

CYTOLOGICAL STUDY OF THYROID LESIONS BY FINE NEEDLE ASPIRATION AND THEIR HISTOPATHOLOGICAL CORRELATION IN TERTIARY HEALTH CARE INSTITUTE

Pathology

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ABSTRACT

Background: Thyroid is the largest endocrine organ which is affected by both neoplastic and non- neoplastic lesions leading to its enlargement. Fine needle aspiration cytology (FNAC) of thyroid serves as diagnostic test to distinguish between these lesions.

Objectives: The aim of the present study was evaluating the role of FNAC as diagnostic tool and to establish cyto-histopathological correlation of various thyroid lesions.

Methods: This is a retrospective study of thyroid lesions carried out at the Department of Pathology, Smt. Kashibai Navale Medical College and General Hospital, Pune for over a period of 2 years. The patients with thyroid swellings who underwent with both FNAC & histopathological examination of swellings, of all ages and both the sexes coming to tertiary care hospital were included in the present study.

Results: Total 108 cases were studied, out of which non- neoplastic cases were 54(50%) and neoplastic were 42 (39%) and in 12(11%) cases material was inadequate. Majority of the non- neoplastic and neoplastic lesion was nodular colloid goiter and follicular neoplasm respectively. The sensitivity, specificity and accuracy of FNAC were found to be 78.6%, 83.3%, and 81.3% respectively.

Conclusion: FNAC is a simple, safe, accurate, cost effective and reliable diagnostic method for thyroid lesions in decision making about surgical intervention.

KEYWORDS

FNAC, Cyto-histopathology correlation, Sensitivity, Specificity

INTRODUCTION:

Fine needle aspiration cytology (FNAC) is now accepted as a cost effective, minimally invasive, low complication, non-operative diagnostic modality for most of thyroid lesions, performed in outpatient department with excellent patient compliance. Martin & Ellis of Memorial hospital for cancer in New York first used FNAC to study thyroid in 1930.² Incidence of Palpable Thyroid nodule in India in general population is 4-5 %.³

FNAC of thyroid can be used as a diagnostic test or triage tool. As diagnostic test it can diagnose papillary carcinoma, poorly differentiated carcinoma, medullary carcinoma, anaplastic carcinoma, metastatic malignancy, thyroiditis & most benign nodular goiters & cysts. However, follicular adenoma, well differentiated carcinoma & some hypercellular goiters are indistinguishable in FNAC preparations; hence histopathological correlation is mandatory for final diagnosis. Sensitivity & specificity of FNAC is up to 94 % & 98 % for diagnosis of malignant lesions & about 90 % accuracy rate for identification of malignancy, if follicular lesions are excluded.⁴ As a triage tool, FNAC can be used to distinguish thyroid nodule that might have a higher risk of malignancy (i.e. neoplasm) & would thus require surgical excision, which is differentiated from nodular goiter or thyroiditis, which can be managed medically.⁵ So that unnecessary thyroidectomies in benign pathologies should be avoided.

At present thyroid FNA is a first line procedure, fully accepted in the diagnostic workup of patients in the conjunction with more traditional methods.

MATERIALS AND METHODS:

This is a retrospective study of thyroid lesions carried out at the Department of Pathology, Smt. Kashibai Navale Medical College and General Hospital, Pune for 2 years from June 2017 to June 2019. Patients of all ages and both the sexes coming to tertiary care hospital with thyroid swelling were included in the present study.

Detailed history was taken and clinical examination of patient was carried out. Relevant past, family and treatment history if any was taken. Procedure and importance of FNAC was explained to the patient. Written informed consent was taken. FNAC was performed under all aseptic precautions as OPD procedure with the help of 23 gauge needle and disposable 5ml/10ml syringes. Smears were prepared, fixed in 95% ethyl alcohol and then stained with H&E and Leishman stains. The smears were studied under 4x, 10x, 40x & results recorded as follows:

Interpretation:-The cytology smears were classified in categories such as:

1. Inadequate - Adequacy criteria- Smears should have at least six follicular cell clusters, each cluster having at least ten follicular cells, spread on at least two separate smears to call it as adequate. Smears which yielded only hemorrhage were considered as inadequate.

2. Non-neoplastic – Included non-inflammatory lesions such as Nodular colloid goiter, Colloid cyst and inflammatory lesions such as Hashimoto's thyroiditis, DeQuervain's thyroiditis, Lymphocytic thyroiditis and Granulomatous thyroiditis

3. Neoplastic - Included Follicular neoplasm, lesions which are suspicious of malignancy and lesions which are suggestive of papillary carcinoma.

A sample of Histopathology was collected from our own surgical department. Specimens were processed in automated tissue processing unit and staining was performed with routine H& E and Leishman staining.

The results of FNAC were compared with histopathology in 96 cases. Statistical analysis was carried out for sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of FNAC and then these parameters were compared with histopathology as gold standard.

RESULTS

Total number of patients studied were 108, out of them cyto-histopathological correlation was found in 96 cases. The present study includes 97 females and 11 male patients. Female to Male ratio being 8.8: 1 for thyroid lesions. Females comprised 89.81% and males comprised 10.19% of total cases. Most of the patients belonged to 5th decade (27.78%) followed by 4th decade (25.93%) The mean age of presentation was found to be 42 years. The most common symptom was neck swelling (78.7%), followed by pain in swelling (7.4%)

Among 96 patients studied, 54% lesions were non neoplastic and 42% reported as neoplastic on cytology examination (Table 1).

Table 1. The basic distribution of thyroid lesions on cytology (n=108)

Type of lesion	Number of cases	%
Non neoplastic	54	50
• Inflammatory	7	6.49
• Non- Inflammatory	47	43.52

Neoplastic	42	38.9
Inadequate	12	11.1
Total	108	100

Nodular colloid goiter was the most common non- neoplastic lesion which comprised 35.1% followed by colloid cyst 25.9% of total thyroid lesions (Table2).

Table 2. Distribution of non-neoplastic lesions of thyroid on cytology (n=54)

Type of lesion	Number of cases	%
Nodular Colloid Goiter	33	61.1
Colloid Cyst	14	25.9
Inflammatory	7	13
• Hashimoto's Thyroiditis	3	3.1
• Lymphocytic Thyroiditis	3	3.1
• Granulomatous Thyroiditis	1	1
Total	54	100

In neoplastic category follicular neoplasm was most common lesion (73.2%) (Table3). And Cyto-histo correlation was done in 96 cases (Table4).

Table 3. Distribution of neoplastic lesions of thyroid on cytology (n=42)

Cytological diagnosis	Number of cases	%
Follicular Neoplasm	30	71.43
Malignancy	11	26.19
• Suspicious of malignancy	6	14.29
• Suggestive of papillary carcinoma	5	11.90
Other	1	2.38
Total	42	100

Table 4. Cyto- histological Correlation (n=96)

FNAC	Histology		Total
	Neoplastic	Non-neoplastic	
Neoplastic	33	09	42
Non-neoplastic	09	45	54
Total	42	54	96

The sensitivity, specificity, accuracy, negative predictive value, positive predictive value of FNAC are 78.6%, 83.3%, 81.3%, 83.3% & 78.6% respectively

DISCUSSION:

Thyroid diseases are quite common worldwide. In India too thyroid diseases carry a significant burden. According to various studies on thyroid diseases, it has been estimated that about 42 million people in India suffer from thyroid diseases.⁶

A total of 108 cases of thyroid swelling aspirations followed by histopathological examination were included in the present study. The results of both cytological and histopathological findings were compared (n=96) for sensitivity, specificity, accuracy and other statistical values. The results obtained were compared with those of previous studies and significant differences and similarities in results are discussed below.

Comparison of age

In the present study the age of patients ranged from 9 to 67 years, with mean of 42 years, this was comparable with study done by Sarunya Kantasueb et al¹ with age range of 6 – 83 years, with mean of 44 years. Majority of the patients were in the age group 40-49 years (27.8%) followed by age group of 30-39 years (26%). Similar finding were recorded by Afroze N et al⁸ had age range from 16 - 78 years, with median age is 40.2 years, with similar finding were recorded by Manoj Gupta et al⁹ had age range from 22-58 years and median age was 38.72 years.

Comparison for sex

In present study there was female predominance, females comprised 97 (89.81%) and males comprised 11 (10.19%) with female to male ratio being 8.8: 1. It was similar to the studies done by Agrawal R et al.¹⁰ and Tilak et al.¹¹

Comparison for clinical features

In present study complaint of neck swelling either solitary nodule or

multinodular or diffuse was present in 85 (78.7%) cases. Pain on swelling was present in 8 (7.4%) of cases. Pressure symptoms that is dysphagia, neck discomfort and hoarseness of voice was present in 5 (4.6%) cases, 4 (3.7%) cases, and 5 (4.6%) of cases respectively. Present study is comparable with studies by Chetan VR et al¹², in which swelling in front of neck was present in all 73 (100%) cases, pain in swelling was present in 4 (5.4%) cases and pressure symptoms were present in 3 (4.1%) of cases. The findings in similar study by Ankush Dhanadia et al¹³ were all patients 100 (100%) cases presents with neck swelling, pain in the swelling was seen in 15 (15%) cases, pressure symptoms were present in 13 (13%) cases which was comparable with our study.

Comparison of FNAC categories

In the present study, 88.9% (n = 108) cytological smears were satisfactory for evaluation whereas 11.1% (n = 12) were inadequate for interpretation, which is comparable to most of the previous studies and closest to Esmail HA et al¹⁴ (2012).

In the present study, out of 108 cases 54 (50%) cases were diagnosed as non-neoplastic which included both 47(43.52) non-inflammatory cases and 7(6.49%) inflammatory cases which was comparable with studies of Esmail HA et al¹⁴ (2012), Ramteke et al¹⁵ (2002)

Nodular colloid goiter was the most common non- neoplastic lesion 33(61.1%), followed by colloid cyst 14(29.9%) and inflammatory lesions comprised 7(13%). The similar findings were noted in the study by Ramateke et al¹⁵ (71.56%), Swati Patel et al¹⁶ (51.55%) and Kantaseub et al⁷ which also showed colloid goiter was most common non- neoplastic lesion.

In this study, neoplastic lesions comprised 42 (38.9%) out of which 30(31.3%) cases were diagnosed as follicular neoplasm. The similar findings were noted in other studies. Literature also shows 27-68% malignancies in which diagnosis of FN was made on FNA & was reported as papillary carcinoma on histopathology. This might be due to richly cellular smears with follicular arrangement and nuclear features of PTC such as nuclear grooving, clearing seen focally.¹⁷

Comparison of results

The value of any test depends on its ability to detect the presence of disease (sensitivity) and to verify the absence of disease when it is not present (specificity). The sensitivity of thyroid FNAC ranges from 50%-92% in different case series.^{8,9,19,20,21,22,23,24}

In present study sensitivity, specificity, accuracy, negative predictive value, positive predictive value are 78.6%, 83.3%, 81.3%, 83.3% & 78.6% respectively which is comparable with previous studies & is shown in Table 5.

Table 5. Comparison of present study with previous other studies

Study	Year	No. of patients	Sensitivity %	Specificity %	Accuracy %	NPV %	PPV %
Afroze et al. ⁸	2002	170	61.9	99.3	94.5	94.7	92.8
KO HM et al. ¹⁹	2003	207	78.4	98.2	84.4	66.3	99
Manoj Gupta et al. ⁹	2006	75	80	86.6	84	86.6	80
Guhamallick et al. ²⁰	2008	288	92.7	98.2	-	-	-
Handa et al. ²¹	2008	434	97	100	-	-	-
Mandal et al. ²²	2011	120	90	84.6	-	-	-
Bamanikar et al. ²³	2014	300	50	100	94.2	-	-
Ramteke DJ et al. ¹⁵	2017	385	92.31	97.01	96.25	98.48	85.71
Nandedkar et al. ²⁴	2018	606	85.7	98.6	97.1	-	-
Present study	2019	108	78.6	83.3	81.3	83.3	78.6

In the present study the HPE report, which was considered to be the gold standard had identified all the 12 samples which were reported as insufficient samples by FNAC. Among the 12 samples, 9 were found to be non- neoplastic and 3 were neoplastic (2- benign, 1- malignant), the remaining 96 samples which were reported by HPE were almost similar to that of FNAC. Similar to our results the studies done by Gupta et al⁹ and Mundasad et al¹⁸ had shown the samples which were reported as insufficient in FNAC had been diagnosed in HPE. This had proven HPE to be considered as the gold standard test.

CONCLUSION:

Thus from present study, we concluded that, FNAC of thyroid is very simple, cost effective, accurate, minimally invasive and safe preoperative diagnostic test. FNA diagnosis of malignancy in thyroid lesions is highly significant and such patients should be subjected to surgery.

A benign diagnosis should be viewed with caution and these patients should be followed up as false negative results can occur.

Images of various Thyroid lesions with Cyto- histo correlation: (Figure 1-4)

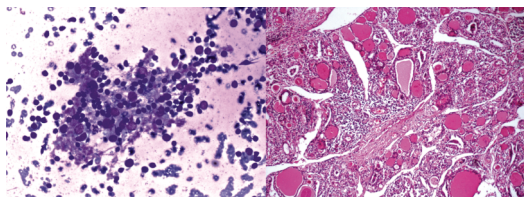


Figure 1. Hashimoto's thyroiditis a. FNAC image showing many lymphoid cells impinging on follicular cells having hurthle cell change (Leishman, 400X)

b. Histopathology examination (HPE) showing diffuse lymphoplasmacytic infiltration with atrophic thyroid follicles (H&E 40X).

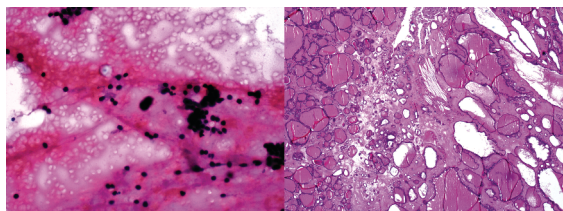


Figure 2. Nodular colloid goiter a. FNAC image showing follicular cells admixed with colloidophages on a background of blood mixed colloid (H&E, 40X) **b.** HPE showing varying sized follicles filled with colloid separated by fibrous septae forming nodules (H&E, 40X).

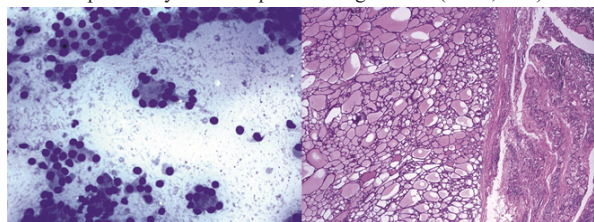


Figure 3. Follicular adenoma a. FNAC image of Follicular neoplasm showing repetitive microfollicular arrangement of follicular cells having relatively uniform nuclei without colloid (Leishman, 400X) **b.** HPE showing well encapsulated tumor showing closely packed follicles. Surrounding thyroid tissue showing signs of compression (H&E, 40X).

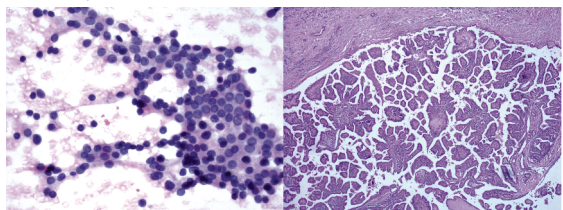


Figure 4. Papillary carcinoma of thyroid (PTC) a. FNAC image showing richly cellular aspirate, papillary arrangement of follicular cells showing marked crowding and overlapping, mild anisonucleosis, with nuclei showing features of grooving and intracytoplasmic nuclear pseudoinclusions (Leishman, 400X) **b.** Complex branching papillae with fibrovascular cores. Nuclei showing features of PTC (H&E, 40X).

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