

Ultrasound is one of the major diagnostic tools in the detection of thyroid nodules. The size, margins and texture of thyroid nodules is important factors for discriminating benign from malignant thyroid nodule.

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