Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20182702

Fine needle aspiration cytology accuracy in diagnosis of thyroid lesions: a comparative study with histopathological examination of thyroid swellings

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Received: 15 February 2018 Revised: 12 April 2018 Accepted: 13 April 2018

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ABSTRACT

Background: Thyroid enlargement, whether diffuse or in the form of a nodule, leads to a battery of investigations to be done. Fine needle aspiration cytology (FNAC) is usually the first line of investigation but the limitations of cytology are well recognized in the diagnosis of some thyroid malignancies, in particular it is not able to differentiate between follicular adenoma and carcinoma. We conducted a prospective study to assess the role of FNAC in diagnosing the nature of thyroid swelling and comparing its result with histopathology finding.

Methods: This was a prospective study conducted on 100 consecutive patients presented with thyroid swelling in department of otorhinolaryngology.

Results: The present data show high specificity (96.29%) of FNAC as compared to sensitivity, which came out to be (78.9%). Positive and negative predictive value is 93.75% and 95.23%. This is quite similar to previous studies.

Conclusions: FNAC has high specificity (96.29%), sensitivity (78.9%), positive predictive value (93.75%), negative predictive value (95.23%) and accuracy (95%) therefore it can be reliably used as initial investigation. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up clinico-radiologically for any progression that will require repeated FNAC and/or surgery.

Keywords: Thyroid swelling, FNAC, Histopathology

INTRODUCTION

Thyroid is the first endocrine gland to develop in fetal life and is the most important too.

Disorders of thyroid include a vast array of genetic, inflammatory, developmental, immunologic and neoplastic disorders. The understanding of these diseases is of immense importance in making an accurate clinical diagnosis and proper institution of treatment.¹

Thyroid enlargement, whether diffuse or in the form of a nodule, leads to a battery of investigations to be done.

Fine needle aspiration cytology (FNAC) is usually the first line of investigation and others like ultrasound study, thyroid function tests (TFT), thyroid scan and antibody levels are done subsequently with an aim to select patients who require surgery and those that can be managed conservatively.²

The limitations of cytology is well recognized in the diagnosis of some thyroid malignancies, in particular it is not able to differentiate between follicular adenoma and carcinoma and also in the detection of some papillary carcinomas because of associated thyroid pathology including multinodular goiter, thyrotoxicosis and marked

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cystic changes.³ The present study was undertaken to correlate the FNAC findings with histopathology so that rate of unnecessary thyroidectomies in benign pathologies should be avoided.

Aims and objectives

- To compare the findings of FNAC of thyroid gland with its histopathology.
- To find out the pathological spectrum of different thyroid lesions.
- To analyse the results with published data.

METHODS

The present study was carried out on patient presenting with thyroid swelling in Department of Otorhinolaryngology, GSVM Medical College, Kanpur from December 2012 to March 2015.

Inclusion criteria

Inclusion criteria were patients presenting with thyroid swellings undergoing thyroidectomy.

Exclusion criteria

Exclusion criteria were non-palpable thyroid lesions; congenital anomalies of thyroid; patient not fit for surgery.

Specimens for study

- Fine needle aspiration smears aspirated from selected cases.
- Total thyroidectomy, subtotal thyroidectomy and biopsy specimens

Method of collection of data

This is a prospective cohort study design. This study is proposed to be carried out on 100 patients undergoing thyroidectomy. Detailed clinical history was taken. General physical examination and systemic examination was performed as per a prepared proforma. Fine needle aspiration cytology of thyroid swellings was done. Thyroidectomy specimens preserved in 10% formalin was sent for histopathologic examination to the pathology department. Comparison of histopathological findings with Fine needle aspiration cytology was done. In case of dilemma in diagnosis after histopathological examination, specimens for immunohistochemical were sent examination. The data recorded during the study was statistically analyzed.

RESULTS

In our study 100 patients who presented with thyroid swelling were included. FNAC of all patients were done

who later on underwent thyroid surgery. Thyroid specimen was sent for histopathological examination after biopsy. The result of FNAC was thus compared with histopathological examination.

Total 100 cases were distributed according to age and sex. The result shows that the disease was maximum prevalent among the females of 21-40 years of age group. Males were more commonly affected in age group of 31-50 years. The majority of patients 39 (39.00%) were in the age group of 31-40 years. Out of 100 mean age of patients is 33.69 with 10.70 standard deviation (SD).Male to female ratio is M:F =1:6.14

Of all the cases, FNAC diagnosed 84 (84%) cases as benign and 16 (16%) cases as malignant. The ratio of neoplastic to non-neoplastic is 1:5.25. In this study, 77 (91.66%) out of 84 benign lesions were of either nodular or colloid goiter, 4 (4.76%) cases comprises of Hashimoto thyroiditis, 1 (1.19%) of adenomatous hyperplasia, 1 (1.19%) of granulomatous hyperplasia and 1 (1.19%) case of lymphocytic hyperplasia.

Among 84 lesions detected as benign in FNAC report, final HPE reports diagnosed 72 (85.71%) as colloid or Nodular goiter, 4 (4.76%) as follicular adenoma, 2 (2.38%) adenomatous hyperplasia, 4 (4.76%) Hashimoto's throiditis, 1 (1.19%) lymphocytic thyroiditis and 1 (1.19%) as granulomatous thyroiditis.

Table 1: Cytopathological comparison of benign lesion.

Lesion	HPE	FNAC
Nodular goiter/colloid goiter	72	77
Follicular adenoma	4	0
Hashimoto thyroiditis	4	4
Adenomatous hyperplasia	2	1
Granulomatous thyroiditis	1	1
Lymphocytic thyroiditis	1	1
Total	84	84

Out of 77 cases diagnosed as colloid/nodular goiter in FNAC, 72 (93.5%) cases were diagnosed as colloid/nodular goiter, 1 (1.29%) as Hashimoto's thyroiditis, 3 (3.89%) as follicular neoplasm and 1 (1.29%) as hyperplastic nodule with multi nodular goiter (MNG) in histopathological examination (Table 1).

HPE analysis of 77 cases reported as colloid/nodular goiter on FNAC (Table 2).

In this study 16 cases were reported as neoplastic in FNAC of thyroid lesions. Out of 16, 12 (75%) cases were of follicular neoplasm, 3 (18.75) of papillary carcinoma and 1 (6.25%) was reported as medullary carcinoma of thyroid (Table 3).

Table 2: Cytopathological comparison of colloid goiter.

FNAC	Histopathological examination						
Colloid/nodular	Colloid/ nodular	Hashimoto's thyroiditis	Follicular	Hyperplastic nodule with			
goiter	goiter	Hashinioto's thyroidius	neoplasm	MNG			
77	72	1	3	1			

Table 3: Cytological analysis of neoplastic lesion.

Lesion	Number	Percentage (%)
Follicular neoplasm	12	75
Papillary carcinoma	3	18.75
Medullary carcinoma	1	6.25
Total	16	100

Table 4: Cytopathological comparison of neoplastic lesion.

Lesion	HPE	FNAC	
Follicular adenoma	7	12 (FN*)	
Follicular carcinoma	1	0	
Medullary carcinoma	2	1	
Papillary carcinoma	5	3	
Adenomatous goiter with Hashimoto thyroiditis	1	0	
Total	16	16	

^{*=}Follicular neoplasm.

Table 5: Cyto-histopathological comparison of follicular neoplasm.

Cytological diagnosis	Histopathological diagnosis						
Follicular neoplasm	Follicular adenoma	Follicular carcinoma	Medullary carcinoma	Papillary carcinoma	Adenomatous goiter with HT		
12	7	1	1	2	1		

Table 6: Cytohistopathological correlation of both non neoplastic and neoplastic lesions.

		Histopathological diagnosis								
Cytological diagnosis (number of cases)	Colloid / nodular Goiter	Hashimoto's thyroiditis	Follicular neoplasm	Lymphocytic throiditis	Granulomatou s thyroiditis	Adenomatous hyperplasia	Hyperplastic nodule with MNG	Papillary carcinoma	Medullary carcinoma	Total
Colloid/nodular goiter (77)	72	1	3	0	0	0	1	0	0	77
Hashimoto thyroiditis (4)	0	3	1	0	0	0	0	0	0	4
Follicular neoplasm (12)	0	0	8	0	0	1	0	2	1	12
Lymphocytic thyroiditis (1)	0	0	0	1	0	0	0	0	0	1
Granulomatous thyroiditis (1)	0	0	0	0	1	0	0	0	0	1
Papillary carcinoma (3)	0	0	0	0	0	0	0	3	0	3
Medullary carcinoma (1)	0	0	0	0	0	0	0	0	1	1
Adenomatous hyperplasia (1)	0	0	0	0	0	1	0	0	0	1
Total										100

Table 7: Statistical analysis of thyroid swellings.

Cutalogu	Histology	Histology			
Cytology	Neoplastic	Non-neoplastic	Total cytology		
Neoplastic	15	1	16		
Non-neoplastic	4	80	84		
Total histology	19	81	100		

True negative (TN): 80, True positive (TP): 15, False negative (FN): 4, False positive (FP): 1.

Table 8: Result of statistical analysis of data.

Variable	Value	0/0	95% confidence interval
Sensitivity	0.7895	78.95	0.5443-0.9395
Specificity	0.9877	98.77	0.9332-0.9997
Positive predictive value	0.9375	93.75	0.6979-0.9984
Negative predictive value	0.9524	95.24	0.8826-0.9869
Accuracy	0.95	95	-

Out of 15 neoplastic lesions reported in FNAC, 14 were diagnosed as malignant in histopathology report. Among 12 cases of follicular neoplasm reported in FNAC, 7 (58.33%) were follicular adenoma, 1 (8.33%) follicular carcinoma, 1 (8.33%) medullary carcinoma, 1 (8.33%) encapsulated variant of papillary carcinoma, 1 (8.33%) with colloid goiter with micropapillary carcinoma and 1 (8.33%) as adenomatous goiter with Hashimoto's thyroiditis.

All 3 cases reported in FNAC as papillary carcinoma and 1 as medullary carcinoma were also diagnosed as same in HPE report (Table 3).

12 cases were reported as Follicular neoplasm on FNAC. Out of which 7 (58.33%) were diagnosed as Follicular adenoma, 1 (8.33%) as follicular carcinoma, 1 (8.33%) medullary carcinoma, 2 (16.66%) as papillary carcinoma and 1 (8.33%) as adenomatous goiter with Hashimoto's thyroiditis (HT) (Table 4).

All 3 cases diagnosed as papillary carcinoma in FNAC were also reported as same in histopathological examination (Table 5).

After statistical analysis specificity of FNAC came out to be 98.77% and sensitivity 78.95%. Positive predictive value was 93.75%, negative predictive value 95.25% and accuracy of FNAC was 95% in this study (Table 7).

The two sided p value is <0.0001, hence considered extremely significant (Table 8).

DISCUSSION

Fine needle aspiration (FNA) has an essential role in the evaluation of patients with a thyroid nodule.

The present study was undertaken to evaluate preoperative results of the lesion with the help of FNAC, the type of thyroid lesion and to compare the observations with the histopathological examination in order to determine the usefulness of the technique. A comparison of various parameters in our study was done with that of studies by other authors.

Study group characteristics

Age incidence

In this study majority of patients were in the age group of 31-40 years (39%) with mean age group of 33.69 years with 10.70 SD. In a study conducted by Sikder et al found maximum number of patients in the age group of 20-40 years with mean age of 35.60 years.⁴ Jawaid et al found 35.45 years as the mean age group in his study of 184 cases.⁵ Sreeramul et al has 35.4 as the mean age group.⁶

Sex distribution

In this study majority of patients were female (86%) while males comprises of 14% with male female ratio of 1: 6.14. A study conducted by Patel et al found the majority of patient to be females with a male female ratio was 1:5.25.⁷ In study of Porwal et al, 87% were females and 13% were males, the male female ratio being 1:7.⁸ Jawaid et al found in 184 cases series male to female ratio of 1:4 which was lower than the ratio of the present study.⁵

Comparison of neoplastic to non-neoplastic

In this case series, we analyzed the ratio of comparison of neoplastic to non neoplastic lesion on FNAC, we found that the ratio was 1:5.25. Sekhri et al reported a ratio of 1:9 of neoplastic to non neoplastic thyroid swellings.⁹

Non neoplastic group characteristics

In this study, out of 84 cases diagnosed as non neoplastic lesions, 77 (91.66%) were colloid/nodular goiter, 4 (4.76%) cases of Hashimoto's thyroiditis, 1 (1.19%) case of Granulomatous thyroiditis, 1 (1.19%) adenomatous hyperplasia and 1 (1.19%) of lymphocytic hyperplasia. The comparison of this finding with histopathology and other studies is as follows:

Colloid /nodular goitre

Five cases were diagnosed as colloid goiter with cystic degeneration on cytological investigation. On histological examination, three of these were diagnosed as follicular adenomas while one case was diagnosed as Hashimoto's thyroiditis with cystic change and 1 as hyperplastic nodule with MNG. This can be explained on the basis of the sampling of areas of cystic change rather than cellular areas occurrence of cystic change in thyroid. The lesions are a common diagnostic pitfall in cytology. This problem can be overcome by using ultrasound guided needle aspiration, which will be more representative of the lesion.

Hashimoto's thyroiditis

Hashimoto's thyroiditis (HT) consist of 4 (4%) cases in the present study out of this 3 were positive in histopathology and 1 was diagnosed as Follicular neoplasm. 1 case of Colloid goiter in FNAC was reported as Hashimoto's thyroiditis in Histopathological examination. In Mangshetty et al study all 6 cases of Hashimoto's thyroiditis were reported as same in HPE, while in study of Mosawi et al one case out of 4 was missed on FNAC of HT. ^{10,11}

Neoplastic group characteristics

In the present study out of 100 patients, 16 (16%) were reported as neoplastic in FNAC. Follicular neoplasm consist of maximum number of cases 12 (75%) out of 16, among 12 cases of follicular neoplasm, 7 (58.33%) were diagnosed as follicular adenoma, 1 (8.33%) as follicular carcinoma, 1 (8.33%) medullary carcinoma 2 (16.66%) papillary carcinoma and 1 (8.33%) as adenomatous goiter with Hashimoto's thyroiditis on HPE.

3 (18.75%) out of 16 were diagnosed as papillary carcinoma, which constituted maximum number of malignant cases, and 1 (6.25%) was reported as medullary carcinoma. All 3 papillary carcinomas were also reported as same in HPE.

The above observation was compared to studies conducted by Sikder et al and Handa et al and results were comparable to present study.^{3,4}

Table 9: Observation compared to studies conducted by Handa et al and Sikder et al.^{3,4}

Lesion	Sikder et al		Handa et al		Present study	
	FNAC	HPE	FNAC	HPE	FNAC	HPE
Follicular neoplasm	2	2 (FA**)	3	4	12	11 (FA)
Follicular carcinoma	0	2	-	-	0	1
Papillary carcinoma	20	26	3	3	3	5
Anaplastic carcinoma	-	-	1	1	-	-
Medullary carcinoma	2	2	2	2	1	2
Hurthle cell neoplasm	•	-	1	2		
Total	24	32	10	12	16	19

^{**=}Follicular adenoma.

Table 10: Present study result comparison with previous studies.

Study	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Accuracy (%)
Sikder et al ⁴	68.75	100	100	87.18	90
Mangshetty et al ¹⁰	90	100	100	96.9	97.56
Parikh et al ¹²	71.43	100	-	-	90.24
Islam et al ¹³	76.68	97.26	-	-	94.44
Sreeramulu et al ⁶	74	100	-	-	-
Gupta et al ¹⁴	80	86.6	-	-	84
Present study	78.9	96.29	93.75	95.23	95

Cytological diagnosis of follicular adenoma is not possible with FNAC and diagnosis is dependent on histological assessment for capsular or vascular invasion.

In this study, both follicular adenoma and follicular carcinoma were included in the follicular neoplasm category.

The present data show high specificity (96.29%) of FNAC as compared to sensitivity, which came out to be (78.9%). Positive and negative predictive value is 93.75% and 95.23%. This is quite similar to previous studies.

The presentations of the thyroid gland diseases are widely varied. The course of treatment and follow up rests on the proper diagnosis of the disorder with specific investigations.

CONCLUSION

FNAC has high specificity (96.29%), sensitivity (78.9%), positive predictive value (93.75%), negative predictive value (95.23%) and accuracy (95%) therefore it can be reliably used as initial investigation. Colloid goiter was found to be the commonest non-neoplastic condition in the current study. Out of the neoplastic conditions, follicular adenoma is the commonest benign lesion and the commonest malignant lesion is papillary carcinoma. Cytodiagnostic errors in some cases with overlapping cytological features can be avoided by paying attention to the possible pitfalls. The suspicious results can be resolved by diagnostic surgical resection. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up clinico-radiologically for any progression that will require repeated FNAC and/or surgery.

Funding: No funding sources
Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Nautiyal S, Jain A, Tiwari S, Kumar A. Fine needle aspiration cytology accuracy in diagnosis of thyroid lesions: a comparative study with histopathological examination of thyroid swellings. Int J Otorhinolaryngol Head Neck Surg 2018;4:1002-7.