

Original article:

Study of sensitivity and specificity of ultrasonography using histopathological report as gold standard

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Abstract

Introduction: The prevalence increases to 19– 27% on including enlargements found on ultrasonography. Most of the enlargements are benign with malignant once forming about 4–14% of cases

Methodology: This was Prospective observational study conducted over two years duration. The study population included all of the suspected cases of thyroid lesions admitted at a tertiary care center and referred to Radiodiagnosis department with sample size as 60.

Results: USG sensitivity and specificity, sensitivity=98.27%, specificity= 50%, Positive Predictive value = 98.27%, Negative Predictive value = 50%. After histopathology reference only 16 patients were malignant and 34 patients were diagnosed as having malignant nodules. The sensitivity, specificity and accuracy of USG were 100%, 94.1% and 96% respectively.

Conclusion: Ultrasound is the investigation of choice in evaluation thyroid diseases as well as it is cost effective modality.

Keywords: ultrasonography, histopathological report, thyroid swelling

Introduction:

The prevalence increases to 19– 27% on including enlargements found on ultrasonography [1,2]. Most of the enlargements are benign with malignant once forming about 4–14% of cases [3,4] ACR TI-RADS is a reporting system for thyroid nodules on ultrasonography offered by the American College of Radiology (ACR). ACR TI-RADS system uses a standardized scoring system. It provides users with the recommendations regarding usage of fine needle aspiration (FNA) or ultrasound follow-up for suspicious nodules, and when to safely leave alone nodules that are benign/not suspicious. This Scoring is determined from the five categories of ultrasound findings. Higher is the cumulative score, higher the TR (TI-RADS) level and the likelihood of malignancy as well.

Methodology:

This was Prospective observational study conducted over two years duration. The study population included all of the suspected cases of thyroid lesions admitted at a tertiary care center and referred to Radiodiagnosis department with sample size as 60.

Inclusion criteria :

- 01) Patients presenting with clinically palpable swelling in the neck region.
- 02) Patients presenting with congenital abnormalities of thyroid gland.
- 03) Patients with clinical suspicion of thyroid dysfunction.
- 04) Patients complaining of pain in thyroid region.

Exclusion criteria:

- 01) All patients not giving consent for histopathological examinations.
- 02) Secondaries in the neck.
- 03) Swelling in the neck other than thyroid.
- 04) Ectopic thyroid
- 05) Post-operative recurrences.
- 06) Post-radiotherapy and post radio isotopic therapy of thyroid.
- 07) All patients with bleeding diathesis.

The observation findings in 60 patients have been analyzed. These cases were referred to the department of Radiodiagnosis for ultrasonography.

Results:

In this study majority of cases found in the age group of 40-49 years e.g 16 (26.66%) followed by 12 cases in 30-39, 11 in 50-59, 7 cases in 60-69 years, 6 cases in 20-29, 5 cases in 70-79 and 3 cases were found in 10-19 group. Majority of study participants were females 41 (68.33%) and males 19 (31.67%) maximum cases swelling was observed on both sides/Diffuse 22 (36.6%) followed by midline 15 (25%) and right side 13 (21.6%). Lowest swelling sites observed on left side 5 (8.33%).

Table no:1 Distribution of patients according to various pathologies diagnosed on USG

USG DIAGNOSIS	NO OF PATIENTS	PERCENTAGE
BENIGN NODULE	14	23.33%
GOITRE	26	43.33%
MALIGNANT NODULE	11	18.33%
THYROID CYST	02	3.34%
THYROIDITIS	05	8.34%
NO LESION FOUND	02	3.34%
TOTAL	60	60 (100%)

The above table shows majority cases with Goiter 26 (43.33%) followed by benign nodule 14 (23.33%), malignant nodule found in 11 (18.33%), Thyroiditis found in 5 cases (8.34%) thyroid cyst found in 2 cases. No lesion was detected in 2 cases (3.34%) on USG.

Table no: 2 Distribution of patients according to various pathologies diagnosed on FNAC

USG DIAGNOSIS	NO OF PATIENTS	PERCENTAGE
BENIGN NODULE	16	26.6%
GOITRE	26	43.3%
MALIGNANT NODULE	09	15%
THYROID CYST	02	3.34%
THYROIDITIS	05	8.34%
NO LESION	02	3.34%
TOTAL	60	60 (100%)

The above table shows majority cases with Goiter 26 (43.3%) followed by benign nodule 16 (26.6%), malignant nodule found in 09 (15%),

Thyroiditis found in 5 cases (8.34%) thyroid cyst found in 2 (3.34%) cases.

Table no: 3 Sensitivity and Specificity of USG

USG Diagnosis	FNAC Diagnosis		Total
	Disease	Not Disease	
Positive	57	1	58
Negative	1	1	2
Total	58	2	60

$$\text{Sensitivity} = \frac{a}{(a+c)} \times 100 = \frac{57}{58} \times 100 = 98.27\%$$

$$\text{Sensitivity} = 98.27\%$$

$$\text{Specificity} = \frac{d}{(b+d)} \times 100 = \frac{1}{2} \times 100 = 50\% \text{ Specificity} =$$

$$50\%$$

$$\text{Positive Predictive value} = \frac{a}{(a+b)} \times 100 = \frac{57}{58} \times 100 = 98.27\% \text{ Positive Predictive value} = 98.27\%$$

$$\text{Negative Predictive value} = \frac{d}{(c+d)} = \frac{1}{2} \times 100 = 50\% \text{ Negative Predictive value} = 50\%$$

$$\text{Diagnostic accuracy} = \frac{(a+d)}{(a+b+c+d)} \times 100 = \frac{(57+1)}{(57+1+1+1)} \times 100 = 96.6\%$$

Table no: 4 Relationship between radiological and FNAC diagnosis of benign and malignant nodules.

USG Diagnosis	FNAC Diagnosis		Total no of cases (benign and malignant)
	Benign	Malignant	
Benign	12	2	14
Malignant	4	7	11
Total	16	9	25

$$\text{Sensitivity} = \frac{a}{(a+c)} \times 100 = \frac{12}{16} \times 100$$

$$\text{Sensitivity} = 75\%$$

$$\text{Specificity} = \frac{d}{(b+d)} \times 100 = \frac{7}{11} \times 100$$

$$\text{Specificity} = 77.7\%$$

$$\text{Positive Predictive value} = \frac{a}{(a+b)} \times 100 = \frac{12}{14} \times 100$$

$$\text{Positive Predictive value} = 85.7\%$$

$$\text{Negative Predictive value} = \frac{d}{(c+d)} = \frac{7}{11} \times 100$$

$$\text{Negative Predictive value} = 63.3\%$$

$$\text{Diagnostic accuracy} = \frac{(a+d)}{(a+b+c+d)} \times 100 = \frac{(12+7)}{(12+2+4+7)} \times 100 = 76\%$$

Discussion:

In our study, out of 60 cases 58 cases showed pathology on FNAC results. Majority cases were Goiter 26 (43.3%) followed by benign nodule 16 (26.6%), malignant nodule found in 09 (15%), Thyroiditis found in 5 cases (8.34%) and thyroid cyst found in 2 cases. Similar result found in the study by Hyder Ali Esmail et al [5]. They studied efficacy of ultrasound guided FNAC of thyroid lesions. Of the total of 1639 aspirates 1054 (64.3%) were benign including goitre cases, 306 (18.66%) were malignant and 128 (7.8%) were of thyroiditis.

In our study, the studied 60 cases were followed after giving USG diagnosis. Out of 60 cases pathologies were detected in 58 patients on USG examination. Out of these 58 cases, 57 were found to have pathologies on FNAC correlation and 1 one was misdiagnosed as thyroiditis which came out to be normal after FNAC. Out of 2 cases that depicted no significant abnormality on USG, 1 was diagnosed as thyroiditis after FNAC and 1 was normal. 11 patients were diagnosed as having malignant nodules out of which 9 came out to be malignant and 2 came out to be benign nodules after FNAC. 14 patients were diagnosed as having benign nodule on USG out of, however after FNAC 16 patients were proven to be with benign nodules. 2 patients were misdiagnosed of having malignant nodules which came out to be benign after FNAC.

Sensitivity and Specificity of USG in detection of thyroid lesions. USG sensitivity and specificity, sensitivity=98.27%, specificity= 50%, Positive Predictive value = 98.27%, Negative Predictive value = 50%. Similar result found in the study by Ahmed Youssef et al [6] who studied diagnostic value of ultrasonography in detection of different thyroid nodules. From 50 thyroid specimens USG could diagnose malignancy in 18 specimens. After histopathology reference only 16 patients were malignant and 34 patients were diagnosed as

having malignant nodules. The sensitivity, specificity and accuracy of USG were 100%, 94.1% and 96% respectively.

In our study out of 60 patients 14 patients were diagnosed as having benign nodules and 11 patients were diagnosed as having malignant nodules. Total no of patients having benign (excluding goitre, thyroiditis and cyst) or malignant lesion is 25. After FNAC of these 25 patients 16 patients were diagnosed as having benign nodules and 9 patients as with malignant nodules. So USG could detect presence of malignant nodule with the sensitivity of 75%, specificity of 77.7% and accuracy of 76%. Similar results were found by PP Baby et al who studied various sonographic features of thyroid nodules to predict malignancy in thyroid nodules. Using these multiple features, they found out that USG has accuracy of 76% with sensitivity of 80% and specificity of 75% for detecting thyroid malignancy, considering ultrasound-guided FNAC as the standard[7]

Conclusion:

Ultrasound is the investigation of choice in evaluation thyroid diseases as well as it is cost effective modality.

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