

Diagnostic Method and Correlation of Fine Needle Aspiration Cytology (FNAC), Ultrasonography (USG), and Thyroid Nodule Histopathology

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Abstract

Background: The thyroid gland is unique amongst endocrine organs because it is the largest endocrine gland in the body and the first to develop in fetal life.

Objectives: To evaluate the correlation of Ultrasonogram (USG), Fine Needle Aspiration cytology (FNAC) with Histopathology in the diagnosis of thyroid nodules and to find the diagnostic criteria of USG and FNAC in detecting the thyroid nodules.

Methods: It is a prospective study carried out on 70 cases of thyroid nodules attending the Department of Surgery and Pathology for Specimen during the period of May 2021 to May 2022. All patients were examined clinically after taking detailed history and status of thyroid function test (TFT), they were investigated with USG and FNAC of the thyroid nodule. SPSS (Version 22.0) was used for analysis.

Results: Eighty-nine percent of the 70 patients were female, compared to 11% of male patients. Out of 71 patients, FNAC found that 21 patients (30%) had follicular hyperplasia, 33 patients (46%), had follicular neoplasia, 11 patients (15%) had papillary carcinoma, and 6 patients (8%), had thyroiditis. Ten of the eleven malignant FNAC interpretations were identified as Papillary carcinoma by HPE, with one instance showing up as a hypertrophic nodule. FNAC's sensitivity and specificity (98%, 71.6%, respectively) are higher than USG's (85%, 62.8%).

Conclusion: When assessing and identifying thyroid gland masses or suspected tumours, USG and FNAC are useful techniques. Instead of using a single diagnostic modality, a combination of different diagnostic modalities will produce the best findings and help many patients avoid unnecessary surgery without overlooking any malignancies.

Keywords: Histopathology, Thyroid nodule, FNAC, USG, Papillary carcinoma, sensitivity,

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Introduction

Even after 100 years, thyroid gland has been the subject of intense research and considerable attention due to the vast array of developmental, inflammatory,

hyperplastic and neoplastic disorders which are exceedingly common in clinical practice [1]. Most common clinical finding in the thyroid gland is thyroid nodule

which is defined as any abnormal growth of thyroid cells into a lump within thyroid.

Incidence of clinically evident thyroid nodules is 4% – 5% in the general population. Moreover, ultrasound examinations reveal the presence of multiple nodules in 20% – 48% of patients with a single palpable thyroid nodule [2,3]. Due to this, thyroid nodules are on the rise. Compressive symptoms, cosmetic disfigurement, functional thyroid nodules, bleeding, and 5% of nodules are malignant are all outcomes of thyroid nodules [4,5].

The ability to identify objects with a diameter of as little as 2 mm in real time allows for the detection of very small nodules. To distinguish between vascular and cystic formations, doppler techniques can be added [6,7]. It approaches the incidence of thyroid nodules seen in research using autopsies and is more reliable than palpation in recognising solitary or dominant nodules within a multinodular goitre [8]. The following are some benefits of US: low cost, quick examination, acquisition of dynamic images, ability to execute guided biopsies, simple accessibility, and non-ionizing nature of the imaging. Because of the thyroid gland's superficial location and high degree of echogenicity, high-frequency transducers can produce images with excellent resolution.

The rationale behind the study was to evaluate the correlation of Ultrasonogram (USG), Fine Needle Aspiration Cytology (FNAC) With Histopathology in the diagnosis of thyroid nodules and to find the sensitivity and specificity of USG and FNAC in detecting the thyroid nodules.

Materials and Methods

It is a prospective study carried out on 70 cases of thyroid nodules attending the Department of General Surgery and Pathology for specimen at Rama Medical College Hospital and Research Centre during the period of May 2021 to May 2022. Patients having a clinically palpable thyroid nodule were included in the

analysis. Each and every patient, regardless of gender, in the 15–75 age range.

Requirements for exclusion

A thyroid enlargement that is not nodular. Patient ineligibility for operation

70 patients total are included in the study's instances. Maintain contact with the patient until surgical discharge. Study timeframe: From May 2021 to May 2022, for a year.

To analyse the data, descriptive statistical procedures such as correlation and sensitivity, specificity, and analysis of variance will be utilised. The institutional ethical review board has discussed and approved this study.

Methodology

After obtaining a thorough medical history and thyroid function test (TFT) results, all patients had clinical examinations. The thyroid nodule was also explored using USG and FNAC. The USG uses a high resolution 7.3 MHz probe. The nodules were assessed sonologically for size, position, echotexture, borders, presence of halo, calcification, vascularity, accessory nodules, and related cervical nodes, as well as consistency of nodule (solid, cystic, or mixed) in order to discriminate between benign and malignant nodules.

With or without the use of a 20 ml disposable syringe, FNAC was performed with a 23-gauge needle attached to a Franken's handle. Cystic nodules were treated by aspiration, centrifugation, and the creation of slides from the sediment for cytological investigation [9].

In this investigation, FNAC revealed thyroiditis in 6 individuals. They received a hémithyroidectomy for cosmetic and medical reasons due to a high suspicion of malignancy, a mass that did not fully regress after receiving suppressive therapy, or a goitre that continued to develop despite treatment. There were no hyperthyroidism patients in this study; instead, all of the thyroiditis patients had

low TSH readings and were on thyroxine. Results from the pre-operative USG and FNAC were then compared with the conclusive histology diagnosis. Calculations were made to determine the sensitivity, specificity, diagnostic accuracy, positive predictive value (PPV), and negative predictive value (NPV) of USG and FNAC in detecting thyroid cancer.

Results

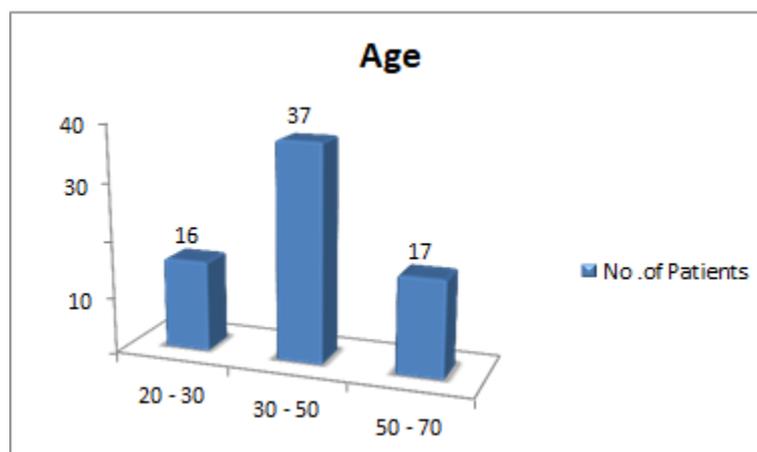


Figure 1: Study Participants' Age and Gender Distribution

Based on figure 1 Out of 70 patients, 16 were between the ages of 20 and 30 years, 37 were between the ages of 30 and 50, and 17 were between the ages of 50 and 70. Eighty-nine percent of the 70 patients were female, compared to 11% of male patients.

Table 1: Alternative FNAC presentations

S.No.	FNAC presentation	No. of patients	%
1	Follicular Hyperplasia	21	30
2	Follicular Neoplasia	32	46
3	Papillary carcinoma	11	15
4	Thyroiditis	6	8
5	Medullary carcinoma	0	0
6	Anaplastic Carcinoma	0	0

According to table 1, 21 patients (30%) had Follicular Hyperplasia, 32 had Follicular Neoplasia, 11 had Papillary Carcinoma, and 6 had Thyroiditis.

Table 2: Various Histopathological Patterns

S.No.	Histopathological Presentation	No. of patient	%
1	Follicular adenoma	14	20
2	Follicular carcinoma	2	3
3	Papillary carcinoma	14	20
4	Medullary carcinoma	0	0
5	Nodular goiter	31	45
6	Thyroiditis	9	13
7	Anaplastic Carcinoma	0	0

According to table 2, histopathological diagnosis confirmed Follicular Adenoma in 14 patients (20%), Follicular Carcinoma in 2 patients (3%), Papillary Carcinoma in 14 patients (20%), Nodular Goitre in 31 patients (45%), and Thyroiditis in 9 patients (13%).

Table 3: Different Ultrasonography Pattern

S. No.	USG	No. of patients	%
1	Nodular goiter	36	51%
2	Nodular		
3	Goiter? Malignancy	17	25%
4	Cystic nodules	7	10%
	Thyroiditis	10	14%

According to table 3, 36 (51%) of the 70 patients had Nodular Goiter, while 17 (25%) had Nodular Goitre. Malignant, 7 patients (10%) had Cystic Nodules, and 10 (14%) had Thyroiditis.

Table 4: Fine Needle Aspiration Cytology (FNAC) and Histopathology Correlation

S.No.		FNAC	%	Histopathology	%	% of patients correlated
1	Papillary carcinoma	11	15.4	14	20	71.4%
2	Thyroiditis	6	8	9	13	67%
3	Follicularneoplasia/hyperplasia/Colloid	53	76	47	68	84%

In this investigation, according to table 4, of the 11 malignant FNAC interpretations, 10 were confirmed by HPE as Papillary carcinomas, with one instance showing up as a hypertrophic nodule on HPE.

Table 5: Correlation of USG with Histopathological diagnosis in thyroid nodules

S.No.		USG	USG %	Histopathology	Histopathology %
1	Nodular goitre	44	61.9%	48	68%
2	Thyroiditis	9	13%	9	13%
3	Malignancy	17	25.3%	10 Pap Ca+2 F.Ca	20%

According to table 5, of the 17 malignant interpretations on USG, papillary carcinoma was confirmed in 10 cases by HPE. Out of 14 papillary carcinomas, 12 malignant interpretations from FNAC and USG combined were confirmed by HPE. In 70 individuals, USG revealed 64 solid nodules and 7 cystic nodules. Three (29%) of the seven cystic nodules were found to be cancerous.

Table 6: Sensitivity and Specificity of FNAC and USG in diagnosing Thyroid Nodule

Technique	Sensitivity	Specificity
FNAC	98%	71.8%
USG	85%	62.6%

As per table 6 it clearly suggests that sensitivity and specificity of FNAC (98%, 71.8%) is better than USG (85%, 62.6%).

Discussion

According to a study by Dorairajan and Jayashree [10], the incidence of cancer in this study was 22.5%. The incidence of papillary carcinoma in the current study was 87% out of 16 malignancies (14 patients). The incidence of papillary carcinoma varies from 50% to 80% in the literature [11]. In this investigation, there were no medullary or anaplastic carcinomas found, however there was a 13% incidence of follicular carcinoma in 2 patients. Patients in the current study ranged in age from 22 to 58, with a mean age of 38.72. Comparing this age range and mean incidence to earlier research, they are marginally lower [12]. Most of the patients, or 42%, were in their third decade of life. According to Dorairajan's analysis, this is the case. 27 participants (or 38%) in our study had benign FNAC. 34 individuals (48%) had FNAC that was determinant. 11 patients (14%) had FNAC with malignancy. A study from Pakistan found that 11.84% of patients had malignant FNAC, 43 (42%) had indeterminate FNAC, and 39.47% of patients had benign FNAC, which is remarkably similar to our data [13]. 16 instances in our study had histological results that indicated they were malignant (14 papillary carcinoma and 2 Follicular carcinomas). It must be emphasised that, with the exception of one case, every case of papillary carcinoma detected by FNAC was also papillary carcinoma on histological inspection. This is consistent with earlier research [13].

The techniques employed to determine the sensitivity, specificity, positive predictive value, and negative predictive value were comparable to those used in earlier investigations [14]. FNAC has a sensitivity and accuracy of 71.4% and 92.9% for the detection of papillary neoplasm, compared to 76% and 69% in a research by Cusick *et al* [14].

In our investigation, we discovered that USG had a sensitivity and specificity of 62.5% and 85%, respectively, for

identifying benign from malignant nodules. Watters *et al.* (1992) reported that the sensitivity and specificity of USG in predicting a malignant lesion were 74% and 83%, respectively. This finding is consistent with our investigation [15].

Out of 11 malignant FNAC interpretations in our investigation, papillary carcinoma was confirmed for 10 of them by HPE. Ten of the 18 malignant USG interpretations were confirmed as papillary carcinoma by HPE. Out of 14 Papillary Carcinomas with combined FNAC & USG, HPE confirmed 12 malignant interpretations. The work-up of all thyroid nodules is advised to include USS plus FNAC since it has been demonstrated to be more sensitive and specific than either procedure alone [16].

Conclusion

When assessing and identifying thyroid gland masses or suspected tumours, USG and FNAC are useful techniques. Instead of using a single diagnostic modality, a combination of many diagnostic modalities will produce the best findings and help many patients avoid unnecessary surgery without missing any malignancies.

Therefore, USG is advised as a part of regular evaluation for all thyroid nodules, to detect small thyroid nodules, to determine changes in nodule size, and to determine recurring lesions in patients suspected of thyroid cancer.

Nearly all palpable and symptomatic nodules should receive FNAC. US-guided FNAC is advised for non-palpable nodules that are deeply located, adjacent to blood arteries, previously debatable nodules, or when a prior FNAC was inconclusive.

Author's Contribution

Dr. Parul Joshi has finalized the draft and guarantor. Dr Neha Ahuja has prepared the conceptual framework, designing of draft and data analysis, Dr. Amrita Sinha was involved in data collection and analysis, and has done manuscript writing.

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