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Research Article

BETHESDA SYSTEM OF REPORTING THYROID CYTOLOGY-HOSPITAL BASED STUDY

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ABSTRACT

Objective: To elucidate the utility of the Bethesda system in reporting thyroid FNAs. .
Methodology: A hospital based retrospective study done between 1 Sep 2012 to 1 June 2016. We retrospectively reviewed thyroid FNAs, classified them using the Bethesda system, found out the distribution of cases in each Bethesda category, and calculated the malignancy risk for each category by follow-up histopathology.
Results: Of the 616 FNAs, 30 (4.8%) were non-diagnostic, 450 (73%) were benign, 37 (6%) were atypical follicular lesion of undetermined significance (AFLUS), 54 (8.76%) were suspicious for follicular neoplasm (SFN), 18 (3%) were suspicious for malignancy (SM), and 27(4.3%) malignant. Of 30 cases originally interpreted as non-diagnostic, 10 remained non-diagnostic after re-aspiration. In 196 cases, data of follow-up histopathologic examination (HPE) were available. Rates of malignancy reported on follow-up HPE were 0% for non-diagnostic, 5% for benign,18% for A/FLUS, 30% for (SFN), 77.5% for (SM) and 96.2% for malignant.
Conclusion: Reviewing the thyroid FNAs with the Bethesda system allowed a more specific cytological diagnosis. In the present study, the number of cases in the Bethesda categories differed from some studies, with the number of benign cases being higher and the number of non-diagnostic cases being lower. The malignancy risk for each category correlated well with other studies. The Bethesda system allows standardization in reporting, thus leads to more consistent patient management.
Keywords: Bethesda system, Atypical follicular lesion, Suspicious for malignancy, Follicular neoplasm.

INTRODUCTION

Disorders of thyroid include a vast array of genetic, inflammatory, developmental, immunologic and neoplastic disorders. The understanding of these disorders is of immense importance because most are amenable to medical or surgical management. Fine needle aspiration cytology (FNAC) is the first-line diagnostic test for evaluating thyroid nodules[1]. It is widely accepted, cost-effective, simple, safe, and accurate method for triaging patients with thyroid nodules. Several reporting schemes have been suggested to define the risk of malignancy and consequent clinical management[2]. In 2007, the National Cancer Institute recommended The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) as a means of improving the accuracy of thyroid cytopathology[3]. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) includes definitions, diagnostic/morphologic criteria, explanatory notes, and a brief management plan for each diagnostic category[4]. Inspite of all different reporting criteria being well defined the question which arise frequently is risk of malignancy and subsequent management hence the above study was done to evaluate the utility of reporting system and also to standardized reporting system of cytology in our institute.

MATERIALS AND METHODS

All the patients were clinically examined ,thyroid gland was palpated, and after taking oral consent of patient,, aspiration was done with the patient in supine or sitting position with extended neck. In our institute, the cytopathologist performs the procedure of FNAC and procures the aspirate, be it under ultrasound guidance or without guidance. A minimum of six slides are smeared with the aspirate, two for May Grunwald Giemsa (MGG – air dried) and two each for Hematoxylin Eosin (HE) and Papanicolaou stains reporting is done within 24 hours. whenever needed alternate to FNA

cytology , fine needle sampling without aspiration also called cytopuncture or fine needle capillary sampling technique, which also yields excellent results when used as alternate or in combination with FNA is done[5]. In present study, we retrospectively collected thyroid FNAC slides reported in our institute between sep 2012 and june 2016 and reviewed them by three cytopathologists as per recommendation.

Non-diagnostic or unsatisfactory (Diagnostic Category1) (DC1)

A smear was categorized as non-diagnostic if it did not fulfill the adequacy criteria laid down by the Bethesda system[6] A smear was considered adequate if it contained at least six well-preserved and well-stained follicular groups, containing at least ten cells, abundant thick colloid, as found in a colloid nodule, did not have a requirement for a minimum number of follicular cells. Thyroid cysts containing histiocytes but with little or no follicular cells were interpreted as non-diagnostic. An aspirate smear containing significant cytological atypia, was never considered inadequate.

Benign (Diagnostic category2) (DC2)

Cases were interpreted as benign if they showed the cytomorphological features of colloid Goiter/adenomatoid goiter, Hashimoto's thyroiditis, thyrotoxicosis, de Quervain's thyroiditis, or granulomatous thyroiditis due to Koch's .

Atypia/follicular lesion of undetermined significance (Diagnostic category3) (DC3)

Atypia/follicular lesion of undetermined significance (A/FLUS) is a new category in the Bethesda System for Reporting Thyroid Cytopathology (BSRTC) for which repeat fine-needle aspiration biopsy (FNAB) is recommended[7]. A smear that showed cytological features of high cellularity, tiny follicular cells arranged in sheets, clusters or singly, with occasional occurrence of multinucleated giant cells, and focal occurrence of Hurthle cells was described as A/FLUS.

Follicular neoplasm/suspicious for follicular neoplasm (Diagnostic category4) (DC4)

Aspirates with cytomorphologic features of moderate to high cellularity, scant or absent colloid, with predominantly microfollicular or trabecular configuration of follicular cells in repetitive pattern were grouped under this category. Aspirates with cytomorphologic features of Hurthle cell neoplasm were also placed in this category.

Suspicious for Malignancy (Diagnostic category5) (DC5)[8]

Suspicious for papillary carcinoma
Suspicious for medullary carcinoma
Suspicious for metastatic carcinoma
Suspicious for lymphoma
Other

Malignant (Diagnostic category6) (DC6)[8]

Papillary thyroid carcinoma
Poorly differentiated carcinoma
Medullary thyroid carcinoma
Undifferentiated (anaplastic) carcinoma
Squamous cell carcinoma
Carcinoma with mixed features (specify)
Metastatic carcinoma
Non-Hodgkin lymphoma
Other

We could obtain follow-up histology for 196 cases. We compared the diagnoses offered in FNAC in the light of the Bethesda system, with the diagnoses obtained on final histopathologic examination (HPE), for these 196 cases. Thereby, we could calculate the malignancy risk for each category and compared it with that in other studies. In calculating the malignancy follow-up rate for the benign category, the total number of original FNA diagnoses was used as the denominator, as similarly performed in other studies[9]. For all other diagnostic categories, malignancy follow-up rates were calculated by using the number of cases with follow-up histology results.

RESULTS

Of the 616 cases who underwent FNAC during the period from 1st sep 2012 to 1st june 2016 **:** , 30 (4.8%) were non-diagnostic, 450 (73%) were benign, 37 (6%) were atypical follicular lesion of undetermined significance (AFLUS), 54 (8.76%) were suspicious for follicular neoplasm (SFN), 18 (3%) were suspicious for malignancy (SM), and 27 (4.3%) malignant. Of 30 cases originally interpreted as non-diagnostic, 10 remained non-diagnostic after re-aspiration., remaining 20 diagnosed as benign.

Table 1: Age wise distribution of cytologically diagnosed cases

Age in years	DC1	DC2	DC3	DC4	DC5	DC6
1-10	5	12	3			
11-20	5	30	3			
21-30	15	146	9	12		
31-40		150	3		6	
41-50	5	76		34	6	8
51-60		24	6	4	6	11
61-70		12	13	4		8
Total(616)	30	450	37	54	18	27

Benign lesions are common thyroid lesions and are common in middle age of age group 21 to 40 years.

Out of 616 cases, 196 cases were available for follow-up histopathology. Out of these 196 cases 60 cases as benign, 37cases as AFLUS, 54 cases as SFN, 18 cases as SM, and 27cases as malignant. We compared the original FNA diagnoses of these 196 cases with the diagnoses obtained on HPE and calculated the malignancy risk for each category .benign lesions were excised because of cosmetic or pressure effects. A ll the malignant lesions ,suspicious lesions were excised.

Table2: Cyto histological correlation of 196 cases

Diagnostic category Cytology	Benign	Atypical follicular lesion of undetermined significance	Follicular neoplasm	Suspicious of malignancy	Malignant
Nodular goiter	02	03	-		
Nodular goiter with cystic degeneration	16	10			
Nodular goiter with adenomatoid change	20	02	30		01
Lymphocytic thyroiditis	04	02			
Hashimotos thyroiditis	05	03	04		
Follicular adenoma	10	10	04	04	
Follicularcarcinoma	01	01	09	10	12
Papillary carcinoma	02	05	06	04	10
Medullary carcinoma		01	01	00	04
Total(196)	60	37	54	18	27

Table 3: Statistical parameters for malignant lesions

Statistical parameters	Formula	Value
Sensitivity	TP/(TP+FN)X100	96.24%
Specificity	TN/(TN+FP)X100	99.42%
Positive predictive value	TP/(TP+FP)X100	96.24%
Negative predictive value	TN/(TN+FN)X100	99.42%
Diagnostic accuracy	TN+TP/(TP+FN+TN+FP)X100	99.009%

Sensitivity shows the portion of the patients having malignant thyroid disease and positive cytological diagnosis on FNAC, which is found to be 96.24% .Specificity shows the portion of the patients with non-malignant thyroid disease and positive cytological diagnosis, which was found to be 99.42%: Accuracy is the portion of the correct results , true positive and true negative in relation to all cases studied is found to be 99.00 % in our study. Positive predictive value (PPV) is the probability of having malignant thyroid disease following a positive FNAC finding and is found to be 96.24%. Negative predictive value (NPV) is the probability of not having malignant thyroid disease following a negative FNAC finding and is found to be 99.42%.

Table 4: Rates of malignancy on Histopathological follow up

Diagnostic category	Malignancy rate
Non diagnostic	1%
Benign	5%
Atypical follicular lesion of undetermined significance	18%
Follicular neoplasm	30%
Suspicious of malignancy	77.5%
Malignant	96.24%

Accordingly, none of the four cases who had original FNA diagnoses as non-diagnostic were reported to be malignant on follow-up HPE. Thus, the malignancy risk for this category was 0%.

Out of the 450 benign cases, specimens of 60 cases were available for follow-up HPE, among which 3 cases were found to be malignant. So the malignancy risk in the benign category in this study was 5%.

Seven out of the 37 cases reported as A/FLUS was found to be malignant, giving a malignancy risk of 18 % in this category.

All 54 out of the 54 cases of SFN were available for HPE; 16 out of which were found to be malignant, giving a malignancy risk of 30% in this category.

14 out of the 18 surgically resected cases of SM were found to be malignant by HPE in the follow-up period, giving a malignancy risk of 77.5% in this category.

Twenty seven out of the 27 patients in the malignancy category were available for HPE and 26 cases turned out to be actually malignant, giving a malignancy risk of 96.24% in this category.

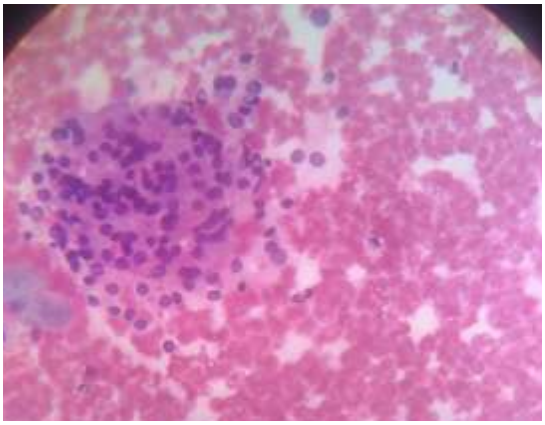

Figure 1: Microphotograph showing nodular goiter (H&E) 40X

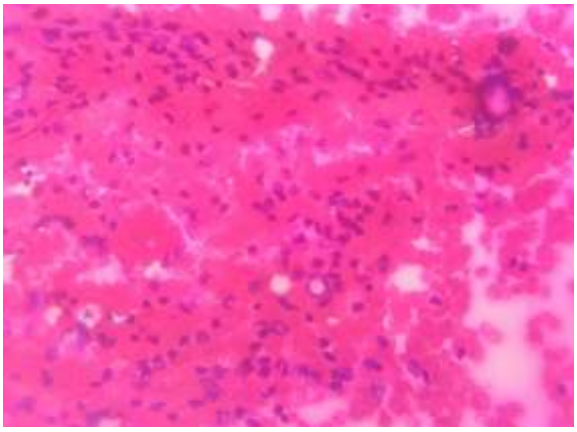

Figure 2: Microphotograph showing lymphocytic thyroiditis (H &E) 40x

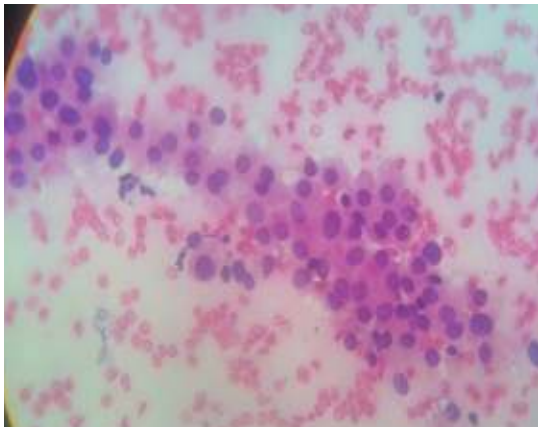

Figure 4: Microphotograph showing Hurthle cell in Follicular neoplasm (H&E) 40x

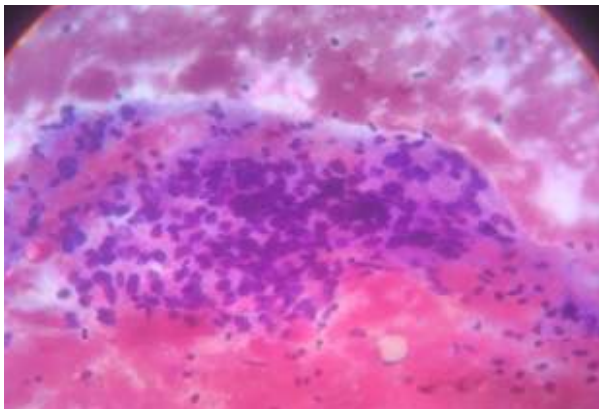

Figure 3: Microphotograph showing follicular cells with atypia categorized as atypia/follicular lesion of undetermined significance.(H&E) 40x

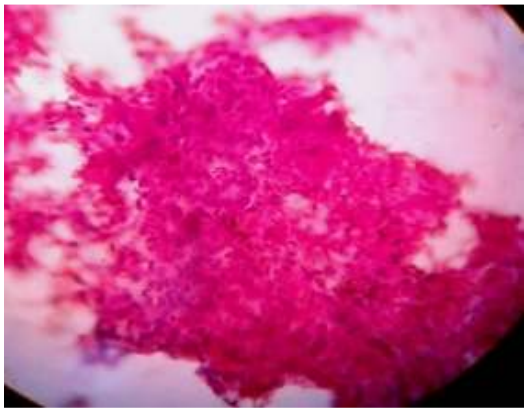

Figure 5: Micrograph showing Papillary carcinoma thyroid (H&E) 40x

DISCUSSION

While retrospective reporting the FNACs in our study using Bethesda system, it was noted that many of the descriptions and diagnoses that were offered previously seemed to have less clinical significance to the clinicians. However, when we recorded the diagnoses as per the criteria laid down in the standardized nomenclature of the Bethesda system, it seemed more simplified, systematic, with greater clarity; thus, it would prove to be more useful in guiding clinicians towards the management of thyroid nodules[10].

Our results were compared with many similar studies and results were found to be comparable, Yassa et al. reported their institutional experience using 1997 guidelines by the Papanicolaou Society of Cytopathology. Their yields for malignancy, using the same calculations, were as follows: nondiagnostic, 10%; benign, 0.3%; atypical follicular lesion, 24%; suspicious for follicular neoplasm, 28%; suspicious for malignancy, 60%; and malignant, 97%[11]. Yang et al. reported the following malignancy rates: nondiagnostic, 10.7%; benign, 0.7%; atypical follicular lesion, 19.2%; suspicious for follicular neoplasm, 32.2%; suspicious for malignancy, 64.8%; and malignant, 98.4%[12]. Nayar and Ivanovic performed a similar retrospective study of their institution's history with application of the 6 proposed Bethesda diagnostic categories, with calculated malignancy risks as follows: nondiagnostic, 9%; benign, 2%; indeterminate for neoplasm, 6%; follicular neoplasm, 14%; suspicious for malignancy, 53%; and malignant, 97%[13]. Vickie et.al reported the rates of malignancy for each FNA diagnostic group as non-diagnostic, 8.9%; benign, 1.1%; AFLUS, 17% (9/53); SFN, 25.4%; SM, 70% (39/56); and malignant, 98.1%[14]. Comparative analysis with Indian study by mondal sk et,al revealed, . Rates of malignancy reported on follow-up HPE were non-diagnostic 0%, benign 4.5%, AFLUS 20%, SFN 30.6%, SM 75%, and malignant 97.8%.[15]. High incidence of benign cases are because of the fact that our institute get referral cases from nearby places.High sensitivity and specificity are because of fact that material collection is done by cytopathologist and meticulous reporting.

CONCLUSION

The Bethesda system is very useful as a standardized system of reporting thyroid cytopathology, improving communication between cytopathologists and clinicians, and inter-laboratory agreement, leading to more uniform and consistent patient management.

FNAC is reliable, safe and accurate method as a first line of evaluation in thyroid swelling before the surgery. FNAC is more sensitive in detecting thyroid gland malignancy. However, a prospective study over a larger population with recommended repeat cytology and biopsy will be more significant.

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