Original Research Article

Diagnostic accuracy of fine-needle aspiration cytology of thyroid gland lesions by using The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC): A retrospective study from January 2019 to August 2021 in tertiary care institute

Chandni Nakum[1*], Bhaskar Thakkar[2], Vaidehi R. Patel[3]

[1]2nd year post graduate Resident, Pathology Department, GMERS Medical College and Hospital, Gandhinagar, Gujarat, India
[2]Associate Professor, Pathology Department, GMERS Medical College and Hospital, Gandhinagar, Gujarat, India
[3]Assistant Professor, Pathology Department, GMERS Medical College and Hospital, Gandhinagar, Gujarat, India

Received: 27-11-2021 / Revised: 08-12-2021 / Accepted: 04-01-2022

Abstract

Background: Fine needle aspiration cytology (FNAC) plays important role in diagnosis of thyroid lesions properly. However conventional reporting method of thyroid cytology do not have standardize format. To overcome this hurdle because of lack of standardization and to facilitate communication between cytopathologist and clinician, "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC) was proposed at Bethesda in 2007. **Aims:** Main Objective of this study was to classify and study thyroid FNACs according to TBSRTC, calculate malignancy risk and to determine the distribution of diagnostic categories and subcategories, to analyze and study cytological features of thyroid lesions. **Materials and methods:** All the FNAC of thyroid lesions came during January 2019 to August 2021 were classified in to six categories of TBSRTC. Distribution of cases in each category was calculated. Cytopathology analysis was carried out and classified according to TBSRTC categories. **Results:** During the study period, total of 147 thyroid FNACs were reported according to TBSRTC. Non diagnostic(ND), benign, atypical follicular lesion of undetermined significance(AFLUS), follicular neoplasm(FN), suspicious of malignancy(SM) and malignancy were reported in 6.8%, 80.9%, 0%, 6.8%, 2% and 3.5% cases respectively. **Conclusion**: Use of TBSRTC guideline for thyroid Cytopathology reporting helps to improve communication and give diagnostic criteria between cytopathologist and clinician leading to most effective management. Also interlaboratory comparative results provide data in a standardize pattern to compare between all different studies related to cytology of thyroid lesions.

Keywords: Bethesda system, cytology, malignancy risk, thyroid, benign lesion.

Introduction

Thyroid nodules are common clinical findings in India females. More than 50% of the world's population harbors at least 1 thyroid swelling and the numbers of nodular thyroid disease increases with patient's age. Despite the frequent occurrence of thyroid nodules in India, the majority (~95%) of them are benign thyroid lesions so surgical removal of thyroid is indicated in some malignant thyroid cases only[1,2]. Fine needle aspiration cytology (FNAC) plays a useful role to differentiate malignant from benign lesion, leading to most appropriate diagnosis and treatment of thyroid lesions[3].

However, pathologists have been using different terminologies and diagnostic criteria for cytology reporting, lack of standardize criteria and terminology of thyroid FNAC reporting interfere with understanding of cytology result by clinicians and hamper optimal clinical diagnosis and management of thyroid patients[4,5]. This different criteria in diagnostic terminology and clinician perception of its inconsistency was addressed in 2007 by the National Cancer Institute (NCI) Thyroid FNA of the Science Conference wherein the terminology and morphologic criteria for reporting thyroid FNA were concluded thus forming the reporting framework for The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)[3,6,7]. Each category has an implied cancer risk, which ranges from 0% to 3% for the "benign" category to virtually 100% for the "malignant" category.

*Correspondence
Dr. Chandni Nakum
2nd year post graduate Resident, Pathology Department, GMERS Medical College and Hospital, Gandhinagar, Gujarat, India

It uses three categories, AUS/FLUS, SFN/Hurthle cell neoplasm, and SFM, to report thyroid aspirates that fall between benign and malignant. As a function of these risk associations, each category is linked to evidence based clinical management guidelines. The purpose of the present study, done in an Indian hospital, was to report all thyroid cytology smears by TBSRTC into various diagnostic categories, analyze their cytological features using TBSRTC giving brief diagnostic and management plan to the clinicians.

Aim and objectives

1) To categorized the diagnosis of thyroid lesion according to TBSRTC at our institution, To determine the distribution of diagnostic categories and subcategories, to analyze cytological features using TBSRTC guiding brief management plan to the clinicians,
2) The FNAC reporting of thyroid lesion compared with previous studies.

Materials and methods

All the cases referred in our cytology laboratory, GMERS medical college and hospital, Gandhinagar for thyroid FNAC from January 2019 to August 2021 were included in this retrospective study. Relevant brief clinical history was taken and examination done of every patients. Aspirations were carried out by the cytopathologist doctors and stained with Hematoxylene and Eosin as well as Giemsa after aspiration from 22 and 24 Gauge needle having 2.5 cm length and 10 cc syringe. All Thyroid lesions were classified according to TBSRTC categories (Table-1).

Table: 1 Description of TBSRTC categories

Sr. No.	TBSRTC category	Description	Comments
1	**Non-diagnostic or unsatisfactory (ND/UNS)**	Not contain at least six well preserved and well stained follicular groups each having at least ten cells.	*Thick abundant colloid as in colloid nodule not required presence of minimum cells for satisfactory aspiration. *Thyroid cyst containing only histiocytes are unsatisfactory. *Significant cytological atypia regardless of cellularity are adequate.
2	**Benign**	Cytomorphological features related to colloid/adenomatoid goiter, thyroiditis and thyrotoxicosis.	*Benign findings as reactive changes, radiation changes, cyst lining cells and amyloid can be mentioned as descriptive diagnosis.
3	**Atypia of undetermined significance / atypical follicular lesion of undetermined significance (AUS/AFLUS)**	Adequate aspiration along with some atypia, but could not categorized in benign, FN/SFN, SM or malignancy.	*Moderate or high cellularity itself without significant atypia does not qualify for an AUS interpretation.
4	**Follicular neoplasm / Suspicious for follicular neoplasm (FN/SFN)**	Cytomorphological features of moderate to high cellularity, scant or absent colloid, redominant microfollicular or trabecular configuration of follicular cells in repetitive pattern	*Cytomorphological features of Hurthle cell neoplasm included in this category
5	**Suspicious of malignancy (SM)**	Cytolomorphological features suggestive of, but not definitive of, papillary carcinoma, medullary carcinoma or lymphoma.	*only 1 or 2 changes for papillary carcinoma present focally or sparse cellularity make it difficult to diagnose papillary carcinoma with confidence.
6	**Malignant**	Aspirates with unequivocally malignant features.	*Papillary carcinoma*Medullary carcinoma *Lymphoma

Results

During the period of study from January 2019 to August 2021, total of 147 FNACs of thyroid were carried out in our cytology department. All were classified in to six categories of TBSRTC.

Out of the 147 cases who underwent FNAC during initially, 10 cases (6.8%) turned out to be non-diagnostic, 119 cases (80.9%) benign, 0 (0%) Atypia of undetermined significance (AFLUS), 10 cases (6.8%) Follicular neoplasm / Suspicious for follicular neoplasm (FN/ SFN), 3 cases (2%) Suspicious of Malignancy (SM), and 5 cases (3.5%) malignant. Even After re-aspiration, 10 cases (6.8%) out of 147 patients remained non-diagnostic.(Table-2)

Table: 2 Distribution of cases according to TBSRTC categories

Sr. No.	Category	Number of cytology cases	Percentages of cytology cases
1.	ND/UNS	10	6.8 %
2.	Benign	119	80.9 %
3.	AUS/AFLUS	0	0 %
4.	FN/SFN	10	6.8 %
5.	Suspicious of malignancy	3	2.0 %
6.	Malignant	5	3.5 %
	Total	147	100 %

ND/ UNS: Non-diagnostic or unsatisfactory, AUS/ AFLUS: Atypia of undetermined significance / Atypical follicular lesion of undetermined significance. FN/SFN: Follicular neoplasm / Suspicious for follicular neoplasm.

Table: 3 Age wise distribution of thyroid lesions according to TBSRTC categories

Category	Age (years)								
	0-10	**10-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**	**71-80**	**Total**
ND/UNS	0	0	1	0	2	6	1	0	10
Benign	4	5	38	30	29	9	3	1	119
AUS/AFLUS	0	0	0	0	0	0	0	0	0
FN/SFN	0	1	1	1	1	3	2	1	10
Suspicious of malignancy	0	0	1	0	0	1	1	0	3
Malignant	0	0	0	2	2	0	1	0	5
Total	4	5	41	33	34	19	8	2	147

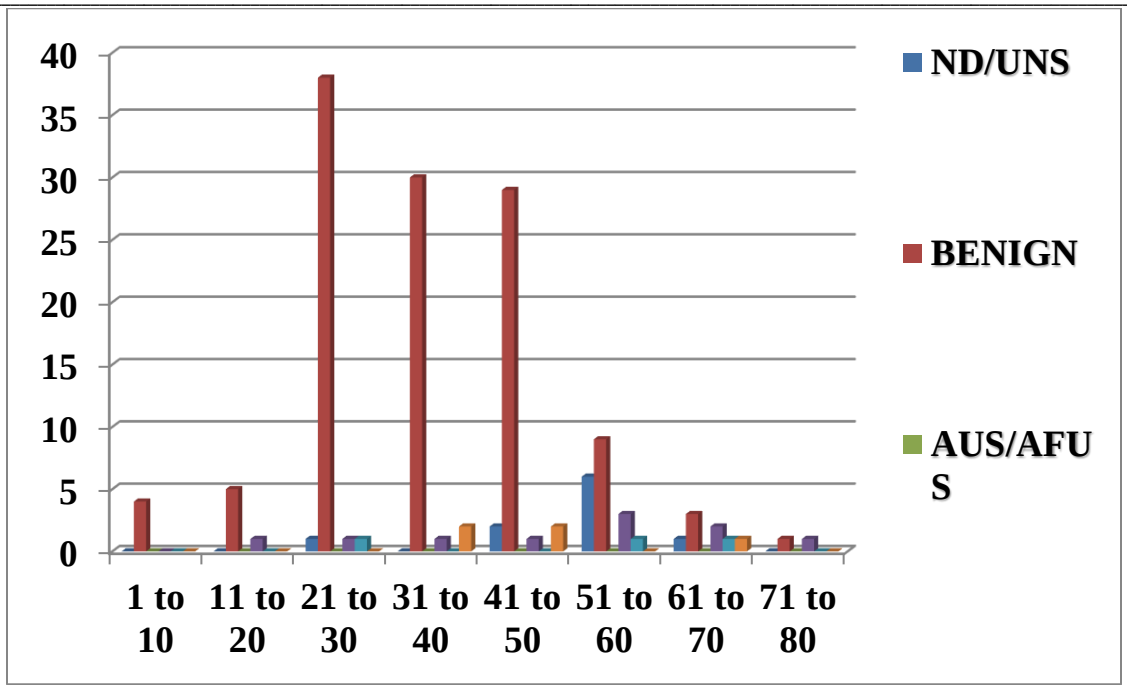

Figure: 1 Age wise distribution of thyroid lesions according to TBSRTC categories

According to age wise distribution of thyroid lesion (Table-3,Graph-1), thyroid lesions are more common in 21-30 age group as well as 31-50 age groups.

Table: 4 Gender wise distribution according to TBSRTC categories

Sr. No.	Category	MALE	FEMALE
1.	ND/UNS	2	8
2.	BENIGN	9	110
3.	AUS/AFLUS	0	0
4.	FN/SFN	1	9
5.	SUSPICIOUS OF MALIGNANCY	0	3
6.	MALIGNANT	1	4
7.	TOTAL	13	134

According to our study, Thyroid lesions are more common in female compared to male (Table-4).

Discussion

Conventional reporting of thyroid cytology lack uniform pattern of reporting and hence result of it produce difficulty for interpretation and treatment for clinicians. For better communication and understanding, TBSRTC recommend use of six categories for reporting with the hope to facilitate communication and guidance about the treatment among cytopathologist, endocrinologist, surgeons and other health care providers and allowing easy and reliable sharing of data among different laboratories[3].

Table: 5 Comparison of frequency of cases (%) with other studies

TBSRTC Category	Our study	Mondal et al(8)	Jo et al(9)	Yassa et al(2)	Yang et al(10)	Nayar et al(11)
ND/UNS	6.8%	1.2%	18.6%	7%	10.4%	5%
Benign	80.9%	87.5%	59.0%	66%	64.6%	64%
AUS/ AFLUS	0	1.0%	3.4%	4%	3.2%	18%
FN/SFN	6.8%	4.2%	9.7%	9%	11.6%	6%
Suspicious of malignancy	2.04%	1.4%	2.3%	9%	2.6%	2%
Malignant	3.5%	4.7%	7.0%	5%	7.5%	5%

There were 10 cases (6.8%) with **unsatisfactory** evaluation in our study which was within range of 1.2 to 18.6 % found in the Table: 5. Low unsatisfactory reports attributed to our policy of doing repeat FNA before giving final diagnosis of unsatisfactory report and all the FNAS were carried out by pathologist. We use USG guided FNAC for solid and cystic lesion to obtain maximum cellularity. **Benign** cases were 119 out of total 147. This category include non neoplastic lesion like colloid goiter, thyroiditis, radiation changes and amyloid. Frequency of cases in benign category in our study was 80.9 % which was consistent with finding of other studies, reported between 59 to 87.5%. In present study, Atypical follicular lesion of undetermined significance (**AFLUS)** cases were 0% and in other studies it ranged from 1.0 to 18%. As per table: 5, 4.2 to 11.6% of all thyroid FNACS were Follicular neoplasm / Suspicious for follicular neoplasm **(FN /SFN)** in other studies. In our study it was reported for 6.8%. That was consistent with other studies. Follicular adenoma and follicular carcinoma are difficult to differentiate on cytology and both were included in same category as follicular neoplasm. Some laboratories prefer the term "Suspicious of malignancy" as significant number of cases in this category (up to 35%) are turn out to be benign conditions as hyperplastic proliferation of follicular cells, as of multinodular goiter [3]. From the entire thyroid FNAS, 2.0 % were reported as

suspicious of malignancy in present study which was consistent with other studies which were ranging from 1.4 to 2.6%. Our study reported 3.5% of all thyroid FNA as **malignancy,** which were consistent with finding of other studies, reported between 4.7 to 7.5%.

Conclusion

Benign thyroid lesion more commonly occur in all thyroid lesion of TBSRTC categories. Benign lesions are more commonly seen in 21-30years of age group. Female predominance is seen in all type of thyroid lesion according to TBSRTC categories. Use of TBSRTC for thyroid Cytopathology reporting helps to improve communication of result between cytopathologist and clinician along with interlaboratory agreement for results leads to most effective management. In our study, we also analysed thyroid cytology smears of different lesions and classified according to the Bethesda system in our hospital. The Bethesda system for reporting thyroid Cytopathology is an excellent system of reporting thyroid Cytopathology, guiding the surgeons and facilitates easy sharing of data among interlaboratory. Each category of TBSRTC provides best management guidelines to clinicians and also extent of surgery.

References

1. Hamberger B, Gharib H, Melton LJ 3rd, Goellner JR, Zinsmeister AR: Fine-needle aspiration biopsy of thyroid nodules: impact on thyroid practice and cost of care. Am J Med 1982;73:381–384.
2. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA, Moore FD Jr, Kim BW, Nosé V, Marqusee E, Larsen PR, Alexander EK: Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer 2007;111:508–516.
3. Cibas ES, Ali SZ. The Bethesda System for Reporting Thyroid Cytopathology. Am J Clin Pathol 2009;132:658-65.
4. Redman R, Yoder BJ, Massoll NA. Perceptions of diagnostic terminology and cytopathologic reporting of fine-needle aspiration biopsies of thyroid nodules: A survey of clinicians and pathologists. Thyroid 2006;16:1003-8
5. Lewis CM, Chang KP, Pitman M, Faquin WC, Randolph GW. Thyroid fine-needle aspiration biopsy: Variability in reporting. Thyroid 2009;19:717-23.
6. Hegedüs L. The Thyroid Nodule. N Eng J Med. 2004;351(17):1764–71.
7. Baloch ZW, Alexander EK, Gharib H, Raab SS. Chapter 1; Overview of Diagnostic Terminology and Reporting. In: Ali SZ, Cibas ES, editors. The Bethesda System for Reporting Thyroid Cytopathology. New York, NY: Springer; 2010. pp. 1–4.
8. Mondal SK, Sinha S. Basak B, Roy DN,Sinha SK. The Bethesda system for reporting thyroid fine needle aspirates: A cytologic study with histologic follow-up. J Cytol 2013;30:94-9.
9. 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.
10. Yang J, Schnadig V. Logrono R. Wasserman PG. Fine-needle aspiration of thyroid nodules: A study of 4703 patients with histologic and clinical correlations. Cancer 2007;111:306-15.
11. Nayar R. Ivanovic M. The indeterminate thyroid fine-needle aspiration: Experience from an academic center using terminology similar to that proposed in the 2007 national cancer institute thyroid fine needle aspiration state of the science 2009;117:195-202.

Conflict of Interest: Nil Source of support: Nil