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Original Research Article

A study on fine needle aspiration cytology of thyroid lesions with correlation to histopathological examination with special reference to Bethesda system of reporting at a tertiary care centre

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ABSTRACT

Background: Annual incidence of thyroid nodules ranges from 40,000 to 70,000 per 1 lac population worldwide. Fine Needle Aspiration (FNA) of the thyroid is widely accepted simple, cost effective and quick to perform outpatient procedure with minimal complication. The National Cancer Institute (NCI) Bethesda, Maryland, United States standardized the reporting system for thyroid FNA by using Bethesda system for reporting thyroid cytopathology.
Methods: FNA was performed in total 155 patients presenting with the thyroid swelling with or without Ultrasonography (USG) guidance. All patients were analyzed for age, gender, type of lesions. FNA was done and smears were examined and reported according to Bethesda system of reporting for thyroid cytopathology. Findings were correlated with post-operative histopathological diagnoses in 103 cases who underwent surgery.
Results: Out of total 155 patients, 32 were male and 123 were female. Average age of presentation was 38.4 years. On cytology, according to Bethesda system, most cases were in benign category (76.1%) followed by malignant (8.4%). On histopathological study most common diagnosis was colloid goiter followed by papillary thyroid carcinoma. From the study it was found that sensitivity, specificity and accuracy of fine needle aspiration cytology of thyroid lesions were 81.8%, 97.3% and 95.4% respectively.
Conclusions: Fine needle aspiration cytology is simple, easy to perform, cost effective procedure with high sensitivity, specificity and diagnostic accuracy in case of thyroid lesions.

Keywords: Bethesda, Colloid goiter, Fine needle aspiration, Sensitivity, Specificity, Thyroid lesions

INTRODUCTION

Thyroid lesions are a common problem in the world. Annual incidence of thyroid nodules ranges from 40,000 to 70,000 per 1 lac population worldwide.[1] Also the incidence of thyroid cancer is increased in a large number, likely due to more use of radiation now a days and increased early detection by use of advanced imaging and fine needle aspiration cytology.[1,2] Thyroid nodules are commonly found in patients younger than 20 years and older than 45 years. These lesions more commonly affect females than males, ratio being approximately 5:1 and individuals living in areas of iodine deficiency.[3]

Fine Needle Aspiration (FNA) of the thyroid was first described in the Martin and Ellis paper in 1934 which was further developed.[4] It is widely accepted simple, cost effective and quick to perform technique which can be used as outpatient procedure with minimal complication and great patient compliance.[5] Its usefulness is mostly relied on to differentiate benign lesions from malignant thyroid nodules which influences treatment decision.

However, there are some pitfalls related to FNA in thyroid lesions mostly in the lack of uniformity in reporting that may cause confusion in management decision. Hence the National Cancer Institute (NCI) Bethesda, Maryland, United States organized the NCI multidiscipline thyroid FNA state of conference and standardized the reporting system for thyroid FNA by using Bethesda system for reporting thyroid cytopathology (BSRTC).[6]

According to the Bethesda system, the six diagnostic categories for FNAC thyroid lesions are Nondiagnostic/Unsatisfactory, Benign, Atypia of Undetermined Significance (AUS)/ Follicular Lesion of Undetermined Significance (FLUS), Follicular Neoplasm (FN)/ Suspicious for Follicular Neoplasm (SFN), Suspicious for Malignancy (SM), Malignant.[7]

METHODS

This study was carried out in the Department of Pathology at a tertiary care health centre in the southern part of Assam for a period of 1.5 years from December 2017 to June 2019. FNA was performed in total 155 patients presenting with the thyroid swelling with or without Ultrasonography (USG) guidance.

Inclusion criteria

- All patients irrespective of age and sex were included in the study.

Exclusion criteria

- Patients with bleeding diathesis, skin infection at aspiration site and cases having neck swelling other than thyroid swelling were excluded from the study.

Proper history and necessary clinical examination were done before performing FNA. FNA was done using 23 to 25-gauge needle. Smears were prepared and stained with MGG stain and Papanicolaou stain. Stained smears were examined under microscope and reported according to Bethesda system of reporting. Findings were correlated with post-operative histopathological diagnoses in 103 cases who underwent surgery and whose specimen was sent to the department for histopathological examination. The statistical parameters sensitivity, specificity and accuracy were used to evaluate the diagnostic validity of FNAC in thyroid lesions.

RESULTS

Out of total 155 patients, 32 were male and 123 were female, male: female ratio being 1:3.8. Age of presentation ranged from 12 years to 78 years, maximum cases (43.8%) belonged to the age group of 31-40 years followed by 21-30 years. Average age of presentation was 38.4 years (Table 1).

Total 115(74%) patients were from rural areas whereas 40(26%) were from urban areas. On clinical examination, thyroid swelling was solid in 58% cases, cystic in 13% cases and mixed in 29% cases. On cytology, according to Bethesda system, most cases were in benign category (76.1%) followed by malignant (8.4%), follicular neoplasm or suspicious of follicular neoplasm (5.9%) and AUS (3.2%) (Table 2).

Table 1: Distribution of cases according to age.

Age (years)	Number of cases	Percentage (%)
11-20	7	4.6
21-30	41	26.5
31-40	68	43.8
41-50	20	12.9
51-60	14	9
61-70	3	1.9
71-80	2	1.3

Table 2: Diagnosis of cases on FNAC.

FNAC	No. of cases	Percentage (%)
Non diagnostic	7	4.5
Benign	118	76.1
AUS/FLUS	5	3.2
Follicular neoplasm/ SFN	9	5.9
SM	3	1.9
Malignant	13	8.4

Among the cases colloid goiter was the most common diagnosis followed by lymphocytic thyroiditis and follicular neoplasm. One case of follicular neoplasm presented with a scalp swelling of metastasis from thyroid, which was given as follicular carcinoma. Out of malignancy, papillary thyroid carcinoma was the most common and 3 cases of anaplastic thyroid carcinoma were found.

Histopathological study was possible in total 103 cases, out of which 84 cases turned out to be benign and 19 cases were malignant. Most common diagnosis was colloid goiter followed by lymphocytic thyroiditis and Follicular adenoma. Papillary thyroid carcinoma was the most common malignant thyroid tumor in this study followed by 1 anaplastic thyroid carcinoma, 2 follicular carcinoma and 1 medullary carcinoma (Table 3).

Out of 118 benign cases reported on cytology, histopathology was available in 76 cases. Out of these 2 cases turned out to be malignant on HPE, one was papillary carcinoma thyroid and other one was follicular carcinoma. Among 13 malignant cases reported on cytology, histopathology was available in 11 cases and out of these 2 cases were benign on histology, one case of nodular hyperplasia and colloid goiter each.

Table 3: Histopathological diagnosis of cases.

Histopathological diagnosis		Number of patients
Benign	Colloid goiter	59
	Nodular hyperplasia	6
	Lymphocytic thyroiditis	11
	Follicular adenoma	8
Total		84
Malignant	Papillary carcinoma	15
	Follicular carcinoma	2
	Anaplastic carcinoma	1
	Medullary carcinoma	1
Total		19
	Grand total	103

Considering the 'grey zone' lesions, 5 and 9 cases of atypia of undetermined significance or follicular lesion of undetermined significance and follicular neoplasm were found respectively. Out of 3 atypia of undetermined significance where histopathology was available, 2 cases turned out to be benign, follicular adenoma and lymphocytic thyroiditis and 1 case turned out to be papillary thyroid carcinoma (33%). Out of 8 cases of follicular neoplasm where histopathology was available, 4 cases turned out to be benign and 4 cases turned out to be malignant (50%). Hence it was found that follicular neoplasm is associated with more malignancy rate than that of atypia of undetermined significance.

Among 3 cases of suspicious malignancy, HPE was available in 2 cases and both were confirmed as malignancy in histopathology, one as medullary thyroid carcinoma and other one as papillary thyroid carcinoma (Table 4).

Table 4: Comparison of FNAC and histopathological diagnosis.

FNAC	No. of cases	HPE available	HPE benign	HPE Malignant
Non diagnostic	7	3	2	1
Benign	118	76	74	2
AUS/ FLUS	5	3	2	1
Follicular neoplasm/ SFN	9	8	4	4
Suspicious of malignancy (sm)	3	2	0	2
Malignant	13	11	2	9
Total	155	103	84	19

From this study it was found that sensitivity, specificity and accuracy of Fine Needle Aspiration Cytology (FNAC) of thyroid lesions were 81.8%, 97.3% and 95.4% respectively (Table 5).

Table 5: Statistical parameters of FNAC in thyroid lesions.

		Sensitivity	Specificity	PPV	NPV	Accuracy
True positive	9	81.8%	97.3%	82%	97.4%	95.4%
True negative	74					
False positive	2					
False negative	2					

DISCUSSION

Fine needle aspiration cytology is a widely accepted procedure for thyroid lesions with maximum patient compliance. It is used as the first line investigation along with USG and thyroid function tests. In the present study, the maximum number of cases belonged to the age group of 31-40 years of range which is also seen in studies by Bhartiya et al, and Handa et al.[8,9] There is significant female preponderance in this study as similar to other studies by Bhatta S et al, that showed 80% female preponderance and Pandey P et al, that showed females far outnumbered males.[10,11]

Published literatures report the rate of non-diagnostic aspirations to be between 1.6% and 20%.[9,10] In this study, the non-diagnostic cases constituted 4.5%. The non-diagnostic cases are mostly due to technical error like over or under fixation, overstating and sclerotic nodules or secondary calcification or cystic degeneration over a previous pathology.

In the present study, on both cytology and histopathology the most common thyroid lesion found was colloid goiter followed by lymphocytic thyroiditis and follicular adenoma. Among the malignant lesions, papillary thyroid carcinoma was the most common. Gupta M et al, in their study found colloid goiter was the most common (56%) followed by same number of cases of follicular adenoma and papillary thyroid carcinoma. Similar finding was found in a study by Kiran Rao et al.[12,13]

In this study on cyto-histopathology correlation, two false positive and two false negative cases were found. The

two false positive cases were reported as papillary carcinoma with papillary architecture, high cellularity, overcrowded nuclei on cytology, one of which was diagnosed as nodular hyperplasia and other as colloid goiter on histopathology. Cytomorphological features of papillary carcinoma were lacking in both cases. The two false negative cases that were reported as colloid goiter on cytology were diagnosed as papillary carcinoma and other one as follicular carcinoma. These cases were underdiagnosed due to less cellularity as aspirated from the cystic part of nodule. In previous studies conducted by Bouvet et al, and Sinna EA et al, the rate of false positive and false negative cases ranged in between 1%-7% and 1%-10% respectively while this study yielded 1.9% as false negative and false positive cases.[14,15]

Another pitfall of thyroid cytology is the cases of atypia of undetermined significance and follicular neoplasm or suspicious of follicular neoplasm which are also known as 'grey zone' lesions. In this study 4 cases of AUS were reported out of which 1 case turned out to be malignant on histopathology. Similarly, among the follicular neoplasm cases, 4 cases turned out to be malignant, one was confirmed as follicular variant of papillary carcinoma, one as follicular carcinoma and other 2 as papillary carcinoma. In this study malignancy was associated more with follicular neoplasm category than atypia of undetermined significance. Goldestein RE et al, described 9 patients of follicular neoplasm with atypia out of which 4 (44.4%) were malignant on histopathology, and 15 lesions of atypia, 3(20%) were malignant on histopathology.[16] It is also difficult to distinguish between follicular neoplasm and nodular goiter on cytology. Sensitivity, specificity and other statistical values of this study are compared with that of other previous studies in the following table (Table 6).

Table 6: Comparison of present study with other studies with respect to sensitivity, specificity and accuracy of FNAC.

Study	Sample size	Sensitivity (%)	Specificity (%)	Accuracy(%)
Gupta M et al [12]	75	80	86	80
Bouvet et al [14]	70	93.5	75	79.6
Sinna et al [15]	296	92.8	94.2	93.6
Muratli et al [17]	126	87.1	64.6	77.3
Present study	155	81.8	97.3	95.4

CONCLUSION

Fine needle aspiration cytology is simple, easy to perform, cost effective procedure with high sensitivity, specificity and diagnostic accuracy in case of thyroid lesions. It should be used as first line of investigation although histopathology is the gold standard for diagnosis. Regular use of standardized Bethesda system of reporting has eased the clinicians taking decision regarding management of thyroid lesions which reduces the surgical burden to some extent.

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