

Original article:

The comparative study of Fine needle aspiration cytology and Histopathology in the diagnosis of palpable thyroid lesions

¹Dr. Shelly Vashisht, ²Dr.Suman Lata Khatri, ³Dr.Veena Saxena, ⁴Dr Ankur Gupta

¹Post graduate resident, NIMS University, Jaipur

²Professor, NIMS University, Jaipur

³Professor&HOD, NIMS University, Jaipur

⁴Assistant professor, NIMS University, Jaipur

Corresponding author*

Abstract

Introduction: FNAC is a quick, direct and safe method for acquiring material for diagnosis of both benign and malignant lesions of thyroid but Histopathology remains gold standard. **Objective:** To compare the findings of fine needle aspiration cytology and histopathological examination of thyroid swellings.

Material & Methods: Cross-sectional study conducted from January 2016 - June 2017 in the pathology department of our institute. FNAC of 67 patients with thyroid swelling was done, smears fixed in alcohol, stained with MGG and H&E, Histopathology specimen of 45 case were available. **Results:-** FNAC sensitivity in the present study was 90%, Specificity-94.28%. and accuracy of 94%

Conclusion- FNAC is an easy, simple, feasible, reliable, inexpensive method for diagnosing the nature of thyroid lesion with a high degree of accuracy, sensitivity and specificity.

Key words: FNAC, histopathology, thyroid.

INTRODUCTION-

Enlargement of thyroid constitutes significant number of cases. The incidence of clinically apparent thyroid nodules in the general population is 4-5%. The prevalence of goitre is more than 40 million in India with more than 2 billion globally¹.The majority of clinically diagnosed thyroid swelling are non neoplastic ; only 5%–30% are malignant and require surgical intervention.²

Fine needle aspiration cytology is a quick, direct and safe method for acquiring material for diagnosis of both benign and malignant lesions. There is practically no trauma to the patient and no risk of complication. Fine needle aspiration cytology (FNAC) is the first line of diagnostic test performed for all types of thyroid enlargement as it is simple, less expensive, reliable, readily available and, time saving, easy to perform, effective and almost

accurate diagnostic technique for investigation of thyroid swelling³. While histopathology is primarily concerned with tissue architecture, cytopathology is concerned with changes in individual cells that is why these techniques should not be considered as separate, but the two side of same coin⁴

LIMITATIONS OF CYTOLOGY:

Evaluation of the samples obtained by FNA allows evaluating cellular findings suggestive of malignancy, like anisonucleosis, irregular nuclear membrane and high nuclear to cytoplasmic ratio. However, inflammation causes a reactive and regenerative process leading to cellular changes somewhat similar to well-differentiated neoplasia. Moreover, certain neoplasms require histological samples for diagnosis, since tissue architecture and cell morphology are essential in these cases for accurate pathological assessment⁵⁻⁸ Given the

relative absence of tissue architectural patterns in smears, and the small amount of tissue material obtainable with a fine needle, specific diagnosis cannot always be made and even when samples are adequate it is difficult to reach to a specific diagnosis hence histopathology plays an important role in diagnosis of lesions.⁹

A definitive diagnosis is not always possible only by cytology, but a disease categorization and in a majority of cases a differential diagnosis can be provided.¹⁰

MATERIAL AND METHOD

The study was conducted in the Department of Pathology, N.I.M.S. Medical College & Hospital, Jaipur .It is a cross-sectional study. The Study was time period specific i.e. from January, 2016 to June 2017. A total 67 patients were included, 2 of the patient had failed aspiration . All the patients presenting with thyroid swelling of both sex and of all age group were included . FNAC was done , slides were stained with MGG (dry slides) & H&E stain (Wet ethanol Fixed slides) & Diagnosis was made . For Histopathology, 45 samples were available .Tissues grossing, processing was done & slide were made & stained with H&E stain & Diagnosis was made. The results of FNAC & HPE were compared.

RESULTS

In this study , 67 cases of thyroid swellings were evaluated between the periods of January 2016- June 2017 . The most common lesion on FNAC was of colloid goiter i.e. 42 cases (64.62%), followed by Hashimoto’s thyroiditis 11 cases (16.93%), follicular neoplasm 7 cases(10.76%), papillary carcinoma 3 cases(4.61%), and 1 case

each of medullary carcinoma and thyroglossal duct cyst i.e. (1.54 %). Out of Histopathologically proven 45 cases, 32 were diagnosed as goiter (71.11%), 11(16.93%) as thyroiditis , 6 cases of follicular neoplasm (13.3%) on histopathological evaluation, comprising of 3 cases of follicular adenoma (50%), 1 case each of hurthle cell neoplasm (16.6%), hylanizing trabecular adenoma (16.6%) and follicular carcinoma(16.6%). All these cases were given as follicular neoplasm on cytological examination except one case of follicular adenoma which was given as adenomatous goiter possibly due to poor cellularity of the smear and presence of predominantly few equal sized clusters derived from follicles (micro follicular cell cluster) and colloid content. Due to this pitfall the accuracy of FNAC in the case of follicular neoplasm was 91.75%. It is difficult to differentiate follicular/ Hurthle cell adenoma from carcinoma on cytological assessment as in both smears were cellular, composed of clusters of crowded cells. The distinction depends on demonstration in tissue section of capsular or vascular invasion. There were 3 cases of papillary carcinoma thyroid on FNAC and consequent biopsy of these 3 cases were also available, and given same diagnosis resulting in 100 % accuracy. Papillary carcinoma thyroid was most common malignancy of thyroid in our study. In the present study false positive cases were 4.44% (2 out of 45) and false negative cases were 2.22% (1 out of 45). Among 65 cases 57 were female and 8 were male. Sex and age distribution of these cases shown in table 1 & 2

.Table 1 Sex Distribution of 65 Thyroid Aspirates

Sex	No. of cases	Percentage	Remarks
Male	08	12	Male : Female 1 : 7.3
Female	57	88	
Total	65	100	

Table 2 Age & Sex Wise Distribution of 65 Thyroid Aspirate

Age	Male	Female	Total	%
10-19	1	1	2	3.08
20-29	3	8	11	16.90
30-39	1	14	15	23.08
40-49	1	21	22	33.85
50-59	0	6	6	9.24
60-69	1	6	7	10.77
70-79	1	-	1	1.54
80-89	-	1	1	1.54
Total	8	57	65	100%

Table 3 Cytological diagnosis and sex wise distribution of total cases

Diagnosis	Female	Male	Total	%
Goitre	37	5	42	64.62
Thyroiditis	11	-	11	16.93
Thyroglossal cyst	-	1	1	1.54
Follicular neoplasm	6	1	7	10.76
Papillary carcinoma	2	1	3	4.61
Medullary carcinoma	1	-	1	1.54
Total	57	8	65	100%

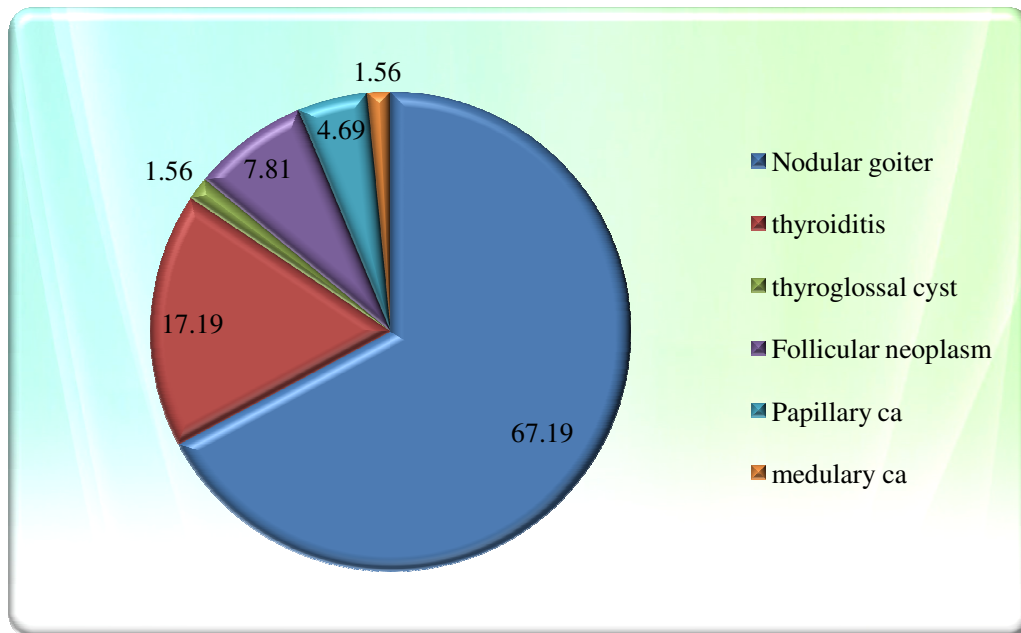


Fig. 1: Pie chart showing cytological diagnosis of 65 thyroid swelling.

Table 4 Age and sex wise distribution in 42 cytologically proven GOITRE

Age	Female	Male	Total	%
10-19	-	1	1	2.38
20-29	4	2	6	14.29
30-39	9	1	10	23.81
40-49	13	1	14	33.34
50-59	4	-	4	9.52
60-69	5	-	5	11.90
70-79	-	1	1	2.38
80-89	1	-	1	2.38
Total	36	6	42	100%

Table 5 Age & Sex wise distribution of in 11 cases of cytologicallyproved thyroiditis

AGE (Yrs)	M	F	Total	%
10-19	-	-	-	-
20-29	-	2	2	18.18
30-39	-	4	4	36.36
40-49	-	4	4	36.36
50-59	-	1	1	9.10
60-69	-	-	-	-
70-79	-	-	-	-
TOTAL	-	11	11	100

Table 6 Age & Sex wise distribution of in 7 cases of cytologically Proved follicular neoplasm

AGE(Yrs)	M	F	Total	%
10-19	-	-	-	-
20-29	-	-	-	-
30-39	-	1	1	14.29
40-49	-	3	3	42.85
50-59	-	1	1	14.29
60-69	1	1	2	28.57
70-79	-	-	-	-
80-89	-	-	-	-
TOTAL	1	6	7	100

Table 7 Age & Sex wise distribution in 3 cases of cytologically proved papillary carcinoma

Age (yrs.)	M	F	Total	%
10-19	-		-	-
20-29	1	2	3	100
30-39	-	-	-	-
40-49	-	-	-	-
50-59	-	-	-	
60-69	-	-	-	
70-79	-	-	-	-
80-89	-	-	-	-
TOTAL	1	2	3	100

Medullary carcinoma

There was only one case of medullary carcinoma that was 48 yr. female.

Table 8 Age & Sex wise distribution in 45 cases of histopathologically proven cases

Age (yrs.)	M	F	Total	%
10-19	1	-	1	2.22
20-29	2	5	7	15.55
30-39	1	9	10	22.23
40-49	1	15	16	35.56
50-59	-	4	4	8.89
60-69	1	5	6	13.33
70-79	1	-	1	2.22
80-89	-	-	-	-
TOTAL	7	38	45	100

There were 45 cases of FNAC of thyroid which had their corresponding tissue biopsies available. Table 8 shows age and sex wise distribution in these 45 cases. The maximum number of cases are seen in 4th decade i.e. 16 cases (35.56%), followed by 10 cases (22.23%) in 3rd decade and 7(15.55%) and 6 cases (13.33%) in 2nd and 6th decade respectively. There were 38 cases (84.45) in female subjects and 7 cases (15.55%) in male subjects with a range of 18 years to 70 years

Table 9 Diagnosis & Sex wise distribution of histopathologically proven 45 cases

DIAGNOSIS	Total	M	F	Total	%
Thyroiditis	2	-	2	2	4.45
Thyroglossal cyst	1	1	-	1	2.22
Goitre	32	4	28	32	71.12
Follicular adenoma	3	-	3	3	6.67
Hyalizing trabecular adenoma	1	-	1	1	2.22
Hurthle cell neoplasm	1	-	1	1	2.22
Follicular carcinoma	1	1	-	1	2.22
Papillary carcinoma	3	1	2	3	6.66
Medullary	1	-	1	1	2.22
TOTAL	45	7	38	45	100

Table 10 False negative, false positive and percentage of accuracy offline needle aspiration cytology in 45 histopathologically proven cases of thyroid swelling

Histopathologic al Diagnosis	Cytological Diagnosis								Accuracy
	Thyroglossal cyst	Thyroiditis	Goitre	Follicular neoplasm	Pap. Ca.	Med. Ca.	False -ve	False +ve	
Thyroiditis (2)		2	-	-	-	-	-	-	100%
Goitre (32)		-	30	2	-	-	-	2	92%
Thyroglossal cyst(1)	1								100%
Follicular adenoma (3)		-	1	2	-	-	1	-	67%
Hyalizing trabecular adenoma(1)		-	-	1	-	-	-	-	100%
Hurthle cell adenoma(1)				1					100%
F. carcinoma (1)		-	-	1	-	-	-	-	100%
Pap. carcinoma (3)		-	-	-	3	-	-	-	100%
Medullary carcinoma of thyroid (1)		-	-	-	-	1	-	-	100%
Total (45)	1	2	31	7	3	1	1	2	

$$\begin{aligned}\text{SENSITIVITY} &= \frac{\text{TP}}{(\text{TP} + \text{FN})} \times 100 \\ &= \frac{09}{(09+01)} \times 100 \\ &= 90.0\%\end{aligned}$$

SPECIFICITY:- Number of patient with benign thyroid disease and (+)ve cytological features i.e. true negative.

$$\begin{aligned}\text{SPECIFICITY} &= \frac{\text{TN}}{(\text{TN}+\text{FP})} \times 100 \\ &= \frac{33}{(33+02)} \times 100 \\ &= 94.28\%\end{aligned}$$

ACCURACY = The correct Portion of the results of true positive and true negative in all cases studied.

$$\begin{aligned}\text{ACCURACY} &= \frac{(\text{TP}+\text{TN})}{\text{Total No. of Pt.}} \times 100 \\ &= \frac{(09+34)}{45} \times 100 \\ &= \frac{43}{45} \times 100 \\ &= 95.55\%\end{aligned}$$

DISCUSSION

Any type of thyroid swelling usually leads to number of investigations with the main aim to rule out the possibility of a neoplasm. FNA of thyroid is the first line procedure fully accepted in the diagnostic workup of patients with thyroid enlargement in additions to other methods.

The main aim of FNAC of thyroid is to differentiate between benign and neoplastic lesions and to differentiate patients who require surgery from those who can be managed conservatively. But as there are some limitations of FNAC like operator skill, inadequate sample rate, also, it is not possible to distinguish between follicular adenoma from follicular carcinoma on FNAC, this diagnosis requires detailed histopathological examination for vascular or capsular invasion^{11,12}, for all these reasons histopathology is considered as gold standard in the diagnosis of thyroid swellings.^{13,14}

The present study was carried out in the Department of Pathology, NIMS college, NIMS University, Jaipur with an aim to evaluate the role of aspiration cytology in diagnosis of various benign and malignant lesions of thyroid.

The present study consists of 67 cases of various thyroid lesions, out of which 2 had failed piration, in 45 cases biopsies were available, hence cytopathological correlation could be achieved in 69.2% cases.

The patients suffering from various type of thyroid lesions were subjected to fine needle aspiration. Aspiration were performed and 65 cases had adequate material but in two cases there was failure of aspiration which might have undergone degeneration, infarction, necrosis or hemorrhage. Similar observation was reported by Blumm et al.¹⁵ and Hossein Gharib¹⁶.

Out of 65 aspirated cases 57 were female subjects and 8 were male subjects, with male to female ratio of 1:7.3, similar findings were reported by

Dorairagen N. et al.¹⁷ with male to female ratio being 1:9, Komal S. likhar et al.¹⁸ reported as 1:7.

The most common lesion on FNAC was of colloid goiter i.e. 42 cases (64.62%), followed by Hashimoto's thyroiditis 11 cases (16.93%), follicular neoplasm 7 cases(10.76%), papillary carcinoma 3 cases(4.61%), and 1 case each of medullary carcinoma and thyroglossal duct cyst i.e. (1.54). Similar findings were reported by senthilkumar et al.¹⁹ with 53 cases of colloid goiter,15 cases of Hasimoto's, 8 cases of follicular lesions and 11 cases of papillary carcinoma out of total 100 cases.

Out of Histopathologically proven 45 cases, 32 were diagnosed as goiter (71.11%). Similar observations were made by Malligaet al²⁰i.e. 73 cases (75.25 %),

There were 11 cases of thyroiditis on FNAC i.e. 16.93 % correlating with the study of Sunita. K. Shereet al²¹ with 10 out of 80 cases (12.5%) and Senthilkumar et al¹⁹ with 15 cases out of 100 (15%) of thyroiditis.

There were 6 cases of follicular neoplasm (13.3%) on histopathological evaluation, comprising o 3 cases of follicular adenoma (50%), 1 case each of hurthle cell neoplasm (16.6%), hylanizing trabecular adenoma (16.6%) and follicular carcinoma(16.6%). Sunita.K. Shereet al²¹ reported 9 (11.25%) cases of follicular adenoma, 1 (1.25%) cases of hurthle cell adenoma, and 2 case (2.5%) of follicular neoplasm. Our findings are in accordance of her study. All these cases were given as follicular neoplasm on cytological examination except one case of follicular adenoma which was given as adenomatous goiter possibly due to poor cellularity of the smear and presence of predominantly few equal sized clusters derived from follicles (micro follicular cell cluster) and colloid content. Due to this pitfall the accuracy of FNAC in the case of follicular neoplasm was

91.75%. Similar observation was found by Malliga S et al.²⁰ and Pandey P et al.²²

There were 3 cases of papillary carcinoma thyroid on FNAC and consequent biopsy of these 3 cases were also available, and given same diagnosis resulting in 100 % accuracy. Same observation was found in the study by Likhari.KS et al¹⁸ with 100% accuracy. Papillary carcinoma thyroid was most common malignancy of thyroid in our study. In the study done by Senthil kumar et al¹⁹ malignant lesions were 14%, out of which 11% were papillary carcinoma.

In the present study false positive cases were 4.44% (2 out of 45) and false negative cases were 2.22% (1 out of 45) which in accordance with the study of Nepali R. et al²³ with 1 (2%) false positive and 1 (2%) false negative.

FNAC sensitivity in the present study was 90%. Similar results were reported by Nepali R. et al²³

with 91.6% sensitivity, Disha J Ramtele et al²⁴ with 92.3 % sensitivity.

Specificity in present study was found to be 94.28%. Likewise reported by Nepali R. et al²³ as 97.39%, by Sunita K. Shere et al²¹ as 91.6 %.

Overall accuracy in our study was 93.3% which is similar to the study of Nepali R. et al²³, in which the accuracy was 94%.

CONCLUSION

Thus, it can be concluded from this research work that Fine needle aspiration cytology is a timesaving, easy & can be very useful in making diagnosis. It has an important role in the early diagnosis & treatment planning with an overall accuracy of 94%, still the HPE examination remains the gold standard for diagnosis of a disease.

REFERENCES

1. Bamanikar S, Soraishm P, Jadhav S, Kumar H, Jhadav P, Bamanikar A. Cancer investigation Journal 2014;3(3)208-212.
2. E. C. Ridgway. Clinical evaluation of solitary thy nodules, in the Thyroid: A Fundamental and Clinical Text. G.B. Lippincott, Philadelphia, Pa, USA. 1986; 1377-85.
3. R. Bakhos, S. M. Selvaggi, S. DeJong. Fine needle aspiration of the thyroid: rate and cause of cytopathologic discordance. DiagnCytopathol, 2010; 23(4); 233-7.
4. Gunvanti B Rathore, PragneshParmar. Fine needle aspiration cytology of swellings of head and neck region. Indian Journal of Medical Sciences. 2012 March- April; 66(3); 49-54.
5. Wiersema MJ, Vilmann P, Giovannini M, Chang KJ, Wiersema LM. Endosonography-guided fine-needle aspiration biopsy: Diagnostic accuracy and complication assessment. Gastroenterology 1997;112:1087-95.
6. Ribeiro A, Vazquez-Sequeiros E, Wiersema LM, Wang KK, Clain JE, Wiersema MJ. EUS-guided fine-needle aspiration combined with flow cytometry and immunocytochemistry in the diagnosis of lymphoma. GastrointestEndosc 2001;53:485-91.
7. Erickson RA, Sayage-Rabie L, Beissner RS. Factors predicting the number of EUS-guided fine-needle passes for diagnosis of pancreatic malignancies. GastrointestEndosc 2000;51:184-90.

8. Mesa H, Stelow EB, Stanley MW, Mallery S, Lai R, Bardales RH. Diagnosis of non-primary pancreatic neoplasms by endoscopic ultrasound-guided fine-needle aspiration. *Diagn Cytopathol* 2004;31:313-8.
9. Julio Iglesias-García^{1,2}, Ihab Abdulkader³, Jose Lariño-Noia¹, *Rev esp enferm dig.* Vol. 106, N.o 1, pp. 6-14, 2014.
10. Frates MC, Benson CB, Doubilet PM, Kunreuther E, Contreras M, Cibas ES, Orcutt J, Moore FD Jr, Larsen PR, Marqusee E, Alexander EK. Prevalence and distribution of carcinoma in patients with solitary and multiple thyroid nodules on sonography. *J Clin Endocrinol Metab.* 2006 Sep;91(9):3411.
11. Gardner HA, Ducatmen BS, Wang HH. Predictive value of fine-needle aspiration of the thyroid in the classification of follicular lesions. *Cancer* 1993;71: 2598-603
12. Miller JM, Kini SR, Hamburger JI. The diagnosis of malignant follicular neoplasms of the thyroid by needle biopsy. *Cancer* 1985; 55: 2812-7
13. Gupta M, Gupta S, Gupta V. Correlation of Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule. *J Thyroid Res.* 2010;2010:1-5.
14. Mundasad B, McCallisier I, Carson J, Pyper P. Accuracy of fine needle aspiration cytology in the diagnosis of thyroid swelling. *The International Journal of endocrinology.* 2006;2(2):20-5.
15. Blum M.: managing the solitary thyroid nodule, role of needle biopsy. *Ann. Tnt. Med.* 1977; 87 : 375-377.
16. Golliner JR, Gharib H, Grant CS and Johnson DA: Fine needle aspiration cytology of the thyroid. 1980 to 1986: *Acta cytological* 1987; 31 : 587-590.
17. N. Dorairajan and N. Jayashree, "Solitary nodule of the thyroid and the role of fine needle aspiration cytology in diagnosis," *Journal of the Indian Medical Association*, vol. 94, no. 2, pp. 50–52, 1996.
18. Likhar KS, Hazari RA, Gupta SG, Shukla U. Diagnostic accuracy of the fine needle aspiration cytology in the thyroid lesions: A hospital – based study. *Thyroid Res Pract* 2013;10:68-71.
19. Senthil Kumar, Usha, Maivelganesan. FNAC Vs Histopathology in the diagnosis of Thyroid Swellings. *JMSCR* February 2017; Vol.5(2);17425-431.
20. Malliga S, Vijayalakshmi A, Visalakshi P. A correlative study on fine needle aspiration and histopathology of thyroid lesions. *Int J Health Sci Res.* 2016; 6(9):122-125.
21. Sunita. K. Shere S, Anjali S. Kulkarni, Pragti P Phulgirkar, Shazia Anjum, Sunita P. Patil, Rajan Bindue : *Journal of Evolution of Medical and Dental Sciences/ Volume 2/ Issue 26/ July 1, 2013*
22. Pandey P, Dixit A, Mahajan NC. Fine-needle aspiration of the thyroid: A cytohistologic correlation with critical evaluation of discordant cases. *Thyroid Res Pract* 2012; 9: 32-9
23. N R, B V, T G. Comparative Study Of FNAC And Histopathology In The Diagnosis Of Thyroid Swelling. *The Internet Journal of Head and Neck Surgery.* 2012 Volume 5 Number 2.
24. Disha J. Ramteke, Prabha S. Mulay: Cyto-histopathological correlation of thyroid lesions. *Int J Res Med Sci.* 2017 Apr;5(4):1425-29.