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Original Research Article

Cyto-histopathological correlation of thyroid lesions

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ABSTRACT

Background: Thyroid is a frequent site of disease in human body. Fine needle aspiration cytology is a rapid, efficient, inexpensive and safe diagnostic method in these cases. FNAC has some limitations, particularly limited to representatives of samples and exact typing of benign and malignant neoplastic lesions. Thus, FNAC alone may not give a confirmative diagnosis regarding few thyroid lesions. Hence, histopathological study has been the standard technique for the diagnosis of thyroid lesions. Objectives were to study cytomorphological features of thyroid enlargement and palpable lesions of thyroid by FNAC, to correlate cytomorphological features of thyroid lesions with Histopathological features wherever possible and to evaluate sensitivity and specificity of FNAC of thyroid lesions.
Methods: In the present study, 385 cases of thyroid FNA's, have been analyzed and cyto-histopathological correlation has been interpreted wherever available.
Results: In present study sensitivity, specificity, positive predictive, negative predictive value and accuracy of FNAC was found out be 92.31%, 97.01%, 85.71%, 98.48% and 96.25%.
Conclusions: Fine needle aspiration cytology is a simple reliable and cost effective technique without complications. This can be used as safe outpatient procedure with minimal discomfort to the patient.

Keywords: Correlation, FNAC, Histopathology, Thyroid lesions

INTRODUCTION

The prevalence of thyroid swelling ranges from 4% to 10% in the general adult population and from 0.2% to 1.2% in children.[1] In surgical practice, thyroid lesions are common, observed in 4-7% of the population and affect women more commonly than men. Excising all the thyroid lesions is impracticable and associated with risk.[2,3] As FNAC distinguishes between benign and malignant lesions quite effectively, it is the pre-operative screening method of choice worldwide.[4] In past five or six decades, FNAC of thyroid has been increasingly utilized for investigation of thyroid lesion to know the neoplastic and non-neoplastic lesions. Simplicity, diagnostic accuracy and most of all cost effectiveness has given FNAC the status of first line diagnostic test in pre-operative evaluation of thyroid lesions. Its accuracy when applied by experienced and well trained practitioners, can approach that of histopathology in providing unequivocal diagnosis.[5]

Its use has decreased the number of thyroid surgeries performed and increased the ratio of malignant to benign lesions resected. As a result, many thyroid surgeries for benign non-neoplastic diseases have been avoided.[6] The present study aims at diagnosing various thyroid lesions based upon cytomorphological features with its histopathological correlation and also evaluates the sensitivity and specificity of fine needle aspiration procedure and its interpretation.

METHODS

A cross sectional study was done in the department of Pathology from 1st January 2014 to 30th June 2015. A total of 385 cases of thyroid masses were thoroughly examined clinically after taking detail history. Necessary clinical investigations were done and patients were subjected to FNAC using 22 to23 gauge needle. Smears were prepared, and fixed by using 95% ethyl alcohol. And then stained by Papanicolaou's method and the cytological diagnosis was made. 80 patients were subjected to surgery. Thyroidectomy specimen was evaluated by histopathological examination. Specimens were processed in automated tissue processing units and staining was performed with routine hematoxylin and eosin stain. Fisher's exact t test is used to compare the possible correlation between FNAC and Histopathology of thyroid lesions. The present study was conducted after obtaining the ethical approval from the Ethical Review Committee.

Inclusion criteria

All patients with palpable thyroid swelling who had undergone FNAC on outpatient and inpatient basis in cytology section with adequate cellular aspirates.

Exclusion criteria

- Patients already diagnosed to have thyroid lesions on Histopathological examination.
- Patients having Inadequate aspirates on FNAC.

RESULTS

During the period of this study from August 2010 to September 2012, 100 FNACs were performed out of which 70 cases were biopsied subsequently and subjected to histopathological study.

Table 1: Distribution of various thyroid lesions on FNAC (n=385).

Type of thyroid lesions		No. of cases	Percentage
Non-neoplastic	Colloid goitre and thyroid cyst	253	65.71%
	Inflammatory	67	17.40%
Neoplastic		65	16.88%
Total		385	100%

Most common age group in which thyroid lesions were found was 31-40 years comprising 118 cases (30.65%) of total patients, From the total number of 385 cases the sex distribution of thyroid aspirates shows more percentage of females i.e. 329 (85.45%) It is observed that non-neoplastic lesions are more common with 320 (83.12%) cases, malignant lesions are least common with 65 (16.88%) cases (Table 1).

Table 2: Different non-neoplastic lesions on FNAC (n=320).

Lesions	No. of cases	Percentage
Colloid Goiter	229	71.56%
Thyroid cyst	24	7.5%
Hashimoto's thyroiditis	7	2.19%
Lymphocytic Thyroiditis	47	14.69%
Acute thyroiditis	5	1.56%
Granulomatous thyroiditis	8	2.5%
Total	320	100%

Amongst Non-neoplastic lesions colloid goiter 229 cases (71.56%) was found to be more common, followed by lymphocytic thyroiditis 47 cases (14.69%) and least common was acute thyroiditis 5 cases (1.56%) (Table 2).

Table 3: Different neoplastic lesions on FNAC (n=65).

Lesions	No. of cases	Percentage
Follicular neoplasm	58	89.23%
Papillary carcinoma	4	6.13%
Anaplastic carcinoma	3	4.62%
Hurthle cell neoplasm	1	1.54%
Total	65	100%

Most common neoplastic thyroid lesion on FNAC was found to be follicular neoplasm 58 (89.23%) cases, followed by papillary carcinoma 4 (6.13%) cases, followed by anaplastic carcinoma 3 (4.62%) cases followed by hurthle cell neoplasm 1 (1.54%) cases (Table 3).

Histopathological diagnosis of the lesions

Out of 80 cases, 67 were Non-neoplastic lesions while 13 were neoplastic lesions (Table 4).

Table 4: Histopathological diagnosis of thyroid lesions (n=80).

Histopathological diagnosis	No. of cases	Percentage
Colloid goitre	53	66.25%
Thyroid cyst	8	10%
Lymphocytic thyroiditis	1	1.25%
Hashimoto's thyroiditis	5	6.25%
Follicular adenoma	5	6.25%
Hurthle cell adenoma	1	1.25%
Papillary carcinoma	4	5%
Follicular carcinoma	2	2.5%
Undifferentiated carcinoma	1	1.25%
Total	80	100%

Amongst non-neoplastic lesions colloid goiter 53 cases (79.10%) were found to be more common, followed by thyroid cyst 8 cases (11.94%) and least common was lymphocytic thyroiditis 1 case (1.49%) (Table 5).

Table 5: Different non-neoplastic lesions on histopathology (n=67).

Lesions	No. of cases	Percentage
Colloid Goitre	53	79.10%
Thyroid cyst	8	11.94%
Hashimoto's thyroiditis	5	7.46%
Lymphocytic Thyroiditis	1	1.49%
Total	67	100%

Most common neoplastic lesion on histopathology was follicular adenoma 05 cases (38.46%), followed by papillary carcinoma 4 cases (30.77%), followed by follicular carcinoma (15.38%). Least common lesions were 7.69% each of hurthle cell adenoma and undifferentiated carcinoma (Table 6).

Table 6: Different neoplastic lesions on histopathology (n=13).

Lesions	No. of cases	Percentage
Follicular adenoma	5	38.46%
Hurthle cell adenoma	1	7.69%
Papillary carcinoma	4	30.77%
Follicular carcinoma	2	15.38%
Undifferentiated carcinoma	1	7.69%
Total	13	100%

Table 7: Cyto-histopathological correlation (n=80).

Cytological diagnosis	No. of cases	Histopathological diagnosis								
		CD	TC	LT	HT	FA	HA	PC	FC	UC
Colloid goiter	53	51			1					1
Thyroid cyst	8		8							
Acute thyroiditis	-									
Granulomatous thyroiditis	-									
Lymphocytic thyroiditis	1			1						
Hashimotos thyroiditis	4				4					
Papillary carcinoma	4							4		
Follicular neoplasm	9	2				5			2	
Hurthle cell neoplasm	1						1			
Anaplastic carcinoma	-									
Total	80	53	8	1	5	5	1	4	2	1

CD=Colloid goiter; TC=Thyroid cyst, LT=Lymphocytic thyroiditis, HT=Hashimotos thyroiditis, FA= Follicular adenoma, HA= Hurthle cell adenoma, Papillary carcinoma, FC= Follicular carcinoma, UC= Undifferentiated carcinoma.

In present study on cyto-histopathological correlation of 80 cases, there was only 1 case of non-neoplastic lesions (colloid goiter) which was diagnosed as neoplastic lesion, i.e. undifferentiated carcinoma on histopathology. False negative diagnosis was given in FNAC for 1 case. Hence false negative error rate was 1.25%. Also, one case of colloid goiter was diagnosed as Hashimoto's thyroiditis on histopathology. 2 cases diagnosed as follicular neoplasm cytologically, were diagnosed as colloid goiter on histopathology, hence false positive diagnosis by FNAC was given in 2 cases with false positive error rate of 2.5%. All other cases of Non-neoplastic lesion available for correlation were confirmed on histopathology. Out of 4 cases of Papillary carcinoma which were diagnosed by FNAC were confirmed histopathologically with diagnostic accuracy of 100% (Table 7).

Fisher's exact t-test was applied to the above table and data analysis was done and according to it p-value is 0.0000001 which is less than 0.05 hence highly significant.

Sensitivity = TP/ TP + FN X 100= 12/13 x100= 92.31%.

Specificity = TN/ TN + FP X 100= 65/67 x100= 97.01%.

Positive predictive value = TP/ TP+ FP X 100= 12/14 x100= 85.71%.

Negative predictive value = TN/ TN + FN X100= 65/66= 98.48%.

Efficacy = TP+TN/ total cases= 77/80 x 100= 96.25%.

Table 8: Sensitivity, specificity, PPV, NPV and efficacy of FNAC.

Sensitivity	92.31%
Specificity	97.01%
Positive predictive value	85.71%
Negative predictive value	98.48%
Efficacy	96.25%

Analysis of the results yielded a sensitivity of 92.31%, specificity of 97.01%, positive predictive value of 85.71%, negative predictive value of 98.48%, and diagnostic accuracy of 96.25%. Above results proves that FNAC is a highly reliable diagnostic test (Table 8).

DISCUSSION

Advantages and limitations of FNA biopsy should be recognized and the procedure should be knowledgeably applied to evaluate the thyroid diseases. In the present study, cytological feature of thyroid lesions was studied and correlated with histopathology wherever available to determine its diagnostic accuracy in determining Neoplastic lesion

In the present study, age range was between 7-80 years with mean age of 36.8 years. Age range was comparable with study done by Handa U et al 2008 with age range of 5-80 years in their study and Hamdani S et al with age range of 7-80 years.[7,8]

Mean age of present study i.e. 36.8 years was comparable with Handa U et al with mean age 37.69 years, Gulia S et al[9] with 38 years and Thapa PB et al with 38.5 years.[7,9,10]

Thyroid lesions are more prevalent in females. In present study 329 of cases were females and 56 males. Male to Female ratio is 1:5.87.

Male to female ratio in our study is comparable to study done by Parikh U R et al with ratio 1:51 and Patel MM et al with ratio 1: 5.25.[11,12]

In present study 320 cases were non-neoplastic and 65 cases were Neoplastic with neoplastic to non-neoplastic ratio of 1:4.92. Ratio in present study is comparable to study done by Leung CS et al i.e. 4.93:1 and Godinho L et al i.e. 4.95:1.[13,14]

In present study among non-neoplastic lesions colloid goitre was most common 229 cases (71.5%) lesion similar observations were made by Abdulkader A et al i.e. 170 cases (80.6%).[15] Lymphocytic thyroiditis was second most common with 47 (14.68%) and also in the study done by Sirpal YM i.e. 146(13%).[16] Least common lesion in present study was acute thyroiditis with 5 cases (1.56%), similar findings were seen in study of Shere SK et al 2013 i.e. 3(3.75%).[17]

In present study out of 65 neoplastic lesions 58 cases (89.23%) were follicular neoplasm, 4 cases (6.15%) were papillary carcinoma, 3 cases (4.61%) of anaplastic carcinoma, 1 case (1.54%) was of hurthle cell neoplasm. similar findings were observed in study done by Gulia S et al and Abdulkader A et al.[9,15] Papillary carcinoma was second most common lesion in our study which is comparable with studies done by Silverman JF et al with 19 (6.1%) and in Gulia S et al with 12 (8.57%).[9,18] Least common lesion was lesion was anaplastic carcinoma, which is comparable to studies done by Tabaqchali M et al with 6 (2.5%) and Gulia S et al with 5(3.57%) (Table 9).[9,19]

Table 9: Comparisons of statistical data.

Study	Sensitivity	Specificity	PPV	NPV	Accuracy
Harsoulis P et al[20]	89.4%	95.4%	92.5%	88.33%	94.2%
Hawkins F et al[21]	86.3%	95.3%	85.4%	92.3%	93.7%
Afroze N et al[22]	80.9%	99.3%	92.8%	94.5%	94.5%
Bagga et al[23]	66%	100%	100%	96%	96.2%
Gulia S et al[9]	100%	90%	100%	97.67%	92.3%
Present study	92.31%	97.01%	85.71%	98.48%	96.25%

In present study sensitivity, specificity, positive predictive, negative predictive value and accuracy are 92.31%, 97.01%, 85.71%, 98.48% and 96.25% respectively and is comparable with all above studies.

CONCLUSION

Fine needle aspiration cytology is a simple reliable and cost effective technique without complications. This can be used as safe outpatient procedure with minimal discomfort to the patient. Among the different parameters like clinical examination, Ultrasonography and thyroid functional test, FNAC has found to be safe, easy, fast and accurate. The combination of clinical examination and FNAC remains the mainstay in selecting patients for thyroid surgery. There are few complications in this procedure like hematoma and rarely tumor may spread along the needle tract. In our study no complication were seen except one case which had minimal hematoma.

The sensitivity, specificity and accuracy of FNA for malignancy detection have eclipsed the diagnostic utility of other diagnostic methods and this procedure has assumed a dominant role in determining the managements of patients with thyroid nodule. The present study suggests that FNAC gives good positive correlation with histopathology with high sensitivity and specificity. False negative and false positivity can be reduced by repeat aspiration, correct sampling from the lesions with meticulous examination and reporting.

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