



FINE NEEDLE ASPIRATION CYTOLOGY OF THYROID LESIONS AND ITS HISTOPATHOLOGICAL CORRELATION

Pathology

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ABSTRACT

Thyroid lesions are commonly seen in day to day clinical practice with an annual incidence rate of 4-7%. A preliminary and effective diagnostic tool is required to provide early diagnosis. This was a retrospective study of 98 fine needle aspirations (FNA) of thyroid swellings over a period of two years. The results were categorized according to the recent Bethesda classification (2017). Histopathological correlation was done, when surgical specimen was available. The statistical analysis was done. FNAC was performed in 98 patients with thyroid swelling. Out of 98 cases, histopathological investigation could be made in 45 cases. Present study highlights the role of fine needle aspiration cytology as a first-line investigation in cases of thyroid swellings and to correlate the cytology findings with histopathological findings wherever possible.

KEYWORDS

Thyroid, Fine needle aspiration, Histopathology

INTRODUCTION

Thyroid lesions are commonly encountered in day to day practice. Thyroid nodules show an incidence rate of 4-7%. (1) Excising all the thyroid lesions is impracticable and associated with risk. (2)

Fine needle aspiration cytology (FNAC) has been increasingly utilized as pre-operative investigation of thyroid swelling. (3,4) The technique is rapid, minimally invasive & cost-effective procedure. (5) FNAC has led to an appreciable decrease in the surgical treatment of the patients with thyroid nodular diseases and has increased the percentage of operated malignant nodules or suspicious of malignancy by 50%. (6) Against this background, in our study we have compared the cytological and histopathological diagnosis of patients who underwent thyroid surgery and aimed to evaluate the diagnostic accuracy of FNAC in terms of sensitivity, specificity and predictive values.

Aims and Objectives

The aim of this study was to find out the spectrum of thyroid lesions with respect to age and sex, evaluate the diagnostic accuracy of FNAC in thyroid lesions by correlating the cytological finding with histopathology.

Material and Methods

This was a retrospective study done at Department of Pathology, Government Medical College, Miraj, Maharashtra, India over a period of two years (January 2017 to December 2018). FNA was done in 98 cases with thyroid swellings. Patients of all age group and both sexes were included. Out of 98 patients, histopathological specimens of 45 cases were received and the histopathological findings were correlated in these cases.

After the brief explanation of the procedure of FNAC and its possible complications to the patient, a written informed consent was taken. The procedure was performed in cytopathology laboratory of pathology department, on an outpatient basis. Fine needle aspiration was performed by using needle of 24 gauge. (7) 2-3 slides were fixed in 95% ethyl alcohol and stained by routine H & E method and PAP method. One slide was kept air dried and stained with Leishman stain. The smears were reviewed and were interpreted according to recent Bethesda classification (2017) (8) into 6 categories viz. non diagnostic/ unsatisfactory (ND/UNS), benign, atypia of undetermined significance/ follicular lesion of undetermined significance (AUS/FLUS), follicular neoplasm/suspicious of follicular neoplasm (FN/SFN), suspicious for malignancy (SFM) and malignant.

After FNAC, the patients were subjected to surgery after preoperative preparation and anaesthesia check-up. Thyroidectomy specimen was

evaluated by histopathological examination. Specimens were processed and staining was performed with routine haematoxylin and eosin stain. Correlation of histopathological findings was performed with FNAC. The sensitivity, specificity, accuracy, false positive rate (FPR) and false negative rate (FNR) of FNAC for various thyroid lesions were calculated.

Results

FNAC was performed in 98 patients with thyroid swelling, of which 85 cases were females and 13 cases were male with female to male ratio of 6.5:1. Maximum number of cases were found in 3rd and 4th decade of age. The distribution of cases is shown in Table no. 1.

Table No.1- Distribution of cases according to cytologic diagnosis based on Bethesda classification

Category	Cytologic Diagnosis	Cases	Percentage
I	Non diagnostic/unsatisfactory	5	5.10%
II	Benign	82	83.67%
III	Atypia of undetermined significance/follicular lesion of undetermined significance	8	8.16%
IV	Follicular neoplasm/ suspicious of follicular neoplasm	2	2.04%
V	Suspicious for malignancy	1	1.03%
VI	Malignant	0	0
	Total	98	100%

In the present study, 82 cases (83.67%) were diagnosed as benign thyroid lesions (Category II of Bethesda classification). Out of these, 65 cases showed features of colloid goitre or nodular goitre or of colloid cyst. On microscopy, smears showed scattered and clusters of benign follicular epithelial cells against background of colloid. (Figure 2) Many of the cases showed hemosiderophages and foamy macrophages in the background. Histopathology sections showed thyroid follicles of varying sizes containing abundant colloid. (Figure 3)

17 cases were diagnosed as lymphocytic thyroiditis. On microscopy, these cases showed scattered & clusters of benign follicular epithelial cells against the background of numerous lymphocytes. At places, lymphocytes were seen impinging on clusters of follicular epithelial cells. Some of the follicular epithelial cells showed hurthle cell change. Histopathology sections showed thyroid follicles of varying sizes with dense & diffuse infiltration by lymphocytes, at places destructing the follicles. Some of the follicular epithelial cells showed hurthle cell

change.(Figure 4)

There were 8 cases classified as atypia of undetermined significance/ follicular lesion of undetermined significance (Category III of Bethesda classification). On microscopy, these cases showed mixed micro & macrofollicular pattern of follicular cells & scant colloid in the background. Some of the clusters showed nuclear crowding, overlapping and anisonucleosis. Occasional cells showed nuclear grooves. On histopathology, two cases were reported as hashimoto's thyroiditis, one was reported as nodular goitre and one as papillary carcinoma. Other 4 patients did not turn out for histopathology.

There were 2 cases of follicular neoplasm/suspicious of a follicular neoplasm (Category IV of Bethesda classification) reported. Cytology smears showed sheets of follicular epithelial cells, repetitive microfollicular pattern, occasional macrofollicular pattern and absent or scant colloid on the background.(Figure 5) Histopathology sections of one case showed well encapsulated tumor separated from normal thyroid tissue by thick capsule. (Figure 6)The tumor was composed of uniform small follicles lined by round to oval cells having mildly pleomorphic nuclei and scant to moderate amount of eosinophilic cytoplasm. The adjacent thyroid was compressed by the tumor. There was no evidence of capsular or vascular invasion. Histopathology of other case showed partially encapsulated nodule composed of varying sized thyroid follicles containing colloid & was reported as adenomatoid goitre.

A single case of suspicious of papillary carcinoma thyroid (Category V of Bethesda classification) was reported. Microscopy showed cellular smears with clusters of follicular epithelial cells, many of which showed crowding and overlapping of nuclei and occasional cells showed nuclear grooves. On histopathology, well-formed papillae lined by tumor cells are noted. The nuclei showed ground glass chromatin, overcrowding & overlapping. Psammoma body was also noted.(Figure 7)

This study also included 5 cases which were non-diagnostic / unsatisfactory. These cases on microscopy didn't fulfill the adequacy criteria of thyroid FNA.

Out of 98 cases, histopathological investigation was done in 45 (45.92%) cases. (Table.2).

Table 2: Correlation between cytological & histopathological diagnoses

Category	Cytopathological Diagnosis	Number of cases where surgical specimens were received	Histopathologic al Diagnosis	No of cases
I	ND/UNS (n=5)	-	-	-
II	Benign(n=82)	38	Nodular goitre	27
			Lymphocytic thyroiditis	5
			Follicular adenoma	1
			Adenomatoid goitre	2
			Colloid cyst	2
			Nodular adenomatoid hyperplasia	1
III	AUS/FLUS(n=8)	4	Hashimoto's thyroiditis	2
			Nodular goitre	1
			Papillary carcinoma	1
IV	FN/SFN(n=2)	2	Follicular adenoma	1
			Adenomatoid goitre	1
V	SFM(n=1)	1	Papillary carcinoma	1
VI	Malignant(n=0)	-	-	-

(ND/UNS-Non-diagnostic/unsatisfactory, AUS/FLUS-Atypia of undetermined significance/follicular lesion of undetermined significance, FN/SFN- Follicular neoplasm/suspicious of a follicular neoplasm, SFM- suspicious for malignancy, TN-true negative, FN-false negative, TP-true positive, FP-false positive)

*In the present study, we have not considered cases in non-diagnostic / unsatisfactory category (Cat.I) and atypia of undetermined significance/follicular lesion of undetermined significance category (Cat.III) for calculations because these cases could not be classified either as benign or malignant on cytology.

Table No.3: Relation between cytological and histopathological diagnosis.

Cytological Diagnosis	Histopathological Diagnosis		Total
	Non- Neoplastic /Benign	Neoplastic	
Benign	37 (TN)	1 (FN)	38
Follicular neoplasm	1 (FP)	1(TP)	2
Suspicious for malignancy	0	1(TP)	1
Total	38	3	41

In our study, the accuracy of cytological diagnosis was 95.12% with a sensitivity of 66.67%, specificity of 97.37%, a positive predictive value of 66.67%, a negative predictive value of 97.37%, false negative rate of 33.33% and false positive rate of 2.63%.



Figure 1 - Nodular Goitre showing single nodule.

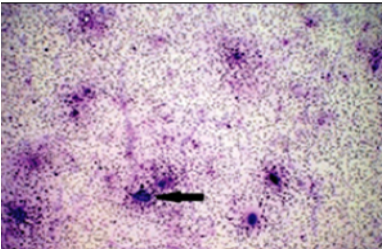


Figure 2 - Colloid Goitre- Smear showing few groups of follicular epithelial cells(arrow) in a background of abundant colloid (Giemsa, X40)

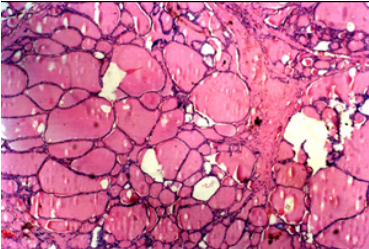


Figure 3 - Colloid Goitre (H & E, X40)

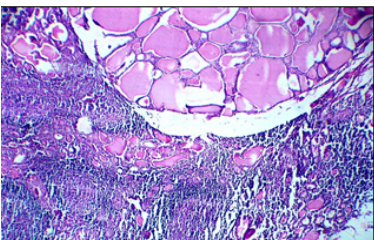
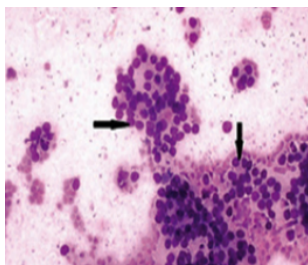
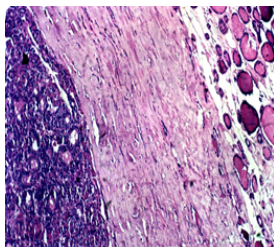
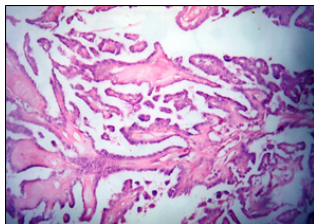
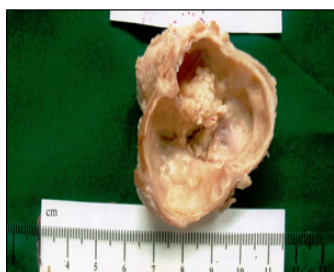


Figure 4 - Nodular Goitre showing non-specific lymphocytic thyroiditis in the adjacent thyroid. (H & E,X10)**Figure 5 - Follicular Neoplasm: Smear showing monolayered sheets of follicular epithelial cells arranged in repetitive follicular pattern(arrow). (Giemsa, X400)****Figure 6-Follicular Adenoma (H & E, X10)****Figure 7 - Papillary Carcinoma showing well developed papillae, some with hyaline core. (H & E, X10)****Figure 8 - Papillary Carcinoma : Gross specimen, predominantly cystic, showing papillary excrescences on inner aspect of cyst.**

DISCUSSION

The utility of FNAC in the diagnosis of thyroid lesions has been well documented since 1930. A good correlation between fine needle aspiration cytology and histopathology has been recorded in many series.

The present study showed female predominance with female to male ratio of 6.5:1. Maximum cases were found in 3rd & 4th decade of age. Handa et al(9)& Pandey et al(10) also reported female predominance with most of the cases in 3rd & 4th decade in their studies.

In our study, maximum number of cases i.e. 82 cases (83.67%) were seen in Category II i.e. benign, 8 cases (8.16%) was of atypia of undetermined significance, 2 cases (2.04%) of follicular neoplasm/suspicious of a follicular neoplasm, 01 case (1.03%) was suspicious for malignancy and 5 cases (5.10%) were Non diagnostic/unsatisfactory. Mehra and Verma(11)&Kaler et al (12) also reported similar findings in their studies. However, unlike other studies, no cases of malignancy were reported in our study.

Table 4: Correlation between cytological & histopathological diagnosis

Category	Cytopathological Diagnosis	Number of cases where surgical specimens were received	Histopathological Diagnosis	No of cases
I	ND/UNS (n=5)	-	-	-
II	Benign(n=82)	38	Nodular goitre	27 (TN)
			Lymphocytic thyroiditis	5 (TN)
			Follicular adenoma	1 (FN)
			Adenomatoid goitre	2 (TN)
			Colloid cyst	2 (TN)
			Nodular adenomatoid hyperplasia	1 (TN)
III	AUS/FLUS(n=8)	4	Hashimoto's thyroiditis	2
			Nodular goitre	1
			Papillary carcinoma	1
IV	FN/SFN(n=2)	2	Follicular adenoma	1 (TP)
			Adenomatoid goitre	1 (FP)
V	SFM(n=1)	1	Papillary carcinoma	1 (TP)
VI	Malignant(n=0)	-	-	-

In our study, the sensitivity was 66.67%, specificity 97.37%, positive predictive value of 66.67%, and a negative predictive value of 97.37%. Our results were comparable with Cap J et al(13) study where FNAC of thyroid is reported to have sensitivity ranges from 65% to 98%, a specificity of 72% to 100%, a positive predictive value of 34% to 100%, and a negative predictive value of 83% to 100%.

The diagnostic accuracy for cytologic diagnosis was 95.12% in the present study which is comparable with Bista et al (14) study which showed diagnostic accuracy of 92.1%.

A false positive case means case which is cytologically diagnosed as neoplastic but later confirmed as benign on histopathology. The false positive rate (FPR) in our study was 2.63%. Caruso & Muzzafarri et al(15) in their study reported false positive rate of <6% and Bartolazzi et al(16) study reported 2.2%. In our study, a false positive case of follicular neoplasm on cytology was reported as adenomatoid goitre on histological examination. The slides were reviewed. The cytology showed features similar to adenomatoid goitre. Hall TL et al(17) showed that distinction between adenomatoid goitre & a follicular neoplasm may be very difficult.

False negative case means case which is cytologically diagnosed as benign but later confirmed as neoplastic on histopathology. The false negative rate (FNR) in our study was 33.33% which is slightly higher when compared with Suen KC et al(18) study, in which the incidence of false negative FNA cytology results ranged from 1.5 to 11.5%. It may be because of small sample size of histopathology specimens for correlation. In our study, a case was diagnosed as benign-nodular goitre which on histological examination showed follicular adenoma.

There were 8 cases (8.16%) diagnosed as follicular lesion of undetermined significance on cytology. Incidence is slight higher when compared with Cibas E et al(19) study. They reported an incidence ranging from 3-6%. On histopathology, two cases were reported as hashimoto's thyroiditis, one was reported as nodular goitre and one as papillary carcinoma. Other 4 patients did not turn out for histopathology. These cases could not be categorised into specific cytologic diagnosis.

CONCLUSION

Thyroid nodules are a common clinical problem. Thyroid problems are

mainly seen in 3rd & 4th decade of life with female predominance. FNAC of the thyroid is an invaluable and minimal invasive procedure for screening or diagnosis of patients with thyroid nodule to guide the surgeons. It is a safe, simple and reliable procedure in the investigation of thyroid swelling. Diagnostic operation can be avoided in many patients.

FNAC is cost effective procedure and does not cause any complication to the patient. So, it effectively distinguishes thyroid lesions suitable for surgical resection with those that can be managed conservatively. It mostly replaces the need for histopathology which is an investigation of choice for confirmation of malignancy.

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