



## Role of Fine Needle Aspiration Cytology in Diagnosis Of Neoplastic And Non Neoplastic Lesions Of Thyroid Gland

### KEYWORDS

FNAC , Neoplastic , histopathology

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**ABSTRACT** *Introduction:* Thyroid nodules are common clinical findings and have a reported prevalence of 4-7% of the adult population, however <5% of adult thyroid nodules are malignant. The thyroid nodules are more common in women and the incidence increases with age, a history of radiation exposure and a diet containing goitrogenic material. . In recent years, fine needle aspiration cytology (FNAC) has supplanted most other tests for pre-operative evaluation of thyroid nodules and increasingly used as a diagnostic procedure due to its simplicity, low cost and absence of major complications.

**Aim and objective :** Aim of the study was cytological evaluation of neoplastic and non neoplastic lesions of thyroid gland .

**Materials and method :** The present study on thyroid nodule was carried out at Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta from 1st June 2015 to 31st May 2016. This was a prospective study in which a total of 50 patients underwent FNAC of thyroid gland. Histopathological examinations was done where biopsies were available. **Results :** 50 patients underwent FNAC of thyroid gland . The results of the FNA diagnosis showed that 4 (8%) of the patients had FNAs , which were inadequate for cytological assessment , 35 (76.08 %) patients had benign lesions , 8 (17.39%) had lesions that were suspicious for malignancy , and 3 (6.52%) had malignant neoplasm . The correlation of the FNAC findings with the histopathological diagnosis , showed that our FNAC diagnostic accuracy rate was 96.77 % , with a sensitivity of 66.67% , and specificity of 100 % .

**Conclusion :** Cytological diagnosis of both neoplastic and neoplastic lesions of thyroid gland can be established with the help of FNAC which is of highly accurate diagnostic value .

### INTRODUCTION

Thyroid gland because of its superficial location is amenable to direct physical examination & needle aspiration . The total burden of significant thyroid diseases in the country is approximately 42 millions <sup>1</sup> . Diseases of thyroid gland are may be due to various inflammatory, hyperplastic & neoplastic conditions. Patients may present with either diffuse thyroid enlargement, a solitary nodule or multinodular enlargement and may be euthyroid, hypothyroid or hyperthyroid.

Thyroid nodules are common clinical findings and have a reported prevalence of 4-7% of the adult population, however <5% of adult thyroid nodules are malignant. The thyroid nodules are more common in women and the incidence increases with age, a history of radiation exposure and a diet containing goitrogenic material. <sup>2</sup>

It is preferred to operate only on those patients with strong suspicion of cancer, thereby avoiding unnecessary surgery and possible injury of recurrent laryngeal nerve, hypoparathyroidism and thyroid hormone dependence in patients with benign thyroid nodule.

However the distinction of the benign lesions from a malignant nodule can not be based reliably on the clinical presentation alone. Several diagnostic tests such as radio nuclide scanning, ultrasonography, thyroid hormone assay and detection of circulating antibodies have been used. But these do not help us to reach a final diagnosis. Imaging techniques have a rather low sensitivity and specificity. Further, these are time consuming and costlier procedures.

In recent years, fine needle aspiration cytology (FNAC) has supplanted most other tests for pre-operative evaluation of thyroid nodules and increasingly used as a diagnostic

procedure. Due to its simplicity, low cost and absence of major complications, FNAC is being performed on an increasing number of patients which has led to the detection of thyroid cancers at an earlier stage, resulting in better outcome of patients .<sup>3</sup>

Nevertheless like any other test FNAC has its limitations. The reported pitfalls are those related to specimen adequacy, sampling techniques, skill of performing the aspiration, interpretation of the aspirate and overlapping cytological features between benign and malignant follicular neoplasm.

Many studies have been reported world wide on evaluation of role of FNAC in the diagnosis of thyroid lesions. Bain and Crockford (1978) said that many patients can be spared unnecessary thyroid surgery by judicious application of FNAC <sup>4</sup>. Lowhagen et al (1979) endorsed Frable's comment (1976) that it seems ironic to spend unnecessary sums for biochemical, angiographic, ultrasonic and radio-nuclide tests to determine the nature of a lump in thyroid when with aspiration cytology the diagnosis can be established in minutes in most cases.<sup>5,6,7,8</sup>

Similar studies have been carried out in India too by Agrawal (1995), Sirpal (1996) and Shah (1998) etc (8910) . FNAC of thyroid gland is firmly established as a 1<sup>st</sup> line diagnostic test for the evaluation of goiter and the single most effective test for preoperative diagnosis of solitary thyroid nodules.<sup>9,10,11</sup>

### MATERIALS AND METHODS

The present study on thyroid nodule was carried out at Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta from **1<sup>st</sup> June 2015 to 31<sup>st</sup> May 2016**. At first each patient was clinically assessed; detailed history, clinical ex-

amination to note the features of goiter and general and systemic examination were done to make a provisional diagnosis. Reports of Bio-chemical investigations (T3; T4; TSH) and scanning were also recorded .

46 cases with adequate material on aspiration were included in the study. For histopathological correlation, subsequent biopsy was available in 36 cases.

FNAC aspirates were obtained with 22 G needle attached to a 10/20 ml disposable syringe. For every case three of four smears were made. Dry and wet smears were prepared in all cases , for MGG and Papanicolou stains .

## RESULTS AND OBSERVATIONS

A total of 50 patients of both sexes and all age groups, presenting with a solitary thyroid nodule, multi-nodular or diffuse thyroid enlargement were taken for study. Out of them, satisfactory aspirates were obtained in 46 cases . Subsequent biopsy for histopathological correlation was obtained in 36 cases only. The following are the results and observations.

### Rate of inadequacy:

4 (four) cases with inadequate material were excluded from the study. Thus, the rate of inadequacy in the present study was 8 %.

**Age distribution:** The majority patients were in the age group between 20-51 years.

**Sex distribution:** Male : female ratio is 1: 3.1 (12/38) . So there was a female preponderance associated with thyroid lesions compared to males.

**TABLE – 1**  
**SHOWING DISTRIBUTION OF BENIGN , MALIGNANT AND SUSPICIOUS LESIONS AS PER CYTOLOGICAL FINDINGS**

Cytological diagnosis	No. of cases	Percentage (%)
Benign	35	76.08
Malignant	3	6.52
Suspicious	8	17.39

Total- 46

Benign lesions of the thyroid were the commonest (76.08%).

**TABLE – 2**  
**SHOWING CYTOLOGICAL DIAGNOSIS OF THYROID SWELLINGS**

Cat-egory	Diagnosis	No. of cases	Percentage (%)
Benign	Colloid goiter	28	60.86
	Adenomatous goiter	02	4.34
	De Quervain's thyroiditis	3	6.52
	Lymphocytic thyroiditis	2	4.35
Suspicious	Follicular neoplasm	8	17.39
Malignant	Papillary carcinoma	2	4.35
	Anaplastic carcinoma	1	2.17

As follicular adenomas can not be distinguished from follicular carcinomas on the basis of cytology alone, they were

diagnosed as follicular neoplasms (8 cases) and were included in the suspicious category.

**Histopathological correlation:** Out of 46 cases, HP correlation was available in 36 cases.

**TABLE – 3**  
**SHOWING HP CORRELATION**

Cat-egory	Cyto. Diag.	Total cases	HP correlate	Histo. Diag.						
				CG	AG	T	FA	FC	PC	AC
Benign	Colloid	28	27	24	1	-	1	-	1	-
	de Q T	3	Nil	-	-	-	-	-	-	-
	LT	2	Nil	-	-	-	-	-	-	-
	AG	2	2	-	2	-	-	-	-	-
Suspicious	Follicular neoplasm	8	5	1	-	-	2	2	-	-
Malignant	Papillary carcinoma	2	2	-	-	-	-	-	2	-
	Anaplastic carcinoma	1	Nil	-	-	-	-	-	-	-

[CG - Colloid goiter, AG - adenomatous goiter, T - Thyroiditis, de Q T – de Quervain's thyroiditis, LT - Lymphocytic thyroiditis, FA - Follicular adenoma, FC - Follicular carcinoma, PC - Papillary carcinoma, AC - Anaplastic carcinoma.]

Out of the cases in which histopathological correlation was available, a benign diagnosis based on FNAC was correct in 28 out of 29 cases (96.6%). 1 case cytologically diagnosed as colloid goiter with cystic change showed presence of papillary carcinoma on HP examination (False negative – 1 case).

FNAC showed papillary carcinoma in 2 cases and all 2 cases were papillary carcinoma on HP (100% correlation).

Out of 8 cases cytologically categorized as suspicious, 5 cases were available for HP correlation; of these 3 were benign (2 follicular adenoma and 1 case of colloid goiter) and 2 malignant (follicular carcinoma) on histopathological examination.

Sensitivity, specificity, positive predictive value, Negative predictive value and accuracy of cytologic results:

**TABLE – 4**  
**CONSIDERING THE CASES WITH AVAILABLE HISTOPATHOLOGICAL CORRELATION**

Cytological results	No. of cases
Malignant tumours (positive)	2
True positive (TP)	2
False (FP)	0
Benign lesions (negative)	29
True negative (TN)	28
False negative (FN)	1

Sensitivity =  $TP/TP+FN \times 100 = 2/2+1 \times 100 = 66.67\%$

Specificity =  $TN/ TN+FP \times 100 = 28/28+0 \times 100 = 100\%$ .

$$PPV = TP / TP + FP \times 100 = 2 / 2 + 0 \times 100 = 100\%$$

$$NPV = TN / TN + FN \times 100 = 28 / 28 + 1 \times 100 = 96.55\%$$

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN} \times 100 = \frac{2 + 28}{2 + 28 + 0 + 1} \times 100 = 96.77\%$$

## DISCUSSION

Thyroid enlargement is a common clinical problem so far the management is concerned and many people with thyroid disorders often face diagnostic difficulties. It is vital to distinguish the types of thyroid nodules as this will help to decide the further line of management.

According to Anderson and Webb the preoperative identification of thyroid malignancy on the basis of clinical findings, isotope scintigraphy and ultrasonography results in a low percentage of yields of malignant disease.<sup>12</sup>

Clinically not more than 50% cases of thyroid cancer have been diagnosed correctly in the pre-operative period (Cattel et al: 1953; Frazell et al: 1953).<sup>13,14</sup>

In the present study, a total of 50 patients diagnosed clinically as thyroid enlargement were subjected to FNAC during a period of twelve months (June 2015 to May 2016).

In our series, the cytological findings were categorized as benign, suspicious and malignant. Lowhagen et al (1979), Gharib and Goellner (1993), Agrawal (1995), Rikabi et al (1998), de Vos tol Nederveen Cappel et al (2001), Mahari et al (2004) and Guha Mallick et al (2008) had all used the same categories for their cytological findings.

Cytologically, colloid goiter was the commonest lesion (60.86%) followed by follicular neoplasm (17.39%), de Quervain's thyroiditis (6.52%), lymphocytic thyroiditis (4.35%), papillary carcinoma (4.35%), adenomatous goiter (4.34%), and anaplastic carcinoma (2.17%) in descending order of frequency. The diagnosis of various lesions was based on standard criteria published by Zajicek (1974) Orell et al (1999) and Gray and Mckee (2003).<sup>15,16,17</sup>

### Diagnostic accuracy:

In the present study, diagnostic accuracy was calculated by comparing the cytologic reports with histopathologic diagnosis of surgically resected specimens. Cases in which histopathologic diagnosis were not available were therefore excluded.

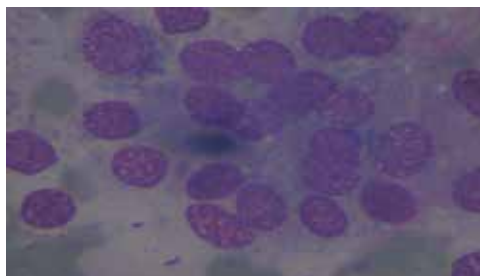
In this study, there was 1 false negative (FN) case. Thus false negative rate in our series was 2.8%. Lowhagen et al (1979) reported 2.2% false negative rate, Ashcraft and Van Herle (1981) reported 1.6%, Silverman et al (1986) had 2.3% and La Rosa et al (1991) reported 2.3% false negative rates. Our findings were almost similar to these authors.<sup>18,19</sup>

Our series showed no false positive results. All cases cytologically diagnosed as were proved to be malignant histopathologically wherever histopathological correlation was available. Lowhagen et al (1979) and Altavilla et al (1990) too had no false positive cases in their series.

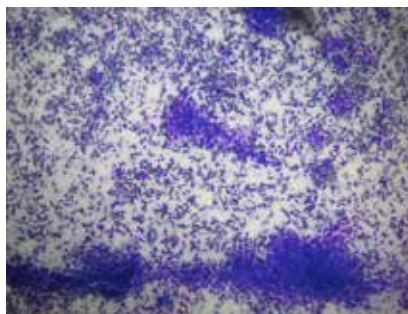
Sensitivity of the present study was 66.67%, specificity 100% and positive predictive value 100%. Diagnostic accuracy in our series was 96.77%. Rate of accuracy of our study was quite comparable to that of Lowhagen (1979), Frible (1980) & Altavilla et al (1990).<sup>7,20</sup>

## CONCLUSION

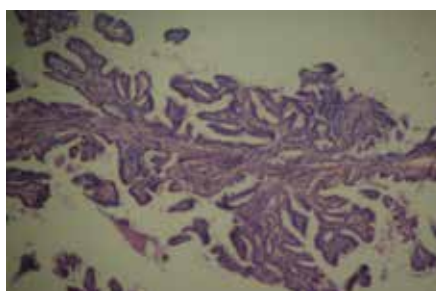
From the foregoing observation it may be concluded that fine needle aspiration cytology of thyroid swelling is a simple, minimally invasive and cost effective procedure. It can be performed in the out patient department, is repeatable when necessary and produces speedy results. It is also capable of diagnosing precise nature of thyroid lesion with reasonable accuracy. Thus, FNAC can provide reliable information on the underlying pathologic condition and can help in the selection of patients for surgery. It is a useful procedure, both for patients as well as clinicians and can play a key role in the diagnosis and management of patients with thyroid swellings.



**Fig 1 : FOLLICULAR NEOPLASM SHOWING FOLLICULAR CELLS ARRANGED IN MICROFOLLICLES WITH NUCLEAR ENLARGEMENT AND PLEOMORPHISM (MGG, HIGH POWER).**



**Fig 2 : PAPILLARY CARCINOMA SHOWING PAPILLARY FRAGMENTS (MGG, LOW POWER)**



**Fig 3 : TISSUE SECTION FROM PAPILLARY CARCINOMA SHOWING PAPILLARY STRUCTURE WITH FIBROVASCULAR CORE (H & E, HIGH POWER)**

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