Our Experience

Thyroid Lesions : Cytomorphological Classification of Fine Needle Aspiration Cytology into Modified Bethesda System : A 3-Year Retrospective Study

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Gaurav Kumar,[1] Ritu Sharma,[2] Saurabh Kumar Jaiswal,[1] Desh Pal[1]

ABSTRACT

Introduction

Thyroid nodule is a common disorder found among the Indian population. Fine Needle Aspiration Cytology (FNAC) is a useful initial screening test for thyroid nodules. FNAC also avoids unnecessary surgery done in the case of benign thyroid nodules.

Materials and Methods

A retrospective study over three years (January 2019 to December 2021). All Thyroid nodule patients were sent for FNAC.

Results

A total of 160 totals were studied in three years. The Cytopathological diagnosis was made and categorization was done on basis of, The Bethesda System for Thyroid Cytopathology (TBSRTC).

Conclusion

FNAC is the most cost-effective, simple, rapid, and useful preliminary method of examination that leads to the diagnosis of thyroid lesions. TBSRTC is a very valuable, practical, and universally acceptable standardized system of reporting thyroid lesions that helps in assessing the risk of malignancy in each Category.

Keywords

Cytotolgy; Thyroidectomy; Thyroid Nodule

Thyroid disorder is the most common endocrinological problem prevalent in India came to ENT OPD.[1] Both benign and malignant thyroid disorders can present as thyroid nodules.[2] Fine Needle Aspiration Cytology (FNAC) is a useful initial screening test for thyroid nodules. It is cost-effective and a minimally invasive technique. FNAC also avoids the rate of unnecessary surgery done in the case of benign thyroid nodules.[3] As mentioned thyroid FNAC is a screening, not a diagnostic test for follicular patterned lesions because the distinction between benign & malignant lesions is based on a demonstration of invasive characteristics, that is tumor capsule and/or vascular invasion and the presence or absence of nuclear features of PCT, which are subjected to much observer variability in surgical specimens.[4] The Bethesda System for Thyroid Cytopathology (TBSRTC) was introduced in 2007 at the National Cancer Thyroid FNA State of Science Conference in Bethesda, Maryland.[5,6] TBSRTC used 6 categories for thyroid cytopathology reporting with each

1 - Department of E.N.T & Head and Neck Surgery, T.S. Misra Medical College and Hospital, Lucknow
2- Department of Pathology, T.S. Misra Medical College and Hospital, Lucknow

Corresponding author:
Dr Gaurav Kumar
email: kumargaurav.1014@gmail.com

category possessing a list of criteria.[7] Previously the use of different nomenclature and terminologies confused surgeons causing delay or misjudgment of planning proper management.[8] This was done to standardize a common internationally approved method of reporting, to minimize the chances of use of different ways of reporting, nomenclature, and terminologies used by cytopathologists all around the globe.[5,8] The present study is done to analyze the implementation of TBSRTC on thyroid lesions coming to our OPD in the last 3 years. (Table I)

Materials and Methods

This is a retrospective study on all the cases of thyroid nodules that presented to the OPD over three years (January 2019 to December 2021), who were sent for FNAC. FNAC done on post-thyroidectomy patients were excluded. All relevant demographic, clinical, and radiological data were collected from the medical records section and hospital information system (HIS). Histopathological reports of the patients, who had undergone Hemithyroidectomy and Total Thyroidectomy with or without Neck Dissection were also retrieved. Approval was taken by the ethical committee of the institution.

Results

A total of 160 cases were studied in three years (from January 2019 to December 2021). Out of these 160 cases, 101 (63.1%) cases were females, and the rest 59 (36.9%) were males. The male to female ratio in our study was 1:1.6. The youngest patient was 21-year old and the oldest was 79 years old. The maximum number of patients were in the age group of 31-40 years and the least number of cases were in the eldest age group i.e. 71-80 years (Table II).

Table I: Various categories of thyroid lesion in Modified Bethesda system.

DIAGNOSTIC CATEGORY	RISK OF MALIGNANCY IN %	USUAL MANAGEMENT
1. Non-diagnostic or unsatisfactory	1-4	Repeat test with USG
2. Benign	0-3	Clinical follow-up
3. Atypia or Undetermined significance/ Follicular lesions of undetermined significances (AUS/FLUS)	5-15	Repeat FNA
4. Follicular neoplasm or Suspicious for a follicular neoplasm.	15-30	Surgical lobectomy
5. Suspicious for malignancy	60-75	Near-total thyroidectomy or surgical lobectomy.
6. Malignant	97-99	Near-total thyroidectomy

Table II: Cases in different age groups

AGE GROUP (years)	NUMBER OF PATIENTS	PERCENTAGE (%)
20-30	10	6.25%
31-40	55	34.4%
41-50	48	30.0%
51-60	09	05.6%
61-70	30	18.7%
71-80	8	05.0%

The cytopathological diagnosis was made and categorization was done on basis of the latest Bethesda system of reporting. Acellular/haemorrhagic smears were in category I, benign lesions on cytology, and atypical lesions were kept in categories II & III respectively. Cases with hypercellular smears of follicular neoplasm on cytological smears were kept in category IV (Fig. 1a). Cases with pleomorphism and anisonucleosis on cytological smears were categorized into Category V (Fig. 1b) cases with clear malignant features were included in category VI. (Fig. 1c)

Of the total 160 cases, the maximum number of 112 (70.0%) cases were present in Category II assigned as the Benign group. 07 (4.4%) cases were in the Unsatisfactory/ Non-diagnostic Category, 06 (3.7%) cases in Atypia or Undetermined significance / Follicular lesions of undetermined significances, 10(6.4%) cases in Follicular neoplasm or Suspicious for a follicular neoplasm. 15 (9.4%) cases belonged to Suspicious for malignancy and 10 (6.4%) cases belonged to the malignant category. Unsatisfactory /Nondiagnostic has 07 cases out of which 05 (3.1%) cases were reported as acellular smears and the rest 2 (1.2%) cases were haemorrhagic. Out of 112 cases belonging to category II i.e., benign, the majority of 90 (56.2%) cases were diagnosed as nodular colloid goitre, 17 (10.6%) cases belong to Hashimoto's thyroiditis and 05 (3.1%) cases were reported as a hyperplastic nodule. Category III showed 06 (3.7%) cases in Atypia of undetermined significance/ Follicular lesion of Undetermined significance (AUS/FLUS). In Category IV, 07 (4.4%) cases in were reported as Follicular neoplasm and 03 (1.9%) cases were reported as Hurthle cell neoplasm. In Category V assigned as Suspicious for malignancy, all 15 (9.4%) cases were reported as Papillary carcinoma of the thyroid. Out of 10 cases of Category VI, 07 (4.4%) cases were Papillary Carcinoma Thyroid, 02 (1.25%) cases were Medullary Carcinoma Thyroid and 01 (0.62%) case was reported as poorly differentiated carcinoma. (Table III)

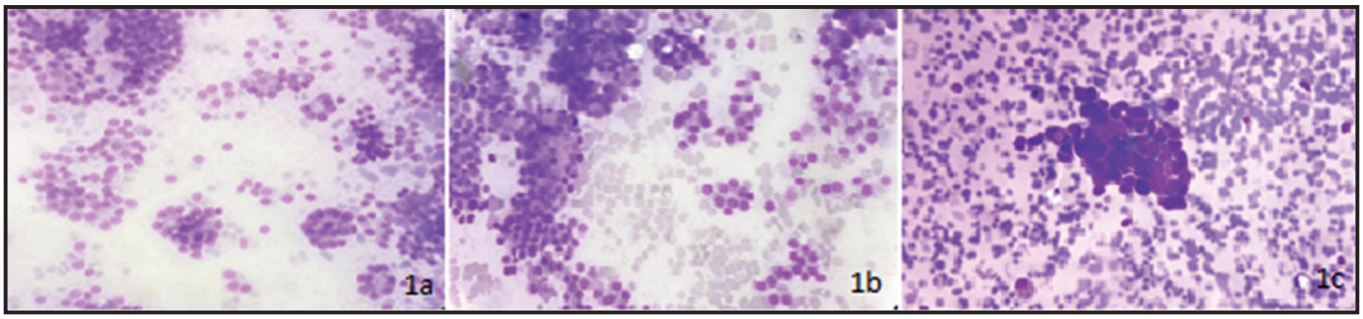

Fig. 1.(a) Follicular neoplasm showing micro follicles and macrofollicles (Cat IV) (MGG, 10X), (b) Clusters of polymorphic, polygonal, and plasmacytoid epithelial cells with focal anisonucleosis and oncocytic changes (Cat V) (MGG, 10X), (c) Papillary Carcinoma showing intranuclear cytoplasmic inclusion (Cat VI) (MGG, 40x).

Table III: Distribution of cases according to Modified Bethesda System.

CAT.	DIAGNOSTIC CATEGORY	CASES	PERCENTAGE (%)
I	Non-diagnostic	Acellular (05)	3.1%
		Hemorrhagic (02)	1.2%
II	Benign	Nodular colloid goiter (90)	56.2%
		Lymphocytic/ Hashimoto's (17)	10.6%
		Hyperplastic nodule (05)	3.1%
III	AUS/ FLUS	FLUS (06)	3.7%
IV	Follicular neoplasm/ Suspicious for Follicular neoplasm	Follicular neoplasm (7)	4.4%
		Hurthle cell neoplasm (3)	1.9%
V	Suspicious for malignancy	Papillary carcinoma (15)	9.4%
VI	Malignancy	Papillary carcinoma (07)	4.4%
		Poorly differentiated carcinoma (01)	0.62%
		Medullary carcinoma thyroid(02)	1.25%

Out of 160 cases, histopathology reports of only 42 cases could be retrieved. These were classified as benign or malignant. Out of these 42 cases, 33 cases were benign, and the rest 09 cases were malignant. A single case from the non-diagnostic category was reported as benign lesions on histopathology thus carrying no malignancy risk for this category. Out of 112 cases of Category II, only 24 could be traced for histopathology reports and among them, a single case was reported to be malignant showing malignancy risk to be 4.1% in this category. None of the cases in Category III of Atypical lesions turned out to be malignant on HPE. Thus malignancy risk was 0% in this category. One out of 07 cases of category IV was turned out to be malignant on HPE showing a 14.3% malignancy risk. Likewise, 3 out of 4 cases belonging to Category V of suspicious for malignancy were reported as a malignancy on histopathology making 75% malignancy risk for this category. All of the cases of Category VI were reported to be malignant on histopathology making 100% malignancy risk for this group. (Table IV)

Discussion

Before the emergence of TBSRTC in 2007, the classification schemes by various organizations in the world were not as consistent and evenly internationally used and lacked uniformity in reporting thyroid cytology leading to confusion among surgeons regarding the planning of treatment.[9,10] There is a need for uniformity and applicable terminologies and the adoption of the universally accepted reporting system for understanding and reproducibility of cytopathological opinions. Thus,

Table IV: Malignancy risk for each Bethesda category after histopathology

S. NO	BETHESDA SYSTEM DIAGNOSIS OF FNAC	DIAGNOSIS ON HISTOPATHOLOGY	NO OF THE CASES TURNED OUT TO BE MALIGNANT	RISK OF MALIGN-ANCY (%)
1.	Non diagnostic (0)	0	0	0
2.	Benign (24)	Colloid/ Adenomatoid goitre (18) Hashimoto's thyroiditis (05) Follicular carcinoma (01)	01	4.1
3.	AFLUS (03)	MNG/Thyroiditis (02) Follicular Adenoma (01)	00	0
4.	SFN (07)	Hashimoto's thyroiditis (01) Follicular adenoma (04) Hurthle cell adenoma (01) Follicular carcinoma (01)	01	14.3
5.	Suspicious for malignancy (04)	Follicular adenoma (01) Papillary carcinoma (03)	03	75
6.	Malignant (04)	Papillary carcinoma (03) Medullary carcinoma (01)	04	100

TBSRTC was introduced in 2007 to fulfil all these needs.[11] Total 160 cases were studied and we tried to categorize these thyroid reports utilizing the TSRBTC and were able to retrieve the histopathological diagnosis as many as possible and a comparison was made between cytopathological and histopathological diagnoses.

Out of 160 cases in the present study, 07 (4.4%) cases were under Category I as Non-Diagnostic. Maximum cases were in category II i.e. Benign and the least number of cases were in Category III AUS/FLUS. This is in concordance with studies done by Reddy et al.[12], Nayar et al.[13], Yassa et al.[4] and Gupta et al.[14] (Table V) In our study, 07 cases were in Category I, and all of them were reported as Acellular smears because of a lack of follicular epithelial cells although the background was colloid and also smears with the presence of haemorrhage only. In the case of the presence of only cyst macrophages, the cases were still categorized as Non-

diagnostic because the presence of follicular epithelial cells is a must to assign other categories. In our study, none of the cases was reported as cystic lesions. All were acellular. Later, on repeat aspiration test and further workup, one of these 07 cases of Category I, 06 cases remained non-diagnostic while one case was diagnosed as a case of colloid nodule both on cytopathology and histopathology. Thyroid cysts containing foamy macrophages but occasional or no follicular epithelial cells were considered Inadequate for diagnosis. However, an aspirate with noticeable cytological atypia is considered adequate, regardless of its cellularity. Thus, a smear is considered adequate only if it contains a minimum of 6 well-preserved and well-stained follicular groups, containing at least 10 cells. However, an aspirate with abundant thick colloid is considered adequate regardless of the minimum criteria of cellularity.

Our study showed a maximum of 112 (70%) cases in the benign group category II which was comparable to the study done by Reddy et al.[12] and Jo et al.[15]. Most of these cases were diagnosed as Nodular colloid goitre and Adenomatoid nodule. The least number of cases were in AUS/FLUS category which is again comparable to the study done by Reddy et al.[12] A study done by Awasthi et al.[16] indicated the lesser utility of the category assigned for AUS/FLUS as the majority of cases in this group were inconclusive and borderline, making clinical management difficult and confusing. Also, this category is most prone to inter-observer variability. In our study majority of cases in Suspicious for malignancy (SFM) and Malignant categories were reported as Papillary carcinoma thyroid which is in concordance with the studies done by Al Dawish et al.[17] Category VI contained 10 (6.2%) cases reported as malignant lesions.

Table V: Comparison of the percentages of distribution of cytopathological diagnosis

CATEGORY	PRESENT STUDY	REDDY et al[12]	NAYAR et al[13]	YASSA et al[4]	GUPTA et al[14]	JO et al[15]
Non diagnostic	**4.4**	**3.7**	**5**	**7**	**11**	**18.6**
Benign	**70.0**	**89.25**	**64**	**66**	**78**	**59**
AUS/ FLUS	**3.7**	**0.002**	**18**	**4**	**2**	**3.4**
SFM	**6.4**	**2**	**6**	**9**	**3**	**9.7**
Suspicious for Malignancy	**9.4**	**0.6**	**2**	**9**	**1**	**2.3**
Malignant	**6.2**	**4.1**	**5**	**5**	**5**	**7.0**

Histopathological reports were retrieved of 42 cases only, of which the majority of lesions were benign. Malignancy risk was calculated for each Category by comparing the cytological and histopathological reports. Regarding malignancy risk, our study was comparable to studies done by other authors. (Table VI)

Conclusion

Thyroid lesions require clinical, radiological, and biochemical along with pathological examination. FNAC is the most cost-effective, simple, rapid, and useful preliminary method of examination that leads to the

Table VI: Comparison of Malignancy Risk in each Bethesda Category

DIAGNOSTIC CATEGORY	PRESENT STUDY	NAYAR et al.[13]	YASSA et al.[4]	JO et al.[15]	YANG et al.[15]
Non diagnostic	**0**	**09**	**10**	**8.9**	**10.7**
Benign	**3.2**	**02**	**0.3**	**11**	**0.7**
AFLUS	**0**	**06**	**24**	**17**	**19.2**
SFM	**20**	**14**	**28**	**25.4**	**32.2**
SM	**75**	**53**	**60**	**70**	**64.8**
Malignant	**100**	**97**	**97**	**98.1**	**98.4**

diagnosis of thyroid lesions. TBSRTC is a very valuable, practical, and universally acceptable standardized system of reporting thyroid lesions by use of uniform terminology as it is better understood and readily applicable. It helps in assessing the risk of malignancy in each Category for prompt management and helps to plan the surgery Hemithyroidectomy or Total Thyroidectomy with or without Neck Dissection from the central and lateral compartment.

References

1. Kochupillai N. Clinical Endocrinology in India. Current Science 2000:8,1061-7
2. Gharib H, Papini E, Paschke R, et al. American association of clinical endocrinologists, Associazione Medici endocrinology and European thyroid association medical guidelines for clinical practice for diagnosis and management of thyroid nodules. Executive summary of recommendation. Endocr Pract. 2010: 16:468-75
3. Somma J, Schlecht NF, Fink D, et al. A. Thyroid fine-needle aspiration cytology: Follicular lesions and the gray zone. Acta Cytol. 2010; 54:123-31
4. Yassa L, Cibas ES, Benson CB, et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer 2007; 111: 508-16
5. Cibas ES, Ali SZ. The Bethesda system of reporting thyroid cytopathology. Am J Clin Pathol. 2009:132:658-65
6. Baloch ZW, Livolsi VA, Asa SL, et al. Diagnostic terminology and morphologic criteria for cytological diagnosis of thyroid lesion: A synopsis of the national cancer institute thyroid fine-needle aspiration state of science conference. Diagn cytopathology 2008:36:425-37
7. Melo-Uribe MA, Sanabria A, Romero- Rojas A, et al. The Bethesda system for reporting thyroid cytopathology in Colombia: Correlation with histopathological diagnosis in oncology and non-oncology institutions. J Cytol. 2015; 32:12-16
8. Mondal SK, Sinha S, et al. The Bethesda system for reporting thyroid fine-needle aspirates. A cytological study with histologic follow-up. J cytol. 2013;30:94-99
9. Cross P, Chandra A, Giles T, et al. Guidance on the Reporting of Thyroid Cytology Specimens. 2nd ed. London: The Royal College of Pathologists; 2016
10. Borderud SP, Li Y, Burkhalter JE, Sheffer CE, Ostroff JS. Electronic cigarette use among patients with cancer: Characteristics of electronic cigarette users and their smoking cessation outcomes. Cancer 2014;120:3527-35
11. Pathak P, Srivastava R, Singh N, Arora VK, Bhatia A. Implementation of the Bethesda System of reporting thyroid cytopathology: Interobserver concordance & reclassification of previously inconclusive aspirates. Diagn Cytopathol. 2014; 42:944-9
12. Reddy P, Prakash A, Giriyan SS. Evaluation of Bethesda system for reporting thyroid cytology with histopathological correlation. International Journal of Research in Medical Sciences

2018; 6:247-52

13. Nayar R, Ivanovic M. The indeterminate thyroid fine-needle aspiration: Experience from an academic center using terminology similar to the 2007 National cancer institute thyroid fine-needle aspiration state of science conference. Cancer 2009; 117: 195-202
14. Gupta V, Bhake A, Dayal S. Pattern and frequency of thyroid pathologies among thyroid cytology specimens in a rural part of central India: A retrospective secondary data analysis. Thyroid Research & Practice 2015;12;93-5
15. Jo VY, Stelow EB, Dustin SM, Hanley KZ. Malignancy risk for fine-needle aspiration of thyroid lesions according to the Bethesda system for reporting thyroid cytopathology. Am J Clin Pathol. 2010; 134:450-6
16. Awasthi P, Goel G, Khurana U, Joshi D et al. Reproducibility of "The Bethesda system for reporting thyroid cytopathology:" A retrospective analysis of 107 patients. Journal of Cytology 2018; 35:33-6
17. Al Dawish M A, Robert A A, Muna A, et al. Bethesda System for Reporting Thyroid Cytopathology: A three-year study at a tertiary care referral center in Saudi Arabia. World J Clin Oncol. 2017; 10:8:151-7
18. Yang J, Schnadig V, Logrono R, Wassermman PG. Fine needle aspiration of thyroid nodules. A study of 4703 patients with histologic and clinical correlations. Cancer 2007; 5:306-15.