

# Evaluating the Efficacy of Fine Needle Aspiration Cytology in Thyroid Swellings: A Comparative Study with Histopathology

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**Abstract:** *This study assesses the sensitivity and specificity of Fine Needle Aspiration Cytology FNAC in diagnosing thyroid swellings by comparing its outcomes with histopathological findings. Conducted on 50 patients with neck swellings at the Trichy SRM Medical College Hospital Research Centre, the research highlights FNACs role as a rapid, cost - effective, and patient - friendly diagnostic tool. Despite its limitations, including difficulty in distinguishing between benign and malignant follicular lesions, FNAC demonstrated a high correlation with histopathological examinations, confirming malignancy in all diagnosed cases. The study, which fills a gap in local research, underscores FNACs importance in early diagnosis, reducing unnecessary surgical interventions, and enhancing the medical management of thyroid lesions. The findings advocate for FNACs continued use as a frontline diagnostic approach, emphasizing the need for cautious interpretation in cases with overlapping cytological features.*

**Keywords:** Thyroid swellings, Fine Needle Aspiration Cytology FNAC, histopathology, sensitivity and specificity, thyroid cancer

## 1. Introduction

A thyroid is a butterfly shaped gland present in the anterior part of neck. Neck swelling is a common clinical presentation of which thyroid swellings are the most common. They carry significant morbidity and mortality if not treated appropriately. The incidence and prevalence of thyroid lesion is gradually increasing and has become common among women. Thyroid cancer is most common cancer of isolated swellings are benign, but it is difficult to exclude malignancy without excision and histological examination. Fine needle aspiration cytology (FNAC) is the first line diagnostic method in diagnosing Thyroid nodules. It is a rapid, cost effective and minimally invasive procedure and it has excellent patient compliance. FNAC is particularly suitable in thyroid where an incisional biopsy may present problems. The lesions in thyroid are varied and they range from simple inflammation to neoplasm. FNAC helps to categorize these lesions. It has been estimated that only 5% are malignant, which requires immediate intervention. The anaplastic and poorly differentiated lesions can be planned for palliative radiotherapy or chemotherapy. Therefore, it is widely accepted, and more thyroid cases are diagnosed at an early stage. It helps to distinguish benign and malignant lesions thereby reducing burden of surgical intervention and increases scope of medical management. Since there are very few studies comparing FNAC and histopathology for thyroid lesions in our geographical locality, we have performed this study to assess the sensitivity and specificity of FNAC by correlating its results with histopathological findings.

## 2. Materials and Methods

### a) Inclusion criteria

All patients aged from 15 to 50 years and both sexes.

### b) Exclusion criteria

Pregnant women and Patients with Parathyroid swellings.

This Diagnostic type of study was done prospectively of 50 patients who presented with swelling in neck referred from Department of General Surgery and Department of Pathology in Trichy SRM Medical College Hospital & Research Centre, Trichy during the period Oct 2023 to September 2024 (1 year). This study was conducted after obtaining the consent from the patients after their approval. All patients were evaluated by thorough history and clinical examination. General diagnostic tests such as Thyroid function tests and USG of both thyroid lobes were done for all cases. FNAC procedure was performed on the patients with Thyroid swellings in aseptic condition by using 24 gauge needle. The aspirated material was immediately transferred onto glass slides. Multiple smears were prepared and were fixed in ethanol with proper care and were later stained with haematoxyline and eosin, Giemsa and Papanicolaou stain. The malignancy cases were later suggested for complete histopathological evaluations.

## 3. Results

A total of 50 aspirate pap smears were examined. Out of 50 cases, 30 were male and diagnosed with Bethesda category III (Atypia of undetermined significance), 5 cases belong to age group between 5 to 15 years and diagnosed as Lymphocytic and Hurtle cell lesions (Bethesda category II) and 15 cases were females and diagnosed with follicular neoplasm (5 cases), papillary neoplasm (5 cases) and medullary neoplasm (5 cases). The age of the patients ranged from 15 to 50 years in our study with the mean age being 45.0 years. The peak age of incidence was seen in third decade i. e between 23 – 36 years. This was followed by the age between 37 - 43 years and 44 – 50 years (Figure 2)

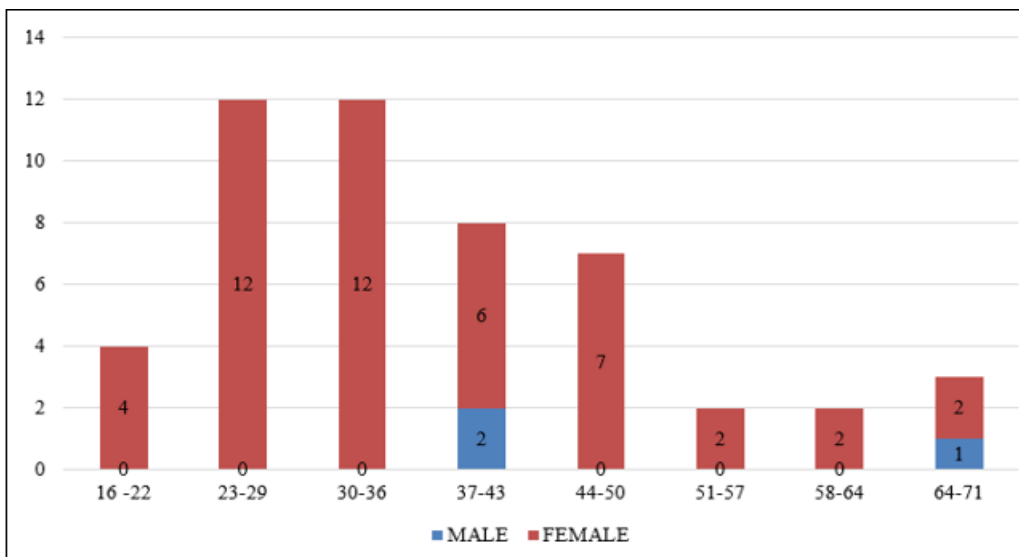


Figure 2: Age-wise distribution of the patients

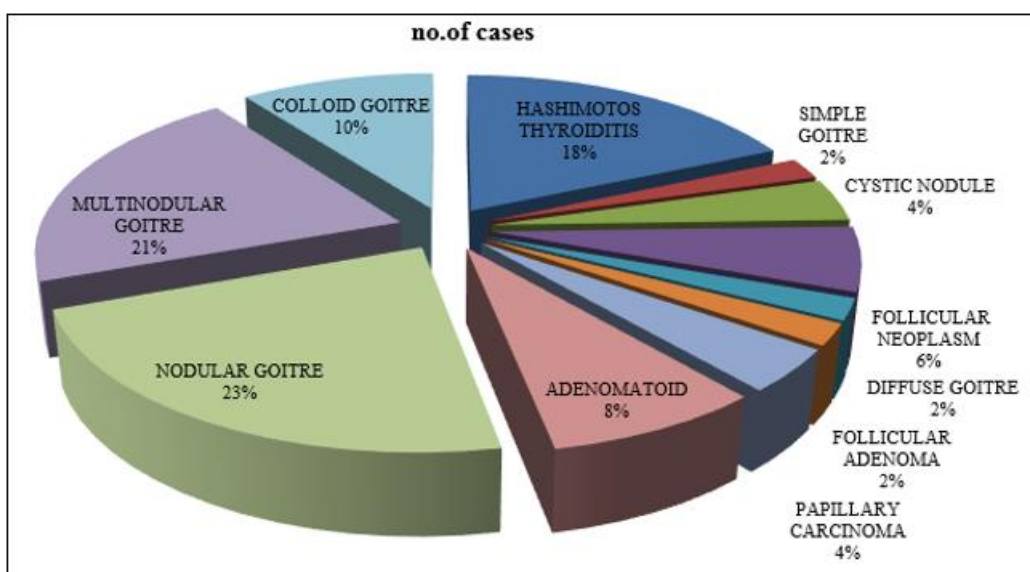


Figure 3: Type of swellings

Among Benign lesions majority were Atypia of Underdetermined significance (23%) and among the Malignant lesions majority were of Follicular Carcinoma. (4%), Papillary carcinoma and medullary carcinoma (5%). All the malignant cases diagnosed by FNAC were confirmed as malignant by histopathological examination implying 100% correlation.

The sensitivity of FNAC was 73.91%, while it was 80.95% specific. The positive predictive value of FNAC was 80% and the negative predictive value was 73%.

Sensitivity	73.91%
Specificity	80.95%
Positive predictive value	80%
Negative predictive value	73%

S. No.	Type of lesion	Correlation	Percentage	Non correlation	Percentage
1	Nodular goitre	3	27.27%	8	72.7%
2	Multinodular goitre	5	50%	5	50%
3	Hashimotos thyroiditis	4	44%	5	55%
4	Simple goitre	0	0	1	100%
5	Cystic nodule	0	0	2	100%
6	Follicular neoplasm	3	100%	0	0
7	Diffuse goitre	0	0	1	100%
8	Follicular adenoma	1	100%	0	0
9	Papillary carcinoma	2	100%	0	0
10	Adenomatoid goitre	2	50%	2	50%
11	Colloid goitre	0	0	5	100%

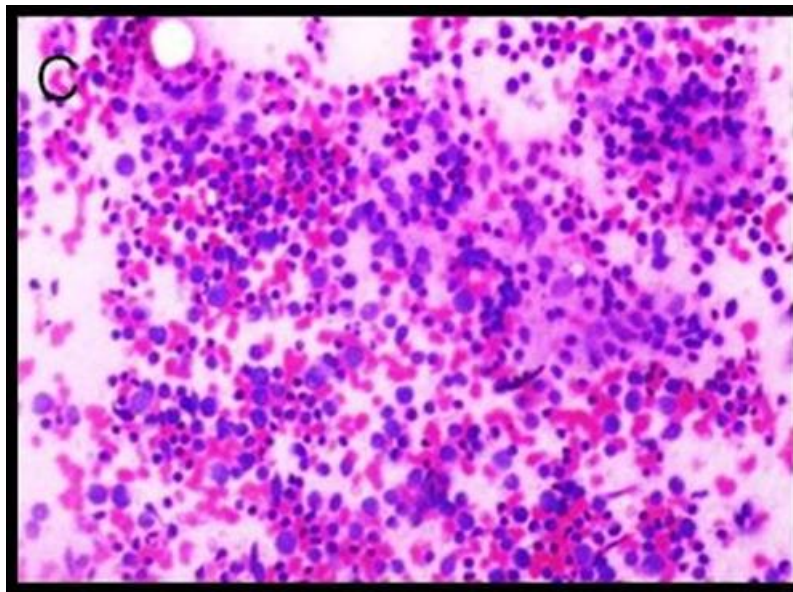


Figure 1: Hurtle cell and Oncocytic changes

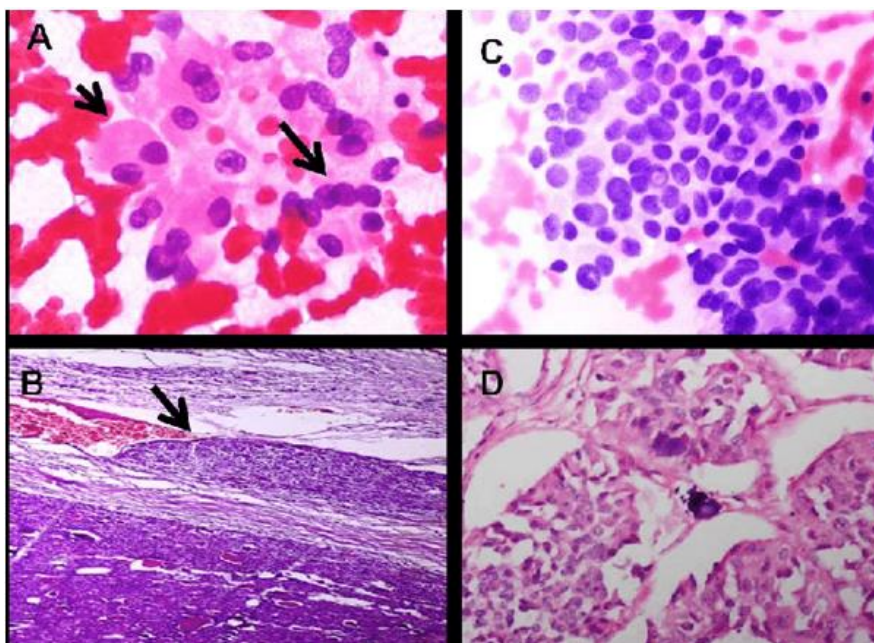


Figure 2: BETHESDA CATEGORY III (A) - ATYPIA OF UNDETERMINED SIGNIFICANCE. FOLLICULAR CARCINOMA VASCULAR INVASION (B). SUSPICIOUS OF MALIGNANCY (C). PAPILLARY CARCINOMA (D).

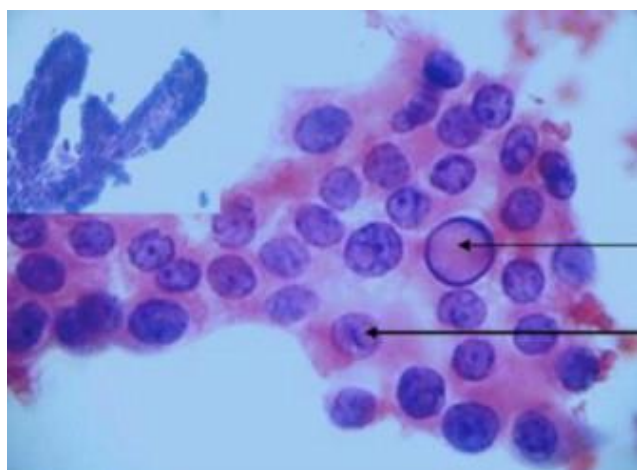


Figure 3: Papillary Carcinoma (Insert), Intranuclear Groove, Intranuclear Inclusions.

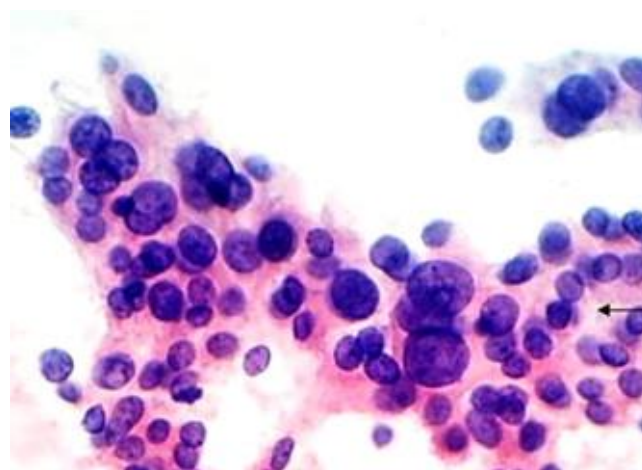
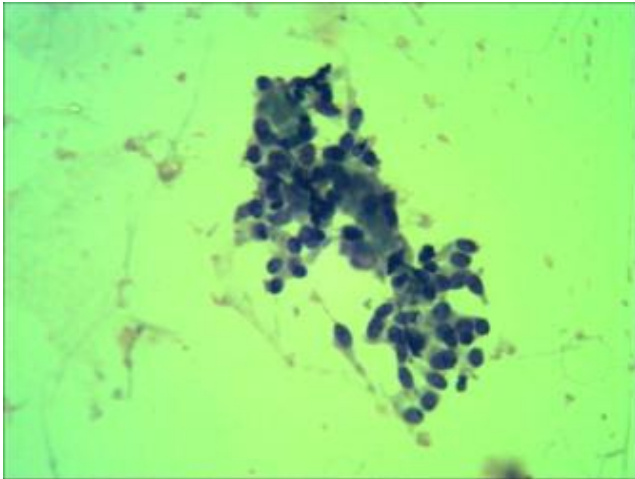


Figure 4: Follicular Neoplasm (Atypical Cells)



**Figure 5:** Medullary Carcinoma showing scattered separate epithelial cells having abundant cytoplasm, and eccentric nuclei (plasmacytoid cells)

#### 4. Discussion

Fine needle aspiration cytology is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings. The technique is safe, simple and quick with a low complication rate. Several other tests, such as high-resolution ultrasonography, radioisotope scanning and others have been used for evaluation of thyroid swellings before proceeding to thyroid surgery. Studies have demonstrated that among all these diagnostic modalities, FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swellings. Fine-needle aspiration cytology has greatly improved the clinical management of thyroid nodules. However, FNA has inherent limitations related not only to inadequate sampling but also, most importantly, to its inability to distinguish between benign and malignant follicular lesions in the absence of nuclear features of papillary carcinoma. The indeterminate diagnosis of follicular neoplasm encompasses a number of heterogeneous thyroid lesions including cellular adenomatoid nodule, follicular adenoma, and follicular carcinoma. Additionally, the interpretation of follicular variant of papillary carcinoma (FVPC) in cytology may be difficult when prominent classic nuclear features of papillary thyroid carcinoma are absent. In such cases, a preoperative diagnosis of "follicular lesion suggestive of papillary carcinoma" results in conservative surgical assessment until a definitive diagnosis can determine the appropriate treatment. Another limitation of FNAC is the presence of false negative and positive results particularly with small tumors and when there is associated degenerative or inflammatory change in adjacent thyroid tissue. In addition, there is a group of lesions which overlap benign and malignant features. For instance, the distinction between a cellular colloid goiter and a follicular neoplasm may be impossible. The age and gender were associated factors of thyroid lesions. In present study, there was a male predominance. The age of patients ranged from 15 to 50 years, with median of 45 years. The incidence of specific histology in the benign and malignant group showed no difference from other reports. Atypia of Undetermined significance constituted the majority of benign lesions (89.8%). In the study also Hurthle cell and oncocytic changes was the most frequent malignant lesion, with an incidence of

(72.4%), while medullary (17.2%). Every thyroid FNA must be evaluated for adequacy. Inadequate samples were reported as "nondiagnostic" or "unsatisfactory". This category applies to specimens that were unsatisfactory owing to obscuring blood, overly thick smears, air drying of alcohol-fixed smears, or an inadequate number of follicular cells. For a thyroid FNA specimen to be satisfactory for evaluation, at least six groups of benign follicular cells are required, each group composed of at least 10 cells. There were no inadequate sample category in our study. In our series, analysis of data revealed a sensitivity of 74% and a specificity of 80%, a PPV of 80%, and a NPV of 73%. The incidence of FLUS cases in our study was 25%, which is higher. This could be explained by the subjective nature of the cytomorphologic diagnostic features of this category between different cytopathologists interpreting the cases in our unit where we are recently introducing the Bethesda system. The false negative rate (FNR) is defined as the percentage of patients with benign cytology in whom malignant lesions are later confirmed on thyroidectomy. The false negative FNAC results may occur because of sampling error, coexistence of benign and malignant lesions, or cytomorphologic overlap between benign and low-grade malignant tumours.

An associated neoplastic lesion, not rarely encountered in cases of Hashimoto's thyroiditis, and that is not properly sampled by FNA, could explain missing of a lymphomatous focus in some cases of Hashimoto's thyroiditis and resulted in increasing the incidence of false negative diagnosis of NHL. The cases of follicular neoplasm showed clusters of follicular cells arranged in clumps with scanty colloid. The histology though, showed features of a nodular colloid goiter. Aspiration was probably done from the hypercellular areas of colloid nodules which led to over diagnosis. The cytological distinction between these two conditions is often difficult. A possible remedy is multiple aspirations from different parts of the swelling that could demonstrate hypocellular, polymorphic, and colloid-rich areas. Demonstration of monolayered sheets of epithelial cells representing macrofollicles and degenerative changes would suggest the possibility of non-neoplastic lesions. The intranuclear inclusions were demonstrated in few cells. The histology showed features consistent with those of a nodular colloid goiter. For cyto diagnosis of papillary thyroid cancer, the most important features suggested are intranuclear cytoplasmic inclusions, dense metaplastic cytoplasm, and papillary structures with distinct anatomical border. Many thyroid cancers, especially papillary thyroid carcinoma, can be diagnosed with certainty by FNA. However, the nuclear and architectural changes of some PTCs are subtle and focal. This is particularly true for the follicular variant of PTC, which can be difficult to distinguish from a benign follicular nodule. Other PTCs may be incompletely sampled and yield only a small number of abnormal cells. If only 1 or 2 characteristic features of PTC are present, or if they are only focal and not widespread throughout the follicular cell population, a malignant diagnosis cannot be made with certainty. Such cases are best classified as "suspicious for malignancy". Nodules called suspicious for papillary carcinoma are resected by lobectomy or thyroidectomy. Most prove to be papillary carcinomas, and the rest are usually follicular adenomas. The same general principle applies to other thyroid malignancies like medullary carcinoma and

lymphoma, but these are encountered less frequently than PTC.

## 5. Conclusion

The results of our study are comparable with the current published data and demonstrate that FNA cytology is a sensitive, specific, and accurate initial diagnostic test for evaluation of patients with thyroid swellings. Cytodiagnostic errors of some cases with overlapping cytological features can be avoided by paying attention to the possible pitfalls. The suspicious results can be resolved by diagnostic surgical resection. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up clinico - radiologically for any progression that will require repeated FNAC and/or surgery.

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