

# Fine Needle Aspiration Cytology of palpable Thyroid lesions –An Evaluation for Diagnostic Accuracy

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## Abstract

**Background:** Fine needle aspiration cytology (FNAC) serves as a diagnostic method in the evaluation of palpable thyroid lesions, facilitating the classification of these lesions into operative and non-operative categories due to their increased likelihood of malignancy. **Materials and Methods:** A prospective analytical study was conducted to evaluate the accuracy of FNAC in palpable thyroid lesions at SIMSRH from December 2008 to May 2010. The study involved the analysis of FNAC results from 220 patients presenting with palpable thyroid lesions. Histopathological examinations were performed on 70 of these patients, allowing for cytohistopathological correlation. **Results:** Among the 220 cases, a significant predominance of female patients was observed (90.45%), with a mean age of 35.67 years. The sensitivity, specificity, and accuracy for non-neoplastic lesions were recorded at 63.16%, 100%, and 91.43%, respectively, while for neoplastic lesions, these values were 80%, 100%, and 95.71%. **Conclusions:** Fine needle aspiration is a highly effective initial approach for assessing the characteristics of thyroid lesions. This method is not only cost-effective and minimally invasive but also demonstrates a high level of diagnostic accuracy.

**Keywords:** FNAC, Cytohistopathological correlation, Palpable thyroid lesions

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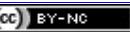
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of the diagnostic evaluation is to identify patients who are most likely to have malignancy and require surgical intervention. This study was initiated to establish a clinically relevant and cost-effective strategy for the assessment and management of palpable thyroid lesions.

## MATERIALS AND METHODS

This research highlights the significance of Fine Needle Aspiration Cytology (FNAC) in diagnosing palpable thyroid lesions. Conducted as a prospective analytical study within the Pathology Department of SIMSRH, the investigation spanned from December 2008 to May 2010. **Inclusion Criteria:** The study encompassed patients presenting with palpable thyroid lesions. **Exclusion Criteria:** Patients with non-palpable thyroid lesions identified incidentally via ultrasound were excluded from participation. All referred patients underwent comprehensive clinical examinations, including meticulous palpation of the thyroid nodule to accurately determine the aspiration site. Utilizing aseptic techniques, the lesion was aspirated using a 23-gauge needle attached

## INTRODUCTION

Thyroid disorders are characterized by distinct presentations and symptoms. Consequently, the diagnosis of thyroid lesions, particularly thyroid neoplasms, is a critical concern for both pathologists and surgeons. The primary challenges in managing palpable thyroid lesions include the diagnostic evaluation and the extent of thyroidectomy required. Fine needle aspiration serves as an initial diagnostic procedure and is instrumental in assessing the nature of the tumor. Therefore, the objective

to a 5 ml syringe. Following the aspiration, patients were monitored for fifteen minutes before being discharged. A visual examination of the aspirate was conducted, and multiple smears were prepared and promptly fixed in a solution containing equal parts of ether and 95% ethyl alcohol. These smears were subsequently stained using Papanicolaou's stain and Hematoxylin and Eosin (H&E) stain. Additionally, air-dried smears were prepared and stained with Leishman stain. In instances where fluid was obtained, efforts were made to extract all contents through gentle pressure applied to the thyroid gland. A macroscopic examination of the fluid was performed, and centrifuged smears were prepared from the sediment and stained with the aforementioned stains. If a residual mass was detected, re-aspiration was conducted. Smears containing a minimum of twelve follicular cell groups, each with over ten preserved follicular cells, were deemed adequate. Upon receipt of excised specimens in the department, they were routinely processed to obtain paraffin sections, which were then stained with H&E for histopathological analysis. The results of cytological and

histopathological examinations were subsequently correlated to assess the effectiveness of FNAC. In this study, out of 220 cases, histopathological correlation was performed for 70 cases, and a 2 x 2 table was constructed for analysis.

## RESULTS

This study involves a comprehensive analysis of Fine Needle Aspiration Cytology conducted on 220 thyroid lesions over an 18-month period, from December 2008 to May 2010, within the Department of Pathology at SIMSRH. The findings indicate that the ages of the patients varied from 11 to 75 years, with an average age of 35.67 years. The highest incidence of lesions was noted in the age group of 30 to 39 years, accounting for 29.55% of the cases. Additionally, the study revealed a significant female predominance, with 199 cases (90.45%) identified as female and 21 cases (9.55%) as male, resulting in a male-to-female ratio of 1:9.4.

**Table 1: Distribution of neoplastic and non-neoplastic thyroid lesions**

| Thyroid lesions | Number of cases | Percentage |
|-----------------|-----------------|------------|
| Non-neoplastic  | 194             | 88.18      |
| Neoplastic      | 26              | 11.82      |
| <b>Total</b>    | <b>220</b>      | <b>100</b> |

$\chi^2=75.093$ ;  $p<.000$

**Table 2: Distribution of non-neoplastic lesions**

| Non-neoplastic lesions                              | Number of cases | Percentage (%) |
|---|-----------------|----------------|
| Nodular colloid goiter                              | 86              | 44.33          |
| Nodular colloid goitre with hyperplastic change     | 6               | 3.09           |
| Nodular colloid goitre with cystic change           | 34              | 17.53          |
| Nodular colloid goitre with adenomatoid hyperplasia | 3               | 1.55           |
| Hashimoto's thyroiditis                             | 41              | 21.13          |
| Lymphocytic thyroiditis                             | 24              | 12.37          |
| <b>Total</b>  | <b>194</b>      | <b>100</b>     |

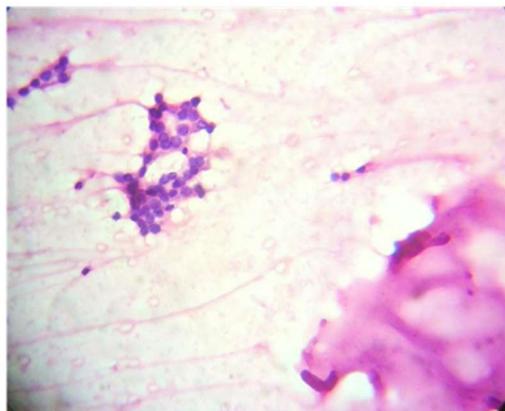
$\chi^2=68.834$ ;  $p<.000$

**Table 3: Distribution of neoplastic lesions**

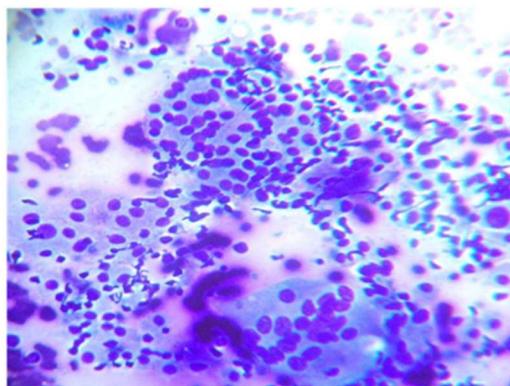
| Neoplastic lesions    | Number of cases | Percentage (%) |
|-----------------------|-----------------|----------------|
| Follicular neoplasm   | 7               | 26.92          |
| Hurthle cell neoplasm | 1               | 3.85           |
| Papillary carcinoma   | 14              | 53.84          |
| Medullary carcinoma   | 1               | 3.85           |
| Anaplastic carcinoma  | 1               | 3.85           |
| Lymphoma              | 2               | 7.69           |
| <b>Total</b>          | <b>26</b>       | <b>100</b>     |

$\chi^2=0.380$ ;  $p<.03$

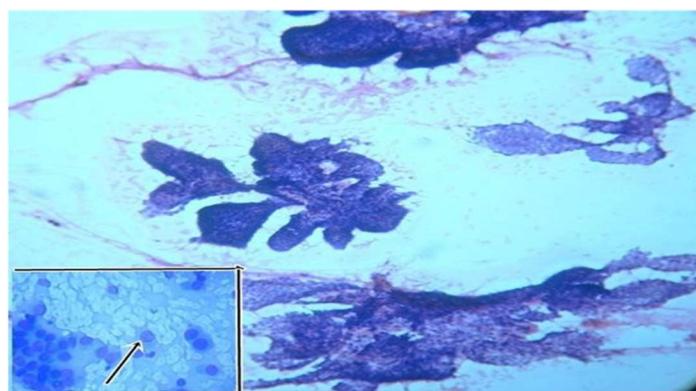
Various neoplastic lesions are depicted in Table 3. Papillary carcinoma (figure 3) was commonest neoplasm encountered followed by follicular neoplasm.



**Figure 1:** Follicular cells with fragile cytoplasm and colloid in Nodular Colloid Goiter (H&E, 400X).



**Figure 2:** Degenerating follicular cells with clinging of lymphocytes and giant cell in Hashimotos thyroiditis (Leishman stain, 400X).



**Figure 3:** Papillary carcinoma showing papillary configuration with anatomical. Border (H&E, 100X) with inset Papillary carcinoma showing intranuclear inclusion (Leishman stain, 400X).

**Table 4:** Sensitivity, Specificity, PPV, NPV and Accuracy of FNAC in diagnosing neoplastic and non-neoplastic thyroid lesions

| S.No. | Statistical index | Non-Neoplastic | Neoplastic |
|-------|-------------------|----------------|------------|
| 1     | Sensitivity       | 63.16%         | 80.00%     |
| 2     | Specificity       | 100%           | 100%       |
| 3     | PPV               | 100%           | 100%       |
| 4     | NPV               | 88.16%         | 95.23%     |
| 5     | Accuracy          | 91.43%         | 95.71%     |

Table 4 presents findings of 100% specificity, 80% sensitivity, and 95.71% accuracy in the detection of neoplastic lesions, underscoring the clinical relevance of aspiration in identifying malignancies. Histopathological correlation for thyroid lesions was established in 70 cases, as illustrated in Table 5. Among these 70 cases, 44 were diagnosed as nodular colloid goiter through fine needle aspiration cytology (FNAC); of these, one was identified as a follicular neoplasm and two as papillary carcinoma. Additionally, five cases of nodular.

Table 5: Histopathological correlation of thyroid lesions

| CYTOLOG | NCG    | Count | HYSTOPATHOLOGY |         |         |        |        |       | Total   |
|---------|--------|-------|----------------|---------|---------|--------|--------|-------|---------|
|         |        |       | NCG            | NCG CC  | HT      | LT     | FN     | PCT   |         |
| Y       | NCG    | Count | 40             | 1       | 0       | 0      | 1      | 2     | 44      |
|         |        | %     | 100.00         | 20.00%  | 0.00%   | 0.00%  | 16.70  | 16.70 | 62.90%  |
|         | NCG CC | Count | 0              | 4       | 0       | 0      | 0      | 1     | 5       |
|         |        | %     | 0.00%          | 80.00%  | 0.00%   | 0.00%  | 0.00%  | 8.30% | 7.10%   |
|         | NCG AH | Count | 0              | 0       | 0       | 0      | 1      | 0     | 1       |
|         |        | %     | 0.00%          | 0.00%   | 0.00%   | 0.00%  | 16.70  | 0.00% | 1.40%   |
| HT      |        | Count | 0              | 0       | 6       | 0      | 0      | 1     | 7       |
|         |        | %     | 0.00%          | 0.00%   | 100.00% | 0.00%  | 0.00%  | 8.30% | 10.00%  |
| LT      |        | Count | 0              | 0       | 0       | 1      | 0      | 0     | 1       |
|         |        | %     | 0.00%          | 0.00%   | 0.00%   | 100.00 | 0.00%  | 0.00% | 1.40%   |
|         | FN     | Count | 0              | 0       | 0       | 0      | 4      | 0     | 4       |
|         |        | %     | 0.00%          | 0.00%   | 0.00%   | 0.00%  | 66.70  | 0.00% | 5.70%   |
|         | PCT    | Count | 0              | 0       | 0       | 0      | 0      | 8     | 8       |
|         |        | %     | 0.00%          | 0.00%   | 0.00%   | 0.00%  | 0.00%  | 66.70 | 11.40%  |
| Total   |        | Count | 5              | 6       | 1       | 6      | 12     | 70    |         |
|         |        | %     | 100.00         | 100.00% | 100.00  | 100.00 | 100.00 | 100.0 | 100.00% |
|         |        | %     |                |         |         |        | %      | 0%    |         |

NCG-Nodular colloid goiter, CC-Cystic Change, AH- Adenomatoid Hyperplasia, HT-Hashimoto's Thyroiditis, LT Lymphocytic Thyroiditis, FN- Follicular Neoplasm, PCT -Papillary carcinoma

## DISCUSSION

FNAC plays a crucial role in the diagnosis of thyroid lesions, serving as the initial step in the diagnostic management of thyroid nodules. It is widely recognized as the most accurate, sensitive, specific, and cost-effective procedure for the pre-operative evaluation of thyroid lesions, thereby reducing the number of patients requiring thyroid surgery and increasing the detection of malignancy in resected specimens. This study focuses on FNAC performed on 220 patients, with a mean age of 35.67 years, which aligns with findings from other researchers. A notable female predominance was observed, with a female-to-male ratio of 9.48:1. Cytological analysis of the aspirates revealed that the majority of cases, 194 (88.18%), were indicative of non-neoplastic lesions, while 26 cases (11.82%) were classified as neoplastic. The ratio of non-neoplastic to neoplastic lesions was 7.46:1. The predominant cytological diagnosis in this study was colloid goiter, identified in 86 cases (44.33%), a finding consistent with the observations of Unnikrishnan *et al.* Among the

neoplastic lesions, papillary carcinoma was the most common, occurring in 14 cases (53.84%), followed by follicular neoplasm in seven cases (26.92%), lymphoma in two cases (7.69%), and one case each of medullary carcinoma, anaplastic carcinoma, and Hurthle cell adenoma (3.85% each). The study highlights the challenges in distinguishing between follicular adenoma or Hurthle cell adenoma and carcinoma based on cytological assessment, as cytology cannot adequately evaluate vascular or capsular invasion or intra-thyroid spread. However, papillary carcinoma, anaplastic carcinoma, and medullary carcinoma can be identified through their distinctive cytological features. Histopathological examination was conducted in four cases diagnosed as follicular neoplasm via FNAC, all of which were confirmed as follicular adenoma. There exists a diagnostic challenge in differentiating adenomatous hyperplasia from follicular neoplasia, with numerous cases of follicular neoplasm being identified.

## CONCLUSION

FNAC represents the most sensitive, specific, and cost-effective approach for investigating solitary thyroid nodules. The specificity of FNAC in thyroid assessments is sufficiently high to decrease the frequency of surgical interventions. Additionally, it can be utilized for monitoring treatment. For small or cystic lesions, ultrasound-guided biopsy is recommended to minimize the risk of false negatives and enhance diagnostic precision.

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