

## FNAC & Histopathology correlation of various thyroid lesions

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### **Abstract:**

**Background:** In surgical practice, thyroid lesions are common, observed in 4-7% of the population and affect women more commonly than men. Excising all the thyroid lesions is impracticable and associated with risk [1, 2]. Therefore an effective screening test is needed to avoid unwanted surgery. The routine use of FNAC in the assessment of thyroid lesions has reduced the number of patients subjected to thyroidectomy for benign lesions.

**Aims and Objectives:** Present study was undertaken to evaluate the accuracy of FNAC in the diagnosis of clinically obvious and palpable thyroid lesions and its correlation with histopathology diagnosis.

**Materials and methods:** This study has retrospective 100 cases of thyroid swelling, conducted from January 2006 to August 2007 in the department of pathology B J Medical College, Ahmedabad. Aspiration was taken after detailed clinical history, physical examination and thyroid function tests. FNAC results were compared with histopathological diagnosis.

**Results:** This study included 100 cases. Out of 100 cases of FNAC of thyroid lesions in 91 cases satisfactory material was obtained. Maximum cases were benign lesions 83(91.2%), malignant cases were 8 (8.8%) and 9 cases were unsatisfactory (9%), with diagnostic accuracy of 92.7%, sensitivity 66.6% and specificity 100%.

**Conclusion:** Results of present study as well as previous various studies highlight the utility of FNAC in thyroid lesions as safe, cost effective and initial diagnostic modality that avoids unwanted surgeries.

**Key words:** Cyto- histo correlation, FNAC, Thyroid lesions

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### I. Introduction

Thyroid gland is unique among endocrine organs. Because of its superficial location, it is the only gland that is amenable to direct physical examination, cytological evaluation and histopathological study. In surgical practice, thyroid lesions are common, observed in 4-7% of the population and affect women more commonly than men. Excising all the thyroid lesions is impracticable and associated with risk [1,2]. Therefore an effective screening test is needed to avoid unwanted surgery. The diagnosis of thyroid lesions using aspiration cytology was first reported by Martin and Ellis in 1930. The routine use of FNAC in the assessment of thyroid lesions has reduced the number of patients subjected to thyroidectomy for benign lesions. As a result, the incidence of malignancy at thyroidectomy has increased from 5-10% to 30-50% in the recent years. The efficacy and diagnostic accuracy of this modality is quite reliable in case of adequate specimen and in the hands of well experienced cytopathologist and correlates well with histological diagnosis. Different imaging techniques are now used for pre operative diagnosis of thyroid nodules, like radio nucleotide scanning, high resolution ultra sonography etc. However FNAC is still regarded as the single most accurate and cost effective OPD procedure, particularly if ultra sound is used as a guide for better sample collection especially for cystic lesions.

### II. Material And Methods

A retrospective study of 100 cases was conducted in the department of Pathology B J Medical College, Ahmedabad from January 2006- August 2007 to determine diagnostic accuracy of FNAC for thyroid lesions. All palpable lesions of thyroid gland are included in the study. Non palpable lesions are studied through ultrasound and CT guided FNAC. Swelling arising from the skin and surrounding structure of the thyroid gland are excluded. Before starting FNAC assure patient, explain the procedure after taking written consent, make the patient lying flat with pillow under shoulder and neck, head should fall back with neck extended- separate neck muscles- lateral lobes becomes more prominent. Ask the patient not to speak/deglutinate during procedure.

Needles commonly used are 22-24 Gauge; 1.5-2.5 cm in length. Under all aseptic precautions needle is introduced attached with 10 ml disposable syringe, with minimal negative pressure material is aspirated. Material expelled immediately on slides. Wet smear without air drying were alcohol fixed and hematoxylin & eosin or PAP stain was done. Procedure was repeated in cases where aspiration was acellular, hemorrhagic.

Whenever the excised specimen was received in the histopathology department, it was routinely processed to obtain paraffin sections which were stained by H&E stain. Results of cytological and histopathological studies were later correlated to evaluate the efficiency of FNAC. Diagnostic accuracy of FNA was calculated.

FNAC results were classified into four groups:

1. Non neoplastic non inflammatory ( goiter, cystic lesions, thyrotoxicosis)
2. Non-neoplastic inflammatory (thyroiditis)
3. Neoplastic (follicular neoplasm, hurthle cell neoplasm)
4. Malignant (papillary carcinoma, anaplastic carcinoma)

### III. Results

A total of 100 patients with various thyroid lesions were diagnosed and treated at our hospital during the period of January, 2006 to August 2007 were taken into consideration. In all the cases, pre-operative FNAC was done and diagnosis was recorded. Out of 100 cases, unsatisfactory material was obtained in 9 cases and satisfactory material was obtained in 91 cases. Out of 91 cases, 57 cases were operated and histopathological correlation was done.

Table I shows thyroid lesions according to sex distribution. Females were predominantly affected. M: F ratio was 1:9.

Table II shows incidence of various types of thyroid lesions, maximum number of lesions were of Colloid goitre i.e. 26 cases (28.6%), 2<sup>nd</sup> highest cases were of Adenomatous goitre 14 cases (15.4%), and of Follicular adenoma 14 (15.4%), followed by Benign cystic lesions 12 cases (13.1%). Others were equal cases, 7 (7.7%) of each Thyroiditis and Thyrotoxicosis, 2 (2.2%) cases of Hurthle cell adenoma and 1 (1.1%) case of Thyroglossal cyst. Overall incidence of benign lesions was 91.2%.

Table II shows Papillary carcinoma, most commonly occurring among all malignant lesions. Overall incidence of malignant lesions was 8.8%.

**Table I: Thyroid Gland Lesions According To Sex Distribution**

Sex	Non neoplastic non inflammatory lesions	Non neoplastic inflammatory lesions	Neoplastic benign lesions	Neoplastic malignant lesions	Total	Percentage (%)
Male	03(3.3%)	0(0.0%)	05(05.5%)	1(1.1%)	09	9.9%
Female	57(62.6%)	7(7.7%)	11(12.1%)	7(7.7%)	82	90.1%
Total	60(65.9.1%)	7(7.7%)	16(17.6%)	8(8.8%)	91	100%

**Table II: Age Incidence Of Thyroid Lesions**

Benign Lesions	11-20 Years	21-30 Years	31-40 Years	41-50 Years	51-60 years	61-70 years	71-80 Years	Total (%)
Colloid goiter	04	11	06	03	02	-	-	26 (28.6%)
Adenomatous	01	10	02	-	-	-	01	14 (15.4%)
Thyrotoxicosis	01	05	01	-	-	-	-	07 (07.7%)
Benign cystic	-	03	06	03	-	-	-	12 (13.1%)
Thyroglossal	-	01	-	-	-	-	-	01 (01.1%)
Thyroiditis	-	04	02	-	01	-	-	07 (07.7%)
Follicular Adenoma	01	04	03	03	02	01	-	14 (15.4%)
Hurthle cell Adenoma	-	-	01	-	01	-	-	02 (02.2%)
Total (%)	07 (7.7%)	38 (41.8%)	21 (23.7%)	09 (9.9%)	06 (6.6%)	01 (1.1%)	01 (1.1%)	83 (91.2%)
Malignant Lesions								
Follicular carcinoma	-	-	-	2	-	-	-	2(2.2%)
Papillary carcinoma	-	1	-	2	1	-	-	4(4.4%)
Medullary carcinoma	-	-	1	-	-	-	-	1(1.1%)
Anaplastic carcinoma	-	-	1	-	-	-	-	1(1.1%)
Total(%)	-	1(1.1%)	2(2.2%)	4(4.4%)	1(1.1%)	-	-	8(8.8%)

**Table III: Thyroid Gland Lesions Correlated By Fnac With Histopathological Examination.**

Lesions	No.of cases by FNAC	No.of cases by HP	Histopathological Correlation			Accura-cy rate (%)
			Correct	Partially correct	Incorrect	
Colloid goitre	26	12	09	0	3	75%
Adenomatous goiter	14	12	12	0	0	100%
Thyroto-Xicosis	07	07	07	0	0	100%
Benign cystic lesions	12	10	01	9	0	100%
Thyroglossal Cyst	01	00	00	0	0	0
Thyroiditis	07	03	03	0	0	100%
Follicular Adenoma	14	05	04	0	1	80%
Hurthle cell Adenoma	02	01	01	0	0	100%
Follicular carcinoma	2	2	2	0	0	100%
Papillary carcinoma	4	3	3	0	0	100%
Medullary carcinoma	1	1	1	0	0	100%
Anaplastic carcinoma	1	1	1	0	0	100%
Total	91	57	44	9	4	77.2% 92.09%

Relative Accuracy: Partially correct lesions were included as correct.

Most of the cases were presented between the 3rd to 5<sup>th</sup> decades of life (83%). Benign lesions were found most commonly between 3rd and 4th decade and malignant were found in 5th decade of life. In 9 cases, smears were unsatisfactory. Out of 91 cases studied, 82(90.1%) patients were female while 9 (9.9%) patients were male. Thus the thyroid lesions showed female predominance with the female to male ratio 9:1. On FNAC, out of 91 cases, 83 patients showed benign lesion and 8 patients showed malignant lesion. Goiter was the most common non-neoplastic lesion, which represent 28.6% (26 cases) while thyroglossal cyst was the least common 1.1% (1 case). Papillary carcinoma was the most common neoplastic lesion 4.4% (4 cases). The incidence of follicular carcinoma was 2.2% (2 cases) while medullary and anaplastic carcinoma was 1.1% (1 case). Out of 91 cases, 57 patients were operated and

histopathological correlation was made. Table III shows correlation between FNAC and histopathology examination. Out of 83 non-neoplastic lesions, 50 were histopathologically correlated. Out of these 50 cases, 46 cases were confirmed by histopathological examination with accuracy rate of 92%.

In non-neoplastic non-inflammatory lesions, i.e. Colloid goitres, out of 26 cases, 12 were histopathologically correlated – 9 were correct and 3 were incorrect. Out of these 3, 2 were follicular adenomas and 1 was follicular variant of papillary carcinoma.

In non-neoplastic inflammatory lesions, out of 7 cases, 3 were histopathologically correlated. All the 3 were correct. In benign cystic lesions, out of 12 cases, 10 cases were correlated with histopathological examination. One case was correct while other 9 cases were diagnosed as adenomatous and colloid goitre with cystic changes, hence were included them in the partially correct group and taken them as relatively correct lesions.

The neoplastic benign lesions include follicular adenoma –14 cases and hurthle cell adenoma 2 cases. Out of these 16 cases, 6 cases were correlated with histopathological examination. 5 cases of follicular adenoma were correlated out of which 4 were correct and 1 case was of follicular carcinoma. The accuracy rate was 80%. 1 case of hurthle cell adenoma on FNAC was confirmed histopathologically. The accuracy rate was 100%.

Out of total 8 malignant lesions, 7 cases were correlated with histopathological examination. All cases were correctly diagnosed.

In the present study, one case was diagnosed as thyroglossal cyst by FNAC which was not confirmed by histopathological examination.

Overall absolute and relative accuracy rate of FNAC in diagnosis of both benign and malignant lesions was 77.2% and 92.09% respectively.

IV. 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. 5 Studies have demonstrated that among all these diagnostic modalities, FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swelling. FNAC of the thyroid nodule is reported to have sensitivity ranges from 65% to 98% and specificity of 72% to 100%.<sup>2</sup> FNAC has been shown to have similar or higher sensitivity and accuracy levels than frozen section examination.

Table IV : Comparison of accuracy of FNAC of various other studies with present study

Lesions		Author	No of cases in HP examination	Histopathological correlation		Accuracy rate(%)
				Correct	Incorrect	
Benign	Colloid goitre	Silverman et al <sup>6</sup> (1986)	11	5	6	45.5
		Y.M.Sirpal et al <sup>7</sup> (1996)	49	28	21	59.2
		Present Study	12	9	3	75
	Thyrotoxicosis	Silverman et al <sup>6</sup> (1986)	1	1	1	100
		Present Study	7	7	0	100
	Benign cystic lesions	Kenneth C. Suen et al (1983)	4	3	1	75
		Y.M.Sirpal et al <sup>7</sup> (1996)	15	15	0	100
		Silverman et al <sup>6</sup> (1986)	2	1	1	50
		Present Study	10	10	0	100
	Thyroiditis	N. Dorairajan et al <sup>9</sup> (1996)	5	5	0	100
		Y.M.Sirpal et al <sup>7</sup> (1996)	14	14	0	100
		Present Study	3	3	0	100
	Follicular adenoma	Kenneth C. Suen et al (1983)	41	37	4	90.2
		N. Dorairajan et al <sup>9</sup> (1996)	75	73	2	97.3
		Present Study	5	4	1	80
	Papillary carcinoma	Silverman et al <sup>6</sup> (1986)	1	1	0	100
		N. Dorairajan et al <sup>9</sup> (1996)	4	4	0	100
		Y.M.Sirpal et al <sup>7</sup> (1996)	7	7	0	100
Present Study		3	3	0	100	
Malignant						

Table IV shows comparison of accuracy rates achieved by various authors. In the present study, the accuracy rate of goiter was 75%. Compared to this, Silverman et al (1986) 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 al (1996) has 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 al<sup>6</sup> (1986). In the present study, total 10 cystic lesions went for operation. One out of 10 cases 1 was pure benign cyst while in the 9 cases, there was cystic change in goiter and it was considered as correct as the aspiration was done from the cystic lesion; Thus the accuracy rate for benign cystic lesion was 100% which was quite comparable with the study Y. M. Sirpal et al<sup>7</sup> (1996). 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 al<sup>8</sup> (1986) found the accuracy rate was 75%. One out of the 4 cases was incorrect; that was papillary carcinoma and Silverman et al (1986) found the accuracy rate was 50% only. In the present study, the accuracy rate of thyroiditis was 66.7% which was comparable with the study of N. Dorairajan et al<sup>9</sup> (1996) and Y. M. Sirpal et al<sup>7</sup> (1996). Follicular adenoma and carcinoma cannot be differentiated on FNA. In the present study, the accuracy rate of follicular adenoma was 80% while the accuracy rate for papillary carcinoma

and anaplastic carcinoma was 100%. In the present study, 14 cases were diagnosed as follicular adenoma during FNAC. Out of these 14 cases of follicular adenoma, 5 were received in histopathology as follicular adenoma, 4 cases were diagnosed as follicular adenoma and the remaining 1 case was diagnosed as follicular carcinoma on histopathological examination. The accuracy rate varies from 66.7% to 97.5% by study of various authors in follicular neoplasm. Y. M. Sirpal et al (1996), Silverman et al (1986) and N. Dorairajan et al (1996) had obtained 100% accuracy rate in diagnosis of papillary carcinoma of thyroid. Published data suggest inadequate sample ranges between 9-13%.<sup>10</sup> In our study; the inadequate sample was received in 9% of cases (9 cases). 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 92% which was comparable with published data. (Table IV) 11-15

Overall accuracy rate for neoplastic lesions was 100% in present study which is comparable with Caplan et al (1991) and Piromali et al (1992). FNAC has higher sensitivity for detection of malignancy compared with ultrasonography and radioisotope scans. False negative result is expected particularly with small tumors and when there is associated 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 always possible on FNA and diagnosis is dependent on histological assessment for capsular or vascular invasion. 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 were 92.02%, 71.43% and 100% in present study.

## V. Conclusion

Fine needle aspiration cytology is considered the gold standard diagnostic test for the diagnosis of thyroid lesions with a high diagnostic yield, accuracy, sensitivity and specificity. Fine needle aspiration cytology is a cost effective procedure that provides specific diagnosis rapidly with minimum complications. Based on the cytology findings, patients can be followed in cases of benign diagnosis and subjected to surgery in cases of malignant diagnosis thereby decreasing the rate of unnecessary surgery.

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