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Research Paper

Diagnostic Accuracy and Role Of Fine Needele Aspiration Cytology in the Diagnosis of Thyroid Lesions (a Retrospective Study of 150 Cases)

Medical Science

KEYWORDS : role of FNAC, histopathology, thyroid

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ABSTRACT

Fine Needle Aspiration Cytology (FNAC) includes sampling of masses with fine needle aspiration technique.It is widely accepted as the most accurate procedure to differentiate benign from malignant thyroid nodules and prevents unnecessary thyroidectomies. Aim of the study was to find out diagnostic accuracy and role of FNAC in diagnosis of thyroid lesions by correlating with histopathology whenever possible and also to correlate thyroid hormone levels and Ultrasonography (USG) findings with cytology diagnosis.The simplicity, rapidity, lack of morbidity, a high sensitivity, specificity and diagnostic accuracy along with cost effectiveness of FNAC makes it the most valuable tool in the evaluation of thyroid lesions.

INTRODUCTION

Fine needle aspiration cytology is one of the most rapidly advancing fields of diagnostic cytopathology[1].Of the initial screening tests for patients with thyroid lesions, fine needle aspiration cytology(FNAC) is a well developed, frequently used method, which is very cost effective and shows low morbidity. It is widely accepted as the most accurate procedure to differentiate benign from malignant thyroid nodules and helps preoperatively in selecting patients for surgery[2].FNAC used together with other diagnostic modalities such as thyroid scanning, USG ,thyroid hormone and antibody level measurements enhances the diagnostic accuracy of the technique[1,3]. Present study was undertaken to correlate the findings of FNAC with histopathology report so that the unnecessary surgeries for benign thyroid diseases can be avoided. We have also tried to evaluate the usefulness of USG of thyroid and serological tests i.e. Thyroid function tests(TFT), when compared to cytological results.

MATERIALS AND METHODS

The present study was carried out in 150 patients who presented with midline neck swelling in cytology OPD of Pathology Department, Medical College and S.S.G Hospital, Baroda from August 2010 to November 2012. All the patients were examined by cytology. Their ultrasonography and thyroid hormone profile were done. Out of 150 cases, 43 cases were subjected for surgical biopsy where paraffin sections were available for study.Inclusion criterion was patients with thyroid enlargement/ nodule in thyroid coming to the cytology department for FNAC irrespective of age, sex.

FNAC was performed with 23 Gauge needle attached to a 10cc disposable syringe. Wet smears were immediately fixed with 95% methanol and stained with Hematoxylin & Eosin stain. The smears intended for Giemsa stain were quickly air dried and fixed with methanol and stained with Giemsa. The surgical biopsy material or excised lesion was received in 10% neutral formalin. Sections were given and fixed in 10% neutral formalin. After fixation, they were processed by paraffin embedding and 3-5 µm thick sections were prepared. They were stained by hematoxylin and eosin stain. Histopathoiogical diagnosis was made independent of the cytological diagnosis.

Findings of USG and Thyroid function tests were correlated with cytology diagnosis.

RESULTS

Table I: Cytological(FNAC) diagnosis

Cytological diagnosis	No. of cases
Benign Thyroid Lesion (BTL)	119
Follicular neoplasm	2
Colloid goiter	5
Hurthle cell tumor	2
Inflammatory cystic lesion	1
Hashimoto's thyroiditis	3
BTL with thyroiditis	5
Granulomatous lesion	1
Anaplastic carcinoma	2
Papillary carcinoma	2
Medullary carcinoma	1
Metastatic SCC	1
Non diagnostic	6
TOTAL	150

131 patients (87.3%) were females and 19 patients (12.7%) were males.Patients of all ages were included with mean age of 39 years. Histopathological examination was available in 43 cases which shows significant reduction in unnecessary surgeries. 6 cases were non diagnostic because smears show only blood or blood mixed with colloid only and no epithelial cells were seen.

Table II:Cytology- hormone profile correlation

FNAC	No. of cases	TFT		
		Euthyroid	Hyperthyroid	Hypothyroid
Benign	135	87	23	25
Suspicious	4	2	0	2
Malignant	5	4	0	1
Non Diagnostic	6	6	0	0

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As table II shows, out of 135 benign thyroid lesions, most of the patients were euthyroid (87), while hyperthyroid(23) and hypothyroid(25) constituted almost similar number of cases.

TABLE III: Correlation between cytology and ultrasonography(USG)

USG	FNAC				No. of cases
	Benign (N=134)	Malignant (N=5)	Suspicious (N=5)	Inadequate (N=6)	
Benign	133	1	2	6	142
Malignant	0	4	1	0	5
Suspicious	1	0	2	0	3

Table III shows that out of 139 cases diagnosed as benign on USG, only one was malignant while two were suspicious cytologically. Out of 5 malignant cases, 4 proved to be malignant and one was suspicious on cytology. Of three cases which were suspicious on USG, 1 was benign and two were suspicious on cytology.

TABLE - IV: Cytohistopathological correlation

FNAC	HISTOPATHOLOGY								No. of cases
	Colloid Goiter	Follicular Adenoma	Hurthle cell Adenoma	Hashimoto thyroiditis	Thyroglossal cyst	Multinodular goiter(MNG)	Papillary carcinoma	Anaplastic carcinoma	
Benign thyroid neoplasm (BTL)	3	23	1	1	...	7	3	-	38
Follicular neoplasm	-	1	-	-	-	-	-	-	1
Inflammatory cystic lesion	-	-	-	-	1	-	-	-	1
Hurthle cell tumor	-	1	-	-	-	-	-	-	1
Papillary ca.(carcinoma)	-	-	-	-	-	-	1	-	1
Metastatic Squamous Cell Ca.	-	-	-	-	-	-	-	1	1

Out of 150 cases, histopathological correlation was available only in 43 cases.

Table IV shows that out of 38 BTL diagnosed cytologically, 23 were diagnosed as follicular adenoma, 7 were MNG, 3 were colloid goiter, 3 cases were diagnosed as papillary carcinoma, 1 was Hurthle cell adenoma and 1 case was Hashimoto's thyroiditis on histopathological examination while one case of inflammatory cystic lesion on cytology proved to be thyroglossal cyst and a case of Hurthle cell tumor turned out to be a follicular adenoma. Out of two malignant cases, 1 case diagnosed as papillary carcinoma was proved on histopathology, while another diagnosed as metastatic squamous cell carcinoma turned out to be anaplastic carcinoma on histopathology.Out of 9 malignant lesions, six cases were diagnosed cytologically. Other three cases which were diagnosed as benign thyroid lesions on cytology, proved to be papillary carcinoma on histopathological examination. Out of these 9 cases, 5 were papillary i.e. 55.5%. Medullary constituted 1 case(11.1%) and anaplastic were 3 cases(33.4%).

TABLE - V: Histopathological and cytology correlation between benign, malignant and suspicious lesions

FNAC	HISTOPATHOLOGY		No. of cases
	Benign	MALIGNANT	
Benign	36	3	39
Malignant	0	2	2
Suspicious	2	0	2

Table V shows that out of 39 benign lesions diagnosed cytologically, 36 were proved benign while only 3 turned out to be malignant on histopathology.

Out of 150 cases, 4 were reported as suspicious on cytology. Histopathological correlation was available in 2 cases. i.e. follicular neoplasm proved to be follicular adenoma and Hurthle cell tumor proved to be follicular adenoma. Other two suspicious cases were not surgically excised. Two malignancies diagnosed cytologically were confirmed on histopathological examination.

TABLE - VI: Cases discrepant on cytohistopathological correlation

CYTOLOGY	HISTOPATHOLOGY
3 cases of BTL	Papillary carcinoma
BTL	Hashimoto's thyroiditis
BTL	Hurthle cell adenoma
Hurthle cell tumor	Follicular adenoma

BTL= Benign thyroid lesion

Table VI shows that out of 40 BTL diagnosed on cytology smears, 3 were papillary carcinoma, 1 was Hashimoto thyroiditis and 1 proved to be Hurthle cell adenoma.One case diagnosed as Hurthle cell tumor on cytology smear was a follicular adenoma on histology.

TABLE - VII: Interpretation of cytology results

Results	No. of patients	Percentage
Positive results	40	93.02
False negative	3	6.98
False positive	0	0

Out of 150 patients, 6 were non-diagnostic. Histopathological correlation was available in 43 cases out of which 40 were positive and 3 were false negative.There were no false positive cases which is shown in Table VII.

DISCUSSIONS

Table I shows cytological diagnosis of 150 patients. It shows that histopathology was available in only in 43 cases out of total 150 cases which shows significant reduction in number of unnecessary surgeries.

Table II shows that there is no correlation between thyroid hormonal profile and cytology. A similar study was done by Sang et al in which forty two patients had their thyroid profiles done and the results were correlated with FNA diagnosis. There was no significant statistical difference ($p>0.05$) of the mean levels of T3 (0.311), T4 (0.406) and TSH (0.90), between and within the various groups of FNA cytological diagnoses[4].

Chandanwale et al concluded that TFT is just a preliminary tool in evaluation of nodular lesions of thyroid and they lack sensitivity and specificity in the diagnosis of thyroid nodules[2]. But need for measurement of thyroid hormonal profile is strongest before initiating hormonal/operative therapy[4].

Table III shows correlation between USG and FNAC diagnosis. Dr Sreeramulu et al[5] did a study and concluded that sensitivity and specificity of USG were 73% and 85.3% respectively while

comparing with results of FNAC with the result that the correlation in their study was relatively good. A similar study was done by Razmpa et al[3] concluding high sensitivity(92.3%) and specificity(76.4%) of USG in comparison to FNAC results. In present study, sensitivity and specificity of USG in comparison to FNAC were 80% and 100% respectively(excluding suspicious and inadequate lesions). The findings are similar to above mentioned studies. Certain features on USG are predictive of malignancy such as hypoechogenicity, irregular margins, presence of calcifications and absence of a hypoechoic rim[3,5,6].

In the present study 150 patients were studied cytologically by FNA technique. Histopathological correlation was available in 43 patients (28.67%).

TABLE - VIII: Distribution of results in various series

Series	Chandanwale et al[2]	Gupta et al[7]	Bagga et al[8]	Ali et al[9]	Bista M et al[10]	Musani et al[11]	Moosa et al[12]	Present study
No. of patients	150	75	252	1639	51	105	98	150
Histopathology examination done in	31.3	100	12.8	11.7	100	100	100	28.6
Benign	77.6	72	90.5	64.3	80.3	87.6	89.8	89.3
Malignant	6.7	8	1.2	7.8	19.6	12.4	8.1	4
Suspicious	13.6	20	6.7	18.6	-	-	2	2.6
Inadequate	2	-	1.6	9.2	-	-	-	4
Positive	97.8	66.7	96	97.9	92.1	94.2	97.9	92.6
False +ve	0	13.3	0	0	1.9	0.9	0	0
False –ve	2.1	20	4	2.1	5.8	4.7	2	7.3
Sensitivity	90	80	66	91.6	70	61.5	77.7	40
Specificity	100	86.6	100	100	97.5	98.9	98.9	100
Diagnostic Accuracy	87.5	84	96.2	97	92.1	94.2	96.9	93

Table VIII shows that the results of present study are in close correlation with P K Bagga et al[8]. In the present study, positive results were 95.12% and false negative were 4.88%. There was no false positive case in the present study. For statistical purpose, suspicious and inadequate results were left out. Sensitivity was 40%, specificity 100% and diagnostic accuracy was 93.02%.

In the present study, out of 5 cases of papillary carcinoma two were diagnosed on cytology of which only one was surgically removed and proved to be papillary carcinoma on histopathological examination. Three lesions, diagnosed as benign thyroid lesions with varying amount of cystic change, were surgically removed and showed papillary carcinoma on histology .

The two cases which were diagnosed as papillary carcinoma on cytology, showed syncytial clusters of follicular epithelial cells with pale nuclei having powdery chromatin, intranuclear cytoplasmic inclusions and nuclear grooves. Formation of papillary architecture with a central fibrovascular core was seen in one case while nuclear features were consistent with papillary carcinoma in both cases diagnosed cytologically. Psammoma bodies were not seen in either case.

In the present study, 2 cases of follicular neoplasm and 2 cases of Hurthle cell neoplasm were diagnosed as suspicious because the diagnosis of follicular and Hurthle cell carcinoma requires demonstration of capsular and/or vascular invasion, which cannot be evaluated on cytology[1,2,4]. FNAC aspirates from the cases diagnosed as Follicular neoplasm showed cellular smears containing syncytial, multilayered cell clusters of variable sizes with nuclear crowding and overlapping with many microfollicles. FNA smears from the case diagnosed as Hurthle cell neoplasm was cellular with many poorly cohesive clusters of Hurthle cells which were large and polygonal with abundant deep blue cytoplasm on Geimsa stain.

CONCLUSIONS

We concluded that the simplicity, rapidity, lack of morbidity, a high sensitivity, specificity and diagnostic accuracy along with cost effectiveness of FNAC makes it the most valuable tool in the evaluation of thyroid lesions.

Papillary carcinoma shows cystic changes in almost 25% cases accounting for the false negativity. So, all cystic lesions should be evaluated cautiously with repeated aspirations and/or under USG guidance. Intranuclear cell inclusions in <5% of cells and/or nuclear grooves in <20% of cells should be reported as suspicious for malignancy even though other cytological features of papillary carcinoma are not evident. However, due to false negative diagnosis seen in some series and also in the present study, all clinically malignant or suspicious lesions should undergo surgical excision in the face of a benign cytology.

Strong correlation was found between USG findings and cytology results.

There was no correlation between FNAC diagnosis and thyroid hormonal profile. But T3,T4,TSH measurement is necessary before hormonal/operative therapy.

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