Section: Pathology

Original Research Article

CYTOMORPHOLOGICAL STUDY OF 96 THYROID LESIONS AIDED BY THE BETHESDA SYSTEM

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ABSTRACT

Background: The Bethesda system of reporting is a standard reporting system used for various thyroid lesions. It has 6 categories indicating each diagnostic criteria. The present study was to analyze various thyroid lesions and classify according to their various categories using the Bethesda system of reporting.

Materials and Methods: It is a retrospective study, of three years from 1stJanuary 2023 to 31stDecember 2025, totally accumulated 96 cases. All cases FNAC were done directly using the standard procedure protocol. The materials used were the 22 gauge needles, 2ml, 5ml syringes, Frazen handle, slides, ethanol and coplin jars.

Results: We have studied 96 cases in FNAC, followed by which some patients underwent surgery in our institution. Mean age was 48.1. Male to female ratio was 0.5: 2. Most common lesions were benign thyroid nodule (65%), which were done directly as they were palpable 3- 5cm (45%). 76% of the patients underwent hemi –thyroidectomy procedure. This study of FNAC reporting was done using the TBSRTC (2023), unsatisfactory/ non-diagnostic (9%), Benign (76%), Atypia of undermined significance (AUS) (3%), Follicular neoplasm (FN)/ Hurtle cell neoplasm (HCN)(6%). Suspicious for malignancy (SFM) (5%) and malignant (3%). Diagnostic values of TBSRTC were noted as sensitivity (96.36), specificity (87.79), positive predictive value (96.77), negative predictive value (71.72) and accuracy (96.66).

Conclusion: The reporting of thyroid lesions aided with the Bethesda system (2023) is an excellent method and mode of communication between the pathologist and clinician which benefits the patients from the treatment and prognosis point of view. This system prevents overlaps and confusion, hence its clear and uniform system world-wide in reporting all thyroid lesions hence aids in management and prognosis of the patient.

Keywords: Thyroid lesion, Bethesda system, Atypia.

INTRODUCTION

In International guidelines, high resolution ultrasonography and FNAC biopsy are recommended as the first line of evaluation in thyroid lesions.[1] FNAC plays an evolutionary role in the interpretation and evaluation of various thyroid lesions. Thyroid lesions are usually common worldwide when assessed clinically.[1] Majority of the thyroid lesions range from asymptomatic swellings to multi-organ involvement. Thyroid carcinomas mimic benign lesions on palpation. Therefore, thyroid profile and FNAC are important in interpretation. FNAC plays a vital role in diagnosis of various thyroid lesions.

The thyroid gland is an encapsulated organ. Fibro-collagenous tissue separates the thyroid gland cut section into lobules composed of several follicles which are filled with acidophilic colloid. Each thyroid follicle measures approximately about 200 microns with considerable variation in sizes. Each follicle is usually lined by a single layer of low cuboidal epithelium. The follicular cells synthesize and secrete hormones. Aspiration of the thyroid gland displays follicular cells, cellular and non-cellular material. Thyroid follicular cells comprise most of the cellular elements. Thyroid follicular cells are arranged in sheets, clusters, follicles, papillary pattern and in singles.

Previously used terminologies caused miscommunication between surgeons, pathologists and radiologists. To avoid confusion, the Bethesda system of reporting thyroid lesion (2023) was introduced. This was a standardized system with six general diagnostic categories and clear categorical nomenclature including malignancy risks.[3] The categories and risk of malignancy for I – Non-diagnostic, II – Benign, III- Atypia of undetermined significance (AUS)/Follicular lesion of undetermined significance (FLUS), IV – Follicular neoplasm (FN)/Suspicious for follicular neoplasm(SFN), V – Suspicious for malignancy(SM), and VI – Malignant.[4] The use of FNAC resulted in a decrease in number of patients who underwent surgical treatment by 30%, while increasing the percentage of malignant results in the operated group of patients.[5] The objectives of the study is to look at the cytological findings in various thyroid lesions and to classify them in various categories under the Bethesda System of Thyroid (2023).

MATERIALS AND METHODS

It is a retrospective study, conducted in the Department of Pathology, BGS GIMS Medical College and hospital, Kengeri. Study duration is 3 years and ethics committee approval was taken.

Inclusion Criteria

Thyroid swelling cases that underwent FNAC followed by surgical removal and specimen were processed for histopathology in our medical college.

Exclusion Criteria

Comatose patients and children less than two years.

Methodology

During the period of three years, 96 patients underwent thyroid FNAC followed by 69 patients who underwent hemi-thyroidectomy

Mean age was 47.1 years. Male: Female ratio was 0.5:2. Most frequent indication for FNAC was thyroid nodule (65%). 69 patients underwent hemi-thyroidectomy procedure.

Cases having neck swelling other than thyroid. FNAC smears interpreted as non-diagnostic. Histopathology reports were not available.

A detailed clinical history was taken, along with written and informed consent. The thyroid swelling was examined for site, size, and consistency. After assessing the swelling, and nature of aspirate, smears were examined under light microscope. In cases of non-palpable lesions, ultrasound guided FNAC was referred after explaining the procedure and written consent taken. Slides were air dried and stained with May Grunwald Giemsa (MGG) and Harris Haematoxylin and Eosin (H & E) and Papanicolaou(Pap) stains respectively. All thyroid FNAC reports were prepared as per The Bethesda System for reporting Thyroid cytopathology (TBSRTC) – (2023).

Surgical resected specimens received underwent standard procedure for histopathology reporting. The diagnostic values (sensitivity, specificity, positive predictive valve, negative predictive value and accuracy) and risk of malignancy for FNAC using the Bethesda system were calculated for cases with surgical follow – up. True negative cases were defined as nodules with benign FNAC and surgical pathology. Follicular neoplasm/ suspicious for follicular neoplasm, suspicious for malignancy, and malignant cases confirmed to be malignant upon final histopathology, were considered true suspicious for malignancy or malignant diagnosed as positive. False negative samples included cases with benign cytology that were found to be malignant upon histopathology reporting.

Statistical analysis was done using descriptive statistics. The present study initial FNAC reporting as per TBSRTC – (2023) was, unsatisfactory/ non-diagnostic(5%), Benign(78%), Atypia of undermined significance(AUS)(2%), Follicular neoplasm(FN)/Hurtle Cell Neoplasm (HCN) (7%), Suspicious for malignancy(SFM)(4%) and malignant(2%).

RESULTS

Table 1: General Characteristics

Characteristic	No. of Patients	Percentage
Age In Years(Mean -+Sd)	46.1 -+ 12.8	
Gender		
Male	22	24%
Female	70	76%
Indication For Fnac		
Nodule	59	64%
Goiter	30	33%
Other	03	03%
Nodules Size(Mean -+Sd)		
<1 Cm	13	14%
1 – 2 Cm	28	30%
2 – 4 Cm	42	46%
>4 Cm	09	10%
Surgery		
Total Thyroidectomy	21	23%
Hemithyroiectomy	69	72%

In present study, diagnostic values of TBSRTC were noted as sensitivity (96.38), specificity (88.89), and positive predictive value (98.76). Negative predictive value (72.72) and accuracy (95.65) respectively.

Sensitivity	**96.38**
Specificty	88.89
Positive Predictive Value	98.76
Negative Predictive Value	72.72
Accuracy	95.65

Table 2.1: Distribution of Thyroid Lesions According To the Bethesda (2023) Diagnostic Categories

Bethesda Diagnostic Categories	Number of Cases	Percentage
Unsatisfactory(Uns/Non-Diagnostic)	06	07%
Benign	72	78%
Atypia Of Undetermined Significance(Aus)	02	02%
Follicular Neoplasm/ Hurthle Cell Neoplasm(Hcn)	06	07%
Suspicious For Malignancy(Sfm)	04	04%
Malignant	06	06%

Table 3.1: Correlation of FNAC & Histopathological Diagnosis & Malignancy Rate

FNAC					HP Diagnosis			
Diagnostic Category	**No. of Cases**	**Benign**	**F/A**	**Hc Adenoma**	**F/C**	**PCT**	**HCN**	**Malignancy Rate (%)**
Nondiagnostic	06	05	01	00	00	00	00	00
Benign	72	66	05	00	01	00	00	1.38
Aus/Flus	02	01	00	00	01	00	00	50
Fn/Sfn	06	01	03	01	01	00	00	16.67
S/M	04	01	00	00	01	02	00	75
Malignant	06	00	00	00	03	02	01	100
Total	96	74	09	01	07	04	01	

Table 4.1: Clinical Presentation of Patients.

		Frequency	Percentage
Clinical Symptoms	Swelling of Gland	90	93.75%
	Tenderness	69	71.87%
	Voice Change	15	15.62%
	Difficulty In Swallowing	24	25%

We have analysed the clinical presentation of all the patients. Majority of the patients have swelling of the thyroid gland 90 cases (93.75%), and the least common symptom was voice change which accounts to 15 cases (15.62%). Majority of the cases have a combination of symptoms which needs to be evaluated carefully.

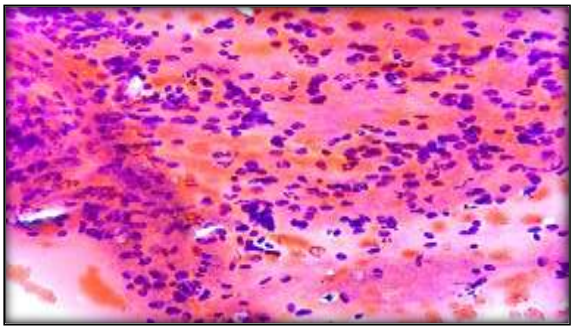

Figure 1.1: Photomicrograph of Lymphocytic Thyroiditis – Bethesda Category II

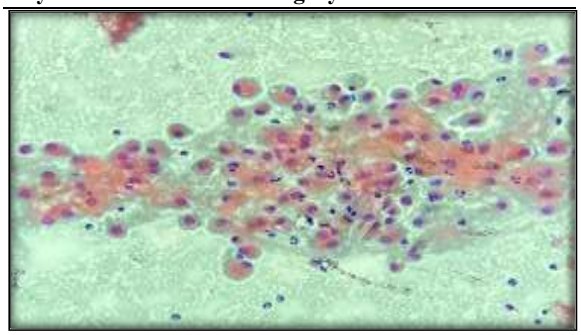

Figure 2.1: Photomicrograph of Hurthle Cell Neoplasm – Bethesda Category - IV

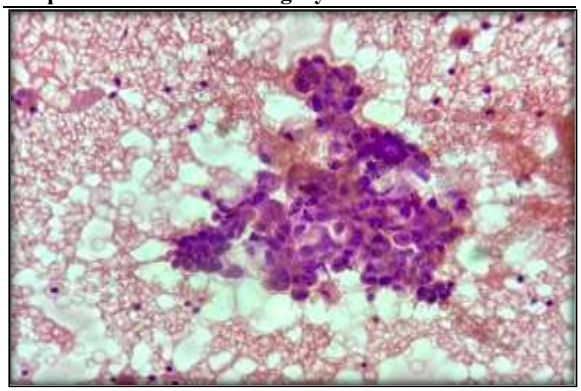

Figure 3.1: Photomicrograph of Papillary Thyroid Carcinoma Bethesda Category–VI

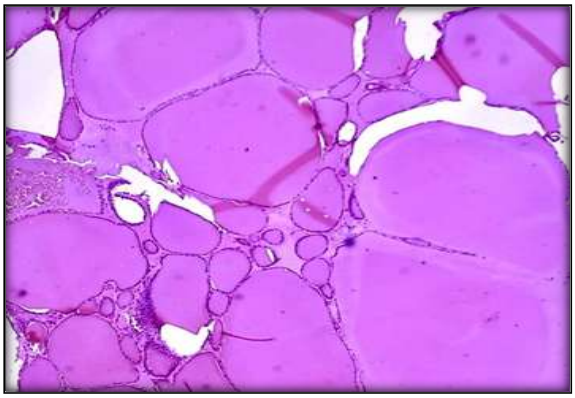

Figure 4.1: Photomicrograph of Nodular Colloid Disease Bethesda Category- II

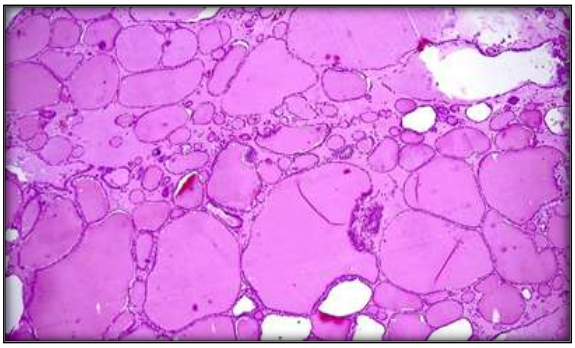

Figure 5.1: Photomicrograph of Sanderson Polsters Seen In Adenomatous Goitre - Bethesda Category- II

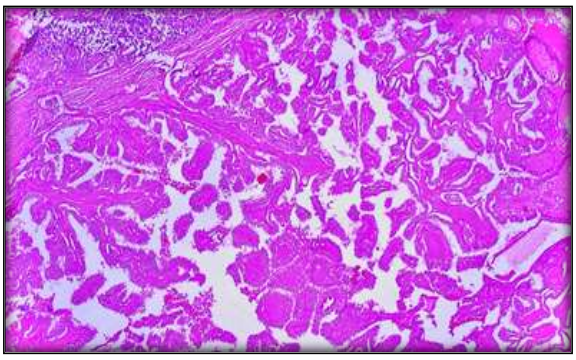

Figure 6.1: Photomicrograph of Papillary Thyroid Carcinoma – Bethesda Category - VI

Above are the following thyroid cytological and histopathological pictures of respective cases.

DISCUSSION

Thyroid swelling being diffuse or nodular should be investigated mainly to rule out the possibility of a neoplasm or thyroiditis. FNAC is usually the first line of investigation and other investigations such as ultrasound, thyroid profile, thyroid scan, and serology are done adjunctly with an aim to select the patients who require surgical management and those require medical management. Non- neoplastic lesions are more common in thyroid, such as goiter, thyroiditis and Graves' disease. Neoplastic lesions like follicular neoplasms, papillary carcinoma, and medullary carcinoma though less common may show overlapping clinical features with non-neoplastic lesions.[6]

Initial screening tests for thyroid lesions include ultrasound, thyroid antibody levels, and radionuclide scan are not confirmatory of the lesion unless each individual cell is studied. FNAC is considered as the best initial diagnostic test which assists to identify various thyroid lesions with accuracy. Therefore a detailed cytological evaluation and an integrated approach is necessary to diagnose according to the material and avoid unnecessary surgeries. Fine needle aspiration (FNA) is utilized as a pre-operative diagnostic technique which is safe, simple, and cost effective for triaging patients with thyroid nodules. It is preferred to operate only on those patients with lesions suspicious of cancer,

thereby avoiding unnecessary surgery and possible injury of the recurrent laryngeal nerve.

The cytological diagnosis of malignancy allows patients to be well aware that an operation for cancer is most likely, and a pre-operative staging procedure will be carried out. Incidence of malignancy at thyroidectomy has increased from 5 – 10 % to 30 – 50% over the past recent years, with the help of FNAC.(8,9) In this study, commonest age group was 31 – 40 years, with mean age of 48.1 -+12.8 years. Male to female ratio was 0.5: 2. Similar finding were noted in study done by Dimple et al.(10)with mean age of 37.2 years, with male to female ratio being 1:9. Shivani et al,[11] noted majority of the patients in the age group 31 – 40 years with mean age of 33.69 years, 86% females and 14% male, with male to female ratio being 1:6.14. In present study benign non-neoplastic lesions were more common than the malignant ones comprising 87%. Other studies had similar findings. In Choudhary et al. study, 90.0% of the cases were benign non- neoplastic lesions.[12] Mondal et al,[13] reported a lower percentage (1%) of AUS/FLUS cases which was a result of ultrasound guided FNAC so that aspirate can be obtained from exact site of lesion.

In a survey from the college of American Pathologists on trends in thyroid FNA, it was the second most common diagnosis after benign cases comprising 8.6% in 2016 in comparison to 7.7% 2011.[14,15] Accordingly, the frequency of AUS/FLUS category increased from 4% in the pre-TBSRTC period to 8% in the post TBSRTC period, even up to a 12% peak in the last analyzed year in an institutional study.[14,15]

In a study by Bhartiya R et al.,[16] the sensitivity specificity and diagnostic accuracy of FNAC in diagnosing thyroid lesions using BSRTC system was found to be 75%, 98.9%. and 97.1%, respectively. In study by RondlaMadhavi,[17] out of 280 cases, 64(22.86%) were of category I, 144(51.43%) were of category II, 11(3.93%) were of category III, 43(15.35%) were category IV, 09 (3.21%) were of category V, 09(3.21%) were category VI. Statistical analysis of this study showed that the 84.3%, 89.3% respectively. The positive predictive value and negative predictive value were 83% and 95% respectively.

Risk of malignancy(ROM) in study by Pattnaik K et al.,[18] was 0% for non- diagnostic, i.e Bethesda Category I, whereas ROM of 2,82%,47.62%, 10%, 100% and 100% was noted for Bethesda II, II, IV, V and VI respectively. Arul et al,[19] found risk of malignancy of 0.8% for benign category III, 28.9% for Category IV, 70.8% and 100% ROM for category III, V and VI.

Similar details were found in other studies. The main purpose of The Bethesda System for reporting Thyroid Cytopathology (TBSRTC)(2023) was to eliminate the ambiguity and follow uniformity in the reporting of thyroid FNAs thereby enabling easy of communication among pathologists and clinicians and to plan appropriate treatment for the patients.[4] The Bethesda system has an added advantage of predicting the risk of malignancy which enables the clinician to plan for follow-up or surgery and also the extent of surgery.

Challenges arise diagnostically when aspirated samples are quantitatively or qualitatively suboptimal to reliably exclude a neoplastic process. Other clinical findings such as TFT, USG correlations are immensely helpful. Significant interobserver variabilities have been reported in making diagnosis of AUS. The use of representative case materials, use of consensus review with cytopathological and histopathological correlation and providing individual feedback through quality assurance metrics and continuous educational sessions may help to improve the performance.[20]

CONCLUSION

The Incorporation of TBSRTC system (2023) in routine cytopathology FNAC reporting aids in better communication between pathologist and clinician, as each Bethesda category has specific malignancy risk and management protocols. The Bethesda system will thus allow a more standard and uniform method of reporting thyroid cytology, providing a clear and consistent management guidelines for the clinicians, hence preventing ambiguity in cytopathology reporting. Ultimately the surgeon depends on the pathologist report worldwide for treatment and better prognosis of the patient.

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