Original Article

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The Bethesda System for Reporting Thyroid Cytopathology with Histological Correlation

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Abstract

Background and Objectives: The Bethesda system for reporting thyroid cytopathology (TBSRTC) is a standard method for analyzing thyroid smears, there by communicating clear and relevant information to the clinician. Objective of the study is to classify the cytological features of different thyroid lesions according to TBSRTC and compare them with histopathology wherever possible and to determine the diagnostic accuracy. *Materials and Methods:* A prospective fine needle aspiration (FNA) study is conducted in the department of pathology VIMS Ballari on all cases of thyroid lesions between January 2015 and June 2016. The smears are classified using the Bethesda system and distribution in each category is done. The malignancy risk for each category is calculated by follow up histopathology wherever possible. *Results:* Of the 300 FNA of thyroid swelling 10.66% were nondiagnostic, 77% were benign, 5.6% were atypical follicular lesions of undetermined significance(AFLUS), 4% were suspicious for follicular neoplasms, 1.33% were suspicious for malignancy and 1.33% were malignant. Follow up histopathological examination(HPE) are available in 70 cases. The distribution of malignancy risk rates in various Bethesda category were 11.11% in nondiagnostic, 2.08% in benign. 66.67% in atypical FLUS, 0% in follicular neoplasms, 100% in suspicious of malignancy and 100% in malignant category. *Conclusion:* The implementation of TBSTRC which stands for a unique, international and a universal terminology for the reporting of the thyroid cytology should be encouraged because of its relative ease of reproducibility. The classification is directly related to the risk of malignancy in each category which in turn prompts the recommended clinical management of that category.

Keywords: Bethesda System; Fine Needle Aspiration; Histopathology; Thyroid Lesions.

Introduction

Thyroid lesions, commonly encountered in clinical practice cannot be diagnosed by clinical evaluation alone, hence investigated to rule out neoplasms to avoid unnecessary surgeries. FNAC is a first line diagnostic technique of choice in the prospective assessment, evaluation and distinguishing the inflammatory, hyperplastic and neoplastic conditions of the thyroid because of simplicity, diagnostic accuracy and cost effectiveness [1].

Lack of standard system of reporting the thyroid smears created confusion amongst the referring clinicians in the interpretation of thyroid cytopathology, hindering a definitive clinical management.

To overcome this issue a consensus conference sponsored by the National Cancer Institute (NCI) in 2007 recommended guidelines for reporting thyroid fine needle aspiration interpretation called as the Bethesda system for reporting thyroid cytopathology (TBSRTC) [2]. TBSRTC is a simple easily reproducible and used in triaging patients for either clinical follow up or surgery. The atlas describes six diagnostic

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categories of lesions; Non diagnostic/Unsatisificatory, benign, atypical follicular lesions of undetermined (AFLUS), suspicious for malignancy (SM) and malignant(M) [3]. The classification is directly related to the risk of malignancy in each category which inturn prompts the recommended clinical management of that category [4]. This study is done to evaluate the various cytological patterns of thyroid lesions with application of TBSRTC for diagnosis and thereby planning proper management.

Material and Methods

The present study was undertaken to study the cytological features of different thyroid lesions and classify them according to TBSRTC and compare them with histopathology wherever possible to determine its diagnostic accuracy. This is a prospective study undertaken in department of pathology VIMS Ballari during the period between January 2015 to June 2016. The study comprised of 300 patients who presented with swelling of the thyroid . FNA of the thyroid swelling was done either with USG guidance or without guidance was done by the thyroid cytopathologist under aseptic precautions using 23 guageneedle. The smears were fixed in 95% ethyl alcohol and stained with H&E stain and reporting is done with in 24hours. The thyorid smears were reviewed as per the current recommended Bethesda nomenclature.

Non diagnostic/Unsatisifactory

A smear is categorized as non diagnostic if it did not fulfill the adequacy criteria laid down by the Bethesda system [4]. A smear is considered adequate if it contained at least six well preserved and well stained follicular groups, containing at least 10 cells. Thyroid cyst macrophages with little or no follicular cells are interpreted as non-diagnostic (Figure 1). In contrast abundant thick colloid or a smear containing significant cytological atypia are never considered inadequate regardless of cellularity.

Benign

The cytological features of colloid goiter / adenomatoid goiter, lymphocytic thyroiditis, de Quervains thyroiditis are interpreted as benign (Figure 2,3).

Atypical follicular lesions of undetermined significance

Aspirates which are adequate and have some features of atypia but could not be categorized definitely into either of the benign, SFN, SM or malignant categories are grouped under this category [5] (Figure 5).

Follicular Neoplasms / Suspicious Follicular Neoplasms

This category comprises of aspirates with moderate to high cellularity, scant to absent colloid with predominant microfollicular or trabecular configuration of follicular cells in repetitive pattern (Figure 4).

Suspicious for Malignancy

Aspirates of this category have cytological features suggestive of but not definitive of papillary carcinoma, medullary carcinoma or lymphoma [6] (Figure 6).

Malignant

Aspirates that appear unequivocally malignant are placed in this category [7](Figure 7,8).

Of the 300 patients , 70 patients underwent surgical removal of the lesions and the specimens were subjected to histopathological examination(HPE).

The diagnosis offered in FNAC using Bethesda system were compared with the diagnoses obtained on final HPE, for these 70 cases. Thereby the malignant risk for each category was calculated and compared with other studies.

Results

Of the 300 cases who underwent FNAC during the period from January 2015 to June 2016 using the TBSRTC, the lesions were classified as non diagnostic 32(10.66%), benign 231(77%), AFLUS 17(5.66%), follicular neoplasms 12(4%), suspicious for malignancy 4(1.33%), malignant 4(1.33%) (Table 1).

The cases operated under various Bethesda category were 9 cases(Non diagnostic), 48(Benign), 5(AFLUS), 3(Follicular neoplasms), 3(Suspicious for malignancy), 2(Malignant). The original FNA diagnoses of these 70 cases were compared with the diagnoses obtained on HPE and malignancy risk for each category was calculated(Table 2).

9 out of 32 cases reported as ND were available for histological work up. One was found to be malignant giving a malignant risk of 11.11% for this category. The distribution of other 8 cases were colloid goiter (2) and nodular goiter(6).

Table 1: Categorizing the cytological lesions according to TBSRTC in our study(n=300)

Bethesda category	Number of cases	Percentage (%)
Non diagnostic/Unsatisifactory	32	10.66
Benign	231	77
AFLUS	17	5.66
Follicular neoplasms	12	4
Suspicious for malignancy	4	1.33
Malignant	4	1.33

Table 2: Showing the malignant risk rate obtained in six categories

The Bethesda Category	Number of Operated Cases	Benign	Malignant	Malignant Risk Rate
Non diagnostic	9	8	1	11.11%
Benign	48	47	1	2.08%
AFLUS	5	3	2	66.67%
Follicular neoplasms	3	3	0	0
Suspicious for malignancy	3	0	3	100
Malignant	2	0	2	100

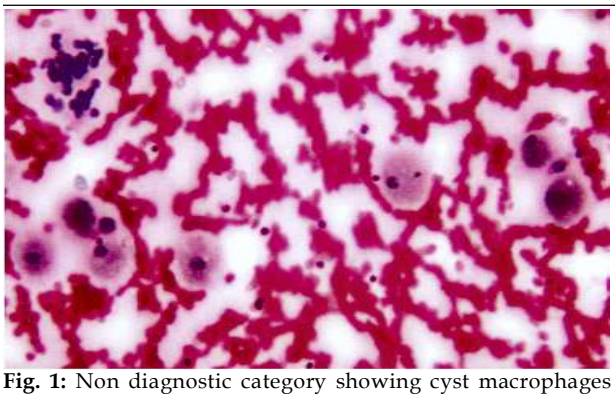

Fig. 1: Non diagnostic category showing cyst macrophages with sparse follicular epithelial cells

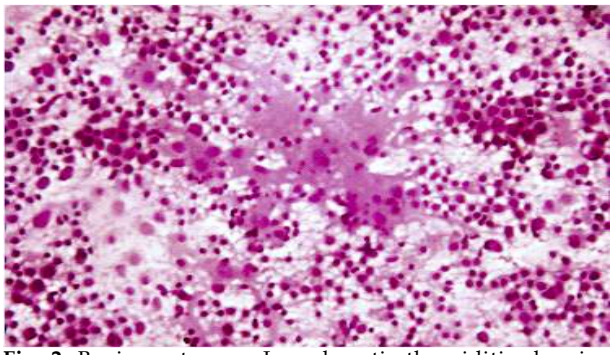

Fig. 2: Benign category- Lymphocytic thyroiditis showing follicular epithelial cells with hurthle cell change and abundant lymphocytes

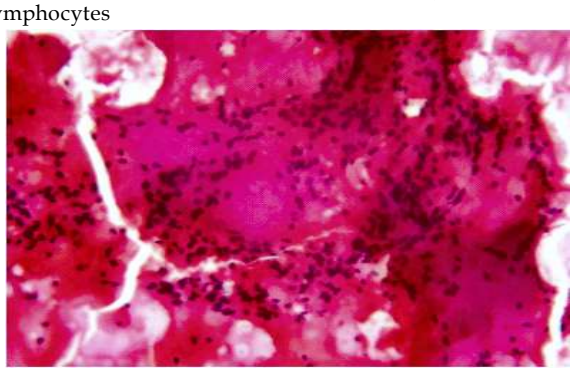

Fig. 3: Benign category: Nodular goiter showing colloid with benign follicular epithelial cells

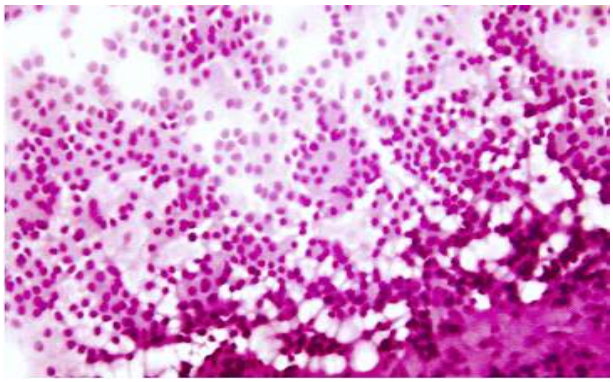

Fig. 4: FN category showing repetitive follicular pattern

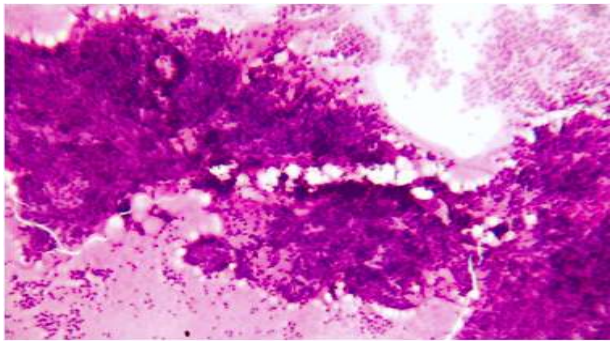

Fig. 5: Atypical follicular lesion of undetermined significance category

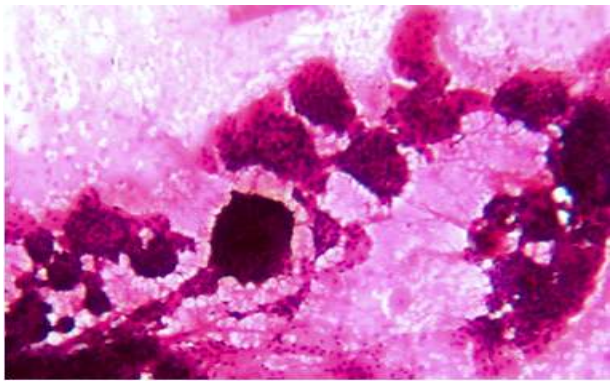

Fig. 6: Suspicious of malignant category

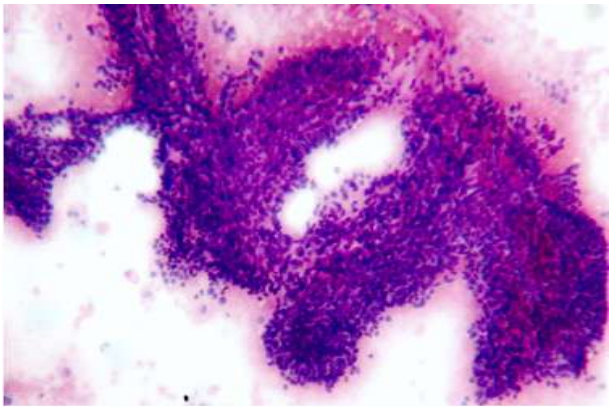

Fig. 7: Malignant category- Papillary carcinoma showing numerous papillae

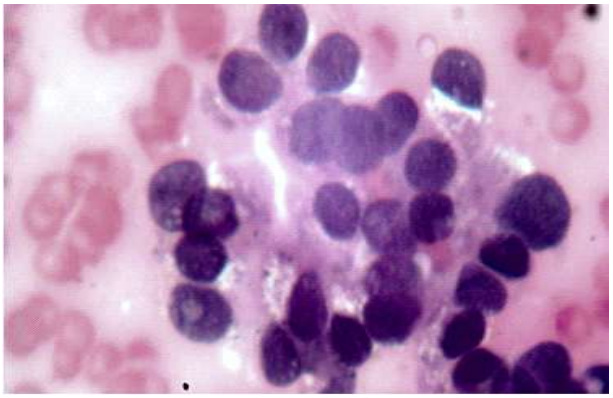

Fig. 8: Malignant category: Nuclear features of Papillary carcinoma showing enlarged nuclei with intranuclear cytoplasmic inclusions

48 out of 231 cases reported cytologically as benign were available for histological wotk up. One was found malignant attributing a malignancy risk of 2.08%. The distribution of cases were nodular hyperplasia(24), follicular adenoma (10) , Hashimoto thyroiditis (2), lymphocytic thyroiditis (11). 5 out of 17 cases reported as AFLUS were operated, out of which 3 were benign(Adenomatous hyperplasias 2, follicular adenoma 1), 2 were malignant giving a malignant risk of 66.67%.

3 out of 12 cases reported as SFN were available for histological workup and none is reported as malignant and three lesions were benign-follicular adenoma.

3 out of 4 cases reported as SM were subjected for HPE and all 3 turned out to be malignant giving a malignant risk of 100%. The 3 malignant cases were papillary carcinoma 2, medullary carcinoma 1.

2 out of 4 cases reported as malignant were on HPE turned out to be malignant giving a malignant risk of 100% in this category. Both the cases were papillary carcinoma.

Discussion

FNAC is the fundamental method for evaluation of thyroid lesions. Examination of the material obtained by FNA enables us not only to differentiate between benign and malignant but in many cases the specific nature of the tumor.

The routine conventional method of reporting the thyroid smears could be complicated and of no significance to the clinician [8]. The standardized nomenclature of the Bethesda system of reporting the thyroid smears seem to be more simplified, systematic, reliable and would beuseful in guiding clinicians towards the management of thyroid nodules [9].

The results obtained in our study are compared with the studies of Yang et al [10], Jo et al [11], Faquinin Krane et al [12], Shagyta et al [13], Renuka et al [14] and Mondal et al [15] (Table 3).The distribution of cases as per the six tier Bethesda system in our study is similar to the distribution in the above mentioned series.

Bethesda Category	Yang et al	Jo et al	Faquinin Krane et al	Shagyta et al	Renuka et al	Mondal et al	Present study
ND	10.4	18.6	13.9	11.6	17	12	10.66
Benign	64.6	59.0	66.9	77.6	70.56	87.5	77
FLUS	3.2	3.4	10.0	0.8	1.95	1	5.66
FN	11.6	9.7	2.0	4.0	4.2	4.2	4
SM	2.6	2.3	3.2	2.4	2.6	2.6	1.33
Malignant	7.6	7.0	3.9	3.6	3.5	3.5	1.33

Bongiovanniet al[16] performed a met analysis study of all the publications in English literature from January 1 2005 to September 2011 that used TBSRTC from a case cohort of 25,445 thyroid FNA, 6362(25%) underwent surgery. The sensitivity, specificity and diagnostic accuracy were 47, 50.7 and 68.8% respectively. They concluded that results showed high overall accuracy indicating that TBSRTC represents a reliable and valid reporting system for thyroid cytology.

The number of cases in the benign category is higher and is attribute to the fact that our institute is accessible to larger representative population and FNA procedure is accessible to the economically

background sections of the society for whom the test can be performed free of cost.

The lower percentage of the nondiagnostic and AFLUS categories can be attributed to the fact that in our institute usually an ultrasound guided FNAC is performed for small nodules or nodules that appear heterogenous on palpation so that aspirate can be procured from the exact pathological site. As the cytopathologist performs the procedure a better quality and adequate aspirate can be ensured.

The malignancy risk for the different categories in our study as seen by follow up HPE has correlated well with the implied risks mentioned in the Bethesda system and also with the studies Shahgupta et al, Bongivanni et al, Nayar et al, Mandal et al though few differences have been noted (Table 4).

Table 4: Comparison of the % age of malignant risk of present study with other studies

	Shahgyta et al	Bongivanni et al	Nayan et al	Mandal et al	Presnt study
ND	20	32	9	0	11.11
Benign	3.1	2.5	2	4.5	2.08
AFLUS	50	14.4	6	20	66.67
FN	20	32.1	14	30.6	0
SFM	80	74.9	53	75	100
Malignant	100	99.4	97	97.8	100

Nayar and Ivanoic analyzed 1150 thyroid FNA samples with calculated malignant risk and concluded that a six tier reporting system for thyroid FNAC was effective for determining patients needed surgery versus follow up FNA and also guided clinicians on the extent of surgery [18].

Bukhari MH et al in their study stated that the recently introduced Bethesda classification system is excellent for reporting thyroid FNAC. Each diagnostic category conveys specific risks of malignancy which offers guidance for patient management [17].

Shagytaet al [13] stated that it is important to keep in mind that nondiagnostic category specimens does not mean inadequacy. Associated high malignant rates found for nondiagnostic cases raise the possibility of malignant risk in this category and validate the past observations that sample inadequacy is a common cause of false negative thyroid FNAC.

Conclusion

FNAC of thyroid lesions has been shown to be safe simple and accurate method for the management of palpable thyroid lesions. The implementation of TBSRTC stands unique, international and a universal terminology for the reporting of the thyroid cytology, improving the communication between cytopathologists and clinicians ,interlaboratory agreement, leading to more consistent management approaches [19]. The high malignancy risk for the AFLUS, SM and malignant categories reflects the importance of these categories in the six tier Bethesda system.

Ethical Clearance

Obtained from ethical committee VIMS Ballari.

Source of Funding

Self

Conflict of Interest

NIL

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