

Diagnostic Evaluation of Ultrasonography for Diagnosing Malignant and Benign Thyroid Nodules Taking FNAC as Gold Standard

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ABSTRACT

Objective: To determine the diagnostic accuracy of ultrasonography for differentiating malignant and benign thyroid nodule taking fine needle aspiration cytology (FNAC) as a gold standard.

Study Design: Cross-sectional study

Place and Duration: Conducted at Radiology department of Hayatabad Medical Complex, Peshawar for duration of six months from 1st February 2020 to 31st July 2020.

Methods: One hundred and eighteen patients of either gender clinically diagnosed to have thyroid nodules with ages 20 to 70 years were enrolled. After taking written consent, detailed demographics including age, sex, BMI and family history were recorded. Ultrasonography was performed and findings were recorded. FNAC was taken as gold standard. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of ultrasound were examined. Data was analyzed by SPSS 27.0.

Results: There were 33 (27.97%) males while 85 (72.03%) were females. Mean age of patients was 40.33±10.65 years. By ultrasonography 30 (25.42%) patients had malignant and 88 (74.58%) had benign thyroid nodules. By FNAC 33 (27.96%) patients had malignant and 85 (72.03%) had benign nodules. The sensitivity and specificity of ultrasonography was 90.91% and 100%. PPV was 100%, NPV was 96.59% and diagnostic accuracy was 97.46%.

Conclusion: Ultrasonography is very useful diagnostic tool for diagnosing malignant thyroid nodules with high diagnostic accuracy rate.

Keywords: Thyroid Nodules, Ultrasound, FNAC, Accuracy

INTRODUCTION

Over the last few decades, thyroid malignancy is the commonest in the world and the global incidence of thyroid cancer has gradually increased [1, 2]. Since the risk of malignancy in any thyroid nodule is 5-15% [3, 4], the latest recommendations for thyroid guidelines demand imaging methods for detecting thyroid malignant conditions early and contribute to a better prognosis [5]. Ultrasound scanning is commonly cited as an early diagnostic imaging tool because of its wide availability, relative easiness, and lack of ionising radiation exposure [6].

Despite the benefits of ultrasound imaging shown, the evidence for thyroid malignancies is not conclusive [7]. Thus, by comparing the findings of a gold standard test the diagnostic accuracy of the ultrasonic scan must be tested. The most reliable economically productive approach for the definitive assessment of thyroid nodules is the Fine-Needle Aspiration Cytology (FNAC) [8-9]. Therefore, recommendations on thyroid cancer treatment suggest that FNAC be performed on any suspectedly malignant thyroid nodule [10]. Global evidence reveals several ultrasound properties suggesting thyroid malignancies [11-12]. Collective global evidence indicates, however, contradictory findings in predictive capacity research. The present study was conducted to determine the diagnostic accuracy of thyroid nodules and its role for the management of malignant thyroid nodules.

MATERIALS AND METHODS

This cross-sectional study was conducted at Radiology department of Hayatabad Medical Complex, Peshawar for duration of six months from 1st February 2020 to 31st July 2020. Total 118 patients of either gender clinically diagnosed to have thyroid nodules with ages 20 to 70 years were enrolled. After taking written consent, detailed demographics including age, sex, BMI and family history of CA were recorded. Patients on radioiodine therapy, already diagnosed, patients with surgical intervention and those with no consent were excluded from the study.

To examine the nodules as malignant we selected solid or predominantly solid nodules with a solid portion greater than 50 percent, showing the hypoechoic texture as lower than or lower than the normal thyroid tissue or strap-muscles with several nodules, irregular or micro-lobular margins, larger than broader shape and p The same could be accessed independently of the number, but the largest biopsy was done in many nodules without above features. Ultrasound driven FNAC was performed in a patient lying supine extending the neck and using a 23 gauge needle and a 5- or 10 cc syringe, a single pass per nodule was made. Philips USG HD3 and Logic 200 machines (3.5/7.5 MHz probes) were used to classify and direct the thyroid nodule.

All the data was analyzed by SPSS 27.0. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of

ultrasound were examined. Mean±SD was done. Frequencies and percentages were recorded.

RESULTS

Out of 118 patients, 33 (27.97%) males while 85 (72.03%) were females. Mean age of patients was 40.33±10.65 years. Mean BMI was 26.82±3.54 kg/m². 7 (5.93%) patients had family history of carcinoma. (Table 1)

Table 1: Baseline characteristics of all the patients

Characteristics	Frequency No.	%age
Mean Age (yrs)	40.33±10.65	-
Gender		
Male	33	27.97
Female	85	72.03
Mean BMI (kg/m)	26.82±3.54	-
Family History		
Yes	7	5.93
No	111	94.07

By ultrasonography 30 (25.42%) patients had malignant and 88 (74.58%) had benign thyroid nodules. (Table 2)

Table 2: Positive findings of malignant thyroid nodules on ultrasound

Variables	Frequency No.	Percentage
Positive	30	25.42
Negative	88	74.58

By ultrasound guided fine needle aspiration cytology (FNAC) 33 (27.96%) patients had malignant and 85 (72.03%) had benign nodules. (Table 3)

Table 3: Positive findings of malignant thyroid nodules on FNAC

Variables	Frequency No.	Percentage
Positive	33	27.96
Negative	85	72.03

On comparison we found that 30 (25.42%) patients were true positive, no patient with false positive, 3 (2.54%) were false negative and 885 (72.03%) were true negative. The sensitivity and specificity of ultrasonography was 90.91% and 100%. PPV was 100%, NPV was 96.59% and diagnostic accuracy was 97.46%.. (Table 4)

Table 4: Association between ultrasound and FNAC

Ultrasound	FNAC		Total
	Positive	Negative	
Positive	TP 30	FP 0	30
Negative	FN 3	TN 85	88
Total	33	85	118

Statistic	Value	95% CI
Sensitivity	90.91%	75.67% to 98.08%
Specificity	100.00%	95.75% to 100.00%
Positive Likelihood Ratio		
Negative Likelihood Ratio	0.09	0.03 to 0.27
Disease prevalence (*)	27.96%	
Positive Predictive Value(*)	100.00%	
Negative Predictive Value (*)	96.59%	90.60% to 98.81%
Accuracy (*)	97.46%	92.75% to 99.47%

DISCUSSION

Thyroid disorders are the most common health conditions in developing countries around the world. Thyroid nodules were malignant and benign, leading to a high rate of morbidity and mortality among thyroid patients[13]. Diagnostic modalities play an important role in thyroid nodular treatment. Many studies indicate that ultrasound is a valuable method for diagnosing malignancies of thyroid nodules, but a gold standard for diagnosing malignant cells is the fine needle aspiration cytology. [14]. In present study majority 72% patients were females while male were 28%. Mean age of patients was 40.33±10.65 years. These results showed similarity to many of previous studies in which females were on high risk for developing thyroid diseases and accounted 65% to 95% and the average age of patients with thyroid nodules was 45 years [15-16].

In our study, by ultrasonography we found 30 (25.42%) patients had malignant and 88 (74.58%) had benign thyroid nodules. Ultrasound guided fine needle aspiration cytology (FNAC) showed that 33 (27.96%) patients had malignant and 85 (72.03%) had benign nodules. A study conducted by Nawaz S et al [17] regarding diagnostic accuracy of ultrasound for diagnosing thyroid nodules and they reported that on FNAC, 27.4% cases were positive and 72.6% cases were negative while on thyroid ultrasound 26.3% cases were positive and 73.7% cases were negative.

In this study we found that 30 (25.42%) patients were true positive, no patient with false positive, 3 (2.54%) were false negative and 885 (72.03%) were true negative. The sensitivity and specificity of ultrasonography was 90.91% and 100%. PPV was 100%, NPV was 96.59% and diagnostic accuracy was 97.46%. A study conducted by Al Ghanimi et al [18] reported that by FNAC, 59 of the 68 nodules analyzed were reported as benign; 56 of these were also designated as benign with US. Therefore, the specificity of US in determining benign nodules was 94.9%.

Another study by Tareen A et al [19] reported that sensitivity, specificity, PPV, NPV and diagnostic accuracy of ultrasonography was 93.15%, 89.86%, 90.67%, 92.54% and 91.55% respectively. Attia R et al [20] reported that diagnostic accuracy of FNAC to be 80%, sensitivity to be 80%, and specificity to be 87.5% in neoplastic lesions, but results in carcinomatous lesions had accuracy of 92.5%, sensitivity of 80%, and specificity of 95.38%.

Gunaratne SA et al [21] reported that Sensitivity, specificity, positive predictive value, negative predictive value and accuracy for FNAC were 94.1%, 87.2%, 86.5%, 94.4%, and 90.4% respectively. The corresponding values for ultrasonography were 64.7%, 69.2%, 64.7%, 69.2% and 67.1% respectively.

CONCLUSION

For the management of thyroid nodules the diagnostic tools such as ultrasound, fine needle aspiration cytology and pathology testing are very important. We concluded from this analysis that ultrasound is an integral part of the diagnosis of high diagnostic precision malignant thyroid nodules. It is a very useful method for making decisions on thyroid nodules management.

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