

Accuracy Of Fine Needle Aspiration Cytology In Diagnosis Of Thyroid Swelling

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Abstracts: Fine needle aspiration cytology is a well established, safe and out patient procedure used in diagnosis of thyroid swelling. **Aims:** The aim of this study is to determine the accuracy of FNAC in detection of thyroid lesions at our institute. **Material and methods:** 100 cases of thyroid swelling were diagnosed and treated at M.P.Shah medical college, Jamnagar from Jan1997 to May 1998. FNAC results were compared with final histopathological diagnosis. FNA results were classified as inadequate material, non-neoplastic, neoplastic and malignant lesions. **Results:** FNA analysis showed 74.19%(69 cases) non-neoplastic lesion, 19.35%(18cases) neoplastic lesion and 6.45%(6cases) malignant lesion. Histopathological analysis showed 70.18%(40) non-neoplastic lesion and 29.83%(17) neoplastic lesion – 15.79%(9) adenomas and 14.04%(8) carcinomas. **Conclusions:** The accuracy rate of FNAC in diagnosis for non-neoplastic, neoplastic and malignant lesions were 90.91%,100% and 100% respectively. So, overall accuracy of FNA in present study was 92.98%. [Patel A et al NJIRM 2012; 3(5) : 124-129]

Key words: Accuracy, Fine Needle Aspiration Cytology (FNAC), thyroid

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Introduction: Fine needle aspiration and cytology (FNAC) is a well established, safe and out-patient procedure used in the primary diagnosis of palpable thyroid swelling.¹ This technique has been successfully utilized in the diagnosis of thyroid, breast, lymphnode and salivary gland swellings. The technique has been shown to be simple, safe and cost effective.^{2,3,4} Fine needle aspiration cytology is an invaluable, rapid, virtually non-invasive and simple diagnostic procedure. The importance and applicability of which is being increasingly appreciated by clinicians and pathologists in recent times.⁵ Thyroid gland in its superficial and easily accessible position is an ideal tissue for fine needle aspiration cytology.⁶ Thyroid swelling display an intriguing range of lesions widely differing in biological behaviour. They are quite common lesions encountered in day to day surgical practice. To make an effective surgical intervention in these lesions, it is very vital to make a pre-operative assessment of the morphological nature of lesion.⁷ The aim of this study was to determine the accuracy of FNAC in detection of thyroid lesions at our institute.

Material and Methods.: A retrospective study was carried out to determine the diagnostic accuracy of FNAC for thyroid swellings, in pathology department of M.P.Shah Medical College, Jamnagar. Total 100 cases of thyroid swelling were

investigated. Detailed clinical history, physical examination, thyroid function test were obtained in each case. Aspiration was done by 23-24 gauge needle. The smears were fixed by 95% ethyl alcohol and stained by Haematoxyline and eosin stain. Out of 100 patients, 57 patients subsequently had thyroid resection. Cytology and Histology specimens were analyzed by two examiners who were unaware of each others diagnosis. FNAC diagnosis was correlated with histological diagnosis. FNAC results were classified into four groups:

- Inadequate material
- Non-neoplastic (goiter, thyroiditis, cystic lesions, thyrotoxicosis)
- Neoplastic (follicular neoplasm, hurthle cell neoplasm)
- Malignant (papillary carcinoma, medullary carcinoma)
- Histology specimens were classified as non-neoplastic and neoplastic.

FNAC diagnosis was compared with final histological diagnosis.

Results: 100 cases of various thyroid lesions from Jan.1997 to May 1998 were diagnosed and treated at the M.P.Shah Medical College, Irwin group of Hospital, Jamnagar. In all the cases, pre-operative FNAC was done and diagnosis was recorded. Out

of 100 cases, unsatisfactory material was obtained in 7 cases and satisfactory material was obtained in 93 cases. Out of 93 cases, 57 cases were operated and histopathological correlation was done. Most of the cases were presented between the 3rd and 4th decade of life (67.74%). Benign lesions were found most commonly between 3rd and 4th decade and malignant lesions were found in 5th decade of life. In seven cases, smears were unsatisfactory. Out of 93 cases studied, 83(89.25%) patients were female while 10 (10.75%) patient were male. Thus the thyroid lesions showed female predominance-with the F: M ratio of 8.3:1. On FNAC, out of 93cases, 69(74.19) patients showed non-neoplastic lesion, 18(19.35%) patient showed neoplastic lesion and 6(6.45%) patient showed malignant lesion. Goiter was the most common non-neoplastic lesion 45.16%(42 cases)

while hypoglossal duct cyst was the least common 1.08%(1case). Follicular neoplasm was the most common neoplastic lesion 17.20%(6 cases). The incidence of hurtle cell neoplasm was 2.15%(2 cases). The incidence of papillary carcinoma was 4.30%(4 cases) while medullary carcinoma was 2.15%(2 cases).

Out of 93 cases, 57 patients were operated and histopathological correlation was made. Table I shows correlation between FNAC and histopathology examination. Out of 69 non-neoplastic lesions, 44 were histopathologically correlated. Out of these 44 cases, 40 cases were confirmed by histopathological examination with accuracy of 90.91% and false negative results were in 7.2%(4 cases).

Table I Cyodiagnosis and its correlation with histopathological diagnosis of various thyroid lesions

Non-neoplastic lesions	No. of cases in FNAC	No. of cases by HP correlation	Histopathological correlation		Accuracy rate (%)
			Correct	Incorrect	
Colloid goiter	42	24	21	3	87.5
Thyrotoxicosis	7	7	7	0	100
Benign cystic lesion	12	10	10	0	100
Thyroglossal cyst	1	0	0	0	
Thyroiditis	7	3	2	1	66.67
Total	69	44	40	4	
Neoplastic lesions					
Follicular neoplasm	16	7	7	0	100
Hurthle cell neoplasm	2	1	1	0	100
Total	18	8	8	0	
Malignant lesions					
Papillary carcinoma	4	3	3	0	100
Medullary carcinoma	2	2	2	0	100
Total	6	5	5	0	

In non-neoplastic lesions, there were 42 cases of goiter out of which 24 were histopathologically correlated – 21 cases were correct and 3 cases were incorrect. 3 cases were misinterpreted as goiter. Out of these 3 cases, 2 were follicular adenoma and 1 was follicular carcinoma on histopathological examination. The accuracy rate for goiter was 87.4%. Out of 7 cases of thyroiditis,

3 cases were histopathologically correlated. Out of these 3 cases – 2 cases were correct and 1 was incorrect which showed follicular adenoma on histopathological examination. The accuracy rate of thyroiditis was 66.7%.

Rest of non-neoplastic lesions showed accuracy of 100%. 18 cases showed neoplastic lesions on FNA.

Out of them only 8 cases were histopathologically correlated. 7 cases showed follicular neoplasm and 1 case showed hurtle cell neoplasm on FNA. Out of 7 cases of follicular neoplasm, 5 cases showed follicular adenoma and 2 cases showed follicular carcinoma on histopathological examination. 1 case of hurthle cell neoplasm showed hurthle cell adenoma on histopathological examination. Here, the accuracy for neoplastic lesion is considered 100%. Accuracy rate was 100% for both papillary and medullary carcinoma. Total 7 cases were diagnosed as malignant on FNAC, 5 cases were histopathologically correlated. Out of these 5 cases, 3 cases were papillary carcinoma and 2 cases were medullary carcinoma. Anplastic carcinoma was not found in the present study.

The accuracy rate of FNAC in diagnosis for non-neoplastic, neoplastic and malignant lesions were 90.91%, 100% and 100% respectively.

Discussion: FNAC is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings. The technique is safe, simple and quick with a low complication rate. Several other tests, such as high resolution ultrasonography, radioisotope scanning and FNA biopsy have been used for evaluation of thyroid swellings before proceeding to thyroid surgery.⁸ Studies have demonstrated that among all these diagnostic modalities, FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swelling.^{2,3,4} FNAC has been shown to have similar or higher sensitivity and accuracy levels than frozen section examination.^{9,10,11}

Table II Comparison of accuracy rate with different authors

	Author	No. of cases in HP Exam	HP correlation		Accuracy rate%
			Correct	Incorrect	
Non-Neoplastic					
Colloid Goitre	Silverman et al ¹² (1986)	11	5	6	45.5
	Y.M.Sirpal et al ¹³ (1996)	49	28	21	59.2
	Present study	24	21	3	87.5
Thyrotoxicosis					
	Silverman et al ¹² (1986)	1	1	0	100
	Present study	7	7	0	100
Benign cystic lesion					
	Kenneth C. Suen et al ¹⁴ (1983)	04	03	1	75
	Silverman et al ¹² (1986)	02	1	1	50
	Y.M.Sirpal et al ¹³ (1996)	15	15	0	100
	Present study	10	10	0	100
Thyroiditis					
	N. Dorairajan et al ¹⁵ (1996)	05	05	0	100
	Y.M.Sirpal et al ¹³ (1996)	14	14	0	100
	Present study	3	2	1	66.67
Neoplastic					
Follicular Neoplasm					
	Kenneth C. Suen et al ¹⁴ (1983)	41	37	04	90.2
	N. Dorairajan et al ¹⁵ (1996)	75	73	02	97.3
	Kenneth C. Suen ¹⁴ et al (1983)	09	06	03	66.7
	Present study	7	7	00	100
Huthle Cell Neoplasm					
	Y.M.Sirpal et al ¹³ (1996)	05	0	5	
	Present study	01	01	01	100
Malignant					
Papillary carcinoma					
	Silverman et al ¹² (1986)	02	01	0	100

N. Dorairajan et al ¹⁵ (1996)	04	04	0	100
Y.M.Sirpal et al ¹³ (1996)	07	07	0	100
Present study	03	03	0	100

Table II shows comparison of accuracy rates achieved by various authors. In the present study, the accuracy rate of goiter was 87.5%. Compared to this, Silverman et al¹² found the accuracy rate was only 45.5%. He found 6 out of 11 cases were misinterpreted as follicular neoplasm while 1 case was misdiagnosed as hurthle cell neoplasm.

Y.M.Sirpal et al¹³ had found an accuracy rate of 59.2%. The differences in the percentage of accuracy rate are mainly due to technical errors, some faulty scanning technique as well as unsatisfactory material. The accuracy rate of thyrotoxicosis was 100% in the present study which was comparable with the study of Silverman et al¹². In the present study, total 10 cystic lesions went for operation. 1 out of 10 cases was pure benign cyst while in the remaining 9 cases, there was cystic change in goiter and it was considered as correct as the aspiration was done from the cystic lesion. The accuracy rate was 100% which was quite comparable with the study Y.M.Sirpal et al¹³. He had found 15 cases of benign cystic lesions. Out of these 15 cases, 11 cases had cystic changes in goiter, in 2 cases cystic change in adenoma, in 1 case cystic change in hyperplasia and in another 1 case, cystic change in thyroiditis, while Kenneth C. Suen et al¹⁴ found the accuracy rate was 75%. 1 case out of 4 cases was incorrect—that was papillary carcinoma and Silverman et al¹² found the accuracy rate was 50% only. In the present study, the accuracy rate of thyroiditis was 100% which was comparable with the study of N.Dorairajan et al¹⁵ and Y.M.Sirpal et al¹³. Follicular adenoma and carcinoma can not be differentiated on FNA so it was reported as follicular neoplasm. In the present study, the accuracy rate of follicular neoplasm and

hurthle cell neoplasm, papillary carcinoma and medullary carcinoma was 100%. In the present study, out of 7 cases of follicular neoplasm, 5 were diagnosed as follicular adenoma and 2 cases were diagnosed as follicular carcinoma. The accuracy rate varies from 66.7% to 97.5% by study of various authors on follicular neoplasm.^{13,14,15}

Y.M.Sirpal et al¹³ had obtained 100% accuracy rate in Hurthle cell neoplasm and papillary carcinoma. Published data suggest inadequate sample ranges between 9-13%.^{16,17,18} In our study, the inadequate sample was 7%. The most important factors include experience of the person who is doing aspiration and the criteria used to define a satisfactory sample. The present study shows accuracy rate in benign non-neoplastic lesion was a 91.91% which was comparable with published data. (Table III)^{19,20,21,22,23}.

Table III Comparison of Accuracy rate in Non-Neoplastic lesions

Author	Accuracy Rate%
Caplan et al ¹⁹ (1991)	89.3
La-Rose et al ²⁰ (1991)	97.7
Lay-Field et al ²¹ (1991)	82.1
Klemi et al ²² (1991)	97.2
Piromali et al ²³ (1992)	97.0
Present study	91.91

Table IV shows the malignancy rate in Neoplastic (indeterminate) lesions which includes follicular and hurthle cell neoplasm. In published data,^{19,20,21,22,23} it was 9.4% to 52.3% while in the present study it was 28.57%. Overall accuracy rate for neoplastic lesions was 100% in present study which is comparable with Caplan et al¹⁹ and Piromali et al²³.

Table IV Comparison of Accuracy rate in Neoplastic lesions

Author	No. of lesions	No. of Adenoma	No. of Malignancy (%)	Accuracy (%)
Caplan et al ¹⁹ (1991)	59	28	31 (52.3)	100
La-Rose et al ²⁰ (1991)	359	297	62 (17.2)	100
Lay-Field et al ²¹ (1991)	51	36	15 (9.4)	100

Klemi et ²² al(1991)	67	60	07 (10.4)	100
Piromali et at ²³ (1992)	37	17	20 (50.2)	100
Present study	7	5	02 (28.6)	100

Table V Reported values of Specificity and Accuracy of Malignant lesion in previous series compared with our results

	Present study (1998)	Suen & Quenville et al ¹⁴ (1983)	Giuseppe Altavilla et al ²⁵ (1987)	Caplan et al ²⁶ (1999)	Holleman ²⁷ (1995)	New castle ⁸ (2000)
Specificity	100%	100%	86.6%	74%	52%	67%
Accuracy	100%	100%	79.1%	75%	65%	75%

FNAC has higher sensitivity for detection of malignancy compared with ultrasonography and radioisotope scans.²⁴ False negative results are expected particularly with small tumours and when there is associated with degenerative or inflammatory change in adjacent thyroid tissue. There is a group of lesions which overlap benign and malignant features. For instance, the distinction between a cellular colloid goiter and a follicular lesion may be impossible. Cytological diagnosis of follicular carcinoma is not possible on FNA and diagnosis is dependent on histological assessment for capsular or vascular invasion.⁸

In the published data,^{14,25,26,27} the sensitivity, specificity and accuracy of thyroid FNAC in detecting malignancy ranges from 52-86%, 52-86.6% and 79.1% respectively (table V). In our study specificity and accuracy was 100%. The determinant factor for such a wide range of sensitivity, specificity and accuracy may be how the cytopathologists classify "suspicious" as well as false positive and negative samples. Some authors include follicular lesion in malignant/neoplastic group others exclude them from the calculations. Overall accuracy, sensitivity and specificity of FNAC thyroid lesions was 92.98%, 71.43% and 100% in present study. Michae S. Sabel et al²⁸ and Orlo H. Clark et al²⁹ observed 92% and 95% respectively. Giuseppe Altavilla⁸ et al achieved a sensitivity, a specificity and an accuracy was 71.43%, 100% and 95.09%.

Conclusion : The accuracy rate of FNAC in diagnosis for non-neoplastic, neoplastic and malignant lesions were 90.91%,100% and 100%

respectively. So, overall accuracy of FNA in present study was 92.98%.

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