



## Fine Needle Aspiration Cytology Study of Thyroid Lesions – A 2 year prospective study in a Tertiary centre.

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### ABSTRACT

**Background;** Fine Needle Aspiration Cytology (FNAC) is the gold standard among diagnostic tests for evaluation of thyroid lesions. It is important for preoperative and pretreatment diagnosis of benign and malignant lesions, thus decreasing the incidence of and preventing unwarranted surgeries.

**Objectives;** This study aims to study and classify various cytomorphological lesions of the thyroid according to The Bethesda System for Reporting of Thyroid Cytopathology (TBSRTC) and correlate these with histopathology wherever possible.

**Methods;** Prospective study to find the diagnostic accuracy of FNAC in evaluating thyroid lesions, from July 2012 to June 2014. Fine needle aspiration done on 150 patients with palpable thyroid lesions were analyzed and classified according to TBSRTC. Cytohistopathological correlation was done in 64 cases.

**Results;** Out of total 150 cases studied, 118 (78.67%) were non neoplastic, 26 (17.3%) were neoplastic, 4 (2.67%) were suspicious for malignancy, 01 (0.67%) was indeterminate and 01 (0.67%) was inadequate. Cytohistopathologic correlation of 64 cases confirmed 37 cases as non neoplastic, 17 as benign neoplasms and 10 as malignant. Sensitivity, specificity and efficacy of the study for malignant lesions were 84.62%, 99.26 % and 97.99 % respectively.

**Conclusion;** FNAC is a simple, safe, cost effective and widely accepted modality for evaluation of thyroid lesions especially in Third world countries like India. FNA helps to avoid unnecessary surgery in patients with benign lesions. The suspicious and indeterminate lesions are an area of uncertainty which can be resolved by histopathology.

**Key words:** Fine Needle Aspiration; Cytology; Thyroid; Histopathology correlation

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### INTRODUCTION

Thyroid FNAC has developed as the most accurate and cost effective initial method for guiding the clinical management of patients with thyroid nodules.<sup>1,2,3</sup>

Over the past 3 decades, confidence in FNAC as a reliable test has grown considerably and it has emerged as a most direct, accurate diagnostic procedure in the management of thyroid disease, gaining world wide acceptance.<sup>1,4</sup>

The primary objective of fine needle aspiration biopsies of the thyroid is to select those patients who require surgery for a neoplastic disorder from those who have a functional or inflammatory abnormality and who can be followed clinically or treated medically.<sup>5</sup>

The role of cytology in thyroid swellings is important for preoperative/pretreatment diagnosis of benign and malignant lesions. Among the array of tests available for evaluation of thyroid nodules, FNAC is the gold standard diagnostic test.<sup>6</sup>

This study was undertaken to study & classify the cytology of palpable thyroid lesions to minimize surgical intervention and to confirm the diagnosis by histopathology.

This study comprised of 150 cases, of which 118 were non neoplastic and 26 were neoplastic.

The study aims to study the cytomorphology of thyroid lesions by Fine Needle Aspiration Cytology and correlate with histopathology wherever possible

and to classify these using The Bethesda System for Reporting of Thyroid Cytopathology (TBSRTC). Using TBSRTC, thyroid lesions were classified as follows: 4 cases were classified under Nondiagnostic category, while 115 were Benign, 1 as Atypia of undetermined significance, 19 as Follicular neoplasm/Suspicious of follicular neoplasm, 4 cases were Suspicious for malignancy and 7 as Malignant Colloid goitre was the commonest non neoplastic lesion and follicular adenoma was the most common neoplastic lesion on histopathology.

**METHODS**

Patients with palpable thyroid lesions referred for FNAC from H. S. Kumareshwar teaching and general hospital, S. Nijalingappa Medical College were studied prospectively for a period of two years, from 1<sup>st</sup> July 2012 to 30<sup>th</sup> June 2014. Patients with other swellings in the neck were excluded from the study. FNAC procedure was done, the material was obtained using a 23- 24 gauge needle. Multiple smears were prepared from the aspirate and they

were immediately fixed in 95% ethanol and stained by Haematoxylin and Eosin (H&E) and Papanicolaou (Pap) stain and air dried smears were stained with May Grunwald Giemsa (MGG).

All aspirations were done under manual guidance. Those patients, who underwent surgery, were followed up by histopathological examination of the excised thyroid specimens.

TBSRTC was followed for reporting and cytological classification of the lesions.

**RESULTS**

A total of 150 patients with thyroid lesions were included in the study, the age of patients ranged from 6 -75 years with a mean age of 37.63 years. Females were 136 (90.67%) and males were 14 (9.3%) with a female to male ratio of 9.7:1.

Criteria taken for adequacy of FNA material were: 6 clusters of well preserved thyroid follicular cells in at least two slides.<sup>7</sup>

TBSRTC was followed for cytological classification of thyroid lesions.

**Table 1: Distribution of cytology of thyroid lesions based on TBSRTC:**

| Diagnostic Criteria  | Number of cases | Percentage |
|--|-----------------|------------|
| I Unsatisfactory   | 04              | 2.67       |
| II Benign  | 115             | 76.67      |
| III AUS/FLUS   | 01              | 0.67       |
| IV Follicular neoplasm/Suspicious for Follicular Neoplasm (Including Hurthle type) | 19              | 12.67      |
| V Suspicious for malignancy  | 04              | 2.67       |
| VI Malignant   | 07              | 4.67       |
| Total  | 150             | 100        |

**AUS/FLUS:** Atypia of undetermined significance/ Follicular lesion of undetermined significance

4 cases were ‘Unsatisfactory/Non diagnostic’ on cytology. One case was excluded from the study due to cellular smears. 3 cases (2%) showed only cyst fluid on smears, suggestive of a diagnosis of Thyroglossal cyst, which was confirmed by histopathology.

Benign follicular nodule was the most frequent cytological diagnosis 76.67% cases, while 4.67% were malignant on cytology.

19 cases of ‘Follicular neoplasm/Suspicious for follicular neoplasm’ were encountered, of which 3 were Hurthle cell type. Out of 7 cases classified as ‘Malignant’, 6 were papillary carcinoma and 1 was anaplastic carcinoma.(Table 1)

**Table 2: Distribution of non neoplastic thyroid lesions based on FNAC:**

| Lesions                                 | Number of cases | Percentage |
|---|-----------------|------------|
| Colloid goitre                          | 61              | 51.7       |
| Colloid goitre with hyperplastic change | 12              | 10.2       |
| Colloid cyst                            | 07              | 5.9        |
| Hashimoto’s thyroiditis                 | 26              | 22.03      |
| Granulomatous thyroiditis               | 01              | 0.9        |
| Primary hyperplasia                     | 08              | 6.8        |
| Thyroglossal cyst                       | 03              | 2.5        |
| Total                                   | 118             | 100        |

Out of 118 non neoplastic lesions, the most common was colloid goiter (61 cases), followed by Hashimoto’s thyroiditis (26 cases), hyperplastic colloid goitre (12 cases), primary hyperplasia (8 cases), 1 case of granulomatous thyroiditis and thyroglossal cyst (3 cases). (Table 2)

**Table 3: Cytohistopathological correlation of non neoplastic lesions based on TBSRTC:**

| Cytological diagnosis                 |                                 |                                | Histopathological diagnosis             |
|---------------------------------------|---------------------------------|--------------------------------|---|
| I Unsatisfactory<br>A Cyst fluid only | IIA Benign<br>Follicular nodule | IIB Hashimoto’s<br>thyroiditis |   |
| 03                                    | 0                               | 0                              | Thyroglossal cyst                       |
| 0                                     | 17                              | 0                              | Nodular colloid goitre                  |
| 0                                     | 01                              | 0                              | Colloid goitre with giant cells         |
| 0                                     | 05                              | 0                              | Colloid goitre with cystic degeneration |
| 0                                     | 01                              | 0                              | Colloid goitre with Hurthle cells       |
| 0                                     | 06                              | 0                              | Colloid goitre with hyperplastic nodule |
| 0                                     | 01                              | 03                             | Hashimoto’s thyroiditis                 |
| 03                                    | 31                              | 03                             | Total                                   |

Nodular colloid goitre as the most commonest non neoplastic lesion in histopathology.

Of 31 cases labeled as benign follicular nodule on cytology, 17 cases were nodular colloid goitre, 6 were colloid goitre with hyperplasia, 5 showed cystic change and 1 was Hashimoto’s thyroiditis.

Of the 26 cases of Hashimoto’s thyroiditis diagnosed on cytology, 3 cases were confirmed by histopathology. (Table 3, Figure 1)

**Table 4: Cytohistopathological correlation of neoplastic lesions based on TBSRTC:**

| Cytological diagnosis |                                     |                              |                      |                      |             | Histopathological diagnosis                     |
|-----------------------|-------------------------------------|------------------------------|----------------------|----------------------|-------------|---|
| IV<br>FN/Susp.<br>FN  | IV A<br>FN/Susp. FN<br>Hurthle type | V<br>Susp. for<br>malignancy | V A<br>Susp. for PTC | V B<br>Susp. for MTC | VI A<br>PTC |   |
| 13                    | 0                                   | 0                            | 0                    | 0                    | 0           | Follicular Adenoma                              |
| 0                     | 03                                  | 0                            | 0                    | 0                    | 0           | Hurthle cell adenoma                            |
| 01                    | 0                                   | 0                            | 0                    | 0                    | 0           | Follicular carcinoma                            |
| 0                     | 0                                   | 01                           | 01                   | 0                    | 02          | Papillary carcinoma                             |
| 0                     | 0                                   | 0                            | 0                    | 0                    | 01          | Follicular variant – PTC<br>with colloid goitre |
| 0                     | 0                                   | 0                            | 0                    | 0                    | 02          | Colloid goitre with PTC                         |
| 0                     | 0                                   | 0                            | 0                    | 0                    | 01          | Hashimoto’s thyroiditis<br>with PTC             |
| 0                     | 0                                   | 0                            | 0                    | 02                   | 0           | Medullary carcinoma                             |
| 14                    | 03                                  | 01                           | 01                   | 02                   | 06          | Total   |

**Susp: Suspicious, FN/Susp.FN:** Follicular Neoplasm/ Suspicious for Follicular Neoplasm,

**PTC:** Papillary thyroid carcinoma, **MTC:** Medullary thyroid carcinoma

Histopathological diagnosis confirmed the cytological diagnosis 'Follicularneoplasm/suspicious of follicular neoplasm' in 13 cases and 3 cases diagnosed as Hurthle cell type on cytology were reported as Hurthle cell adenoma on histopathology. 1 case was reported as follicular carcinoma.

Of the 4cases 'Suspicious for malignancy', histopathology confirmed these as papillary carcinoma and medullary carcinoma (2 cases each).

All 6 cases of papillary carcinoma on cytology, were confirmed on histopathology, 1 was follicular variant of PTC and 1 case also had Hashimoto's thyroiditis. (Table 4, Figures 2 and 3) In this study, 2 cases were false positive and 1 was false negative.

The Sensitivity was 84.62 %, Specificity 99.26%, Positive Predictive value 91.67%

Negative Predictive value 98.54 % and Diagnostic accuracy of FNAC was 97.99 % in the study.

**DISCUSSION**

Fine needle aspiration cytology is the cornerstone for preoperative evaluation of thyroid nodules. It has emerged as a reliable, cost effective and safe method in the diagnosis and management of thyroid disorders.

Within the general population, palpable thyroid nodules are present in 4–7% of adults and subclinical (non palpable) nodules are present in upto 70% of individuals.<sup>1,4,8</sup> The majority of clinically diagnosed thyroid nodules are non neoplastic with about 30-50% being malignant.<sup>2,3</sup>

**Table 5: Comparison of Non neoplastic and neoplastic lesions with other studies:**

| Study  | Non neoplastic | Neoplastic | Ratio     |
|--|----------------|------------|-----------|
| Silverman JF <i>et al</i> (1986) <sup>9</sup>    | 193            | 80         | 2.41:1    |
| Godinho-Matos L <i>et al</i> (1992) <sup>6</sup> | 109            | 22         | 4.95 : 1  |
| Uma H <i>et al</i> (2008) <sup>10</sup>          | 381            | 31         | 12.29 : 1 |
| Sengupta <i>et al</i> (2011) <sup>11</sup>       | 148            | 30         | 4.93 : 1  |
| Present study                                    | 118            | 31         | 3.80 : 1  |

In this study, the nonneoplastic to neoplastic ratio was comparable with the Godinho-Matos L *et al* and Sengupta *et al* studies. The ratio in other studies varied from 2.41:1 to 12.29:1. (Table 5)

**Table 6: Comparison of statistical data of FNAC with other studies:**

| Study  | Sensitivity % | Specificity % | Diagnostic accuracy % |
|--|---------------|---------------|-----------------------|
| Silverman JF <i>et al</i> (1986) <sup>9</sup>    | 93            | 95.1          | 94                    |
| Godinho-Matos L <i>et al</i> (1992) <sup>6</sup> | 73            | 100           | 83                    |
| Uma H <i>et al</i> (2008) <sup>10</sup>          | 97            | 100           | 98.48                 |
| Sengupta <i>et al</i> (2011) <sup>11</sup>       | 90            | 100           | 98.88                 |
| Esmaili <i>et al</i> (2012) <sup>12</sup>        | 91.6          | 100           | 97                    |
| Present study                                    | 84.62         | 99.26         | 97.99                 |

In this study, sensitivity was 84.62 %, specificity 99.26 % and diagnostic accuracy was 97.99 % which was comparable with Esmaili *et al.* and Sengupta *et al.* In studies by Godinho-Matos L *et al*, Uma H *et al*, Sengupta *et al.* and Esmaili *et al.*, specificity was 100%. (Table 6)

Limitations in FNAC may be due to scanty sample, vascularity of thyroid swelling, variation in sampling technique and skill of the performing doctor as

well as the experience of pathologist in interpreting the aspirate and inability to differentiate between follicular adenoma and carcinoma.<sup>13</sup>

In addition to clinical information for diagnosis and treatment of thyroid lesions, ultrasonography, scintigraphy, serology, radiographic evaluation of the soft tissues of the neck and FNAC studies are essential.<sup>14</sup>

FNAC of unsatisfactory or indeterminate lesions should be done preferably under ultrasound guidance. The risk of malignancy in these lesions is low. Multiple aspirations should be done from a lesion to avoid missing a neoplastic focus. The efficacy of FNAC in thyroid neoplasms was high enough to permit surgical intervention after a cytological diagnosis of malignancy.

#### CONCLUSION

The primary objective of FNAC of the thyroid is to differentiate those patients who require surgery for a neoplastic disorder from those who have a functional or inflammatory abnormality and who can be followed clinically or treated medically. Fundamental to the success of efficient reporting of thyroid cytology is adequate history with complete clinical examination, technical competence in performing the procedure, preparation of smears and their evaluation.

Interpretation of cytologic material requires a great deal of experience and multiple sites of the lesion should be aspirated to avoid missing any occult malignancy.

The introduction of The Bethesda System for Reporting Thyroid Cytopathology has brought about standardisation in the reporting of thyroid FNAC. It helps to clearly communicate cytologic interpretations to referring physicians in terms that are clinically helpful and unambiguous.

The present study shows good positive correlation with histopathology with high sensitivity and specificity. In view of false negative cases, it is important that patients with benign cytologic findings should have close clinical follow up.

False negative results can be minimized by the policy of clinical follow up and repeat aspiration to obtain adequate aspirates and thus broaden the diagnostic spectrum.

The diagnostic accuracy of FNAC can be improved when it is done in conjunction with advanced imaging techniques, immunologic analysis and electron microscopy and thereby further reduce misdiagnosis.

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