



A comparative study between conventional system and the Bethesda system applied for reporting thyroid cytopathology

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Abstract

Aim and objectives: To compare the conventional and the Bethesda system for reporting thyroid cytopathology (TBSRTC), to correlate the cases with histology wherever available and to determine the sensitivity, specificity and false positive rates of both the methods.

Material and methods: A Total of 240 patients who presented with thyroid gland swelling were subjected to thyroid fine needle aspiration cytology (FNAC) and the smears were made followed by H&E staining and reporting was done. The conventional system used at our centre includes description of microscopic findings of the case along with an impression at the end. The categorization according to the Bethesda system of reporting thyroid cytology were done using criteria published in the atlas and related literature. The cytological diagnosis was correlated with the histological diagnosis wherever it was available. The sensitivity, specificity, false positive rates were calculated considering cytology as screening test for differentiating between neoplastic and non-neoplastic lesions.

Results: When the results of the conventional system were compared with the Bethesda adapted method was found to be more superior. Sensitivity of Bethesda system was significantly high (100%) as compared to conventional system (77%). Specificity of Bethesda system was also significantly high (82.5%) as compared to conventional system (69%).

Conclusion: Our findings were consistent with others who used the Bethesda cytopathology reporting system.

Key words

Thyroid swelling, Thyroid cytology classification systems, Fine needle aspiration technique, Bethesda system.

Introduction

Fine needle aspiration cytology (FNAC) has been widely accepted as diagnostic procedure of choice in the evaluation of patients presenting with non-toxic thyroid nodules [1, 2]. The technique is a safe, minimally invasive, easily performed with minimal patient discomfort, efficient, and an excellent cost-effective method of evaluating thyroid lesions [3, 4]. Its main purpose is to provide rational approach to management and to determine the correct surgical procedure when it is required. A standardized categorical system for FNAC reporting can make results easier to understand for clinicians and give clear indications for therapeutic action [5, 6].

Aim and objectives

- To compare the conventional and the Bethesda system for reporting thyroid cytopathology (TBSRTC).
- To correlate the cases with histology wherever available.
- To determine the sensitivity, specificity, and false positive rates of both the methods.

Material and methods

A prospective study was conducted on 240 smears of thyroid swellings which were sent for fine needle aspiration to the Department of Pathology from August 2013 to July 2014 and the Bethesda system for reporting thyroid cytopathology was followed in comparison to the old conventional reporting system. Histopathology was used as a gold standard to compare the sensitivity of both systems.

Conventional method

As per conventional method of reporting, the cases were diagnosed and placed under the following categories [5, 7].

- **Non diagnostic/ Unsatisfactory:** when smears were hemorrhagic or containing less than six groups of well-preserved follicular cells on each of at least two slides.
- **Colloid cyst:** When follicular cells, thin or thick colloid in the background and hemosiderin laden macrophages were seen in the smears. (**Photo – 1, Photo – 2**)
- **Colloid goitre:** When smears contained follicular cells with abundant thick colloid in the background. (**Photo – 3, Photo – 4**)
- **Follicular lesions/ Neoplasm:** When smears contained many follicular cells without or scanty colloid in the background or when smears contain predominant population of Hurthle cells, the differential diagnosis would include hyperplastic adenomatoid nodule with Hurthle cell change, Hurthle cell adenoma, and Hurthle cell carcinoma.
- **Indeterminate smears:** When smears containing cells with findings that were not clearly benign but were not diagnostic of a neoplasm or malignant lesions.
- **Suspicious for malignancy:** Suspicious when aspirates suggested a follicular neoplasm, i.e., hyper cellular sample with scant colloid and a significant proportion of microfollicles, trabeculae, or crowded overlapping

clusters of follicular cells (also includes lesions consisting of oncocytic (Hurthle cell) neoplasm).

- **Malignant lesions:**
 - Papillary Carcinoma
 - Medullary carcinoma
 - Anaplastic Carcinoma
 - Lymphoma
 - Metastatic

TBSRTC

The same cases were re-screened and reported as per the Bethesda system of reporting having the following six categories [8].

- **Non diagnostic/ Unsatisfactory:** Cyst fluid only virtually a cellular specimen other (obscuring blood, clotting artifact, etc). For a thyroid FNA specimen to be satisfactory for evaluation (and benign), at least six groups of benign follicular cells were required, each composed of at least 10 cells [9, 10].
- **Benign:** Consistent with a benign follicular nodule (includes adenomatoid nodule, colloid nodule, etc). (Photo – 5, Photo – 6, Photo – 7) Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context. (Photo – 8, Photo – 9, Photo – 10) Consistent with granulomatous (sub acute) thyroiditis and others.
- **Atypia of undetermined significance (AUS)/ Follicular lesion of undetermined significance:** An AUS result was obtained in 3% to 6% of thyroid FNAs [11, 12].
- **Follicular neoplasm/ Suspicious for a follicular neoplasm:** Specify if Hurthle cell (oncocytic) type.
- **Suspicious for malignancy:** Suspicious for papillary carcinoma, suspicious for medullary carcinoma, suspicious for

metastatic carcinoma, suspicious for lymphoma.

- **Malignant:** Papillary thyroid carcinoma, Poorly differentiated carcinoma, Medullary thyroid carcinoma, Undifferentiated (anaplastic), Squamous cell carcinoma. Carcinoma with mixed features (specify), Metastatic carcinoma, Non-Hodgkin lymphoma, and others. (Photo – 11, Photo – 12, Photo – 13, Photo – 14)

Histopathological diagnosis of patients who had undergone surgery was used as the gold standard for correlation with the cytological interpretations.

Results

Distribution of cases as per conventional method of reporting was as per **Table – 1** and **Graph – 1**. Distribution of cases as per Bethesda system of reporting was as per **Table – 2** and **Graph – 2**.

Statistical analysis

The sensitivity, specificity and diagnostic accuracy were calculated considering thyroid FNA as a 'screening test'. FNA specimens interpreted as benign were considered to be true negative samples and the remaining categories were considered to be true-positive samples because they led to a recommendation of surgery. The false-positive category included cases that were diagnosed as malignant but which were confirmed as benign on histopathological evaluation. The false-negative cases included those diagnosed as benign on FNA but confirmed as malignant on histopathology.

Conventional method

- Sensitivity - 77%



- Specificity - 69%
- Positive predictive value - 37%
- Negative predictive value - 93%

Bethesda system of reporting

- Sensitivity - 100%
- Specificity - 82.5%
- Positive predictive value - 45%
- Negative predictive value - 100%

Discussion

Thyroid nodules are a common clinical problem and FNAC of the thyroid is the key preoperative investigation of thyroid lesions. Fortunately, the vast majority of nodules are benign, but when they are discovered, an assessment regarding the need to exclude malignancy using FNA must be performed [8]. It helps to determine whether surgical removal of a detected nodule is recommended or not. The data shows that, introduction of the new simplified Bethesda thyroid reporting system into six categories logically relates to the prognosis of thyroid diseases and may increase the reproducibility of diagnosis [13]. Each diagnostic category conveys specific risks of malignancy, which offers guidance for patient management [14]. The reporting is based upon number of stepwise descriptions.

The Bethesda system for reporting thyroid cytopathology is a standardized reporting system for classifying thyroid fine-needle aspiration results comprising of 6 diagnostic categories with unique risks of malignancy and recommendations for clinical management like

- Non diagnostic
- Benign
- Aspirates of atypia/follicular lesion of undetermined significance
- Follicular neoplasm/suspicion for a follicular neoplasm

- Suspiciously malignant aspirates
- Malignant aspirates [5, 6, 10, 15].

The vast array of diagnostic nomenclature currently in use can usually be made to fit into these systems and thus easily explained to clinicians. The sensitivity and negative predictive values of our study proved to be 100% with no false positive results and high (82.5%) specificity with low false negative values. When compared with similar studies we found that our findings were consistent with the study of Wong, et al. [15]. Other studies like Gharib, et al. [16] and Yassa L, et al. [11] which was conducted on 731 and 268 cases respectively also showed that by adopting the Bethesda system of reporting, a higher level of sensitivity (99.3% and 98.6%) can be achieved which were also supporting our study as per **Table - 3**.

Conclusion

Adapting the Bethesda system of reporting has lead to a high sensitivity and high negative predictive values. Data support FNAC as initial management. Inter observer variability is reduced by adopting Bethesda system of reporting. Use of Bethesda reporting system helps in the prognosis, management and minimizes the unnecessary surgical procedures for thyroid swellings [17]. The relative risk of malignancy is implicit in the proposed probabilistic classification.

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Table – 1: Distribution of cases as per conventional method of reporting.

Cytopathology	Numbers	Histopathology		Total
		Benign	Malignant	
Non-diagnostic /Unsatisfactory	26	Excluded	Excluded	26
Colloid goitre	100	95	05	100
Colloid cyst	32	30	02	32
Thyroiditis	10	09	01	10
Follicular lesions / Neoplasms	36	34	02	36
Indeterminate	10	08	02	10
Suspicious for malignancy	10	04	06	10
Malignant lesions	16	0	16	16
Totals	240	180	34	214

Graph – 1: Representing distribution of cases - Conventional method of reporting.

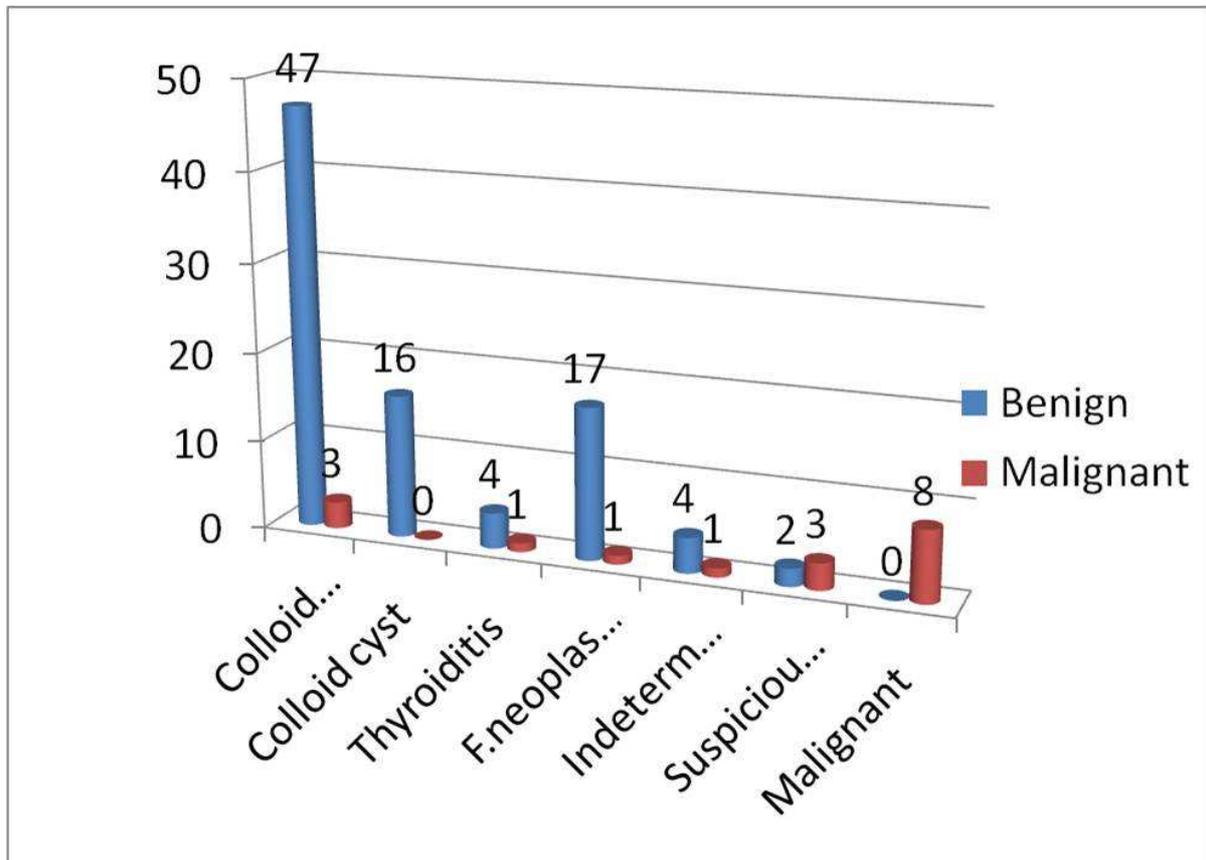


Table – 2: Distribution of cases as per Bethesda system of reporting.

Cytopathology	Histopathology		Total
	Benign	Malignant	
Non-diagnostic / Unsatisfactory	Nil	Nil	26
Benign	144	0	144
Follicular neoplasm / Suspicious for follicular neoplasm	28	2	30
Atypia of undetermined significance or follicular lesion of undetermined significance	4	4	8
Suspicious of malignancy	4	6	10
Malignant	0	22	22
Total	180	34	240

Graph – 2: Representing distribution of cases – Bethesda system of reporting.

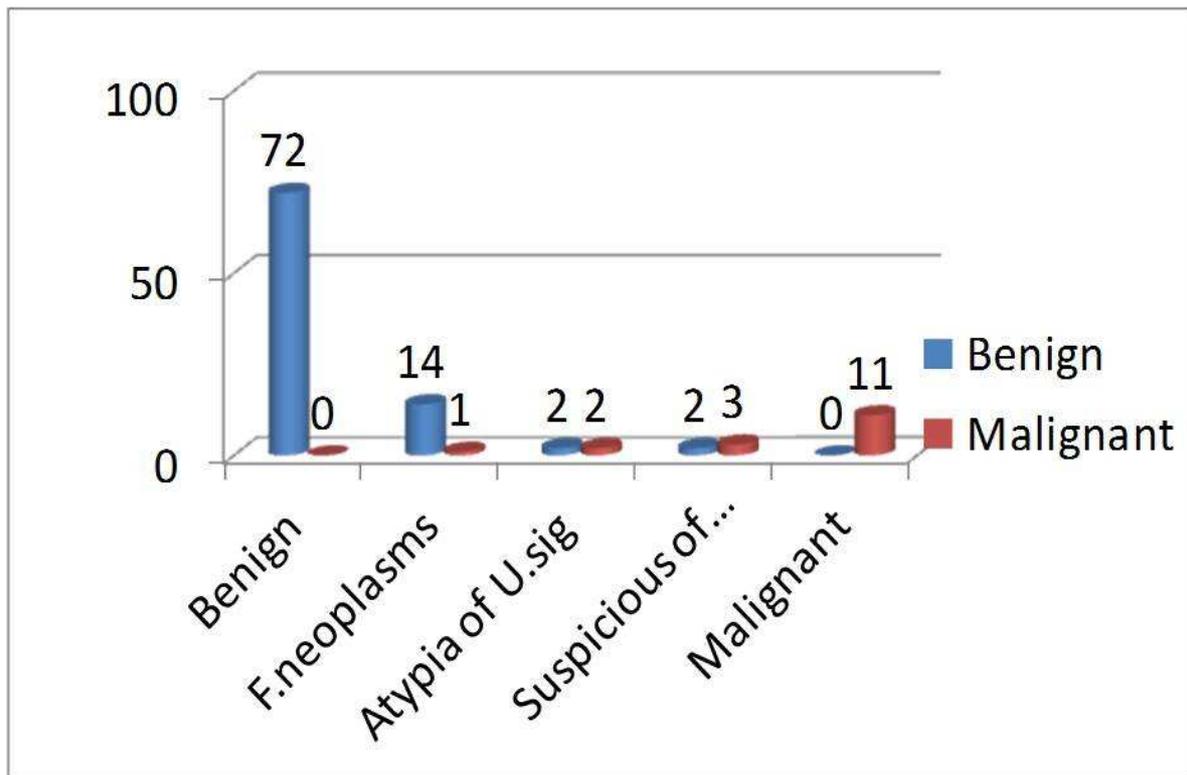


Table – 3: Comparative studies.

Various studies	Cases	Sensitivity	Specificity
Gharib, et al. [16]	731	99.3%	81.4%
Yassa, et al. [11]	268	98.6%	80%
Present study	240	100%	82.5%

Photo – 1: Colloid cyst (4X).

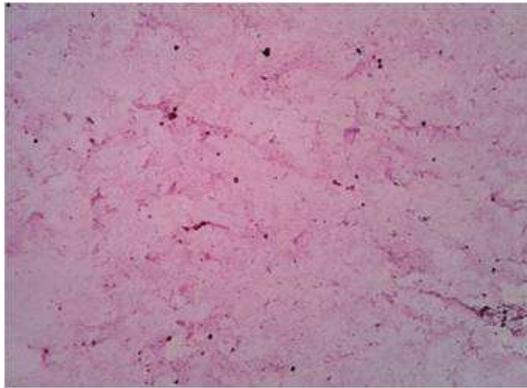


Photo – 5: Follicular adenoma of thyroid (Gross).



Photo – 2: Colloid cyst (10X).

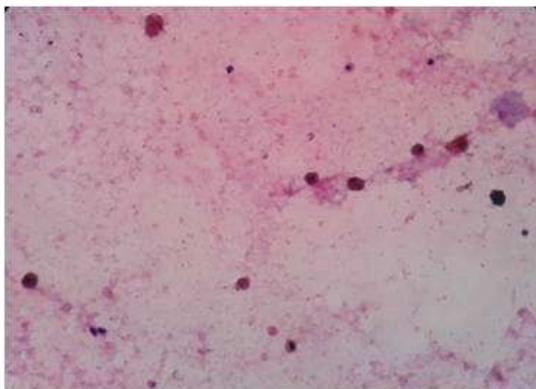


Photo – 6: Follicular adenoma of thyroid (4X).

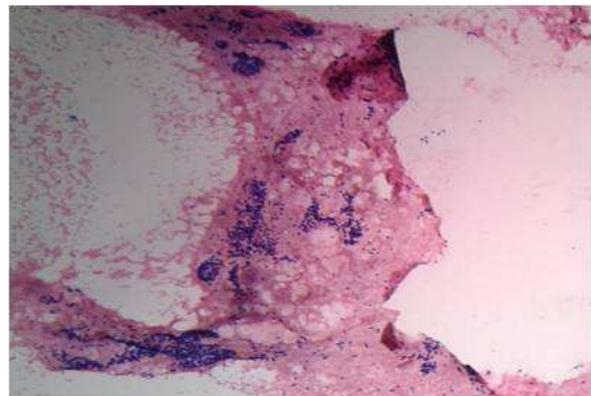


Photo – 3: Colloid goitre (4X).



Photo – 7: Follicular adenoma of thyroid (10X).

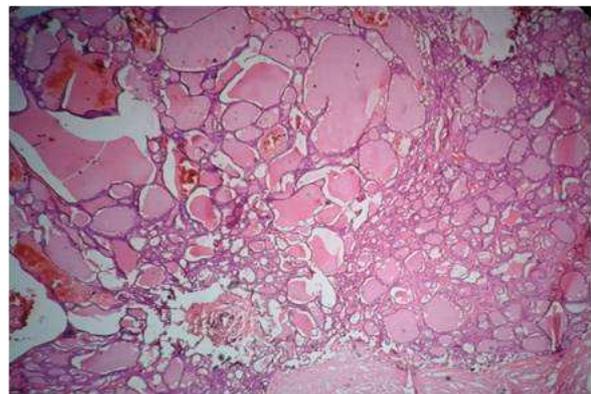


Photo – 4: Colloid goiter (10X).

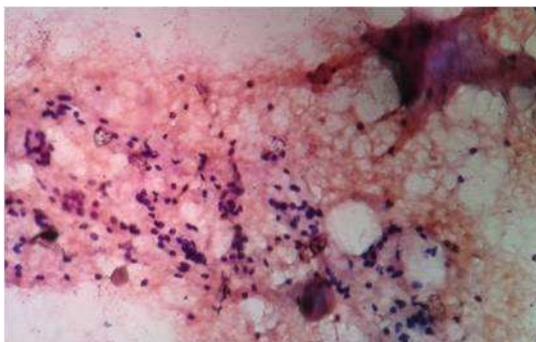


Photo – 8: Hashimoto thyroiditis (Gross).



Photo – 9: Hashimoto thyroiditis (4X).

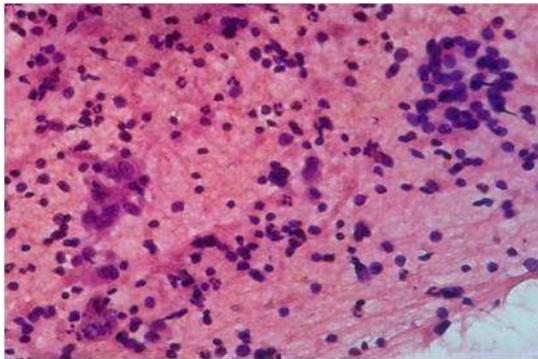


Photo – 12: Papillary carcinoma of thyroid (4X).

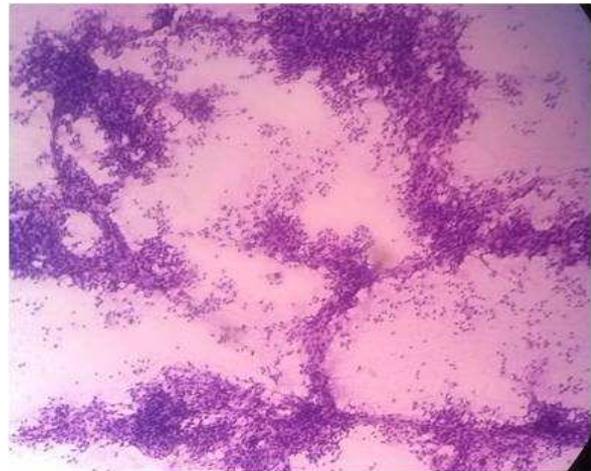


Photo – 10: Hashimoto thyroiditis (10X).

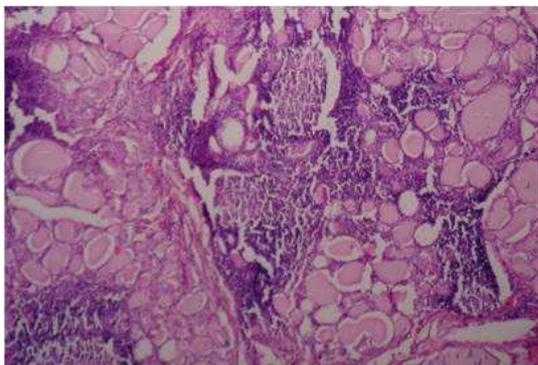


Photo – 13: Papillary carcinoma of thyroid (10X).

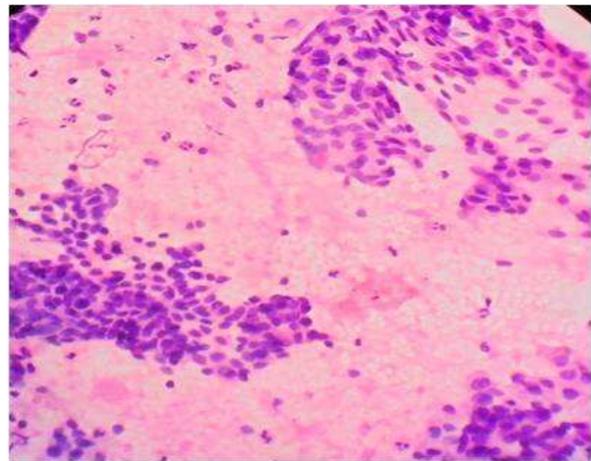


Photo – 11: Papillary carcinoma of thyroid (Gross)



Photo – 14: Papillary carcinoma of thyroid (40X).

