

Cytohystological Correlation of Thyroid Lesions with Special Emphasis on Recent Trends

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Abstract

Background: Thyroid is a frequent site of disease in human body. Fine-needle aspiration cytology (FNAC) is a rapid, efficient, inexpensive and safe diagnostic method in these cases. FNAC has some limitations, particularly limited to representativity of samples and exact typing of neoplastic and non-neoplastic lesions.

Materials and Methods: In the present study, 130 cases of thyroid FNAC's which were subsequently followed by excision biopsy, have been analyzed, and cytohistopathological correlation has been interpreted.

Results: Of these 130 cases, 97 (75%) were non-neoplastic, 22 (17%) were benign neoplasms, and 11(8%) were malignant neoplasms. Among 97 non-neoplastic lesions, 73 cases correlated histopathologically. In the present study, sensitivity of FNAC was 78.57%, specificity was 100%, and diagnostic accuracy was 97.69% for malignant lesions.

Conclusion: FNAC is a rapid, efficient, cost-effective, relatively painless procedure and produces a speedy result with a high diagnostic accuracy. It has high rates of sensitivity and specificity in diagnosing thyroid lesions and hence is a valuable tool in the diagnosis and management of patients with thyroid lesions.

Key words: Benign, Diagnosis, Fine-needle aspiration cytology, Malignant, Non-neoplastic lesions

INTRODUCTION

Fine-needle aspiration cytology (FNAC) is now accepted as a cost-effective procedure in the initial assessment and management of thyroid enlargement. It is a valuable adjunct to preoperative screening in the diagnosis of thyroid nodules and in most cases it can distinguish between neoplastic and non-neoplastic lesions.¹ Its accuracy, when applied by experienced and well-trained practitioners, can approach that of histopathology in providing an unequivocal diagnosis. It is an extremely valuable complement to surgical histopathology. Thus, today FNAC is a well-established procedure and is a valuable tool in the diagnosis and management of a patient with thyroid lesions.²

With the advent of ultrasonography (USG), guided FNAC with detailed USG findings are taken about the size and echogenicity of the lesion. The precise location of the lesion under USG offers a better yield. Under USG - solid lesions, lesions with nodular halo and punctuate calcifications are targeted. Color Doppler may be used to identify internal vascularity.³ Apart from USG, morphometry can help in preoperative assessment and may act as an adjunct to morphological features in thyroid lesions.⁴

Hence, this study is undertaken to study the cytology of palpable thyroid lesions to minimize surgical intervention and also the need for the confirmation of the diagnosis by histopathological study for planning post-surgical management of malignant thyroid lesions.

MATERIALS AND METHODS

J.S.S. Hospital is a major tertiary referral center in South Karnataka. About 408,690 patients seek consultation as outpatients and about 51,000 are admitted as in patients a year. All the patients referred for FNAC of thyroid lesions

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in the cytology unit of JSS Hospital, Mysore were studied prospectively for a period of 2-year.

All the patients were clinically examined in detail, and a careful palpation of the thyroid gland was done to judge precisely the location for aspiration. Multiple passes (2-4) were done under aseptic precautions using 24-25 G needle by non-aspiration technique. A minimum of six slides were smeared with the aspirate, two for May-Grunwald Giemsa (air dried) and two each for haematoxylin eosin and papanicolaou stains (wet smears). Slides for wet smears were fixed in 95% ethyl alcohol, while the others were air dried. Stained smears were studied under light microscopy. A special stain like congored was done wherever necessary. These were correlated with histopathological examination (HPE) in 130 cases.

RESULTS

The present study deals with the FNAC of the palpable thyroid lesions and determination of the diagnostic accuracy of the aspiration cytology with histopathologic correlation. During the period of this study for 2 years, 547 cases of thyroid FNAC were done and only 130 cases were biopsied subsequently and subjected to histopathological study. Only those cases with histopathological correlation were selected for this study.

Age group of patients referred for thyroid aspirations ranged from 5 years to 70 years with mean age of 40.57 years. The majority of the patients were in the age group of 31-40 years, and most of them were females forming a female to male ratio of 6.6:1 (Table 1).

Out of 130 patients, 129 presented with a midline swelling in front of neck and one patient presented with two swellings - one in the midline in front of the neck and the other was medial to sternocleidomastoid in the submandibular region on the left side. Biochemical investigations were available in 17 cases and revealed hyperthyroidism in three cases, hypothyroidism in 2 cases and rest in euthyroid state. There were no complications following fine-needle aspiration.

The majority of the aspirates were blood mixed to frankly hemorrhagic. However, in 15 patients aspiration yielded either brown or dark brown fluid, amount ranging from 0.5 ml to 20 ml. The serous fluid was aspirated in 2 patients. Satisfactory cell sample was obtained in 127 patients while in the remaining 3 cases aspiration was unsatisfactory with satisfactory to unsatisfactory ratio of 43.3:1. For the 3 unsatisfactory aspirations USG guided FNAC was done, which yielded adequate material.

Cytohistological Findings

In the present study, the non-neoplastic lesions were more commonly encountered than the neoplastic lesions (Table 2).

Thyroglossal Duct Cyst

Patient aged 5 years presented with midline neck swelling, moving with deglutition. FNAC yielded 5 ml brown colored fluid. FNAC smears showed squamous epithelial cells, anucleate squames, foamy macrophages, occasional neutrophils and few degenerated epithelial cells. The histopathological study confirmed the cytodagnosis of thyroglossal duct cyst.

Simple Colloid and Nodular Goitre

In the present study, the cytological diagnosis of colloid and nodular goitre was made in 72 cases out of 130. The histopathological study confirmed the cytodagnosis in 55 cases. It differed in 17 cases of which follicular adenoma was seen in 9, Hashimoto's thyroiditis in 2, lymphocytic thyroiditis in 1, follicular adenoma with colloid goitre in 2, colloid goitre with follicular adenoma and micropapillary carcinoma in 1, colloid goitre with Hashimoto's thyroiditis in 1 and one case of medullary carcinoma. Congo red stain done was negative under polarized light.

Hyperplastic Colloid Goitre/Nodular Goitre with Hyperplasia

This was diagnosed in 3 cases and biochemical investigation was available in two cases which showed hyperthyroidism. Histopathological study confirmed the cytodagnosis in 2 cases and differed in 1 case which was diagnosed as follicular adenoma.

Hashimoto's Thyroiditis

Cytological diagnosis of Hashimoto's thyroiditis was made in 15 cases out of 130 cases. Histopathological

Table 1: Age and sex distribution of the patients

Age group (years)	Male	Female	Total
5-10	1	0	1
11-20	0	3	3
21-30	4	27	31
31-40	5	37	42
41-50	1	24	25
51-60	5	16	21
61-70	1	6	7
Total	17	113	130

Table 2: Distribution of neoplastic and non-neoplastic lesions based on cytological study

Lesions	n (%)
Non neoplastic	97 (74.6)
Neoplastic	33 (25.4)
Total	130 (100)

diagnosis remained same as cytodiagnosis in 10 cases. Histopathological diagnosis differed in 5 cases of which, one was colloid goitre with cystic change, 2 follicular adenomas, one papillary carcinoma with Hashimoto's thyroiditis and one follicular adenoma with Hashimoto's thyroiditis.

Lymphocytic Thyroiditis

6 cases of lymphocytic thyroiditis were diagnosed cytologically and all of them were females. Histopathological diagnosis remained same as cytological diagnosis in 5 cases and differed in one case which was diagnosed as follicular adenoma.

Follicular Neoplasm

Cytological diagnosis was made in 22 cases. Clinically, all these patients presented with solitary thyroid nodule. Histopathological diagnosis remained the same as the cytodiagnosis in 16 cases with a diagnostic accuracy of 72.73%. It differed in remaining 6 cases of which 4 were diagnosed as colloid goitre, 1 Hashimoto's thyroiditis and 1 colloid goitre with Hashimoto's thyroiditis. Among 16 correlated cases, one was cytologically reported as follicular neoplasm - Hurthle cell type and histopathologically diagnosed as Hurthle cell adenoma.

Papillary Carcinoma

Cytodiagnosis was made in 10 cases of which one was reported as a tall cell variant. Histopathological diagnosis remained same in all the 10 cases with an accuracy of 100%. One case had lymphnode metastasis. One case which was reported as tall cell variant in cytology correlated well with histopathology also.

Anaplastic Carcinoma

Cytodiagnosis of anaplastic carcinoma was made in 1 case. Histopathological diagnosis remained the same as the cytodiagnosis with a diagnostic accuracy of 100% (Tables 3 and 4).

The present study showed 92.86% specificity, 58.69% sensitivity and 80.77% efficacy for neoplastic lesions while for malignant lesions, it was 100%, 78.57% and 97.69%, respectively (Table 5).

DISCUSSION

FNAC is a safe, simple and inexpensive technique that has emerged as a valuable and popular adjunct in the diagnosis and management of various thyroid disorders. Nature of the disease, experience and understanding of certain limitations determine its diagnostic utility. The present study was undertaken to evaluate preoperatively with the help of FNAC, the type of thyroid lesion and to correlate

Table 3: Distribution of individual thyroid lesions based on cytological study

Lesions	Number of cases	Percentage
Nodular and colloid goitre	72	55.4
Hashimoto's thyroiditis	15	11.5
Hyperplastic colloid goitre	03	2.3
Lymphocytic thyroiditis	06	4.6
Thyroglossal duct cyst	01	0.8
Follicular neoplasm	22	16.9
Papillary carcinoma	10	7.7
Anaplastic carcinoma	01	0.8
Total	130	100

the observations with the HPE to determine the usefulness of the technique.

The FNAC of the thyroid gland was performed in 547 patients of which 130 patients were selected for the study which were followed by excision biopsy. It is also one of the frequent pre-operative investigations done for thyroid diseases.

In the present study, the age of the patients ranged from 5 to 70 years with a median age of 40.57 years. Age distribution and the median age of the present study was comparable to Sekhri *et al.*, study but the median age was lower when compared to Gharib *et al.*, and other studies (Table 6).⁵⁻⁹

Among 130 patients, the majority were females numbering 113 and 17 males forming a male to female ratio of 1:6.6. Sex distribution was similar when compared to studies by Sekhri *et al.*, but male patients were less in number when compared to studies by Burch *et al.*, and others (Table 7).^{5,7,8,10}

The majority (127) of the of the aspirates done by routine FNAC were satisfactory for cytological evaluation with satisfactory to unsatisfactory ratio of 43.3:1. Among the remaining 3 inconclusive aspirates, USG guided FNAC was done which yielded sufficient material for the cytological study.¹¹

For considering the aspirate adequacy for the interpretation, it requires five to six groups of well-preserved cells with each group consisting of 10 or more cells. Many studies have applied the same criteria for the satisfactory aspirates. The ratio of satisfactory to unsatisfactory aspiration when compared to other studies was similar to Hsu and Boey study. It was better than Silverman *et al.*, and other studies and unsatisfactory component was more than Hawkins *et al.*, study (Table 8).^{7,9,10,12-18}

In the present study, 97 were non-neoplastic and 33 were neoplastic lesions with non-neoplastic to neoplastic ratio of 2.9:1. Many authors have studied the cytology of thyroid lesions with ratio of non-neoplastic to neoplastic lesions

Table 4: Cytohistopathological correlation of both non-neoplastic and neoplastic lesions

Histopathological diagnosis	Cytologic diagnosis								
	Colloid/nodular goitre	Hashimoto's thyroiditis	Thyroglossal duct cyst	Follicular neoplasm	Papillary carcinoma	Anaplastic carcinoma	Hyperplastic colloid goitre	Lymphocytic thyroiditis	
Colloid/nodular goitre	55	1	0	4	0	0	0	0	60
Hashimoto's thyroiditis	2	10	0	1	0	0	0	0	13
Thyroglossal cyst	0	0	1	0	0	0	0	0	1
Follicular neoplasm	9	2	0	16	0	0	1	1	29
Papillary carcinoma	0	0	0	0	10	0	0	0	10
Anaplastic carcinoma	0	0	0	0	0	1	0	0	1
Medullary carcinoma	1	0	0	0	0	0	0	0	1
Papillary carcinoma with Hashimoto's	0	1	0	0	0	0	0	0	1
Hashimoto's with follicular adenoma	0	1	0	0	0	0	0	0	1
Colloid goitre with follicular adenoma	2	0	0	0	0	0	0	0	2
Colloid goitre with follicular adenoma and micropapillary Ca	1	0	0	0	0	0	0	0	1
Colloid goitre with Hashimoto's	1	0	0	1	0	0	0	0	2
Lymphocytic thyroiditis	1	0	0	0	0	0	0	5	6
Hyperplastic colloid goiter	0	0	0	0	0	0	2	0	2
Total	72	15	1	22	10	1	3	6	130

Table 5: Statistical values for neoplastic and malignant lesions calculated by Galen and Gambino's method

Statistical index	For neoplasm	For malignancy
True positive	27	11
True negative	78	116
False positive	06	00
False negative	19	03
False positive error rate (%)	4.62	00
False negative error rate (%)	14.62	2.31
Sensitivity (%)	58.69	78.57
Specificity (%)	92.86	100.0
Positive predictive value (%)	81.82	100.0
Negative predictive value (%)	80.41	97.48
Efficacy (%)	80.77	97.69

Table 6: Age range and median age of different studies and present study

Authors	Age range (years)	Median age (years)
Hawkins <i>et al.</i>	9-84	43
Gharib <i>et al.</i>	11-84	52
Sekhri <i>et al.</i>	9-70	33.9±11.7
Silverman <i>et al.</i>	16-79	44.8
Burch <i>et al.</i>	15-83	51.1±14.7
Present study	5-70	40.57

ranging from 0.46:1 to 12.5:1. Ratio when compared to other studies, it was comparable to studies by Frable and Frable 1989 but non-neoplastic lesions were very much low when compared to Altavilla *et al.*'s, study (Table 9).^{8,9,13,18-21}

CONCLUSION

FNAC of thyroid lesions has been shown to be safe, simple, cost-effective and accurate method for management of

Table 7: Sex distribution and male to female ratio of different studies and present study

Authors	Total cases	Male	Female	Male:female
Burch <i>et al.</i>	422	91	331	1:3.6
Silverman <i>et al.</i>	295	25	270	1:10.8
Pandit and Kinare	64	26	58	1:2
Sekhri <i>et al.</i>	300	44	256	1:6
Present study	130	17	113	1:6.6

Table 8: Satisfactory to unsatisfactory ratio of the present study and different studies

Authors	Total	Satisfactory	Unsatisfactory	Ratio
Hawkins <i>et al.</i>	1399	1377	22	63.6:1
Hsu and Boey	555	543	12	45.25:1
Silverman <i>et al.</i>	309	273	36	7.58:1
Pandit and Kinare	84	80	4	20:1
Altavilla <i>et al.</i>	2433	2041	392	5.21:1
Crile and William	135	128	7	18.28:1
Crockford and Bain	103	89	14	6.35:1
Friedman <i>et al.</i>	310	289	21	13.76:1
Gershengorn <i>et al.</i>	33	32	1	32:1
Aguilar-Diosdado <i>et al.</i> (1997)	289	252	37	6.81:1
Present study	130	127	03	43.3:1

palpable thyroid lesions. In the present study, it was possible to classify non-neoplastic and neoplastic lesions. Its use has decreased the number of surgeries performed.

We wish to stress the importance of doing multiple aspirations because of the fact that thyroid is affected by many lesions at a time. Cystic change can occur in both non-neoplastic and neoplastic lesions. In cystic nodules fluid should be aspirated completely, and FNAC should be done from the residual mass. If there is no palpable mass, the

Table 9: Incidence of thyroid lesions in different studies and present study

Lesions	Suen and Quenvilla		Silverman <i>et al.</i>		Present study	
Nodular and colloid goitre	133	43.75	156	50.4	72	55.4
Hashimoto's thyroiditis	41	13.48	13	4.2	15	11.5
Primary hyperplasia	-	-	5	1.6	-	-
Hyperplastic nodular goitre	-	-	-	-	3	2.3
Thyroglossal duct cyst	-	-	-	-	1	0.8
Cysts	59	19.41	19	6.1	-	-
Lymphocytic thyroiditis	-	-	-	-	6	4.6
Follicular neoplasm	41	13.49	70	22.6	21	16.1
Hurthle cell neoplasm	-	-	3	1.0	1	0.8
Carcinoma	16	5.2	-	-	-	-
Follicular carcinoma	-	-	1	0.3	-	-
Papillary carcinoma	-	-	2	0.6	10	7.7
Medullary carcinoma	-	-	2	0.6	-	-
Anaplastic carcinoma	-	-	-	-	1	0.8
Insular carcinoma	-	-	-	-	-	-
Metastatic squamous cell carcinoma	-	-	2	0.6	-	-
Metastatic sarcoma	-	-	2	0.6	-	-
Suspicious carcinoma	14	4.6	-	-	-	-
Unsatisfactory	-	-	36	11.71	-	-
Total	304		309		130	

patient should be followed up with USG examination and USG guided FNAC should be done wherever necessary.

The diagnostic accuracy can be improved when combined with advanced imaging techniques, morphometry, immunologic analysis and electron microscopy and thereby the management of thyroid diseases.

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