

Original Research Article

# Fine Needle Aspiration Cytology in the Diagnosis and Management of Thyroid Diseases

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## Abstract

**Background:** Swellings of thyroid are frequently encountered in surgical practice. With clinical evaluation it is difficult to distinguish early malignant lesions from common benign goiters. Surgical excision is the only means by which a definitive diagnosis is obtained based on HPE. An alternative approach is called for other than surgery as most cases are benign. FNAC is a simpler and safer procedure carried out in the OPD with minimal equipment and has good patient compliance. The present study aims at correlating the cytological diagnosis with the final histological diagnosis to evaluate the sensitivity, specificity and accuracy of FNAC smears, thereby its role in preoperative diagnosis in planning proper management.

**Aim:** To determine the accuracy and the role of fine needle aspiration cytology (FNAC) as a diagnostic modality in the diagnosis and treatment of thyroid diseases.

**Materials and methods:** A proforma was drafted for the study of all patients presenting with history of palpable thyroid swelling and undergo surgery in our hospital. Clinical presentations, FNAC and histopathology of all cases were documented.

**Results:** 100 cases who presented with thyroid swellings were studied and their histopathological diagnosis was compared with the FNAC. Of the 86 cases which were seen benign by FNAC, 82 were confirmed by histopathology. Of the 18 cases which were proved to be malignant by histopathology 14 were only seen as malignant by FNAC. The sensitivity of FNAC in the diagnosis of benign lesions was found to be 77.78%, specificity was 100%, positive predictive value 100% and accuracy is 96%.

**Conclusion:** Most of our patients were between third and fourth decade, with females being predominant. Most cases were benign of which multinodular goiter being the most dominant pathology (25%). Among the malignancies, majority being papillary carcinoma (78.94%). The

sensitivity, specificity and predictive value of positive smears being 77.78%, 100%, and 100% respectively. FNAC was of greater help in the preoperative management of thyroid swellings. Multinodular goiters and colloid goiters were distinguished easily by FNAC but confusion prevailed in cases of follicular adenomas. In patients who cannot be followed up regularly clinical suspicion should be one of the indications for surgery despite of FNAC being negative. FNAC is simpler, safer, quicker and more informative, when compared with other sophisticated methods in the diagnosis of thyroid lesions.

## Key words

Fine needle aspiration cytology, Thyroid swelling, Accuracy, Positive predictive value.

## Introduction

Thyroid diseases are among the commonest endocrine disorders worldwide. Majority of these are benign diseases of which goiter is the commonest and a few are malignant. Thyroid swellings can be isolated or dominant. True incidence of thyroid nodularity is less apparent on clinical examination. When such glands are exposed at operation, clinically impalpable nodules are often detected. Importance of discrete thyroid nodule lies in the risk of neoplasia as compared to other thyroid swellings. The majority of these nodules are benign. However, the distinction of these benign lesions from a malignant nodule cannot be based reliably on the clinical presentation alone. Complications of surgery are possible injury to the recurrent laryngeal nerve, hypoparathyroidism and thyroid hormone dependence. Several diagnostic tests such as scintigraphy (with  $I^{123}$  or  $^{99m}Tc$  pertechnetate), ultrasonography and fine needle aspiration cytology (FNAC) have been used to differentiate benign from malignant thyroid disease pre-operatively [1-5]. FNAC has now supplanted most of the other tests for pre-operative evaluation of thyroid nodules. Due to its simplicity, low cost and absence of major complications, this procedure is being performed on an increasing number of patients, which has led to the detection of thyroid cancers at earlier stages, resulting in better outcome for patients.

The limitations are those related to specimen adequacy, sampling techniques, the skill of the physician performing the aspiration, the experience of the pathologist and overlapping

cytological features between benign and malignant follicular neoplasm. Because of this discrepancy in the result, the present study was undertaken to assess the accuracy of Fine needle aspiration cytology in patients presenting with thyroid swelling.

## Materials and methods

The study included those patients admitted in the surgical wards of Tirunelveli Medical College Hospital from January 2012 to June 2013 for treatment of thyroid diseases.

### Selection criteria

#### Inclusion criteria

The study includes those patients-

- Getting admitted in the surgical wards for the treatment of various thyroid diseases.
- Thyroid Function Tests (TFT) normal.

#### Exclusion criteria

The study excludes those patients with-

- Bleeding disorders.
- Reduced TSH levels.
- Pregnant ladies and children below 12 years.

Patients with goiter were evaluated clinically. Relevant aspects of patient's history included age, sex, rapidity of growth, recent onset of hoarseness, dysphagia, dyspnea, symptoms of hypo or hyperthyroidism, history of head and neck irradiation, family history of endocrine diseases was included.

Physical examination to determine whether the gland was diffusely enlarged, solitary, nodular or multinodular with symmetric or asymmetric enlargement was done. In nodular swelling, the size, shape, consistency, location and mobility was assessed. The patients will be examined for the presence of cervical lymphadenopathy.

A thyroid function test and an ultrasound was performed.

## Results

The results of the 100 patients studied with their FNAC and HPE is as follows:

**Table – 1:** Age and Sex distribution.

AGE (years)	MALE	FEMALE	TOTAL	%
10 TO 20	2	5	7	7
21 TO 30	3	21	24	24
31 TO 40	1	31	32	32
41 TO 50	1	14	15	15
51 TO 60	3	13	16	16
61 TO 70	2	3	5	5
71 TO 80	0	1	1	1
<b>TOTAL</b>	<b>12</b>	<b>88</b>	<b>100</b>	<b>100</b>

**Table – 2:** Cytology and Histology.

Cytology	Histology		Total cytology
	Benign	Malignant	
Benign	82	4	86
Malignant (malignant cells)	0	14	14
<b>Total histology</b>	<b>82</b>	<b>18</b>	<b>100</b>

### Cytological diagnosis

Of the 100 cases of thyroid selected for study, 86 were cytologically benign and 14 were malignant (**Table – 2**).

Among the benign thyroid swellings 37 were multinodular goiters, 22 colloid goiters, 21 Hashimotos thyroiditis, 5 follicular neoplasm and one was Hurtle cell neoplasm.

Of the 14 malignant thyroid lesions, 13 were papillary carcinoma and one was small cell variant of medullary carcinoma.

### Sex distribution

The study consisted of a total of 100 patients among whom, 88 were females and 12 were males.

Females: 88

Males: 12

Females: Males = 7.3: 1

### Age distribution

The study group of 100 patients included cases ranging from 12 years to 75 years. Majority of thyroid cases (56%) were in the 2<sup>nd</sup> and 3<sup>rd</sup> and decades of life (21-40) years (**Table – 1**).

Of the 100 excised specimens, 82 were confirmed to be benign and 18 were malignant.

Among the benign ones, 25 were multinodular goiters, 24 were thyroiditis, 13 were follicular adenoma, 10 were colloid goiter, 9 were microfollicular adenoma, and one was Hurtle cell adenoma (**Table – 3, 4**).

Among the malignancies, 15 were papillary carcinoma thyroid, one follicular carcinoma, one anaplastic carcinoma, and one turned out to be small cell variant of medullary carcinoma.

**Table – 3:** Fine needle aspiration cytology diagnosis.

FNAC Diagnosis	Number	%
Multinodular goitre	37	37
Colloid goitre	22	22
Hashimoto's thyroiditis	21	21
Follicular neoplasm	5	5
Hurtle cell neoplasm	1	1
Papillary carcinoma	13	13
Medullary carcinoma	1	1

**Table – 4:** Histopathological diagnosis.

Histopathological diagnosis	No	%
Multinodular goitre	25	25
Thyroiditis	24	24
Follicular adenoma	13	13
Colloid goitre	10	10
Microfollicular adenoma	9	9
Hurtle cell adenoma	1	1
Malignancy	18	18

**Table – 5:** Malignancy in Histopathology.

Malignancy	No	%
Papillary carcinoma	15	78.94
Follicular carcinoma	1	5.26
Medullary carcinoma	1	5.26
Anaplastic carcinoma	1	5.26
<b>Total</b>	<b>18</b>	<b>100</b>

Of the 18 malignancies diagnosed histologically as malignant, 14 were diagnosed correctly from cytology too. But four were found to be benign in cytological study (**Table – 5**).

Of the 12 male patients studied, 8 had benign lesions, and 4 had malignant lesions.

Among the benign ones, 4 had multinodular goitre, 3 Hashimotos thyroiditis, one colloid goiter, and of the malignancies, 3 were papillary carcinomas and one turned out to be anaplastic carcinoma.

The accuracy of FNAC in the diagnosis of malignant disease of thyroid was evaluated by using the predictive value theory. The sensitivity, specificity, positive and negative predictive values and accuracy were determined.

### Predictive Value of FNAC of Thyroid Swellings

True negative (TN) - 82

True positive (TP) - 14

False negative (FN) - 4

False positive (FP) - 0

Sensitivity: Positive in disease = **77.78%**

Specificity: Negative in disease = **100%**

Positive predictive value = **100 %**

Negative predictive value = **95.35 %**

Accuracy = **96%**

### Discussion

#### Age distribution

The age of the patients in the present study varied from 12 to 75 years (**Table – 6**).

#### Sex ratio

The sex ratio in the present series was 7.3: 1 with 88 women and 12 men. High frequency of women was seen in the present series.

#### Incidence of malignancy

18 out of 100 patients (18%) studied were malignant. Among the malignant lesions, papillary carcinoma comprised 79%, follicular, medullary and anaplastic comprised 5% each. Papillary carcinoma was frequent in the 3<sup>rd</sup> and 4<sup>th</sup> decades, while follicular carcinoma was seen in the 4<sup>th</sup> decade and medullary and anaplastic carcinoma was frequent in the 5<sup>th</sup> and 6<sup>th</sup> decades.

#### Predictive value

The predictive values of FNAC in the present series are:

Sensitivity: 77.78%

Specificity: 100%

Positive predictive value: 100%

Negative predictive value: 95.35%

Accuracy: 96%.

**Table - 6:** Age distribution of thyroid swellings in present series.

Age (years)	Multinodular goiter	Thyroiditis	Follicular adenoma	Colloid goitre	Microfollicular adenoma	Hurtle cell adenoma	Papillary ca	Medullary ca	Follicular ca	Anaplastic ca	Total (%)
10 - 20		2	1	3	1						7
21- 30	5	5	4	2	4	1	3				24
31 -40	10	8	6	2	1		5				32
41 - 50	3	6	1	3	1				1		15
51 - 60	4	3	1		1		5	1		1	16
61 -70	3				1		1				5
71 - 80							1				1
<b>Total (%)</b>	<b>25</b>	<b>24</b>	<b>13</b>	<b>10</b>	<b>9</b>	<b>1</b>	<b>15</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>100</b>

### Sensitivity and specificity

According to one study, the sensitivity and specificity of FNAC in thyroid diseases should be more than 83%. Sensitivity and specificity from 8 different series showed to range from 70% to 100%. More false negatives decrease the sensitivity and specificity of the test [6].

According to one study, a large cyst that reaccumulates haemorrhagic fluid after complete evacuation should be suspected for malignancy. Cytological diagnosis is less accurate for cystic than solid lesions according to one study [7].

After studying the results of both FNAC and Core Needle Biopsy, one study concluded that the accuracy is similar but the superiority of FNAC lies in its simplicity and absence of complications [8].

In Sweden, FNAC has been used as a diagnostic modality in thyroid diseases for more than 40 years, and over the last two decades it has gained popularity worldwide [9]. It has been used as first choice investigation for a solitary nodule thyroid. The method is cost effective and eliminates the need for diagnostic surgery.

FNAC can also diagnose the underlying thyroiditis in a case of hypo or hyperthyroidism. Since the regular use of FNAC, unnecessary operations on thyroid have reduced, cancer yield has increased and medical expenses and bed occupancy has decreased as per one study. Diagnosis from FNAC is very closely approximate to that on surgical biopsy as per one study [10].

One study concluded that FNAC is certainly main diagnostic tool in diagnosing thyroid pathology. Its employment should undergo to a centralized diagnostic evaluation in such a way that cytology is analysed together with clinical and other instrumental data [11].

In one study, they concluded that FNAC was accurate in the diagnosis of nodular thyroid disease, presenting a high correlation rate with histology [12].

In most of the cases, mistakes were because of

- Confusion between nodular colloid or hyperplastic nodular goiter and Hashimotos thyroiditis, especially with Hurtle cell neoplasm. Orrel has quoted it

as one of the difficulties in interpretation in 4 – 6 % of cases.

- Difficulty in distinguishing multinodular goiter from follicular neoplasm.

### **Conclusion**

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- Majority of patients were in the second and third decades of life, females being predominant.
- Majority of cases were benign, of which multinodular goiter (30.48%) was the most common pathology.
- Among the malignancies, majority was papillary carcinoma (79%).
- The sensitivity, specificity, negative and positive predictive values were 77.78%, 100%, 95.35% and 100%.
- The overall accuracy was 96%.
- FNAC was of greater help in the diagnosis of thyroid swellings. Multinodular goitres and colloid goitres were diagnosed easily with FNAC, but confusion prevailed in cases of follicular adenoma.
- Majority of our cases were rural folks, who cannot be followed up regularly and for long time, hence clinical suspicion of malignancy should be one of the indications of surgery, in spite of negative FNAC reports.
- FNAC is simpler, safer, quicker and more informative, compared to other sophisticated investigations in diagnosis of thyroid diseases. It should be exploited to its maximum benefit on all thyroid swellings.

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