

Cytohistopathological Correlation of Thyroid Lesions with Evaluation of Diagnostic Accuracy

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ABSTRACT

Introduction: Thyroid nodules are common endocrine disorders. Fine Needle Aspiration Cytology (FNAC) is widely used as an initial diagnostic tool for evaluating thyroid lesions. Histopathology remains the gold standard for definitive diagnosis.

Aim: To study the cytohistopathological correlation of thyroid lesions and evaluate the diagnostic accuracy of FNAC.

Materials and Methods: This study included 320 patients presenting with thyroid swelling who underwent FNAC evaluation. Surgical specimens were available in 43 cases and were subjected to histopathological examination. Cytological diagnosis was correlated with histopathological findings and diagnostic indices such as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated.

Results: Out of 43 surgically excised thyroid lesions, 33 cases (76.9%) were benign and 10 cases (23.1%) were malignant on histopathology. FNAC showed high diagnostic performance with sensitivity of 100%, specificity of 99.3%, positive predictive value of 91.6%, negative predictive value of 100%, and overall diagnostic accuracy of 99.35%.

Conclusion: FNAC is a highly sensitive and specific diagnostic tool for evaluating thyroid lesions and shows excellent correlation with histopathological findings.

Keywords: Thyroid lesions, FNAC, Histopathology, Cytohistological correlation, Thyroid cytology.

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Introduction

The word 'Thyroid' originated from 'Thyreos', a Greek word meaning shield.¹

Thyroid nodules are frequently encountered in clinical practice. Although most thyroid nodules are benign, a small proportion may represent malignancy, necessitating accurate diagnosis and appropriate management.

Palpable thyroid nodules are common in women, male/female ratio ranged from 1.2 to 4.3.^{2,3} Thyroid nodules may cause hypothyroidism, hyperthyroidism, cosmetic issues and problems in other organs such as compression, and they also have potential for malignancy.⁴

Solitary nodule thyroid (SNT) is defined as a discrete palpable mass in a gland that is otherwise clinically apparently normal. Virtually any disease can present as SNT and a large

number of thyroid nodules diagnosed clinically as solitary are actually hyperplastic nodules in multinodular goitres. Though SNT is commoner in women,⁵⁻⁸

The incidence of palpable thyroid swelling is 4 - 7%.⁹ As there is a 10% lifetime risk of developing a thyroid nodule, screening thyroid nodules has emerged as a common medical problem affecting the general population. Thyroid enlargement whether diffuse or in the form of a nodule has to be investigated to rule out neoplasm. Only 1 in 29 clinically identified swellings is malignant. This corresponds to approximately 2 - 4 /1, 00,000 people / year, constituting only 1% of all cancers and 0.5% of all cancer 2 deaths.¹⁰ Only about 20% of patients undergoing thyroid surgery for suspicion of carcinoma actually show the histology of malignancy.¹¹

Thyroid fine needle aspiration cytology (FNAC) has been an effective tool for the evaluation of thyroid nodules and thyroid diseases. To address terminology and other issues related to thyroid FNAC, THE NATIONAL CANCER INSTITUTE (NCI) proposed the six tiered “The Bethesda System for Reporting Thyroid Cytopathology” (TBSRTC).¹²

Fine Needle Aspiration Cytology (FNAC) is a simple, safe, minimally invasive and cost-effective diagnostic procedure for evaluating thyroid nodules. It plays an important role in distinguishing benign from malignant lesions and helps in planning appropriate treatment.

Despite the usefulness of FNAC, histopathological examination remains the gold standard for definitive diagnosis. Therefore, correlation between cytological findings and histopathological diagnosis is essential to assess the reliability and diagnostic accuracy of FNAC.

The present study was undertaken to evaluate the cytohistopathological correlation of thyroid lesions and determine the diagnostic accuracy of FNAC.

Materials and Methods

Source of data:

All patients referred to cytology section of the Department of Pathology, KIMS Hospital, Hubballi for FNAC of Thyroid lesion.

Method of data collection:

After taking informed consent from the patient, clinical history, physical findings will be noted. The thyroid lesion will be localized, and with 23 gauge needle aspiration will be done under negative pressure. On an average 2-3 passes will be given. Smears will be prepared for routine staining (Hematoxylin and Eosin, Papanicolaou and Wright’s stain) and for special stains if necessary. The specimens will be processed , sectioned and put on slides and stained with Hematoxylin and Eosin. Whenever necessary special histochemical stains will be used.

Inclusion criteria:

All patients irrespective of age and sex with enlarged thyroid gland referred to department of pathology KIMS Hubballi, who give consent for the procedure.

Exclusion criteria:

1. Neck swelling other than thyroid.
2. Bleeding disorder.
3. Patients with skin infection at the site of aspiration.
4. Critically ill or anxious patients.

Type of study: Prospective study. (November 2018 to April 2020).

Study period 18 Months.

Data analysis: Sample size was calculated to estimate the sensitivity of FNAC for diagnosis of malignant thyroid lesions. Based on literature sensitivity of FNAC was 72.72%, and based on records the proportion of malignancy out of total thyroid lesions was 25%. So to estimate the sensitivity of FNAC with 95% confidence and 10% error we require minimum of 312 thyroid cases.

Cytological findings were compared with histopathological diagnosis and diagnostic indices including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated.

Ethical clearance: Taken.

Histopathological Examination:

Surgical specimens were available in 43 cases which were processed and examined histopathologically.

Results:

FNAC diagnosis:

Out of the 320 patients with thyroid swelling 109cases (34%) were diagnosed as Nodular goitre. 79cases (24.6%) were diagnosed as Hashimotos thyroiditis. 5 cases (1.5%) were diagnosed as Follicular neoplasm. 3 cases (0.9%) of Papillary thyroid carcinoma. 3 cases (0.9%) of Medullary thyroid carcinoma. And 10 cases (3.1%) were non diagnostic because of the low cellular yield on aspiration as shown in the below Table 1.

Table1: Routine FNAC diagnosis of thyroid lesions of patient studied.

IMPRESSION	No.of Patients	%
NON DIAGNOSTIC	10	3.1
COLLOID CYST/CYSTIC COLLOID NODULE.	59	18.4
NODULAR GOITRE.	109	34.0
HYPERPLASTIC NODULE/ADENOMATOID NODULE	37	11.5
THYROGLOSSAL CYST	2	0.6

HASHIMOTOS THYROIDITIS	79	24.6
GRAVES DISEASE.	2	0.6
FOLLICULAR NEOPLASM	4	1.25
SUSP PTC	9	2.8
PAPILLARY CA.	3	0.9
SUSP MTC	2	0.6
MEDULLARY CA.	3	0.9
ANAPLASTIC CA	0	0.0
POORLYDIFFERENTIATED CA	1	0.31
TOTAL	320	100.0

A total of 320 thyroid FNAC cases were evaluated. Out of these, 43 cases underwent surgical excision and histopathological examination.

Distribution of cases as per FNAC diagnosis:

Out of 320 cases, 288cases (90%) were diagnosed as non neoplastic. 22cases (6.8%) were diagnosed as neoplastic and 10cases (3.2%) are non diagnostic as shown in the below table 2.

Table 2: Distribution of cases as per FNAC diagnosis

FNAC	NO.OF CASES	%
NON NEOPLASTIC	288	90
NEOPLASTIC	22	6.8
NON DIAGNOSTIC	10	3.2
TOTAL	320	100

Among 43 cases, 33 cases (76.9%) were benign and 10 cases (23.1%) were malignant.

Diagnostic Accuracy of FNAC:
Sensitivity: 100%

Specificity: 99.3%
Positive Predictive Value (PPV): 91.6%
Negative Predictive Value (NPV): 100%
Overall Accuracy: 99.35%

These results indicate a strong correlation between FNAC and histopathological findings.

Histopathology diagnosis:

Follow up of patients showed that, total 43 specimens were excised for histopathology reporting and among them maximum, 9cases (20.9%) were diagnosed as Nodular Goitre, followed by 7cases (16.2%) were diagnosed as MNG with secondary hyperplasia. 2case (4.6%) were reported as Follicular carcinoma. 4cases (9.3%) were reported as PTC. 3case 6.9%) were reported as MTC. 1case (2.3%) was reported as Poorly differentiated carcinoma thyroid. All the FNAC diagnosis were correlating with the histopathology diagnosis as shown in the below Table 3.

Table 3: Histopathology diagnosis of surgically excised specimen.

HISTOPATHOLOGY DIAGNOSIS	No. of Patients (n=43)	%
NODULAR GOITRE (NG)	9	20.9
NG WITH CYSTIC CHANGE	5	11.6
NG WITH SECONDARY HYPERPLASIA (SH)	2	4.6
MNG	5	11.6
MNG WITH SH	7	16.2
HASHITOXICOSIS.	2	4.6
SOLITARY ADENOMATOUS HYPEPASTIC NODULE	1	2.3
FOLLICULAR ADENOMA	2	4.6
FOLLICULAR CARCINOMA	2	4.6
PTC	4	9.3
MTC	3	6.9

POORLY DIFF CA	1	2.3
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Discussion

FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swellings. Factors that influence the efficacy of FNAC of thyroid include adequate sampling, cooperation of the patient, expertise of the reporting cytopathologist. On FNAC distinction between follicular adenoma and follicular carcinoma cannot be made.¹³⁻¹⁵

To distinguish between these lesions it requires detailed histological examination to look for vascular or capsular invasion, which cannot be made out on FNAC.¹⁶⁻¹⁹

Benign versus Malignant thyroid lesions on histopathology.

A total of 43 thyroid lesions were excised and sent for Histopathological examination, because most of the lesions were diagnosed as non-neoplastic or Benign and didn't require surgery. Some of the patients also refused for surgery. Among 43cases, 33 cases (76.9%) were diagnosed as benign, and 10 cases (23.1%) were diagnosed as malignant as shown in the below table 4.

Table 4: Comparison of Benign versus Malignant thyroid lesions on histopathology

Lesions	Khadilkar UN e tal. (2008) ²⁰ (n=100)	Present study (n=43)
Benign	66(66%)	33(76.9%)
Malignant	34(34%)	10(23.1%)

FNAC is considered the first-line diagnostic investigation for thyroid nodules. The present study demonstrated excellent correlation between cytological and histopathological findings.

Table 5: Comparison of statistical indices between FNAC and Histopathology.

STUDY	TOT AL N O. O F C A S E S	SENSIT I V I T Y (%)	SPECIF I C I T Y (%)	P P V (%)	N P V (%)
Handa U et al. ²¹ (2008)	43	97	100	96	100
Present study	43	100	100	100	100

A study done by Handa U et al.²¹ (2008) Sensitivity and PPV are slightly lower than the present study, whereas Specificity and NPV are 100% in both the studies as shown in the above table 5.

In the present study, the majority of surgically excised lesions were benign (76.9%), which is comparable with the findings of Khadilkar UN et al.²⁰, who reported 66% benign lesions.

The sensitivity of FNAC in the present study was 100% and specificity was 99.3%, which is slightly higher than the findings reported by Ahmed Z et al.²², who reported sensitivity and specificity of 93.75%.

The high diagnostic accuracy observed in the present study highlights the reliability of FNAC in the evaluation of thyroid lesions.

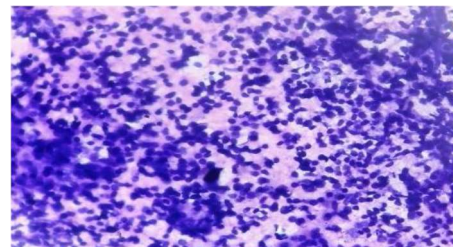


Figure. 1: Hashimoto's thyroiditis- Photomicrograph FNAC showing follicular cells

with clinging of lymphocytes. (Wright strain, 40x)



Figure. 2 : Hashimoto's thyroiditis- Gross: Diffusely enlarged gland more towards right lobe with whitish cut surface.

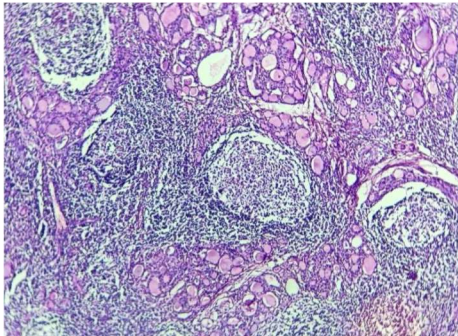


Figure. 3: Hashimoto's thyroiditis- Photomicrograph tissue section showing scanty colloid filled follicles with dense lymphocytic infiltration and a prominent lymphoid follicle towards the right. (H&E, 10x)

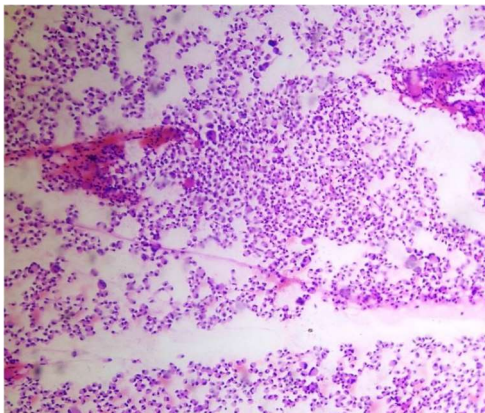


Figure. 4 : Medullary thyroid carcinoma- photomicrograph: FNCA showing plasmacytoid tumour cells arranged in sheets. (Wrights stain,

10x)

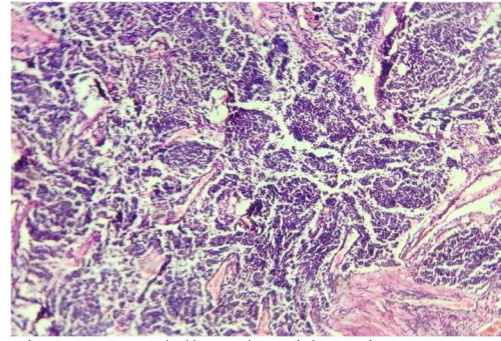


Figure. 5: Medullary thyroid carcinoma- photomicrograph: Tissue section showing dispersed tumour cells and acellular homogeneous material (Amyloid) (H&E, 40x)

Conclusion:

Fine Needle Aspiration Cytology is a highly reliable, minimally invasive and cost-effective diagnostic tool for evaluating thyroid lesions. The strong correlation between FNAC and histopathology confirms its usefulness as a primary diagnostic modality in the management of thyroid nodules.

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