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Original research article

A study to correlate the cytological features with histopathological study of all surgically removed thyroid lesions

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Abstract

Fine Needle Aspiration Cytology (FNAC) study of thyroid lesions along with clinical evaluation is emphasized in order to aid towards accurate diagnosis. A uniform reporting system for thyroid FNA will facilitate effective communication among cytopathologists, endocrinologists, surgeons, radiologists, and other health care providers. Also, it will facilitate cytologic-histologic correlation for thyroid diseases, facilitate research into the epidemiology, molecular biology, pathology and diagnosis of thyroid diseases, particularly neoplasia and allow easy and reliable sharing of data from different laboratories for national and international collaborative studies. The present study aims at diagnosing various thyroid diseases based upon cytomorphological features in FNAC with its histopathological correlation, which is the gold standard.
Keywords: Histopathology, surgery, cytomorphology, correlation, accuracy

Introduction

Bommanahalli BP *et al.* (2010) in a pattern analysis study observed that, FNA is more sensitive and specific in differentiating neoplastic from non-neoplastic thyroid lesions. Identification of the predominant cell pattern would be complementary to analysis of cell morphology and background details in cytological diagnosis of thyroid lesions. The key to interpretation is largely dependent on recognition of various cellular patterns, details of follicular cells and background elements like colloid and cyst macrophages. Syncytial pattern, papillary pattern, and microfollicular pattern are more commonly seen in neoplasms and thyroiditis. This cell pattern approach helps to diagnose follicular neoplasm and follicular variant of papillary thyroid carcinoma. Pitfalls in thyroid cytology could be resolved by correct sampling from lesions with meticulous examination[1].GG Swamy *et al.*(2011) studied a total of 120 cases with cyto histological correlation. Among 120 cases 100 (83.66%) were reported cytologically as benign and 20 (16.66%) were malignant. But histologically 98 (81.66%) were benign and 22(18.33%) were malignant.FNAC showed an accuracy of 96.6%, sensitivity 75%, specificity 95.83%, positive predicative value of 81.81% and negative predicative value of 93.81%.Authors concluded that FNAC is specific and sensitive in detecting thyroid malignancy and hencea reliable diagnostic test[2].Tauro *et al.*(2012) in his study, aimed at comparing Fine needle aspiration cytology(FNA) and Fine needle capillary cytology(FNC).Study included 50 patients and they were subjected to both the cytological techniques. Results were correlated with final histopathological findings wherever available. Sensitivity was 50% for FNC and 100% for FNA while specificity was 100% for both techniques; accuracy score was 97.4% for FNC and 100% for FNA

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in predicting malignancy. While sensitivity was 75% for FNC and 100% for FNA; specificity was 100% for both techniques, and accuracy score was 97.4% for FNC and 100% for FNA in the prediction of neoplasia. Authors concluded that there was no significant difference between the two techniques. In highly cellular lesions, in which abundant material was obtained, FNC was more likely to be diagnostically superior, but FNA can diagnose most of the lesions. In less cellular lesions, FNA is more likely to be diagnostically superior to FNC[3].

Rangaswamy *et al.*(2013) studied the cytology of 100 neoplastic thyroid lesions and compared with histopathological diagnosis wherever available.According to their study, sensitivity of FNAC was 75.60%and positive predictive value was 83.78% for malignant lesions. Authors concluded that FNAC is a rapid, efficient, cost-effective and relatively painless procedure with a high diagnostic accuracy. It has high rate of sensitivity and positive predictive value in diagnosing thyroid neoplastic lesions and hence it is a valuable tool in the diagnosis and management of patients and by aiding in minimizing the surgical interventions[4].

Komal singh *et al.*(2013) did a retrospective hospital-based study of 4 years which included 234 thyroid patients. The aim was to study the diagnostic accuracy of FNAC in thyroid lesions and to compare it with histopathology. In their study, the most common thyroid lesions encountered were benign 221 (94.4%), followed by malignant 6 (2.6%), indeterminate 3 (1.3%) and inadequate 4 (1.7%).Authors concluded by saying that the cytological criteria for the diagnosis of thyroid lesions as benign and malignant by FNAC is a highly reliable method as it showed sensitivity, specificityand diagnostic accuracy of 100% in the diagnosis of malignant lesions like papillary carcinoma[5-10].

Aims and Objectives

To correlate the cytological features with histopathological study of all surgically removed thyroid lesions.

Materials and Methods

The present study was undertaken to analyze the role of fine needle aspiration cytology in the cytomorphological features of various thyroid lesions with histopathological correlation wherever the surgery was done and to determine its diagnostic accuracy and to classify all the fine needle aspiration performed thyroid lesions according to TBSRTC.

The study was undertaken in the Department of Pathology, Srinivas Institute of Medical Sciences, Mangalore from Jan 2018 to Jan 2020. The study comprised of 704 patients who presented with the history of swelling in neck which were referred from.

All patients reporting to Srinivas Institute of Medical Sciences with thyroid swelling in whom FNAC was done the Departments of Surgery, Medicine & ENT were included in the study and patients who have had surgery at this Institute but FNAC was not performed preoperatively for thyroid swelling were excluded.

Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of FNAC, relative to the final histological diagnoses was calculated using the following formula[11]:

a. **True positive (TP):** Positive result in the FNA for malignancy, and confirmed in the histological study.
b. **False positive (FP):** Positive result in the FNA for malignancy, but not confirmed in the histological study.
c. **True negative (TN):** Negative result in the FNA for malignancy and no carcinoma in the histological study.
d. **False negative (FN):** Negative result in the FNA for malignancy, but with carcinoma in the histological study.

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e. **Sensitivity (S):** Proportion of patients with associated carcinoma and a positive result in the FNA for malignancy, S = TP/(TP + FN).
f. **Specificity (Sp):** Proportion of patients without associated carcinoma and with a negative result in the FNA for malignancy SP = TN/(TN + FP).
g. **Positive predictive value (PPV):** Proportion of patients with a positive result and a histological confirmation of PPV = TP/(TP + FP).
h. **Negative Predictive value (NPV):** Proportion of patients with negative results, without a carcinoma in the histological study. NPV = TN/(TN + FN).
i. **Diagnostic accuracy (DA):** Proportion of patients diagnosed correctly by the diagnostic test, DA = (TP + TN)/(FP + FN + TP + TN).

Results

Cyto-histopathological correlation

In the present study, 125 cases were available for cyto-histological correlation.

Table 1: Showing Cyto-histological correlation of 125 cases

FNA diagnosis	N	Histopathological Diagnosis										
		Colloid goitre	Nodular goitre	Adenomatoid goitre	Hashimoto thyroiditis	Hyperplasia	Follicular adenoma	Hurthlecell adenoma	Papillary carcinoma	Follicular carcinoma	Medullary carcinoma	Squamouscell carcinoma
Colloid goitre	7	6							1			
Nodular goitre	63		57				2	1	3			
Adenomatoid goitre	9			8			1					
Hashimoto thyroiditis	6				6							
Hyperplasia	1					1						
Follicular neoplasm	22						21			1		
Hurthle cell neoplasm	3							3				
Papillarycarcinoma	12		1						11			
Medullary carcinoma	1										1	
Squamouscell carcinoma	1											1
Total	125	6	58	8	6	1	24	4	15	1	1	1

Table 2: Table showing concordant and discordant cases among non-neoplastic lesions

Lesions	No of patients	%
Concordant cases	78	90.7
Discordant cases	8	9.3
Total	86	100

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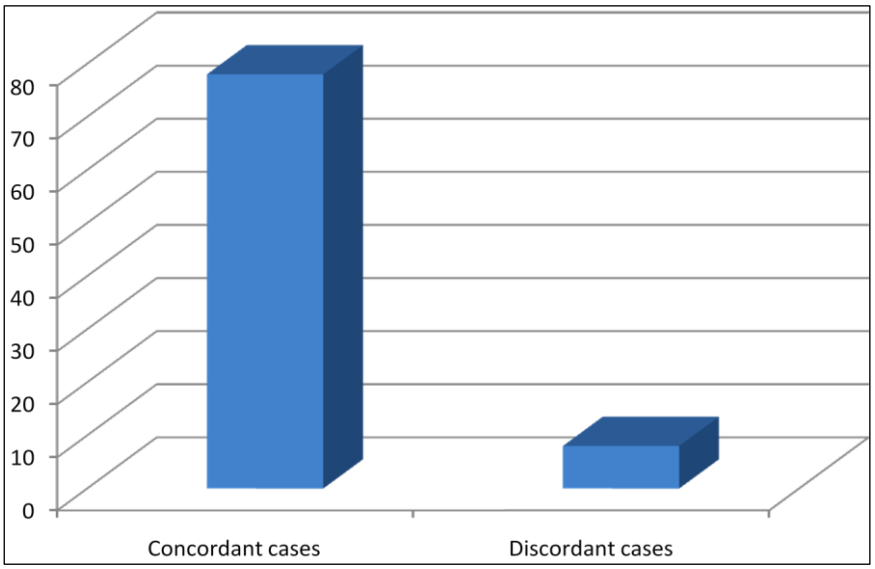
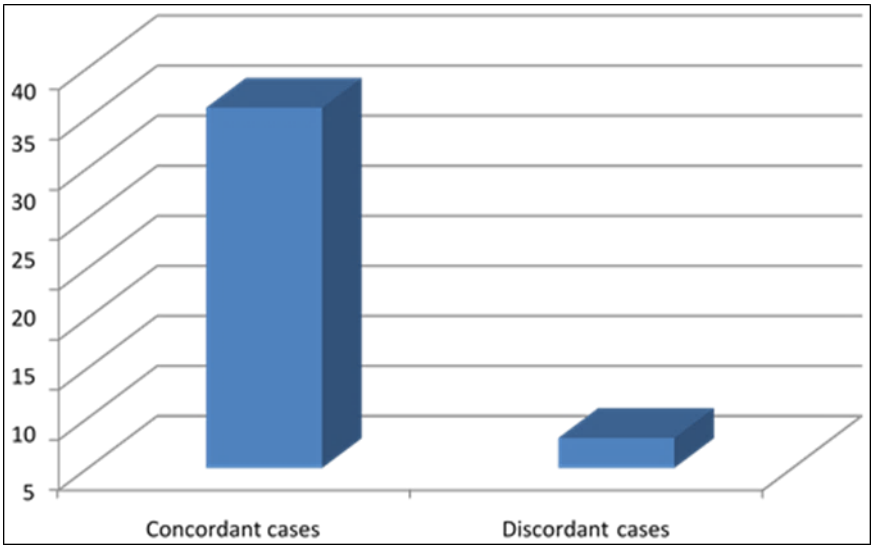


Graph 1: Graph showing concordant and discordant cases among non-neoplastic lesions

Table 3: Table showing concordant and discordant cases among neoplastic lesions

Lesions	No of patients	%
Concordant cases	36	92.30
Discordant cases	3	7.7
Total	39	100



Graph 2: Graph showing concordant and discordant cases among neoplastic lesions

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Table 4: Showing comparison of pre-operative FNAC diagnosis with the diagnosis on histopathology after surgical resection and calculation of malignancy risk for each Bethesda category

Diagnosis of pre-operative FNAC as per Bethesdasystem	Actual diagnosis observed on HPE after surgical resection	Number of cases which turned out to bemalignant	Malignancy risk (%)
Non-diagnostic-I(n- 10)	Nodular goitre-2 Multinodular goitre-5 Follicular adenoma-1 Hurthle cell adenoma-1 Papillary carcinoma-1	1	10
Benign-II (n-81)	Colloid goitre-5 Nodular goitre-18 Multinodular goitre-31 Adenomatoid goitre-10 Hashimoto thyroiditis-6 Hyperplasia-1 Follicular adenoma-4 Hurthle cell adenoma-2 Papillary carcinoma-4	4	4.93
Atypia of undetermined significance-III (n-0)		0	0
Follicular neoplasm/Suspicious of follicular neoplasm-IV (n-21)	Follicular adenoma-19 Hurthle cell adenoma-1 Follicular carcinoma-1	1	4.76
Suspicious of malignancy-V (n-0)		0	0
Malignant-VI(n-13)	Multinodular goitre-1 Papillary carcinoma-10 Medullary carcinoma-1 Squamous cell carcinoma-1	12	92.30

Table 5: Statistical data of cyto-histologically correlated 125 cases:

FNAC	Histopathology		
	Malignant n (%)	Benign n (%)	Total
Malignant	13(10.4)	1(0.8)	14
Benign	5(4)	106(84.8)	111
Total	18	107	125

Table 6: Results of Statistical data of 125 cases after analysis in the present study

Sensitivity	72.2%
Specificity	99.06%
Positive predictive value	92.86%
Negative predictive value	95.49%

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Diagnostic accuracy	95.2%

Discussion

In the present study, six cases of colloid goitre were diagnosed by fine needle aspiration cytology, out of which five cases were histopathologically proven to be colloid goitre but one case turned out to be papillary carcinoma on histology. Sixty-three cases of nodular goitre were diagnosed by fine needle aspiration cytology out of which 57 cases histopathologically proved to be nodular goitre. Out of remaining six cases, two cases turned out to be follicular adenoma, one case Hurthle cell adenoma, one case papillary carcinoma with MNG and two cases of micro occult papillary carcinoma. Nine cases were diagnosed as adenomatoid goitre by cytology out of which eight were consistent with adenomatoid goitre and one case was follicular adenoma on histopathology.
We studied 22 cases of follicular neoplasm diagnosed by cytology out of which 21 cases were follicular adenoma and one case was follicular carcinoma on histopathology. There were 12 casesof papillary carcinoma diagnosed by cytology out of which 11 cases were consistent with papillary carcinoma but one case turned out to be multinodular goitre on histopathology. Present study included six cases of Hashimoto's thyroiditis, one case of hyperplasia, three cases of Hurthle cell neoplasm, one case of medullary carcinoma and one case of squamous cell carcinoma which were diagnosed on cytology and were concordant with histopathological diagnosis respectively. Out of 125 cases, concordance and discordant rate among the non-neoplastic and neoplastic lesions were calculated. In the present study, out of 20 non-diagnostic cases, specimens of 10 cases were available for follow up histopathology, among which one case turned out to be malignant. Hence, the malignancy risk in non-diagnostic category is 10%. Out of 626 benign cases, 81 cases were available for histopathological follow up, among which four cases turned out to be malignant. Hence, the malignancy risk in benign category is 4.93%. Out of 44 cases Follicular neoplasm/ Suspicious of follicular neoplasm, 21 cases were available for histopathological follow up, among which one case turned out to be malignant. Hence, the malignancy risk in follicular neoplasm category is 4.76%. In malignant category there were 28 cases, among which 13 cases were followed up with histopathological examination. Out of 13 cases on histopathology, twelve cases were malignant and one case turned out to be benign. Hence, the malignancy risk in malignant category is 93.30%. In the present study, no cases were available for histopathological follow up in Atypia of undetermined significance-III and Suspicious of malignancy-V categories since in these cases, follow up was lost and patients did not undergo surgery, hence the risk of malignancy could not be calculated in these categories. In our study of 125 cyto histologically correlated cases, 13 cases (10.4%) were malignant on both FNAC and histopathology. 5 cases (4%) were benign on FNAC but malignant on histopathology. 106 cases (84.8%) were benign both on FNAC and histopathology.
Only 1 case (0.8%) was malignant on FNAC but benign on histopathology.
X^2-78.731
df-1
p value-0.0001: Statistically significant.

In the present study, value of Kappa was 0.786, which signifies good agreement between FNAC and histopathological diagnosis which is the gold standard.

Conclusion
The overall diagnostic accuracy of FNAC for thyroid lesions is 95.21%.

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References

1. Bommanahalli BP, Bhat RV, Rupnarayan R. A cell pattern approach to interpretation of Fine Needle Aspiration Cytology of Thyroid Lesions: A cytohistological Study. Journal of Cytology. 2010;27:127-32.
2. Swamy GG, Madhuravani S, Swamy GM. Fine needle aspiration cytology-A reliable diagnostic tool in the diagnosis of Thyroid gland enlargements. Nepal Med Coll J. 2011;13:289-92.
3. Tauro LF, Lobo GJ, Fernandes H, George C, Aithala PS, Shenoy D, *et al.* A Comparative Study on Fine Needle Aspiration Cytology versus Fine Needle CapillaryCytology in Thyroid Nodules. Oman Medical Journal. 2012;27:151-56.
4. Rangaswamy M,Narendra KL,Patel S,Gururajprasad C,Manjunath GV.Insight to neoplastic thyroid lesions by fine needle aspiration cytology.Journal of cytology. 2013;30:23-27.
5. Bongiovanni M, Cibas ES, Faquin WC. The role of thyroid fine needle aspiration cytology and the Bethesda system for reporting thyroid Cytopathology. Diagnostic histopathology. 2010;17:95-105.
6. Baloch ZW, Mandel SJ, Livolsi VA. Are we ready to modify the Bethesda thyroid fine needle aspiration classification scheme? Cancer Cytopathology, 2013, 171-74.
7. Baloch ZW, Cibas ES, Clark DP, Layfield LJ, Ljung BM, Pitman MB, *et al.* The National Cancer Institute Thyroid fine needle aspiration state of the science conference: a summation. Cyto. Journal. 2008;5:1-17.
8. Crothers BA, Henry MR, Firat P, Hamper UM. Nondiagnostic/Unsatisfactory. In, Ali SZ, Cibas ES (eds). The Bethesda System for Reporting Thyroid Cytopathology- Definitions, criteria and explanatory notes, New York, Springer, 2010, 17-26.
9. Carcangiu ML, Dellis RA. Thyroid gland. In: Anderson's pathology,10th ed. Damjanov I, Linder J, St Louis: Mosby-year book, 1996, 1943-1979.
10. Likhar KS,Hazari RA,Gupta SG,Shukla U.Diagnostic accuracy of fine needle aspiration cytology in thyroid lesions: A hospital-based study.Thyroid research and practice. 2013;10:68-71.
11. Screening for disease. In: Park's Text book of Preventive & Social Medicine, 20th ed. Park K, Jabalpur: M/s Banaridas Bhanot Publishers, 2009, 123-130.