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ORIGINAL PAPER

Fine Needle Aspiration Cytology (FNAC) of Thyroid Neoplasms

Devi Junu[1], Talukdar Kunja L[2]

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ABSTRACT

***Background:** Evaluation of diagnostic value of fine needle aspiration cytology in diagnosis of neoplastic lesions of thyroid gland. **Materials and method**: it is a crossectional study of 47 neoplastic lesions of thyroid out of 343 thyroid FNAC. Results were analysed according to the Bethesda classification . Histopathological diagnmosis were considered the gold standard. **Results:** Total 47 neoplastic cases were analysed. Female to male ratio was 4.2:1, and common age group was 21-40 years.Twoentycases(42.55%) were diagnosed as follicular neoplasms ,22 cases(46.81%) as malignant and 5 cases(10.64%) as suspicious for malignancy.Papillary carcinoma was most commonly encountered malignant neoplasm (31.91%). Cytologicdiagnosis were compared with corresponding histologic ones whenever possible. FNAC achived a diagnostic accuracy of 95.0% and false positive rate of 5.0% . **Conclusion:** FNAC is highly accurate first line diagnostic technique for the evaluation of neoplastic lesions of thyroid.*

***Keywords**: Neoplastic lesion, Bethesda classification, histopathology, diagnostic accuracy*

INTRODUCTION

Thyroid is an endocrine gland and can be affected by various disorders of endocrine, inflammatory or neoplastic origin. Thyroid nodules are common clinical findings and have a reported prevalence of 4-7% of adult population. However fewer than 5% of adult thyroid nodules are malignant and the vast majority is non neoplastic lesions or benign neoplasms. It is preferred to operate only on those patients with lesions suspicious of cancer, thereby avoiding unnecessary surgery and possible injury of the recurrent laryngeal nerve.[1] A cytological diagnosis of malignancy allows the patient to be informed that an operation for cancer is likely and preoperative staging procedure to be carried out.[2]

FNA biopsy is the most preferred test and has improved the selection of patient for thyroid surgery.[3,4] Incidence of malignancy at thyroidectomy has increased from 5-10% to 30-50% over the recent years following the use of FNA.[5] Confirmation of clinically obvious malignancy in particular anaplastic carcinoma and malignant lymphoma, spares the patients additional invasive diagnostic procedure. A cytological diagnosis allows preoperative irradiation or palliative therapy. FNAC is also valuable in metastatic disease, both to identify metastatic tumors in the thyroid and to diagnosed distant metastasis of thyroid cancer.[2]

MATERIALS AND METHODS

This is a cross-sectional study that provides cytomorphological analysis of thyroid neoplasms at Gauhati Medical College and Hospital, Assam, India, from September 2011 to August 2014. Ethical clearance was obtained from hospital administration. All total 47 neoplastic lesions out of 343 thyroid swellings (both neoplastic and non neoplastic lesions)were analysed. All cases within age group 0 to >60 years, both sexes are included in the study and all non tumorous benign lesions and inconclusive aspirates were excluded from the study.

FNAC was performed using a 22 gauge needle. An average two passes was performed and minimum 4 slides were prepared. Two slides were air dried and stained by Giemsa stain, while the remaining two slides were fixed in equal parts of ether alcohol mixture and then stain with PAP (Papanicolau) stain. Smears

Address for correspondence:
[1]Associate Professor (**Corresponding Author**)
Department of Pathology
Assam Medical College, Dibrugarh, Assam
Mobile : +91 9435144568
Email: drjdevipath@gmail.com
[2]Professor of Anatomy, Gauhati Medical College, Guwahati, Assam

showing enough cellular material to provide a diagnosis were considered satisfactory. In this study FNAC results were correlated with histological findings, whenever available.

All data collected were thoroughly cleaned and entered in to MS- Excel spread sheet and analysis were carried out. Statistical analysis was done to find out the diagnostic accuracy of the FNAC. Association between the variables were calculated by students exact test & "p" value of <0.05 was taken as being significant.

RESULTS

Total numbers of thyroid neoplasms 47, out of 343 thyroid FNAC are analysed. Highest numbers of cases are seen in the age group of 21 to 40 years of age group (**Table 1**). Highest relative frequency of thyroid neoplasms, 0.468 can be seen in the age group 21 to 40 years with a simple frequency 22 and percentage of frequency 46.800 (Table 2). In male highest relative frequency 0.444 can be seen in the age group both in "21 to 40" and "41 to 60" years with a simple frequency 4 and percentage of frequency 44.500 (**Figure 1**). In female highest relative frequency 0.474 can be seen in the age group 21 to 40 years with a simple frequency of 18 and percentage of frequency 47.400; (**Figure 1**). Most common diagnosis is follicular neoplasms followed by papillary carcinoma (**Table 3 and Figure 2**). Biopsy was available in 20 cases for histopathological examination, out of these a sum of 19 cases were consistent with cytological diagnosis with mean 3.800, standard deviation 4.817, standard error of mean 2.154 which is seen in the . Whereas in one case histopathological diagnosis was inconsistent with cytological diagnosis with mean 0.200, standard deviation 0.447, standard error of mean 0.199 (**Table 4**). In thyroid neoplasmas we got 7 (True negative) cases of benign neoplasms (cytologically and histologically benign), 12 (True positive) cases of malignant neoplasm (cytologically and histologically malignant), 1 false positive (F.P) case, no false negative (FN) case was detected. This gives diagnostic accuracy of 95% and 5% F.P. rate. In this study we got $P< 0.001$; $t = 6.809$ for thyroid neoplasms in male and female which is statistically significant.

Table 1 Number of thyroid neoplasms in different age group in male and female

Thyroid Neoplasms		
	Number of cases	
Age in years	Male	Female
0 to 20	0	4
21 to 40	4	18
41 to 60	4	15
More than 60	1	1
Sum	**9**	**38**
Mean	**2.25**	**9.5**
SD	**±2.062**	**±8.266**
SEM	**±1.031**	**±4.133**
N	**4**	**4**

Table 2 Distribution of frequency of different types of thyroid neoplasms

Class interval in years	Thyroid neoplasms		
	F (Frequency)	Fr (Relative frequency)	f% (Percentage of frequency)
0 to 20	4	0.085	8.500
21 to 40	22	0.468	46.800
41 to 60	19	0.404	40.400
Above 60	2	0.043	4.300
Sum	**47**	**1.000**	**100.000**

Table 3 Numbers of different type of thyroid neoplasms

Neoplastic lesions of thyroid	
Cytodiagnosis	**Number of case**
Follicular neoplasm	20
Papillary Carcinoma	15
Suspicious of malignancy	05
Medullary carcinoma	02
Anaplastic carcinoma	05
SUM	47

Table 4 Histopathological consistency with cytodiagnosis in thyroid neoplasms

Histopathology consistency with cytodiagnosis				
Cytodiagnosis	**Cytopositive cases N=47**	**HPE available Cases N=20**	**HPE consistent with cytodiagnosis**	**HPE inconsistent with cytodiagnosis**
Follicular neoplasms	20	11	10	01
Papillary carcinoma	15	08	08	00
Suspicious malignancy	05	01	01	00
Medulary Carcinoma	02	00	00	00
Anaplastic carcinoma	05	00	00	00
SUM			**19**	**1**
Mean			**3.800**	**0.200**
SD			**±4.817**	**±0.447**
SEM			**±2.154**	**±0.199**

(**N.B.** There are 10 cases of follicular neoplasms in which HPE is consistent with cytodiagnosis. Out of these 10 cases, 7 are adenomas and 3 are carcinomas.)

Table 5 Comparison of diagnostic accuracy with other studies

Authors	Diagnostic accuracy
Arup Sengupta et al (2011)[13]	97%
HeydarAli, HassanTaghipur (2012)[10]	93.6%
E.A. Sinna,N. Ezzat (2012)[1]	98.8%
SuninaBamanikar (2014)[7]	94.2%
Present study (2015)	95%

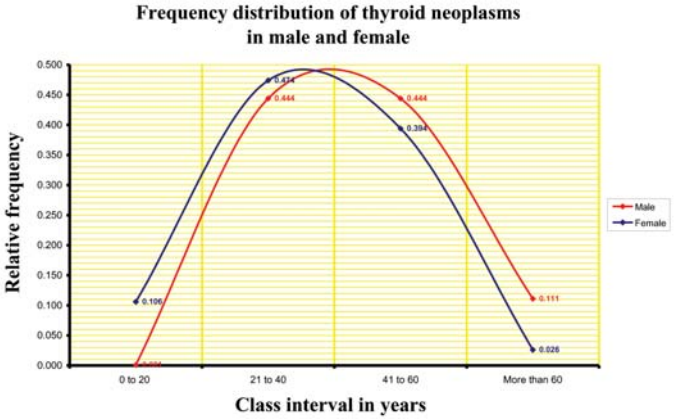

Figure 1 Frequency distribution of thyroid neoplasms in different age group in male and female

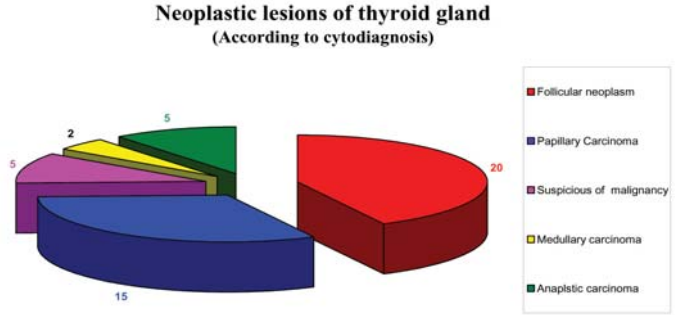

Figure 2 Pai chart showing numbers of different type of thyroid neoplasms

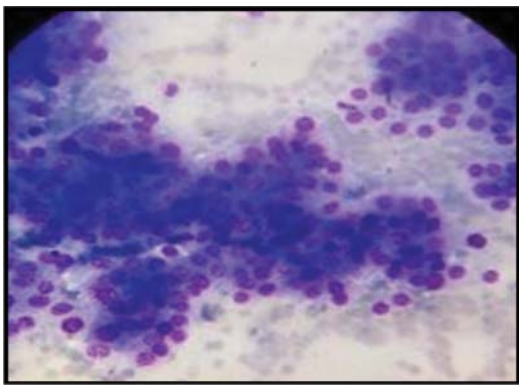

Figure 3 Cytological smear of follicular neoplasm of thyroid gland(MGGX100)

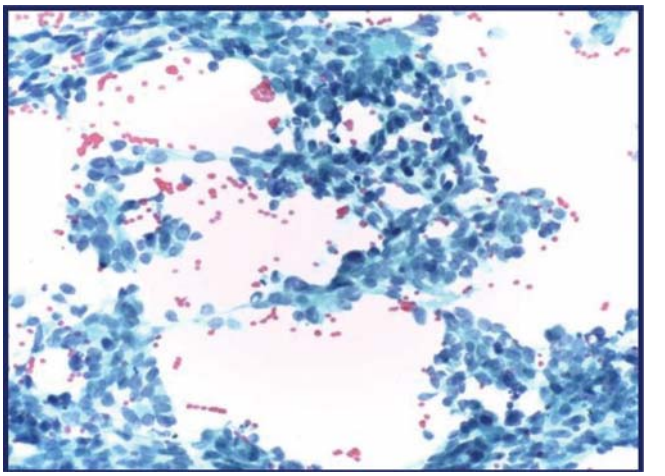

Figure 4 Cytological smear of papillary carcinoma thyroid(Pap x100)

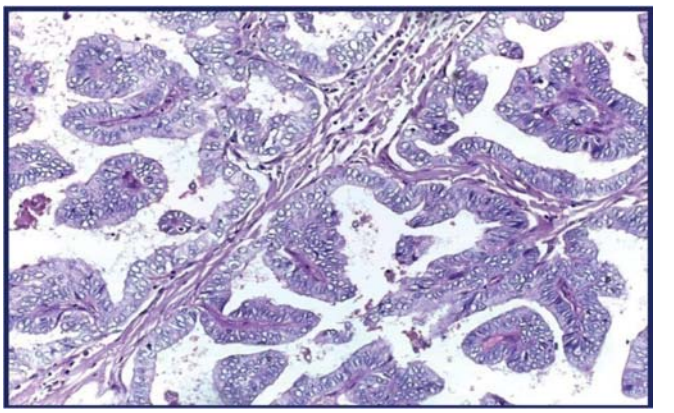

Figure 5 Tissue section from paoillary carcinoma thyroid (H&E x400)

DISCUSSION

In the present study most cases of thyroid neoplasms were found in the 21-40 years age group which is similar to studies done by E.A Sinna (2012)[1] and GunvantiRathod (2012).[6] In our study we found female predominance. Thirty nine female cases and 9 male cases were found, giving the female: male ratio=4.2.1 ($t = 6.089$, $p < 0.001$). E.A Sinna and Gunvanti Rathod reported F:M ratio 5.2:1 and 4:1 respectively which are similar to the present study.

Thyroid nodule presents a very common clinical problem and the differential diagnosis include cancer.[8]Here we recorded the diagnosis as per the criteria laid down in the standardized nomenclature of the Bethesda system. According to Bethesda system of categorization, "follicular neoplasm"/"suspicious for FN", "suspicious for malignancy" and "malignant" categories were included in our study and analysed. "Benign" and "atypical follicular lesion of undetermined significance" were excluded.

In the present study we got total 47 neoplasms out of these 20 cases (42.55%) were follicular neoplasm, 15 cases (31.91%) were papillary carcinoma, 5 cases (10.64%) suspicious of malignancy, 2 cases (4.26%) were medullary carcinoma, 5 cases were (10.64%) anaplastic carcinoma.

Overall we got 42.55% cases of follicular neoplasm, 46.81% cases

of malignant neoplasm and 10.64% cases of suspicious of malignancy. Santosh Mandal[9] reported out of 93 neoplastic lesions 38.71% follicular neoplasms (F.N), 12.90% suspicious for malignancy, 48.39% malignant neoplasms. E. A. Sinna (2012)[1] reported out of 121 neoplastic lesion of thyroid, 40.5% follicular neoplasms (F.N)., 24.79% suspicious for malignancy, 34.7% malignant neoplasms. Hyder Ali (2012)[10] reported 18.66% of suspicious for malignancy and 7.8% malignant neoplasms. Findings of the present study correlated well with other studies.

Out of 47 cases of thyroid neoplasms histopathology was available in 20 cases (42.5%) . Of these 20 cases,10cases were follicular neoplasms [7 cases(70%) were follicular adenoma and 3 cases(30%) were follicular carcinoma] (Fig 3); 8 (40%) cases were papillary carcinoma(Fig.4,5); one case (5%), suspicious for malignancy proved as papillary carcinoma on histopathology. One case (5%) cytologically diagnosed as follicular neoplasm was inconsistent and proved as adenomatoid nodule on histopathology. Medullary carcinoma and anaplastic carcinoma were not available for histopathological examination (HPE). Out of 11 cases of follicular neoplasms available for histopathogy 10 cases were consistent, one case (5%) cytological diagnosis was inconsistent and diagnosed as adenomatoid nodule on histopathology (False positive). This gave 5.0% false positive (FP) rate. Which is similar to other study which cite F.P. rate 0-9%.[11,12]

In the category of follicular neoplasm or suspicious for follicular neoplasm (F.N/SFN), percentage of malignancy risk was 27.27%. Only one out of 5 cases of suspicious for malignancy was available for histopathology and it was turned out as papillary carcinoma giving malignancy risk 100% in this category. Eight cases were available for histopathologcal examination (HPE) in "malignant" category. All 8 cases (100%) were malignant (papillary carcinoma) on histopathology (H.P) giving malignancy rate 100%. Findings of malignancy rate are compared with S.KumarMandal et al (2013)[9].

In this study diagnostic accuracy of FNAC in thyroid neoplasms was 95% which is comparable to other studies (**Table 5**).

In the present study it was noted that fine needle aspiration cytology of thyroid gland has certain limitations on account of an intermidiate/suspicious diagnosis. Intermediate FNAC results and cytodiagnostic error are unavoidable due to overlapping cytological features, particularly among hyperplastic adenomatoid nodules, follicular neoplasms, and follicular variant of papillary carcinoma.[14]In the present study among the follicular neoplasms 3 cases were malignant (F.carcinoma) and 7 cases were benign (follicular adenoma) on histopathology. It was not possible to group them in either benign or malignant cytologically. This was mainly due to the limitation of thyroid cytology to distinguish follicular adenoma from follicular carcinoma. The diagnosis required a detailed histopathological examination for vascular and capsular invasion which is possible only on histopathology of biopsy specimens. As the risk of malignancy in intermediate /suspicious category is high, surgical removal of the thyroid swelling should be considered strongly in these cases.

Inadequate samples /haemorrhagic aspirates also another diagnostic difficulty we faced for which we had to repeat the procedure. Because of high vascularity of the gland, large area of cystic degeneration most of the time blood was aspirated and smears were hypocellular. The use of ultrasound guided (USG) FNA improves sample acquisition and can reduce the sampling error. The cytopathologist should be aware of the potential diagnostic pitfalls and the interpretational error that can be reduced further if the aspirate are obtain from different portion of the nodule/swelling with the use of the ultrasound guided FNA procedure, with expert cytopathologist to perform and interpret the aspirates.

CONCLUSION

FNAC is a highly accurate initial diagnostic test for evaluation of patients with neoplastic lesions. Multiple passes from different sites and ultrasound guided FNAC are advisible and smears should be viwed with caution to avoid false positive diagnosis and unnecessary surgical procedure.

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