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Comparative Study of Cytological Analysis of Thyroid Lesions According to Bethesda Classification and their Histopathological Correlation

Nimisha Tandon[1], Archana Bidari[2], C. P. Bhale[3]

[1]Junior Resident III, Department of Pathology, MGM Medical College and hospital, Chh. Sambhajinagar
Corresponding Author Email: *nimishatandon654[at]gmail.com*

[2]Professor, Department of Pathology, MGM Medical College and hospital, Chh. Sambhajinagar

[3]Professor and Head, Department of Pathology, MGM Medical College and hospital, Chh. Sambhajinagar

Abstract: ***Introduction: Thyroid lesions are common occurrence in Indian population and represent widespread conditions usually benign but correct diagnosis is important crucially to ensure an appropriate treatment. Fine needle aspiration cytology (FNAC) has a crucial role in differentiating between neoplastic and non-neoplastic lesions. Bethesda classification helps in better understanding of the borderline cases where decision of surgical intervention over medical management is crucial. Aim: To classify the thyroid lesions according to Bethesda system and to corelate the results of cytological diagnosis with histological diagnosis. Materials and Methods: The present study was performed over a period of two years in department of pathology at tertiary care center. 100 cases of thyroid lesions were included in study which underwent FNAC and were classified according to Bethesda classification. Histopathological reports of the available cases were taken and corelated with cytological findings. Results: Of 100 cases, the most common category was Bethesda II (Benign)- 84 cases followed by category V (suspicious for malignancy) - 08 cases and category I (non-diagnostic)- 04 cases and least common were category III (02 cases) and suspicious for malignancy (02 cases). The cytological and histopathological diagnosis were corelated with each other in 50 cases among which 48 cases were concordant and 2 cases were discordant. Conclusion: FNAC is a simple and cost-effective diagnostic modality for detecting thyroid disease and has a good diagnostic accuracy with histopathology in detecting malignant thyroid lesions using the Bethesda system.***

Keywords: Thyroid lesion, Cytology, Histopathology, Bethesda system.

1. Introduction

Thyroid disorders are among the most common endocrine disorder encountered in routine clinical practice.[1] The majority of solitary thyroid nodules are benign; the incidence of malignancy being only 5-20% of surgically excised thyroid nodules on histopathology. Thus, to separate benign nodules (the majority) from malignant lesions is the primary challenge in management of solitary thyroid nodule.[2] Fine Needle Aspiration Cytology (FNAC) is first-line, simple, cost effective, minimally invasive and quick screening test as well as the diagnostic tool.[3] FNAC helps in triaging the 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.[4]

Bethesda System for Reporting Thyroid Cytopathology [TBSRTC] is a standardized system with six general diagnostic categories and clear categorical nomenclature including. [(TBSRTC) which includes definitions, diagnostic/ morphologic criteria, explanatory notes, malignancy risks, and a brief management plan for each diagnostic category.[5] TBSRTC provides a 6-tiered diagnostic framework that uses defined criteria to promote uniformity in the reporting of thyroid aspirates. One of the major advantages of this scheme is that the individual diagnostic categories are associated with defined risks of malignancy, allowing for standardized management algorithms for each diagnosis. FNAC is an extremely valuable diagnostic tool in the diagnosis and management of patients with thyroid lesions, though it cannot be a substitute to surgical histopathology.

2. Aims and Objectives

Aim of our study was to study FNAC of various thyroid lesions according to Bethesda system and correlate the results with histological findings.

Objectives were

- To study the cytomorphological features in various thyroid lesions and categorize according to Bethesda system.
- To correlate the cytological features with histopathological study of all surgically removed thyroid lesions.
- To evaluate sensitivity, specificity, and accuracy of FNAC as a procedure in diagnosing various thyroid lesions.

3. Materials and Methods

The present study was a prospective comparative observational study conducted in the Department of Pathology, MGM MCH, Chh. Sambhajinagar at a tertiary care hospital. The study was carried out over a period of 2 years (January 2024- December 2025). A total of 100 consecutive thyroid lesion cases were included in the study which

underwent FNAC and were classified according to Bethesda classification. histopathological reports of the available cases were taken and corelated with cytological findings.

A) Inclusion Criteria
- Patients presenting with thyroid swelling and undergoing FNAC
- Adequate tissue samples suitable for histopathology.

B) Exclusion Criteria
- Inadequate clinical data.
- Non-diagnostic smears without repeat FNAC
- Poorly preserved or autolyzed specimens.
- Previously treated thyroid lesions.

Methodology:
For most patients, thyroid FNAC procedure was performed under ultrasound guidance by the diagnostic radiologists after detailed ultrasonographic examination. Under aseptic precautions, 21-gauge needle with syringe was inserted into the lesion and under negative pressure, material got collected in the needle, after collection of material negative pressure gets released, needle with syringe holder was removed, the material was spread over a clean labelled slide and smears were prepared. Smears were wet fixed in 95% ethyl alcohol and stained with Hematoxylin and Eosin (H & E). Cytological diagnosis categorized according to Bethesda system.

After surgery, the received specimens were fixed with 10% formalin and detailed gross examination was done and sections were taken from the representative areas for paraffin sections and stained by H & E. Cytological diagnosis was correlated with histopathology where ever possible and efficacy of FNAC was estimated by using the following methodology of Galen and Gambino.[6]

Statistical method:
Data for study was obtained from departmental records and tissue specimens received in the histopathology and cytology sections section in the specified period of study.

Data was entered into Microsoft Excel and analyzed using statistical software.

Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated for imprint cytology and frozen section.

4. Results

During the period from January 2024 to December 2025, 100 patients were examined for thyroid lesion. FNAC done on the patients and reported according to Bethesda category of thyroid cytopathology. Post- surgical excision specimens of 50 patients were received in the department and slides were studied and Histopathologically reported.

The cases were divided in five groups; maximum number of cases were seen in the age group 31 to 40 years (28 cases). It was followed by 41 to 50 years (24 cases), 21 to 30 years (22 cases), >50 years (18 cases) and 10 to 20 years (8 cases). (Table 1)

Table 1: Distribution of patients according to Age.

Age group (years)	Number of cases	Percentage
Oct-20	8	8%
21-30	22	22%
31-40	28	28%
41-50	24	24%
> 50	18	18%

In our study females were mostly affected with thyroid lesions representing 82 cases than males with 18 cases. Female to Male ratio was 4.5:1. Table 2 shows cases distribution according to gender.

Table 2: Cases distribution according to gender

Gender	Number of cases	Percentage
Female	82	82%
Male	18	18%
Total	100	100%

Table 3 shows distribution of cases according to Bethesda category of reporting cytopathology report. Majority of cases were reported as category II 70 cases. 4 cases were reported as category I, 6cases were reported as category III, while 8 cases and 5 cases were reported as category IV and category V respectively. Bethesda category IV, V and VI was considered as positive or malignant for analysis.

Table 3: Categorization of thyroid lesions according to the Bethesda category

Diagnostic Category	Frequency	Percentage
I Non-diagnostic	4	4%
II Benign	70	70%
III Atypia of undetermined significance (AUS)	6	6%
IV Follicular Neoplasm	8	8%
V Suspicious	5	5%
VI Malignant	7	7
TOTAL	100	100%

Table 4: Distribution of cases according to Cytological Diagnosis

Diagnosis	Cases
Colloid goitre	52
Nodular goitre	12
Hashimoto thyroiditis	6
Follicular neoplasm	8
Suspicious for malignancy	5
Papillary carcinoma	7
Others	10
Total	100

Table 4 shows Distribution of cases according to Cytological Diagnosis suggesting colloid goitre as most common finding on FNAC with 52 cases.

Table 5: Distribution of cases according to histological Diagnosis

Diagnosis	Cases
Nodular goitre	24
Colloid goitre	8
Hashimoto thyroiditis	3
Follicular adenoma	6
Papillary carcinoma	7
Follicular carcinoma	2
Total	50

Table 5 shows Distribution of cases according to Histological Diagnosis suggesting Nodular goitre as most common finding on FNAC with 24 cases.

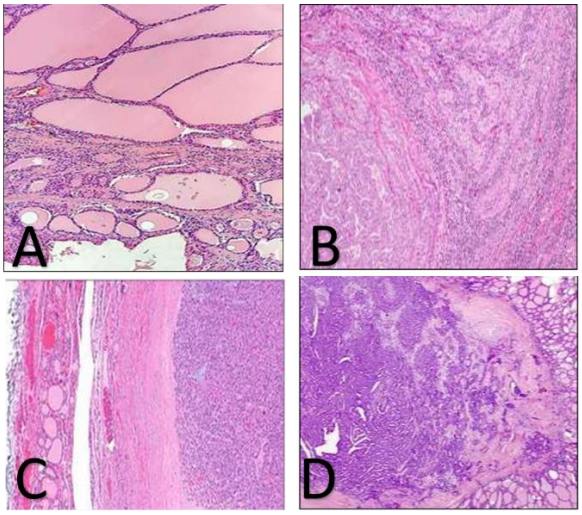

Figure 1: Histopathology slides showing A- Colloid Goitre, B- Hashimoto thyroiditis, C- Follicular adenoma, D- Papillary thyroid carcinoma.

Table 6: Cyto-Histological Correlation

Cytology	Histopathology	Cases
Benign	Benign	34
Benign	Malignant	2
Malignant	Malignant	9
Malignant	Benign	1
Indeterminate	Benign	3
Indeterminate	Malignant	1
Total correlated cases		50

Table 7: Diagnostic accuracy table

	Histology Malignant	Histology Benign
Cytology Malignant	9 (TP)	1 (FP)
Cytology Benign	2 (FN)	38 (TN)

Overall sensitivity, specificity, and diagnostic accuracy value of FNAC for thyroid lesions were found as 81.8%, 97.4% and 94% respectively.

5. Discussion

Diseases of thyroid are of great importance because they are most amenable to medical or surgical management. The clinical importance of thyroid nodules lies in the fact that although most nodules are benign, they may be the first sign of malignancy. For clarification and communication to clinicians, the FNAC report format should contain either one of the six-tiered Bethesda category.

The incidence of thyroid malignancies is three times higher in women than men, and the incidence of thyroid cancer peaks in the third and fourth decades of life. [8]

Present study showed maximum no of cases in 31-40 yrs age group with 28% which was comparable with study done by Nikita r et al [2] and Amit et al [1] with 31.20% and 24% respectively.

In similar study Nagare MR et al. [9] shows maximum incidence of thyroid lesions in the 31 to 40 years age group in which there were 33 cases (29.72%) Other study by Arif M et al. [10] shows majority of patients (55%) belongs to 21 to 40 years of age. The study showed M:F ratio 1:4.5 which was comparable with study of Rajesh et al [7], Amit et al [1] showed M:F ratio 1:7.6 and 1:7.6 respectively.

Out of 100 cases, histopathological correlation was done in 50 cases. In the present study, the most common non-Inflammatory thyroid lesion was colloid goiter follicular adenoma was the most common benign neoplastic thyroid lesion and papillary thyroid carcinoma (PTC) the most common malignancy.

In present study, one case of Follicular neoplasm (TBSRTC category IV) was diagnosed as granulomatous thyroiditis on histopathology. This was due to degenerative changes in follicular neoplasm with large nuclei having prominent nucleoli and degenerative changes in cytology smears. On histopathology it was correctly diagnosed as a Granulomatous thyroiditis.

In the present study a case of Follicular thyroid carcinoma was diagnosed as benign thyroid lesion on FNAC as sampling was only done from one nodule which showed benign follicular cells.

In the present study comprised of 7 cases of papillary carcinoma thyroid. 5 of these cases were conventional papillary carcinoma and 2 were Medullary carcinoma which were correctly diagnosed on FNAC.

The present study showed sensitivity of 81.8%, specificity of 97.4% and diagnostic accuracy of present study of 94%.

On comparison with other studies the present study showed sensitivity of 81.8% which was comparable to 73.91% in a study by Reddy MR et al. [11]

The present study showed specificity of 97.4% which was comparable with study conducted by Kumar HC et al [12] who reported specificity of FNAC was 87.5%

In our study the accuracy of FNAC in detection of the thyroid lesions was found to be 94%. It is well compared with the study done by Abdullahi IM et al [13] where the accuracy was 94.9% and another study showed 91.66% by Gangadhara KS et al [14]

6. Conclusion

Fine Needle Aspiration Cytology of Thyroid lesions are thus proved to be a simple, cost effective and accurate method to diagnose and to guide the management of palpable thyroid lesions. The method can accurately diagnose non-neoplastic thyroid conditions and reduce the number of unnecessary thyroid surgeries.

The sensitivity, specificity and the diagnostic accuracy of the procedure is very good. This makes it a suitable first line investigation for the diagnosis of thyroid lesions and to guide the management of the patients with thyroid nodule. Thus, we

can very well say that though HPE is the final and confirmatory diagnostic procedure, FNAC remains the preliminary time-tested procedure of choice.

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Ethical approval: Not required

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