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# APPLICATION OF THE BETHESDA SYSTEM FOR REPORTING THYROID FINE NEEDLE ASPIRATES

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## ABSTRACT
Thyroid is one of the largest endocrine organ in the body, situated in the anterior aspect of root of the neck. Enlargement of the gland is called goitre. Goitre could be diffuse, nodular or solitary. It occurs in various pathological processes including hyperplasia or benign and malignant neoplasia. Fine needle aspiration cytology (FNAC) is a minimally invasive and cost effective technique and is extremely useful in the management of majority of the thyroid lesions. It is a valuable adjunct to preoperative screening in the diagnosis of thyroid nodules and in most cases it can distinguish between neoplastic and non neoplastic lesions. To address the variability in terminology and other issues related to thyroid FNA, the National Cancer Institute proposed the six tiered "The Bethesda System for reporting of thyroid cytopathology"{TBSRTC}. This system represents a major step towards standardization and reproducibility of Thyroid FNA reporting, clinical significance and predictive value of thyroid FNA.

**KEYWORDS:** The Bethesda System for reporting of thyroid cytopathology.

## AIMS AND OBJECTIVES
1. To report thyroid FNA using the Bethesda system of reporting.
2. To review the distribution of diagnoses categories with a variable risk of malignancy, thus improving the clinical management of patients with thyroid lesions, and to analyse the histopathological correlation after using TBSRTC.

## MATERIALS AND METHODS
A Prospective study was done during the period from April 2011 - September 2012, in the Department of Pathology, Gandhi Hospital. A total number of 200 cases were studied. For this study, data was collected from all the patients sent for FNAC of thyroid to the Department of Pathology, Gandhi Hospital.

## RESULTS
TBSRTC reduces interobserver variability and brings out the uniformity in diagnostic terminology in reporting thyroid FNA's.

TBSRTC is an evidence based standard classification system with good reproducibility. In the present study, Benign lesions (Category II) were predominated, majority of the lesions were constituted by Hashimoto's thyroiditis and benign follicular nodule, thus preventing unnecessary surgical intervention

Papillary carcinoma was the most common malignancy in the present study. Early diagnosis by FNA and surgical resection improves the prognosis of patients.

## INTRODUCTION
Thyroid is one of the largest endocrine organ in the body, situated in the anterior aspect of root of the neck. Enlargement of the gland is called goitre. Goitre could be diffuse, nodular or solitary. It occurs in various pathological processes including hyperplasia or benign and malignant neoplasia. It may result in only cosmetic disfiguration or may be associated with symptoms of hypothyroidism or hyperthyroidism. Identifying the cause of goitre and differentiating the benign and the malignant lesions are important in the management of the patients.

Various investigation modalities like FNAC, Ultrasonography, Radionucleotide scan, Computerized Tomography, Thyroid function tests are used in the diagnosis of the thyroid lesions.

Fine needle aspiration cytology (FNAC) is a minimally invasive and cost effective technique and is extremely useful in the management of majority of the thyroid lesions. It is a valuable adjunct to preoperative screening in the diagnosis of thyroid nodules and in most cases it can distinguish between neoplastic and non neoplastic lesions. Its greatest merit is to substantially differentiate between the benign and malignant lesions.

In clinical practice, it is recommended that ultrasound guidance should be sought after a failed manual thyroid FNA, in small nodules (less than 15mm in diameter), in deep seated non-palpable nodules, in lesions that are located in difficult-to-access locations, in nodules with extensive cystic change, fibrosis or calcification. Ultrasound guidance is also helpful in directing the needle to solid portions of the nodules with variable consistencies thus reduces the need for repeat FNAs.

The current state of art for FNA thyroid is characterised by numerous competing reporting systems using diagnostic terminology and variable number of diagnostic criteria, thereby causing a discordance amongst clinicians and pathologists

To address the variability in terminology and other issues related to thyroid FNA, the National Cancer Institute proposed the six tiered "The Bethesda System for reporting of thyroid cytopathology"{TBSRTC}. This system represents a major step towards standardization and reproducibility of Thyroid FNA reporting, clinical significance and predictive value of thyroid FNA. TBSRTC is based on extensive review of published literature on thyroid cytology and thus can be considered an evidence based classification system.

**AIMS OF THE STUDY**

1 To report thyroid FNA using the Bethesda system of reporting
2 To review the distribution of diagnoses categories with a variable risk of malignancy, thus improving the clinical management of patients with thyroid lesions.
3 To analyse the histopathological correlation after using TBSRTC.

**MATERIALS AND METHODS**

A Prospective study was done during the period from April 2011 - September 2012, in the Department of Pathology, Gandhi Hospital. A total number of 200 cases were studied. For this study, data was collected from all the patients sent for FNAC of thyroid to the Department of Pathology, Gandhi Hospital.

The patients consent was obtained for the study. Data was collected from the patients by personal interview. Local examination of Thyroid gland was done. Each patient was subjected to ultrasound evaluation by linear high frequency probe (5 to 12 MHz transducer) in the department of Radiology, Gandhi Hospital. Conventional FNAC was done in all the patients after the procedure was explained to them, using imaging guidance wherever necessary. FNAC was done under aseptic precautions using 22- gauze needle with patient in supine with neck extended. On an average, 2 -3 passes were made per nodule. In some cases aspiration technique was used. The aspirate was then expressed on clean glass slide and fixed by air dry and 95% alcohol accordingly. The smears were then stained with Haematoxylin and Eosin (H&E), Papanicolaou, and Giemsa stains.

Whenever fluid was obtained, all the contents were aspirated using a syringe attached to the aspiration needle. Macroscopic examination of the fluid was done and centrifuged. Smears were made from the sediment and stained by the stains described earlier. Reaspiration of residual mass was done.

All the cytologic smears were reported based on The Bethesda system and divided into 6 major categories[1]. Recommended cases were then followed up. In case of surgery, the specimen was received in 10% formalin and allowed to fix for 24 hours. Detailed gross examination was done and bits were given. Paraffin embedded H&E stained sections were obtained and studied under light microscopy.

The results were compiled and compared with the literature.

The Bethesda System for Reporting Thyroid Cytopathology; recommended diagnostic categories.

**I. Nondiagnostic or Unsatisfactory**
**II. Benign**
**III. Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance**
**IV. Follicular Neoplasm or Suspicious for a Follicular Neoplasm** specify if Hürthle cell (oncocytic) type (FN/SFN)
**V. Suspicious for Malignancy**
**VI. Malignant**

**Table: 1- The Bethesda system for reporting cytopathology: Implied risk of malignancy and recommended management.**

| DIAGNOSTIC CATEGORY | RISK OF MALIGNANCY (%) | USUAL MANAGEMENT |
|---|---|---|
| Non Diagnostic or Unsatisfactory | 1-4 | Repeat FNA with Ultra sound guidance |
| Benign | 0-3 | Follow up |
| Follicular lesion of Undetermined | 5-15 | Repeat FNA |

| | | |
|---|---|---|
| Significance/ Atypia of Undetermined Significance | | |
| Follicular Neoplasm or Suspicious for Follicular neoplasm | 15-30 | Surgical Lobectomy |
| Suspicious for Malignancy | 60-75 | Near total thyroidectomy |
| Malignancy | 97-99 | Near total thyroidectomy or Surgical Lobectomy |

## RESULTS

### Age distribution

Age group of the cases referred for thyroid aspirations ranged from 12 years to 80 years with mean age being 33.8 years. The lesions in the age group of 11-20 years were 16 cases( 08 %), 21- 30 years were 54 cases (27 %), 31- 40 years were 66 cases (33%), 41- 50 years were 36 cases (18%), 51- 60 years were 14 cases (07 %), 61- 70 years were 11 cases (06 %), 71 –80 years were 02 cases (01%).

### Sex distribution

Majority of the cases were females accounting for 180cases (90%) out of 200 cases. Male were 20cases (10 %).

**Table: 2- Table showing different clinical features with number of cases**

| FEATURE | | NO OF CASES (%) |
|---|---|---|
| Presentation | Diffuse | 91 (45.5) |
| | Nodular | 109 (55.5) |
| Pain | 28 (14) | |
| Pressureffects | 36 (18) | |
| Hypothyroidism | 38 (19) | |
| Hyperthyroidism | 08 (04) | |
| Consistency | Soft | 03 (1.5) |
| | Firm | 166 (88) |
| | Hard | 02 (01) |
| | Cystic | 08 (04) |
| | Variable | 20(10) |

### Ultrasonograhy

In the present study, ultrasound evaluation was done in all the cases. Iso echoic lesions were seen in 87 cases (43%), hypoechoic lesions in 28 cases (14 %), hyperechoic lesions in 12 cases (06%).

### Nature of aspirate

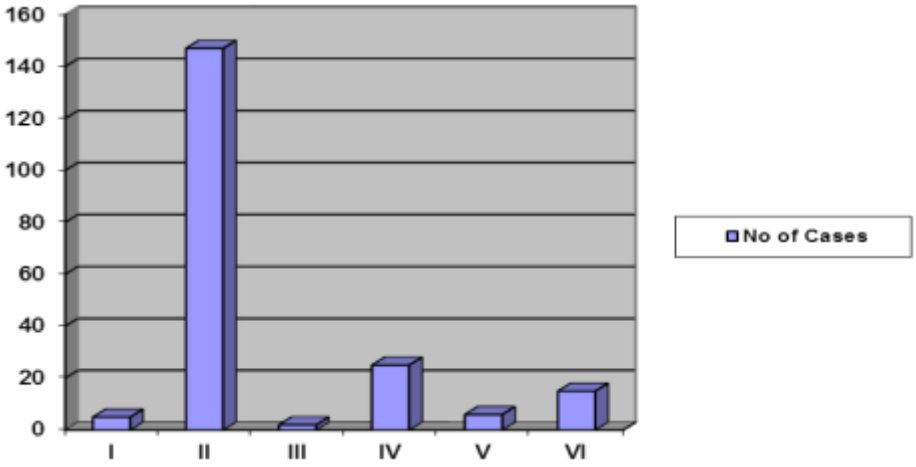
Aspirate was bloody in 163cases (82 %), colloid was aspirated in 23 cases (11 %), blood mixed colloid in 14 cases (07 %).

### Distribution of Categories by cytologic diagnosis

The distribution of the categories from 200 cases was as follows: 2.5% unsatisfactory, 73.5% benign, 1% indeterminate, 12.5% FN, 3% suspicious for malignancy, 7.5% malignant.

**Table: 3- Distribution of no of cases in each category**

| CYTOLOGIC CATEGORY | NO OF CASES (%) |
|---|---|
| I (Non Diagnostic/ Unsatisfactory) | 05 (2.5%) |
| II (Benign) | **147 (73.5%)** |
| III (FLUS/ AUS) | 2 (01%) |
| IV (FN / SFN) | 25 (12.5%) |
| V (Suspicious For Malignancy) | 06 (03%) |
| VI ( Malignancy) | 15 (7.5%) |
| TOTAL CASES | 200 |




**Graph: 1- Distribution of no of cases in each category in the present study**

**Table: 4- Distribution of lesions in each category in the present study**

| CATEGORY | TOTAL NO OF CASES | LESION | NO OF INDIVIDUAL LESIONS |
|---|---|---|---|
| I | 05 | | |
| II | 147 | Hashimoto's thyroiditis | 70 |
| | | Benign follicular nodule | 56 |
| | | Graves disease | 04 |
| | | Granulomatous thyroiditis | 01 |
| | | Colloid cyst | 15 |
| | | Acute suppurative thyroiditis | 01 |
| III | 02 | | |
| IV | 25 | Follicular neoplasm | 22 |
| | | Suspicious of follicular neoplasm | 03 |
| V | 06 | Suspicious of papillary carcinoma | 05 |
| | | Suspicious of medullary carcinoma | 01 |
| VI | 15 | Papillary carcinoma | 09 |
| | | Medullary carcinoma | 02 |
| | | Anaplastic carcinoma | 03 |
| | | Lymhoma | 01 |

Of the total 200 patients, 68 cases underwent thyroidectomy. The distribution of diagnoses of patients that underwent surgery was as follows: 40% unsatisfactory, 20.4% benign, 80% FN, 66.6% suspicious, 80% malignant.

In surgical follow up, out of 20 cases of follicular neoplasm, 3 cases proved to have papillary carcinoma, 17 cases were follicular adenoma. Out of 4 cases of suspicious for malignancy, one case was proved to have follicular adenoma which is benign.[5]


**Figure 1: Hashimoto's Thyroiditis- Gross showing soft grey white areas**


**Figure 2: MNG- Gross showing multinodular lesion with cystic and mucoid degeneration**


**Figure 3: PTC- Gross showing multiple grey white areas**

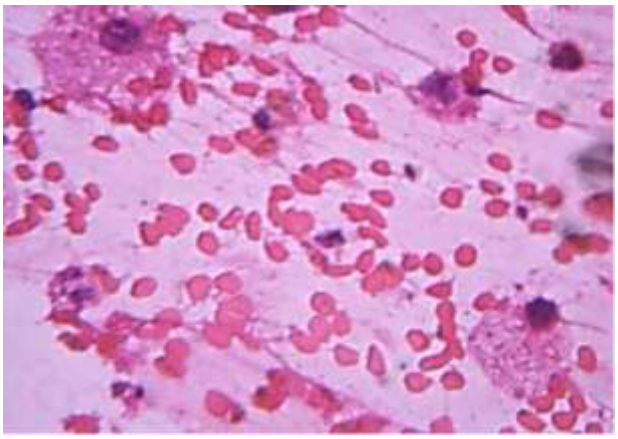


**Figure 4: Unsatisfactory- smear shows only cyst macrophages in haemorrhagic background. H & E- 40x**

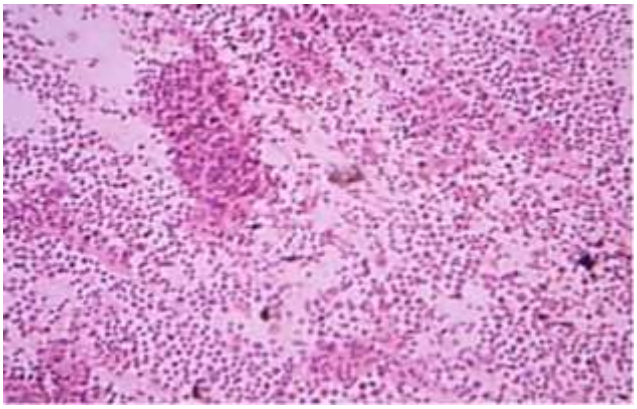


**Figure 5: Benign- Hashimoto's thyroiditis: Smear shows hurthle cells, lymhocytic infiltration. H & E- 10x**

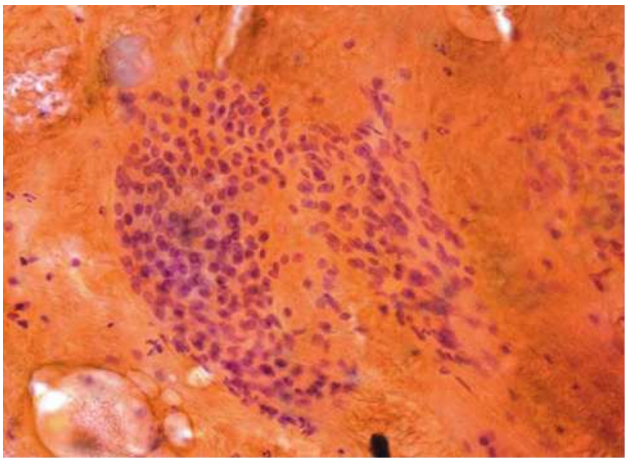


**Figure 6: AUS- Smear shows follicular cells showing nuclear pseudoinclusions with occasional grooving with rest of smear was benign. Pap- 40x**

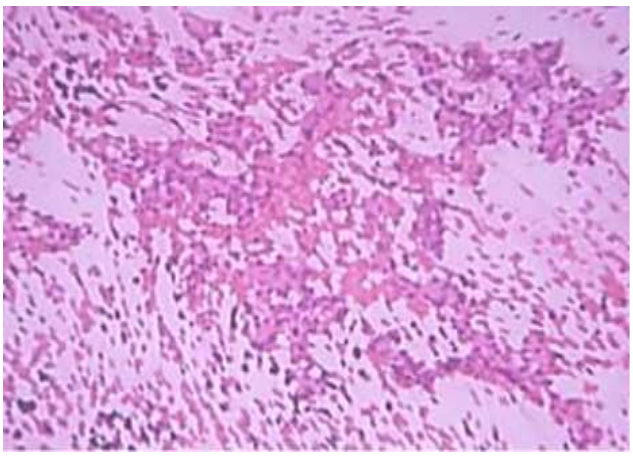


**Figure 7: SFM- PTC: Smear shows pseudopapillary pattern with pseudonuclear cytoplasmic inclusions. H & E- 10x**

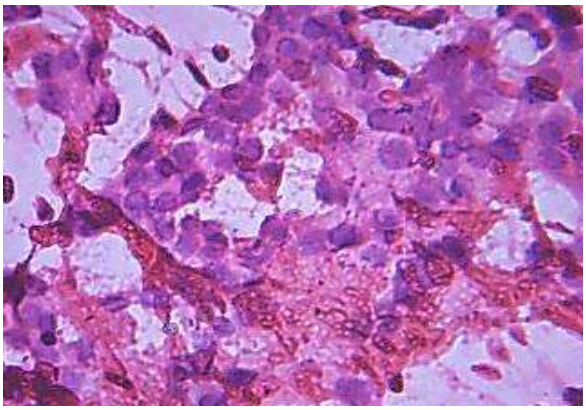


**Figure 8: SFM- PTC: Smear shows follicular cells with pseudonuclear cytoplasmic inclusions. H & E- 10x**

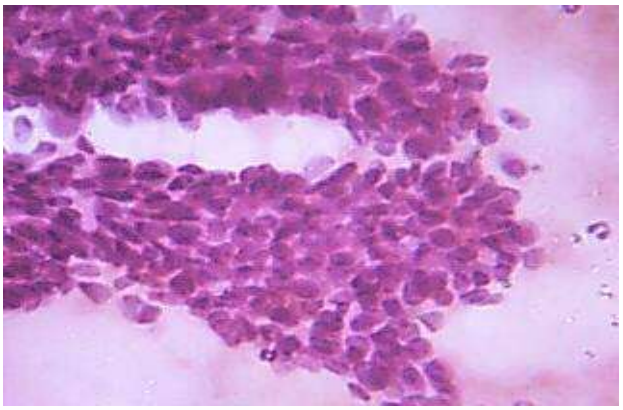


**Figure10: PTC- Smear shows papillary pattern of follicular cells with nuclear grooving. H & E- 40x**

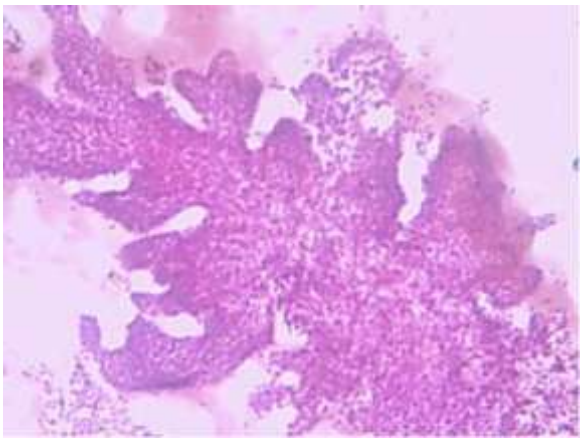


**Figure 9: PTC- Smear shows papillary pattern of follicular cells. H & E- 10x**

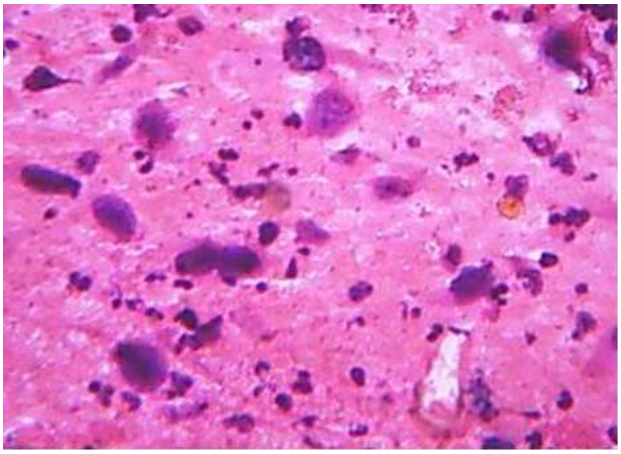


**Figure 11: ATC- Smear shows highly pleomorphic cells. H & E-10x**

In surgical follow up, results of percentage of malignancy in the present study were similar in category of malignant, comparable in category of suspicious for malignancy of Theoharis et al study.

**Table: 5- showing comparision of surgical follow up in each category with other study**

| STUDY | | CATEGORY | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI |
| Present study | No. of cases | 5 | 147 | 2 | 25 | 6 | 15 |
| | Surgical intervention | 2 | 30 | - | 20 | 4 | 12 |
| | Malignancy on HPE | 0 | 0 | - | 3 | 3 | 12 |
| | Malignancy on HPE % | 0 | 0 | - | 15 | 75 | 100 |
| Theoharis et al | No.of cases | 230 | 1799 | 89 | 166 | 39 | 145 |
| | Surgical intervention | 25 | 82 | 27 | 102 | 30 | 112 |
| | Malignancy on HPE | 8 | 8 | 13 | 35 | 26 | 112 |
| | Malignancy on HPE % | 32 | 10 | 48 | 34 | 87 | 100 |

## CONCLUSION

FNA of thyroid lesion is a safe, simple, cost effective and accurate method for management of thyroid lesions. FNA classifies non-neoplastic and neoplastic lesions. FNAC helps in making decision for an appropriate line of management and decreases the number of unnecessaray surgeries. TBSRTC reduces interobserver variability and brings out the uniformity in diagnostic terminology in reporting thyroid FNA's. TBSRTC is an evidence based standard classification system with good reproducibility. In the present study, Benign lesions (Category II) were predominated, majority of the lesions were constituted by Hashimoto's thyroiditis and benign follicular nodule, thus preventing unnecessary surgical intervention. Papillary carcinoma was the most common malignancy in the present study. Early diagnosis by FNA and surgical resection improves the prognosis of patients. For patients with an indeterminate thyroid FNA, benefit

may be obtained from repeat thyroid FNA in the absence of clinical and or radiologic concerns of an underlying malignancy. The percentage of malignancy in each category was well correlated with the implied risk of malignancy as proposed by TBSRTC

Histopathology was well correlated in surgically resected specimens thus recommended management as proposed by TBSRTC is an efficient system in guiding the clinicians in the management of patients.

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