

# Thyroid Lesions: FNAC and Histopathology Correlation in Our Experience.

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## ABSTRACT

**Background:** Fine needle aspiration cytology is considered the gold standard diagnostic test for the diagnosis of thyroid nodules. Fine needle aspiration cytology is a cost effective procedure that provides a specific diagnosis rapidly with minimal complications. Based on the cytology findings, patients can be followed up in cases of benign diagnosis and subjected to surgery in cases of malignant diagnosis thereby decreasing the rate of unnecessary surgery. The purpose of the present study was to correlate the fine needle aspiration cytology findings with histopathology of excised specimens. **Methods:** This was a prospective study conducted on 310 consecutive patients between June 2012 and May 2015. All patients with clinically diagnosed thyroid nodule were included in the study. **Results:** In our study sensitivity of the thyroid FNAC ranges from 93.02% to 100% and its specificity from 60.42% to 96.62% respectively. Positive predictive value is 94.44% and negative predictive value is 100%. Commonest benign condition is multinodular goiter and malignancy is papillary carcinoma. Most difficult thyroid lesions to be reported are those in the intermediate category as cytomorphological features are overlapping. **Conclusion:** Fine needle aspiration cytology is a simple, easy to perform, cost effective, and easily repeated procedure for the diagnosis of thyroid cancer. It is recommended as the first line investigation for the diagnosis of thyroid nodules.

**Keywords:** accuracy rate, thyroid lesions, FNAC, histopathology correlation, unnecessary surgery, initial screening.

## INTRODUCTION

In surgical practice, thyroid lesions are common, observed in 4-7% of the population and affect women more commonly than men.<sup>[1]</sup> Excising all the thyroid lesions is impracticable and associated with risk of surgery. Fine needle aspiration cytology has proved to be cost effective, easy and sensitive method for the initial screening of the thyroid lesions. Thyroid gland in its superficial and easily accessible position is an ideal tissue for fine needle aspiration cytology.<sup>[2]</sup> Based on the cytology findings, patients can be followed up in cases of benign diagnosis and subjected to surgery in cases of benign lesions with pressure effects and in malignant lesions, thereby decreasing the rate of unnecessary surgery and risks that are associated with it. The purpose of the present study was to correlate the fine needle aspiration cytology findings with histopathology of excised specimens.

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## MATERIALS AND METHODS

This was a prospective study conducted on 310 consecutive patients between June 2012 and May 2015. All patients with clinically diagnosed thyroid nodule were included in the study.

Fine needle aspiration cytology [FNAC] was performed with 23-gauge needle with minimal

suction, smears were made and fixed with 95% alcohol solution, and staining was performed using Papanicolaou's staining, Giemsa and Haematoxylin and Eosin. Criteria of adequacy of material for FNAC were the same as those that are universally accepted i.e. The presence of at least six groups of well-visualized follicular epithelial cells with at least 10 cells in each group. Thyroidectomy specimens were evaluated by histopathological examination. Specimens were processed in automated tissue processing units and staining was performed with routine haematoxylin and eosin stain.

## RESULTS

Out of 310 cases studied on FNAC, 266 cases were non-neoplastic, 18 were intermediate and 21 were malignant [Table 1]. In about 5 cases the material was inadequate to report even after repeated aspirations. Most of the patients were females [83.9%] compared to males (16.1%). The majority of the patients were from the age group of 21-40 years (44.8%) followed by 40-60 years (38.7%) age group. Only 11 patients were from the age group below 20 and 40 patients above the age of 60 years. [Table 2].

Out of 310 cases, 192 cases presented with painless, slow growing swelling, 79 cases presented with pain and discomfort, 12 cases presented with difficulty in swallowing, 5 cases presented with rapid growth, 1 case presented with hoarseness of voice, and 21 cases presented with thyromegaly and cervical lymphadenopathy. [Table 3]

**Table 1:** FNAC correlation with HPE with their false positives and false negatives

FNAC diagnosis	Total no. of FNAC cases	No. of surgical biopsy cases	Correct FNAC diagnosis	FN	FP
Benign	266 [85.80%]	48	41	5	
Intermediate	18 [5.80%]	17		3	3
Malignant	21 [6.77%]	24	21		
Unsatisfactory	5[1.6%]	-			
Total	310	90			

[HPE- histopathology, FNAC- fine needle aspiration cytology, FN- false negatives, FP- false positives]

**Table 2:** Male to female ratio according to age

Age	Females	Males	Number of cases	Percentage (%)
< 20 years	11	-	11	3.5
21-40 years	126	10	139	44.8
41-60 years	103	17	120	38.7
>61 years	32	8	40	13

Thyroid function test were performed in 259 patients, 183 patients (59%) were found to be euthyroid, 29 hyperthyroid (9.4%) and 47 (15.1%)

hypothyroid. In about 51 cases, thyroid function tests were not available. [Table 4].

**Table 3:** Clinical features

Clinical features	Painless slow growing	Discomfort	Difficulty in swallowing	Rapid growth	Hoarseness of voice	Thyromegaly and lymphadenopathy
Number of cases	192	79	12	5	1	21
Percentage	62%	25.5%	3.8%	1.6%	0.3%	6.8%

**Table 4:** Biochemical investigations

Euthyroid	Hypothyroid	Hyperthyroid	Unavailable
183	47	29	51
59%	15.1%	9.4%	16.5%

FNAC revealed 209 cases (6.4%) of colloid goiter, [Figure 1b] 49 cases (15.8%) of Hashimoto's thyroiditis, 8 cases (2.6%) of lymphocytic thyroiditis, 18 cases (5.8%) of follicular neoplasm, 14 cases papillary carcinoma (4.5%), [Figure 3b] 2 cases medullary carcinoma (0.6%), 1 case anaplastic carcinoma (0.3%) and lymphomas 4 cases (1.2%). [Table 5].

FNAC cases were correlated with histopathology wherever available (90 cases). Of these 90 cases, in 79 cases FNAC report was correlating. Only in 11 cases FNAC report was not correlated with the histopathology. Most of the cases were given as colloid goiter on FNAC, which had a small focus showing either follicular adenoma or a tiny focus of papillary carcinoma. One case was given as

lymphocytic thyroiditis, which turned out to be low-grade lymphoma on histopathology [Table 5].

Out of 21 cases of malignancies diagnosed on FNAC, 16 specimens histopathology correlated, in two cases of lymphoma thyroid needle biopsy was obtained which were also correlating and 2 cases of lymphoma and an anaplastic carcinoma were lost for follow up. 5 new cases were diagnosed as malignancy on histopathology which included 1 case of papillary carcinoma [Figure 3a] which was given as multinodular goiter (MNG) on FNAC, 1 case of low grade lymphoma, which was given as lymphocytic thyroiditis, 3 cases of follicular carcinoma [Figure 2a and 2b] of which 2 were given as follicular adenoma and 1 case was missed on FNAC.

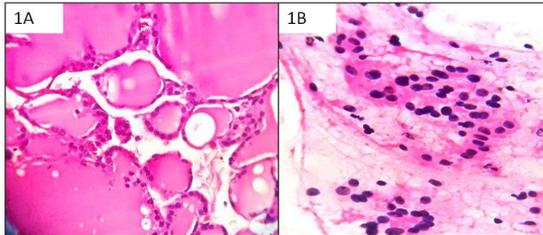
In the intermediate grade, 18 cases of follicular neoplasm's [Figure 4] were diagnosed of which in histopathology examination[HPE] 2 cases were follicular carcinoma, 3 cases were MNG [Figure 1a] with nodular hyperplasia, 2 cases were follicular variant of papillary carcinoma and remaining were follicular adenomas.

**Table 5:** Cytodiagnosis and its correlation with histopathological diagnosis of various thyroid lesion

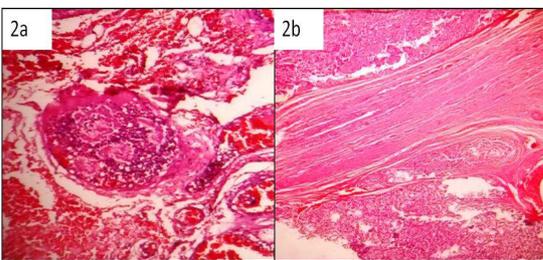
Thyroid lesion	No. of cases FNAC	No. of cases available for HPE correlation	HPE correlated	HPE not correlated
MNG	209	49	45	4[1-FC;2-FA;1-PC]
HT	49	4	4	-
LT	8	1	-	[1-L]
FA	18	18	12	6[1-FVPC;3-MNG;2-FC]
PC	14	14	14	-
MC	2	2	2	-

L	4	2	2	-
AC	1	-	-	-
Unsatisfactory	5	-	-	-
Total	310	90	79	11

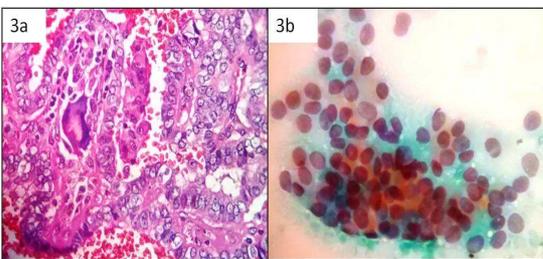
[MNG- multinodular goiter; HT- Hashimoto's thyroiditis; LT- Lymphocytic thyroiditis; FA- follicular adenoma; PC- papillary carcinoma; MC- Medullary carcinoma; L- Lymphoma; AC- anaplastic carcinoma; FC- follicular carcinoma; FVPC- follicular variant of papillary carcinoma]



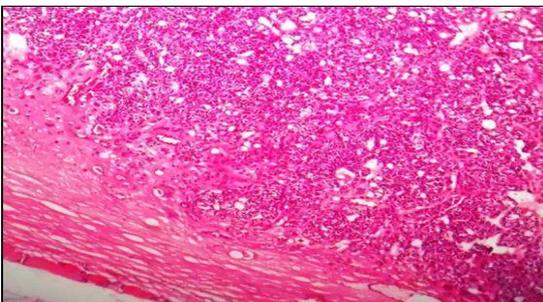
**Figure1:** multinodular goiter- figure 1a shows thyroid follicles of varying size lined by flattened epithelium and filled with colloid and figure 1b shows fine needle aspiration smear showing benign thyroid follicular cells in clusters with background showing colloid.



**Figure2:** follicular carcinoma- figure 2a shows malignant thyroid follicles invading blood vessel and figure 2b shows malignant thyroid follicles infiltrating the capsule..



**Figure3:** papillary carcinoma- figure 3a shows tumor cells having ground glass (Orphan-Annie eye appearance) nuclei and nuclear grooves. Also shown is a psammoma body and figure 3b shows sheets of malignant tumor cells with few showing nuclear grooves.



**Figure4:** follicular adenoma- shows tightly packed micro-follicles filled with scanty colloid surrounded by thick capsule.

**DISCUSSION**

Thyroid nodular (TN) lesions are a common clinical problem in the world. The prevalence of thyroid nodules ranges from 4% to 10% in the general adult population and from 0.2% to 1.2% in children.<sup>[3]</sup> The majority of clinically diagnosed thyroid nodules are non-neoplastic; only 5%–30% are malignant and require surgical intervention.<sup>[3]</sup>

These are more common in women and in areas of iodine deficiency.<sup>[4, 5]</sup> Our study also shows a female preponderance. Exposure to ionizing radiation in childhood and adolescence increases the risk of solitary thyroid nodule and thyroid carcinoma.

The cytological diagnoses were divided into four categories: non-neoplastic, intermediate, malignant and unsatisfactory. Non-neoplastic category encompassed colloid goiter, adenomatous goiter, different types of thyroiditis and Grave's disease. All malignant lesions without any overt follicular architecture were included in the malignant category. The intermediate category encompassed diagnoses of follicular neoplasm and Hurthle cell neoplasm.

In non-neoplastic category, the majority were MNG with 5 cases not correlating. 4 cases which were diagnosed as multinodular goiter on FNAC turned out to be 1 case of follicular carcinoma, 2 cases of follicular adenoma and 1 papillary carcinoma. The rate of failure to diagnose cancer could be attributed to the failure of aspiration from precise location or malignant focus may be very small which was not aspirated in FNAC. One case which was diagnosed as lymphocytic thyroiditis was diagnosed on HPE as low grade lymphoma. While high grade lymphomas are easily diagnosed on FNAC low grade lymphomas are difficult to distinguish from reactive lymphoid population seen in thyroiditis. Most of the lymphomas arise in the background of Hashimoto's thyroiditis and most of the lymphomas may show focal involvement which may cause sampling errors. False negative cytology results may cause delay in treatment and hence adversely affects the outcome in patients with thyroid cancer. Probably in these cases, ultrasound guided FNAC would have helped for better sampling.

In intermediate category of lesions 11 cases correlated with FNAC. Remaining seven cases turned out to be 2 cases of follicular variant of papillary carcinoma, 3 cases of multinodular goiter with adenomatous hyperplasia and 2 cases of

follicular carcinoma. Cytological appearance of adenomatoid nodule in a colloid goiter may mimic follicular neoplasm on FNAC making the diagnosis difficult. Selective sampling of a microfollicular focus in nodular goiter leads to repetitive patterns of microfollicles with scant colloid making the distinction impossible. Most of the false positives or false negatives will be in this group. However, since this is a focal phenomenon multiple sampling

from other areas may show macrofollicles and abundant colloid. Also FNAC cannot diagnose follicular carcinoma as the criteria for follicular carcinoma is capsular and vascular invasion which is big limitation on FNAC.

In 21 malignant lesions diagnosed on FNAC 18 cases were available for correlations which were correlating.

**Table 6:** Comparison of accuracy rate with different authors

Lesions		Author	No of cases in HPE	HPE correlation [correct]	HPE correlation [incorrect]	Accuracy Rate (%)
Non neoplastic	Colloid Goiter	Silverman et al (1986)	11	5	6	45.5
		Y.M. Sirpal et al (1996)	49	28	21	59.2
		Parikh et al (2012)	64	58	06	90.63
		Present study	49	45	4	91.83
Intermediate	Follicular neoplasm	Kenneth C. Suen et al (1983)	41	37	4	90.2
		N. Dorairajan et al (1996)	75	73	2	97.3
		Parikh et al(2012)	9	8	1	88.89
		Present study	18	12	6	66.66
Malignant	Papillary carcinoma	Silverman et al (1986)	1	1	0	100
		N. Dorairajan et al (1996)	4	4	0	100
		Y.M. Sirpal et al(1996)	7	7	0	100
		Parikh et al	5	5	0	100
		Present Study	14	14	0	100

FNAC is widely accepted as an accurate and cost-effective diagnostic modality in the pre-operative diagnosis of various thyroid lesions. The sensitivity of the thyroid FNAC ranges from 43% to 99% and its specificity from 72% to 100% respectively.<sup>[6, 7]</sup> In our study sensitivity of the thyroid FNAC ranges from 93.02% to 100% and its specificity from 60.42% to 96.62% respectively. Positive predictive value is 94.44% and negative predictive value is 100%. These findings were comparable with those reported in other series. The inadequacy rate in this study was only 1.6%. Previous studies have shown the percentage of inadequate material ranges from 0% to 25%.<sup>[8-10]</sup>In our study, the incidence of malignant lesion was 7.7%. Most of the studies have shown a incidence rate of malignancy between 5-20% which is correlating with our study.<sup>[11]</sup>Most of the malignancies are papillary carcinomas. Accuracy rates of our study are compared with other authors in their studies [Table 6].

**CONCLUSION**

Fine needle aspiration cytology is a simple, easy to perform, cost effective, and easily repeated

procedure for the diagnosis of thyroid cancer. It is recommended as the first line investigation for the diagnosis of thyroid nodules. FNAC is, however, not without limitations; accuracy is lower in suspicious cytology and in follicular neoplasms. The main aim of FNAC is to identify nodules that require surgery and those benign nodules that can be observed clinically and thus, decrease the overall thyroidectomy rate in patients with benign diseases. The present study was undertaken to correlate the FNAC findings with histopathology so that rate of unnecessary thyroidectomy in benign pathology should be avoided.

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