



THE BETHESDA SYSTEM FOR REPORTING THYROID CYTOPATHOLOGY WITH HISTOPATHOLOGIC CORRELATION: A RETROSPECTIVE STUDY AT A TERTIARY CARE HOSPITAL OF LOWER ASSAM

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ABSTRACT

Background: Fine needle aspiration is currently the preferred screening test for guiding the diagnosis and treatment of thyroid nodules as it is quick, assessible, inexpensive, relatively painless with quite accurate diagnosis. The Bethesda system for reporting thyroid cytopathology (TBSRTC) was introduced in 2007 in an attempt to standardize international terminology and to categorize morphological criteria in fine-needle aspirations (FNAs) from patients with thyroid nodules. It introduced 6 diagnostic categories for FNA results and assigns a malignancy risk and recommendations for patient management for each category. **Objectives:** To categorize the thyroid swelling following The Bethesda system for reporting Thyroid Cytopathology (TBSRTC) and to correlate with final histopathological reports wherever available. **Materials and Methods:** 99 patients underwent FNAC in our institute from the period of January 2019 to July 2020, and were categorized according to the Bethesda system for reporting thyroid cytopathology. Results: The 99 cases taken up for FNAC were categorized according to The Bethesda system for reporting Thyroid Cytopathology (TBSRTC) as Non-diagnostic or unsatisfactory at 6.06%, Benign at 81.81%, Atypia of undetermined significance at 0%, Suspicious for a follicular neoplasm at 4.04%, Suspicious for malignancy at 2.02%, Malignant at 6.06%. The sensitivity, specificity, positive predictive value (PPN), negative predictive value (NPN), and accuracy of FNAC in diagnosing thyroid malignancy were calculated as 66.67%, 100%, 100%, 93.33% and 94.12% respectively. **Conclusion:** The Bethesda system for reporting Thyroid Cytopathology (TBSRTC) helps in standardization of thyroid fine needle aspiration reporting. This leads to timely and adequate intervention for the patient and also minimizes unnecessary thyroid surgeries.

KEYWORDS : Thyroid, FNAC, Bethesda system, cytology, histopathology

Introduction:

Thyroid is one of the most important endocrine organs of the human body. Swellings of thyroid are commonly encountered in clinical practice. Majority are benign lesions, but few may turn out to be malignant [1]. Prevalence of thyroid lesions is increasingly becoming common in India. Around a third of the Indian population is suffering from different kinds of thyroid disorders such as thyroid nodules, goitre, thyroiditis and thyroid cancer^[2].

Fine Needle Aspiration Cytology (FNAC) is currently the preferred screening test for guiding the diagnosis and treatment of thyroid nodules. It is a fast, safe, minimally invasive, cost-effective technique with high sensitivity and specificity^[3].

The Bethesda system for reporting thyroid cytopathology (TBSRTC) [4] was introduced in 2007 in an attempt to standardize international terminology and to categorize morphological criteria in fine-needle aspirations (FNAs) from patients with thyroid nodules. TBSRTC establishes six diagnostic categories for FNA results and assigns a malignancy risk and recommendations for patient management for each category [4]. Global studies of the incorporation of TBSRTC in diagnostic algorithms for patients with thyroid nodules have concluded that TBSRTC reduces unnecessary thyroidectomies while also ensuring the quality of thyroid malignancy detection^[5].

Aims & Objectives of the study:

a) To categorize the thyroid swelling following The Bethesda system for reporting Thyroid Cytopathology (TBSRTC).

b) To determine the correlation between the results of thyroid fine-needle aspirations interpreted using the Bethesda system and final histopathological reports wherever available.

Materials & Methodology:

The present retrospective observational study was carried out in our institute (Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta, Assam). Data were obtained from archives for the period of January 2019 to July 2020 after Institutional Ethics Committee clearance. The study included 99 patients who presented with the swelling of thyroid, and were referred from the Departments of ENT, Surgery & Medicine.

Inclusion criteria: All patients presenting with thyroid swelling and advised for FNAC study at Cytopathology section of Dept. of Pathology, FAAMCH, Barpeta

Exclusion criteria: Patients presenting with neck swellings other than thyroid, or having bleeding disorders were excluded from this study. Patients were duly explained about the procedure in their own language and written consent was taken. Fine needle aspiration was performed using a 22-26G needle in supine position with hyper-extended neck. The smears were either air-dried and fixed in methanol and then stained with May-Grünwald-Giemsa (MGG), or were wet-fixed in ethanol and stained with Papanicolaou (PAP) stain. Subsequently, reporting was done by 2 cytopathologists following The Bethesda system for reporting Thyroid Cytopathology (TBSRTC) [TABLE 1].

TABLE 1: THE BETHESDA SYSTEM FOR REPORTING THYROID CYTOPATHOLOGY (TBSRTC) [2017]^[4]

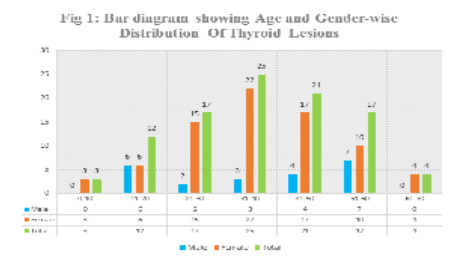
| Category | Category Name | Thyroid Lesions | Risk of Malignancy (ROM) | Usual Management |
|----------|---------------------------------|--|--------------------------|-------------------------------|
| I | Nondiagnostic or unsatisfactory | <ul style="list-style-type: none"> • Cyst fluid only • Virtually acellular specimen • Other (obscuring blood, clotting artifact, etc.) | 1-4% | Repeat FNAC with USG guidance |
| II | Benign | <ul style="list-style-type: none"> • Consistent with a benign follicular nodule (adenomatoid nodule, colloid nodule, etc.) • Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context • Consistent with granulomatous (subacute) thyroiditis • Other | 0-3% | Clinical Follow-up |

| | | | | |
|-----|---|--|--------|--|
| III | Atypia of undetermined significance or follicular lesion of undetermined significance | | 5-15% | Repeat FNAC |
| IV | Follicular neoplasm or suspicious for a follicular neoplasm | Specify if Hurthle cell (oncocytic) type | 15-30% | Surgical lobectomy |
| V | Suspicious for malignancy | <ul style="list-style-type: none"> Suspicious for papillary carcinoma Suspicious for medullary carcinoma Suspicious for metastatic carcinoma Suspicious for lymphoma Other | 60-75% | Near-total thyroidectomy or surgical lobectomy |
| VI | Malignant | <ul style="list-style-type: none"> Papillary thyroid carcinoma Poorly differentiated carcinoma Medullary thyroid carcinoma Undifferentiated (anaplastic) carcinoma Squamous cell carcinoma Carcinoma with mixed features (specify) Metastatic carcinoma Non-Hodgkin lymphoma Others | 97-99% | Near-total thyroidectomy |

Results and Observations:

A total of 99 patients were included in this study, ages ranging from 5 to 70 years. The mean age was 43 years. Majority of the thyroid lesions occurred in 3rd (25.25%) and 4th (21.21%) decades of life.

In the present study group, 76 patients were women and 23 were men, implying a sex ratio (Male:Female) of 3.30:1.



Fine needle aspiration of the thyroid lesions were done, and the reporting was done as per the Bethesda system for reporting Thyroid Cytopathology. USG-guided aspiration was undertaken wherever necessary. Of the 99 patients, majority were graded into Category II (Benign) at 81.81% followed by Category I (Non-diagnostic or unsatisfactory) and Category VI (Malignant) at 6.06% each.

Table 1: Categorization of FNAC findings of patients according to The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)

| Categories | Male | Female | Total | Percentage |
|------------------------------------|------|--------|-------|------------|
| I.Non-diagnostic or unsatisfactory | 3 | 3 | 6 | 6.06% |

Out of the 81 lesions categorized as Category II (Benign), Colloid Goiter (54.32%) was the most frequent followed by Colloid Goiter with cystic changes at 25.91%.

Table 2: Benign thyroid lesions on FNAC

| Lesion | Number of cases | Percentage (%) |
|--|-----------------|----------------|
| Colloid goiter | 44 | 54.32 |
| Colloid goiter with cystic changes | 21 | 25.91 |
| Nodular goiter | 03 | 3.70 |
| Lymphocytic thyroiditis or Hashimoto thyroiditis | 06 | 7.41 |
| Graves disease | 02 | 2.47 |
| Hyperplastic thyroid nodule | 01 | 1.23 |
| Granulomatous thyroiditis | 04 | 4.94 |
| Grand total | 81 | 100 |

8 cases out of the 99 patients in FNAC were categorized as malignant (Category VI) and suspicious for malignancy (Category V). 5 cases (62.5%) were reported to have papillary carcinoma (Category VI), 1 case (12.5%) was reported to have Anaplastic carcinoma (Category VI) and 2 cases (25%) were suspicious for malignancy (Category V). Out of these 99 patients, 18 underwent surgery, and the histopathological results showed that 14 (77.77%) of the patients had a benign disease, 1 (5.55%) had a borderline neoplasm (Non-invasive follicular thyroid neoplasm with papillary-like nuclear features) and 3 (16.66%) had a malignant pathology.

Table 3: Distribution of thyroid lesions on histopathology

| Thyroid lesions | Number of cases | Percentage (%) |
|-------------------------|-----------------|----------------|
| Benign lesions | | |
| Colloid Goiter | 11 | 61.11 |
| Follicular Adenoma | 1 | 5.55 |
| Hashimoto's thyroiditis | 1 | 5.55 |
| Cavernous Hemangioma | 1 | 5.55 |
| Borderline | | |
| NIFTP | 1 | 5.55 |
| Malignant lesions | | |
| Papillary Carcinoma | 3 | 16.66 |
| Grand total | 18 | 100 |

Table 4: Cyto-histopathological correlations of thyroid lesions

| Lesion | FNAC | Histopathology |
|--|------|----------------|
| Colloid Goiter | 14 | 11 |
| Lymphocytic thyroiditis or Hashimoto thyroiditis | 00 | 01 |
| Follicular neoplasm | 01 | 01 |
| Cavernous Hemangioma | 00 | 01 |
| Papillary Carcinoma | 02 | 03 |
| Grand total | 17 | 17 |

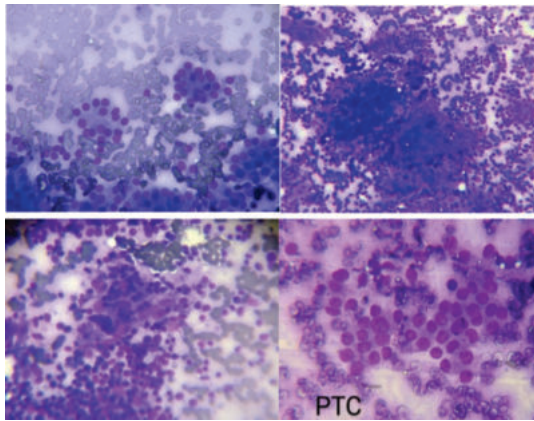
The cyto-histopathological correlation co-efficient was calculated to be 0.9948.

The sensitivity, specificity, positive predictive value (PPN), negative predictive value (NPN), and accuracy of FNAC in diagnosing thyroid malignancy were calculated as follows

| FNAC Diagnosis | HPE Diagnosis | | Total |
|-------------------------|---------------|---------|-------|
| | Malignant | Benign | |
| Positive for malignancy | 2 (TP) | 0 (FP) | 2 |
| Negative for malignancy | 1 (FN) | 14 (TN) | 15 |

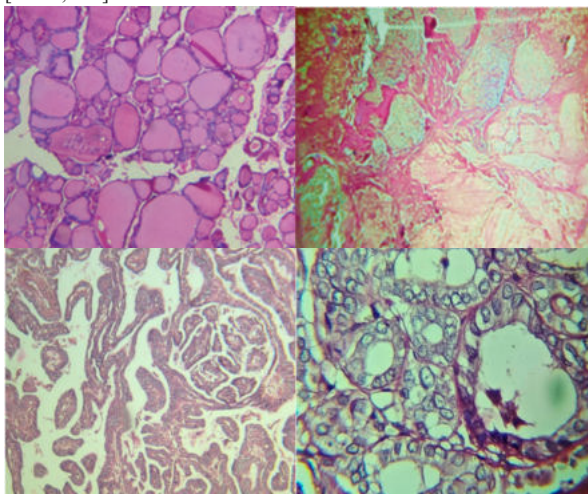
| | |
|--|--------|
| SENSITIVITY (TP/TP+FN) x 100 | 66.67% |
| SPECIFICITY (TN/TN+FP) x 100 | 100% |
| POSITIVE PREDICTIVE VALUE (PPV) (TP/TP+FP) x 100 | 100% |

| | |
|---|--------|
| NEGATIVE PREDICTIVE VALUE (NPV) (TN/TN+FN) x 100 | 93.33% |
| ACCURACY {(TP+TN)/(TP+TN+FP+FN)} x 100 | 94.12% |



Cytology:

- A) Micro-follicle formation in Bethesda Cat IV (suspicious of follicular neoplasm) [MGG, 10x]
- B) Hashimoto's lymphocytic thyroiditis showing lymphocytes impinging upon the thyroid follicular cells [MGG, 10x]
- C) De-Quervain's granulomatous thyroiditis showing granuloma formation [MGG, 10x]
- D) Papillary Carcinoma of thyroid showing intra-nuclear inclusions [MGG, 40x]



Histopathology:

- A) Colloid filled follicle in Colloid goitre [H&E, 10x]
- B) Blood filled caverns with colloid filled follicles in Cavernous hemangioma [H&E, 4x]
- C) Papillary carcinoma showing papillary formations [H&E, 10x]
- D) Nuclear grooving, optically clear cytoplasm (Orphan Annie Eye nucleus) [H&E, 40x]

Discussion:

Fine needle aspiration cytology has been widely regarded as a safe, simple, inexpensive technique for thyroid cytopathology which provides a relatively accurate diagnosis. The aim of our study was to categorize the thyroid swelling following The Bethesda system for reporting Thyroid Cytopathology (TBSRTC) and to correlate the results with histopathological reports wherever available. In this present study, 99 patients had undergone fine needle aspiration.

The majority of the lesions occurred in the 3rd decade of life. Male:Female ratio was 1:3.3 with 23 men and 76 female. This was comparable to the studies conducted by Vinod et al[7] (1:2.65), Nandedkar S et al[8] (1:4.2), Zarif HA et al[9] (1:4.1).

Histopathological follow-up of 18 cases yielded 14 benign results (11 colloid goiter, 1 case each of Follicular Adenoma, Hashimoto's thyroiditis and Cavernous Hemangioma); 1 case was borderline (NIFTP) and 3 cases were malignant (Papillary carcinoma).

Table 5: Distribution of cases in comparison with other studies

| Bethesda Category | Mondal et al[6] (%) | Vinod et al [7] (%) | Nandedkar S et al[8] (%) | Zarif HA et al[9] (%) | Present study (%) |
|-------------------|---------------------|---------------------|--------------------------|-----------------------|-------------------|
| Category I | 1.18 | 3.2 | 4.29 | 6.4 | 6.06 |
| Category II | 87.5 | 62.9 | 82.67 | 31.4 | 81.81 |
| Category III | 0.98 | 4.8 | 0.82 | 12.8 | 0 |
| Category IV | 3.58 | 16.1 | 9.07 | 20.3 | 4.04 |
| Category V | 1.37 | 4.8 | 1.15 | 5.6 | 2.02 |
| Category VI | 4.7 | 8.1 | 1.98 | 23.5 | 6.06 |

The cases in Category II yielded a malignancy rate of 25%. The Category VI in our study yielded a malignancy rate of 66.67%.

Table 6: Comparison of sensitivity, specificity, positive predictive value (PPN), negative predictive value (NPN), and accuracy of FNAC with other studies

| | Sensitivity (%) | Specificity (%) | PPN (%) | NPN (%) | Accuracy (%) |
|-----------------------|-----------------|-----------------|---------|---------|--------------|
| Vinod et al [7] | 41.2 | 97 | 87.5 | 75.6 | 77.6 |
| Nandedkar S et al [8] | 85.7 | 98.68 | | | 97.1 |
| Zarif S et al [9] | 88.9 | 75.6 | 79.7 | 84.4 | 81.6 |
| Present Study | 66.67 | 100 | 100 | 93.33 | 94.12 |

Conclusion:

FNAC is a simple, accurate, relatively safe and inexpensive method for detection of thyroid lesions. The Bethesda system for reporting thyroid cytopathology (TBSRTC) helps in standardization of reporting of thyroid lesions by FNAC, serving as a means of effective communication between surgeons and pathologists. It can differentiate between benign and malignant lesions quite accurately, and thus help in minimizing unnecessary thyroidectomies, while ensuring adequate and timely intervention for the patient.

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Conflicts of interest: There are no conflicts of interest in this study.

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