

# A RETROSPECTIVE RESEARCH TO EVALUATE THE ROLE OF FINE NEEDLE ASPIRATION CYTOLOGY IN THE DIAGNOSIS OF THYROID LESIONS

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## Abstract

**Aim:** To evaluate the role of Fine Needle Aspiration Cytology in Diagnosis of Thyroid lesion.

**Materials and Methods:** A retrospective research was conducted at the Department of Pathology, Assiut University and Hospital, Egypt. An overall total of 200 patients with a single thyroid nodule who met the inclusion criteria were included in the research. In the case of fine needle aspiration cytology, the sensitivity, specificity, positive predictive value, and negative predictive value were determined based on histopathologic examination, which was the gold standard.

**Results:** There were 120 females and 80 men in attendance, resulting in a female to male ratio of 1.5:1. The patients' ages varied from 14 to 71 years, with a mean age of 43.69 years plus standard deviation (12.49 years). The majority of the patients are between the ages of 30 and 40. Neck oedema was the most common symptom among these patients (100 percent), followed by vocal cord palsy (15 percent), breathing difficulties 11 percent, and dysphagia 9 (4.5 percent), respectively. The thyroid nodule varied in size from 2 to 6.9 cm, with a mean of 4.51 +/- S.D. 1.89 cm and a standard deviation of 1.89 cm. Based on the results of this study, nodular goitre accounted for 52 percent of solitary thyroid nodules, with benign cyst accounting for 32 percent of benign lesions, 33 percent of follicular carcinoma, 17 percent of papillary carcinoma, and three cases being suspicious of neoplasm among the benign lesions.

**Conclusion:** FNAC has key rule in diagnosis of solitary thyroid nodule because it is safe, minimally invasive and cost effective diagnostic tool.

**Keyword:** Fine needle aspiration cytology, histopathology, solitary thyroid nodule

## Introduction

When it comes to the preoperative examination of thyroid nodules, fine-needle aspiration cytology (FNAC) is a well-established method<sup>[1]</sup>. It is widely regarded as the gold standard diagnostic test for the assessment of thyroid nodules in patients<sup>[2]</sup>. When used in conjunction with other imaging techniques, FNAC may give a definitive benign diagnosis in 60 percent of patients with benign nodules, and its potential to decrease the number of surgical procedures is considerable<sup>[3]</sup>. The prevalence of thyroid nodules in adults ranges from 4-10 percent, whereas it is 0.2-1.2 percent in children. The vast majority of clinically detected thyroid nodules are benign, with just 5-30 percent being cancerous and necessitating surgical intervention in most cases<sup>[4]</sup>. The primary aim of FNAC evaluation of nodules is to detect

nodules with malignant potential and to get early treatment of these nodules, taking into consideration the limitations of open biopsy and the benefits of FNAC<sup>[5]</sup>. When comparing the advantages of preoperative FNAC of thyroid swelling with the advantages of postoperative histopathology of thyroid swelling, FNAC is becoming a more important tool in the preoperative decision-making process of thyroid swelling. This allows for the development of a consensus protocol for the diagnosis and optimal management of thyroid diseases<sup>[5]</sup>. As the usage of imaging has increased over the last few decades, the number of accidentally found nodules has increased, and this picture is utilised to guide the FNAC<sup>[6]</sup>. The FNAC is generally regarded as the gold standard first diagnostic technique in the differential diagnosis of thyroid nodules, and it is extensively used<sup>[7]</sup>. Thyroid nodules may appear with almost any condition of the thyroid gland, and there is no noninvasive technique that can reliably differentiate between benign and malignant thyroid nodules<sup>[8]</sup>. The use of FNAC for thyroid surgery has gained unparalleled popularity, owing mostly to the aesthetic complications and technical challenges associated with thyroid surgery, as well as the very limited percentage of actual neoplasms found in patients with thyroid nodules<sup>[9]</sup>. While open biopsy has its limits, FNAC has many benefits over open biopsy in that it may detect nodules with malignant potential and treat them as soon as possible. This is the primary aim of

FNAC evaluation of these nodules.

## Materials and Methods

A retrospective research was conducted at the Department of Pathology, Assiut University and Hospital, Egypt. An overall total of 200 patients with a single thyroid nodule who met the inclusion criteria were included in the research.

## Ethical approval

The study protocol was reviewed by the Ethical Committee of the Hospital and granted ethical clearance.

## Inclusion criteria

- Both male and female patients.
- All age groups
- Solitary thyroid nodule.

## Exclusion criteria

- Non-thyroidal neck masses.
- Diffuse goiter.
- Multinodular goiter.

## Methodology

The triple evaluation method, which included clinical, radiographic and tissue diagnosis, was used to determine the presence of a single thyroid nodule. In this study, the mucosal lining of the upper aerodigestive tract was evaluated and a systemic examination was also performed. In all of the instances, routine investigations were carried out. Ultrasonography, radioiodine scan, thyroid function tests, computed tomography, magnetic resonance imaging (MRI) and endoscopy were all performed as needed. FNAC was done in all patients by the same cytopathologist who had performed the fine needle aspiration cytology. Thyroid surgery was done and the specimens were evaluated by the same histopathologist. In the case of fine needle aspiration cytology, the sensitivity, specificity, positive predictive value and negative predictive value were determined based on histopathologic examination, which was the gold standard.

## Statistical analysis

The recorded data was compiled and inserted into a spreadsheet computer programme (Microsoft Excel 2010), which was then exported to the data editor page of the SPSS version 20 statistical software application (SPSS Inc., Chicago, Illinois, USA). The calculation of percentages, means and standard deviations were all part of descriptive statistics, as well.

## Results

**Table 1:** Demographic profile of patients

Variables	N=200	Percentage
<b>Gender</b>		
Female	120	60
Male	80	40
<b>Age</b>		
Below 20	4	2
20-30	10	5
30-40	84	42
40-50	68	34
50-60	26	13
Above 60	8	4

**Table 2:** Clinical features of patients (n=200)

Symptom/Sign	Number	Percentage
Neck Swelling	200	100%
Vocal Cord Palsy	15	7.5%

Difficult Breathing	11	5.5%
Dysphasia	9	4.5%
Hoarseness	4	2%
Weight Loss	4	2%

**Table 3:** FNAC of thyroid nodule (n=200)

Diagnosis on FNAC		Patients		
		N	Total	% Age
Non-neoplastic lesions	Nodular goitre	104	145	72.5
	Benign cyst	32		
	Lymphocytic thyroiditis	9		
Neoplastic lesions	Follicular carcinoma	33	55	27.5
	Papillary carcinoma	17		
	Hurthle cell lesion	2		
	Suspicious of neoplasm	3		
Total patients			200	100%

**Table 4:** Histopathology of thyroid nodule

Diagnosis on Histopathology		Patients		
		N	Total	% Age
Non-neoplastic lesions	Solitary colloid nodule	100	139	69.5
	Benign thyroid cyst	30		
	Chronic Lymphocytic thyroiditis	8		
	Hashimoto's thyroiditis	1		
Neoplastic lesions	Follicular adenoma	35	61	31.5

	Colloid adenoma	11		
	Hurthle cell	2		
	Adenoma Follicular	4		
	Carcinoma Papillary carcinoma	9		
Total patients			200	100%

**Table 5:** Table of frequency of diseases in this study (n=200)

Gold standard test (BIOPSY)			
Test result (FNAC)	Disease	No disease	Total
Positive	97	20	117
Negative	11	72	83
Total	108	92	N=200

**Table 6:** Diagnostic yield of FNAC in diagnosis of solitary thyroid nodule (n=82)

FNAC	Sensitivity	Specificity	PPV	NPV
	89.81%	78.26%	82.90%	86.74%

## Discussion

It is still difficult to identify solitary thyroid lesions with FNAC, despite the many years of work that has gone into developing cytologic and clinical criteria for detecting follicular neoplasms and differentiating between benign and malignant lesions<sup>[10]</sup>. Although there is some disagreement, it is generally agreed that, at this time, FNAC is the best and most reliable diagnostic technique for use in the preoperative treatment of patients with such lesions. Females are more likely than men to get a thyroid nodule. Among those who participated in this research were 120 females and 80 men, for a female-to-male ratio of 1.5:1, which is similar to the ratios seen in other national and international studies<sup>[11]</sup>. According to the findings of Bukhari and colleagues, the majority of the patients in this research are between the ages of 30 and 40 years, with the remainder between 40 and 50 years<sup>[12]</sup>. The following was the conclusion reached by the FNAC in this study: Non-neoplastic lesions were identified in 145 instances (72.5 percent), which is consistent with the findings of the Korah<sup>[13]</sup> research, which showed benign lesions in 69 percent of cases, while in other studies benign lesions were detected in 50 percent of cases<sup>[14]</sup>. Nodular goitre was the most frequent finding among the benign lesions, accounting for 104 instances (52%), which is consistent with studies by Gupta<sup>[15]</sup>, who reported 39 cases (52%), all of which were colloid nodular goitre and Saddique<sup>[16]</sup>, who reported thirty cases (50%), all of which were nodular goitre. Another frequent FNAC finding among benign lesions was a malignant cyst in 32 instances (16 percent), which contrasts with the Abu-Salem research, which found thyroid cysts in 43 cases (instead of 32 cases) (8.3 percent)<sup>[17]</sup>. The prevalence of malignant illnesses in this research was 27.5 percent, which is similar to the findings of the Gupta<sup>15</sup> study, which found 26 percent of participants had malignant lesions and the Baloch study, which found 29 percent of participants had malignant lesions (n=110)<sup>[18]</sup>. The most common malignant condition was follicular carcinoma, which accounted for 33 cases (16.5 percent) in this research, as opposed to the Pai study, in which malignancy was discovered in 15 instances (23 percent)<sup>[19]</sup>. On histology, non-neoplastic lesions accounted for 69.5 percent of the total and neoplastic lesions accounted for 31.5 percent, while in the Mehmood<sup>[20]</sup> study, non-neoplastic lesions accounted for 79.49 percent of the total and neoplastic lesions accounted for 20.51 percent. Thirty-five percent of the neoplastic lesions identified on histology were follicular angiomas, whereas in the Tabaqchali<sup>[21]</sup> research, follicular angiomas were discovered by chance in 60 individuals (25.10 percent). 17 cases (8.5 percent) were diagnosed as malignant on FNAC, but on histopathology, they were found to be benign nodular goitre. Three cases were diagnosed as suspicious on FNAC but were later found to be Hashimoto's thyroiditis on histopathology, which is comparable to the findings of Gharib<sup>[22]</sup>,

who reported a false-negative rate of 1 percent to 11 percent and a false-positive rate of 1 percent to 8 percent. The diagnostic yield of FNAC for a single thyroid nodule was 89.81 percent in this research, with sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) being 78.26 percent, 82.90 percent and 86.74 percent, respectively. The diagnostic yield of FNAC has been reported in the literature at various levels ranging from 50 percent to 95 percent based on the study. Kumar's sensitivity and specificity were 77 percent and 100 percent, respectively; according to his findings<sup>[23]</sup>. A research conducted by Moosa found that the yield of FNAC had the following characteristics: sensitivity of 77.7%, specificity of 98.9%, positive predictive value of 87.5 percent, and negative predictive value of 97.8 percent<sup>[24]</sup>. In a similar vein, Abu-Salem discovered that specificity was 99 percent and sensitivity was 93 percent<sup>[17]</sup>. Tariq reported a sensitivity of 75%, a specificity of 97.6%, a positive predictive value of 85.71 percent and a negative predictive value of 95.34 percent<sup>[25]</sup>. Using his research, Saddique discovered that sensitivity was 75%, specificity was 95%, positive predictive value was 81.8% and negative predictive value was 93.8% in his experiment<sup>[16]</sup>. Alam found a sensitivity of 100 percent and a specificity of 95.12 percent in the same study as well<sup>[26]</sup>. My results are lower than those of Korah<sup>[13]</sup>, who reported sensitivity, negative predictive value (NPV), specificity and positive predictive value (PPV) of 88 percent, 98 percent, 100 percent and 100 percent, respectively, for sensitivity, negative predictive value (NPV), specificity and positive predictive value (PPV). Mehmood's research revealed that the FNAC has 79.17 percent sensitivity and 91.40 percent specificity in the study's results<sup>[20]</sup>. In our study the accuracy of FNAC was 82.92% which is comparable to the studies of Bukhari<sup>[12]</sup> having accuracy 87% and Pai accuracy 89%<sup>[19]</sup>. However accuracy of my study is greater than Gupta study revealed accuracy of 13.3%<sup>[15]</sup>.

## Conclusion

For patients with thyroid nodules, FNAC is an important diagnostic tool for preoperative evaluation. It may aid the surgeon in the treatment of these nodules since it is a safe, minimally invasive and cost-effective diagnostic technique for preoperative assessment of thyroid nodules.

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