

## Role of The Bethesda system for reporting fine needle aspiration cytology of lesions of the thyroid and its histopathological correlation

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**Introduction:** The incidence of clinically apparent thyroid swellings in the general population is 4–5%. The majority of these swellings are benign, among which goitre is the most common. The prevalence of goiter is more than 40 million in India with more than 2 billion globally. The Bethesda system is a uniform reporting system for thyroid cytology that facilitates the clarity of communication among cytopathologists, radiologists, and surgeons and facilitates cytohistologic correlation for thyroid diseases. **Methods:** This is a retrospective review done by retrieving the records (cytology and histopathology) of 50 patients who have undergone FNAC of thyroid from the archives of the Department of Pathology over 1.5 years and the results were analyzed using descriptive statistics and Chi-square test with Software SPSS version 23. **Results:** Based on the Bethesda system of classification of thyroid lesions, out of 44 satisfactory samples; 33 lesions were diagnosed as benign (Group 2), 1 was in the category of suspicious for follicular neoplasm (group 4), 2 were diagnosed as suspicious for malignancy (Group 5), and 8 cases were malignant (Group 6). In the present study, the sensitivity of FNAC was 100%, specificity 83%. **Conclusion:** Reviewing the thyroid FNAs with the Bethesda system for reporting allowed precise cytological diagnosis. It represents standardization and reproducibility in reporting thyroid cytology with improved clinical significance and greater predictive value. The nature of the disease, the experience of the cytopathologist, and the understanding of certain limitations determine its diagnostic utility.

**Keywords:** Cytohistologic correlation, Fine needle aspiration, thyroid lesion, Thyroid, The Bethesda system,

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## Introduction

The incidence of clinically apparent thyroid swellings in the general population is 4–5%. The majority of these swellings are benign, among which goiter is the most common. The prevalence of goiter is more than 40 million in India with more than 2 billion globally [1]. According to The American Cancer Society, the most recent estimates for thyroid cancer in the United States for 2020 are 52,890 (12,720 in men and 40,170 in women) [2].

Fine needle aspiration cytology (FNAC) is considered the first line of investigation apart from other investigations like ultrasonography (USG), thyroid function tests, thyroid scans and antibody levels for the primary evaluation of the patients. It effectively helps in distinguishing thyroid lesions suitable for surgical resection from those that can be managed conservatively. Thus, FNAC being minimally invasive and cost-effective is extremely useful in reducing unnecessary surgery for patients with benign thyroid disease [2].

**Table 1: The Bethesda System for Reporting Thyroid Cytopathology: Diagnostic categories [3].**

I.	<b>Non diagnostic or Unsatisfactory</b> Cyst fluid only, Virtually acellular smear, Other ( obscuring blood, clotting artefact etc)
II.	<b>Benign</b> Consistent with a benign follicular nodule (includes adenomatoid nodule, colloid nodule etc). Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context. Consistent with granulomatous (sub acute) thyroiditis and Others
III.	<b>Atypia of Undetermined significance/ Follicular lesion of Undetermined significance(AUS/FLUS)</b>
IV.	<b>Follicular neoplasm or suspicious for a follicular neoplasm (SFN)</b> Specify if Hürthle cell (oncocytic) type
V.	<b>Suspicious for malignancy (SFM)</b> Suspicious for papillary carcinoma. Suspicious for medullary carcinoma. Suspicious for metastatic carcinoma. Suspicious for lymphoma.
VI.	<b>Malignant</b> Papillary thyroid carcinoma. Poorly differentiated carcinoma. Medullary thyroid carcinoma. Undifferentiated (anaplastic) carcinoma. Squamous cell carcinoma. Metastatic carcinoma Non Hodgkin lymphoma and Others

However, previously, thyroid FNAC had a reporting confusion due to the multiplicity of category terminologies. To overcome this, The Bethesda System For Reporting Thyroid Cytopathology was introduced in 2007 at the “Thyroid Fine Needle Aspiration State of the Science Conference” held in Bethesda, Maryland, for unifying the terminology and morphologic criteria

Along with the corresponding risk of malignancy [1]. The 2017 revision included revised guidelines for the management of patients with thyroid nodules, the introduction of molecular testing as an adjunct to cytopathologic examination, and the reclassification of the noninvasive follicular variant of papillary thyroid carcinoma as noninvasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP) [3]

## Materials and Methods

A retrospective study during the period, of January 1, 2018, to January 31, 2020, was conducted after approval from the ethical committee of our institute. Slides were retrieved from the department of pathology. All patients having clinically palpable thyroid swellings, irrespective of their age and sex, were included in the study. Exclusion criteria were [1]. Patients not willing to FNAC of thyroid lesions even after explaining the purpose, utility, and consequences of the procedure, [2]. Lesions of the parathyroid, lymph nodes, and other surrounding structures. H and E-stained slides as well as cytological slides were evaluated and correlation was established.

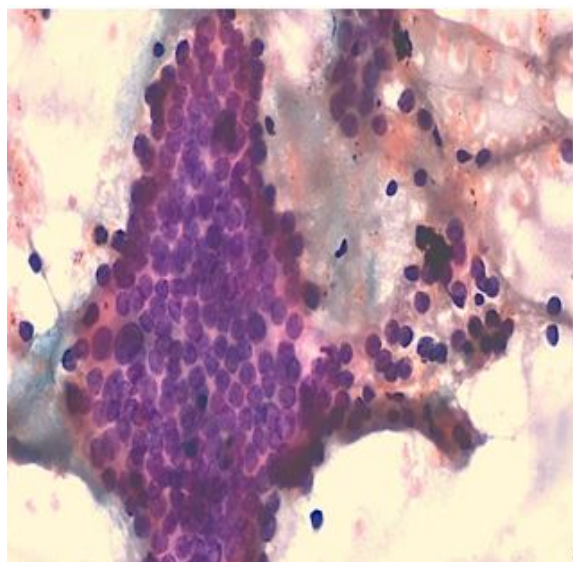
**Statistical analysis:** A sample size of 50 was collected. SPSS Version 23.0 was used for data analysis. Frequency tables were constructed for each category in TBSRTC for comparison with the final histopathological reports. Chi square test was used to find the cyto-histo correlation. Sensitivity, specificity, positive predictive value and negative predictive value were also assessed. P =0.05 was considered as significant.

## Results

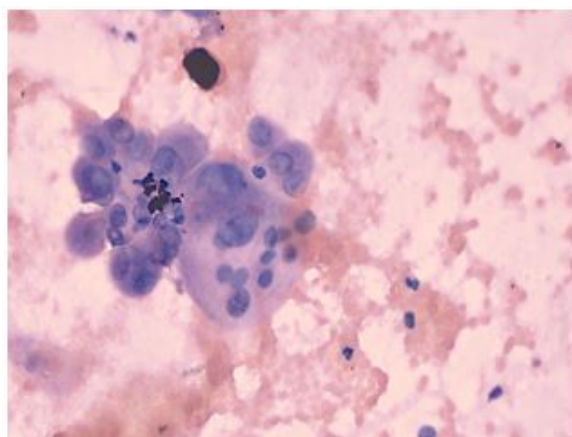
A total of 50 patients were included in this study, of which 82% were females and 18% were males. The age of presentation ranged from 27 years to 66 years. Most of the patients were in the age range of 31-40 years accounting for 30% of the total cases. The youngest patient was 27years-old. According to the Bethesda system of reporting thyroid lesions, the nondiagnostic category (Group 1) included 6 cases (12%), and histopathology was not available in any of the cases of this category. Out of 44 satisfactory samples, 66 % ( n=33) cases were diagnosed as benign (Group 2), 1(2%) was in the category of suspicious for follicular neoplasm (group 4), 2(4%) were diagnosed as suspicious

For malignancy (Group 5), and 8 (16%) cases were malignant (Group 6).

- Group 1: Inadequate/nondiagnostic category-6 aspirates (12% of total cases) were categorized as inadequate for evaluation or non-diagnostic
- Group 2: Benign lesions included colloid goiter, lymphocytic thyroiditis, adenomatous goiter/hyperplastic nodule
- Group 3: AUS/atypical follicular lesion of undetermined significance (AFLUS) – No cases.
- Group 4: FN/SFN – There was 1 case of suspicion follicular neoplasm.
- Group 5: Suspicious for malignancy – included 2 cases
- Group 6: Malignant – There were 8 cytologically diagnosed malignancies; including papillary carcinoma and anaplastic carcinoma.



**Figure 1:** PAP stain, 40x-Papillary thyroid carcinoma



**Figure 2:** PAP stain, 100x-Papillary thyroid carcinoma

The Sensitivity of TBSRTC in reporting thyroid cytology was found to be 100% and the Specificity: was 83%. It has a positive predictive value of 75% and a Negative predictive value of 100%. p-value was found to be 0.000 (0.05=significant) and hence found to be significant.

## Discussion

Thyroid cancer accounts for 1% of all cancers and is responsible for 0.5 percent of cancer-related deaths. Because of the low malignant potential of thyroid nodules and the slow progression of thyroid gland cancers, early detection remains important for increased life expectancy. Martin and Ellis made the first cytological diagnosis of FNAC in the 1930s [5]. Many studies were conducted in the years that followed, but the method was widely used after 1952. The FNAC test is simple to use, has a low complication rate, a high diagnostic value, and is a cost-effective test for the diagnosis of thyroid nodules.

FNAC is a safe, simple, and inexpensive technique that has emerged as a valuable and popular adjunct in the diagnosis and management of various thyroid lesions. In the present study, cytological features of thyroid lesions were studied according to the Bethesda system of reporting and correlated with histopathology, wherever available, to determine its diagnostic accuracy [6].

The present study reported 12 % of aspirates as nondiagnostic or unsatisfactory which correlates with the studies of Yassa et al [10]. and Nayar and Ivanovic [11]. Who reported 7% and 5% unsatisfactory smears in their studies, respectively, whereas Jo et al [12]. reported a much higher percentage (18.6%) of nondiagnostic/unsatisfactory smears in their study. Usually, an ultrasound-guided FNAC is performed for small nodules or nodules that appear heterogeneous on palpation and the cytopathologist himself performs the procedure of FNAC, thereby ensuring a lower percentage of cases in the unsatisfactory category as well as giving a better quality of adequate aspirate.

Results of various case series reported by previous authors showed the sensitivity of thyroid cytology ranged widely from 50% to 97%. In the present study, the sensitivity of thyroid cytology was 100%. On the other hand, the specificity of thyroid cytology ranged from 74.9% to 100% in

Different case series. In the present study, the specificity of thyroid cytology was 83% which is comparable to the other studies and closest to reported by Guhamallick et al.

**Table 2: Comparison of sensitivity, specificity, positive predictive value and negative predictive value of the present study with other studies**

Studies	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Present study	100%	83%	75%	100%
Kasliwal et al.	85%	100%	100%	98%
Kulkarni et al.	66%	100%	100%	92%
Bagga and Mahajan et al.	66%	100%	100%	96%

## Conclusion

The present study showed that the Bethesda system of reporting thyroid cytology is a standardized initial modality for diagnosing different thyroid lesions. It can detect benign and malignant lesions thus avoiding unnecessary surgery for benign thyroid lesions. However, a study of a larger population would provide more information about the merits and demerits of the Bethesda system.

**Relevance:** This study demonstrates greater reproducibility among pathologists who use TBSRTC to make a precise diagnosis, with the added benefit of predicting the risk of malignancy, allowing the clinician to plan for follow-up or surgery, as well as the extent of surgery.

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