



ORIGINAL RESEARCH PAPER

ENT

A COMPARATIVE STUDY BETWEEN FNAC AND POSTOPERATIVE HITOPATHOLOGY IN THYROID SWELLINGS

KEY WORDS: FNAC,Thyroid swellings, Aspiration cytology, Histopathology, Sensitivity, Specificity, Thyroid nodule

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ABSTRACT

Background: While non-surgical and non-invasive procedures can offer a diagnosis, histological analysis of the removed thyroid tissue provides the final answer. This study aimed to compare the results of two tests, FNAC and HPE, as well as make recommendations for the future. **Methods:** From January 2022 to September 2022, 66 outdoor patients with thyroid lesions were studied at the Postgraduate Department of Otorhinolaryngology and Head & Neck Surgery, S.M. G.S. Hospital, Government Medical College, Jammu. Following statistical analysis, the preoperative FNAC and postoperative histology data were linked and conclusions were reached. **Results:** The specimens from all 66 instances were sent for gross and microscopic inspection. There were two cases of malignant neoplasms discovered, one of which was benign. Correlation of FNAC with histology for benign and malignant lesions revealed that the sensitivity of FNAC was 50%, the specificity was 100%, the negative predictive value was 96.94%, and the positive predictive value was 100%. The P value is 0.001. **Conclusion:** FNAC is a simple, safe and cost effective modality in investigation of thyroid disease with high accuracy and specificity

INTRODUCTION:

The thyroid gland is distinct among endocrine organs. It is the body's biggest endocrine gland and the first to mature throughout fetal life. Thyroid swelling is extremely common. It is believed that 4-7% of people have palpable thyroid enlargement and ten times more have palpable nodules. The majority of them are benign, with less than 5% being cancerous. To examine goitre, a variety of diagnostic techniques such as ultrasonography, thyroid nuclear scan, fine needle aspiration cytology (FNAC), and others are available. Final diagnosis necessitates morphological evaluation of lesions, which necessitates FNAC and histological investigation (HPE).

Leyden initially published FNAC as a technique in 1883.

Martin and Ellis published the first report on the use of aspiration cytology to diagnose thyroid lesions in 1930. According to American Thyroid Association and National Comprehensive Cancer Network practice guidelines, FNAC should be utilized as an initial diagnostic test due to its greater diagnostic reliability and cost efficiency.

In the examination of thyroid swelling, fine needle aspiration cytology is considered the gold standard. In the outpatient department, it is a straightforward, cost-effective, easily repeatable, and rapid technique with great patient compliance. A representative specimen from the goiter and an expert cytologist to interpret the data are important factors for a successful test.

FNAC has limitations in specimen adequacy, sampling techniques, aspiration skill, aspirate interpretation, and overlapping cytological features between benign and malignant follicular neoplasms, as well as in the detection of some papillary carcinomas due to associated thyroid pathology such as multinodular goiter, thyrotoxicosis, and marked cystic changes. Histopathological investigation is required in this case since it is considered the last diagnostic test.

As the last diagnostic test, HPE is required in this situation. Even though nonsurgical and non-invasive procedures can

yield a diagnosis, the HPE of the removed thyroid tissue holds the definitive answer. This also raises the question of how much corroborative is FNAC and HPE.

Literature Review:

In a study of 262 thyroid lesions, Shah A et al discovered that the FNAC had a diagnosis accuracy of 84.66% for non-neoplastic lesions, 97.13% for neoplastic lesions, and 80.45% for neoplastic lesions when compared to histological inspection. As a result, FNAC is a useful diagnostic technique for distinguishing between neoplastic and non-neoplastic thyroid lesions.

Fine needle aspiration was conducted on 255 individuals in a research by Loureds et al. 77% were in agreement, while 18% were not. It was determined that the most prevalent cause of discrepant instances is FNA diagnostic perceived as inadequate for diagnosis. The presence of microscopic papillary thyroid cancer was the primary cause of false negative instances. The existence of overlapping cytological characteristics among adenomatous nodules, follicular neoplasms, the follicular form of papillary thyroid cancer, and hashimoto's thyroiditis explains the 6% false positive rate owing to interpretation mistake.

Fine-needle aspiration (FNA) of the thyroid was done in 616 patients during a three and a half year period, according to a study of institutional experience by Zubair W Baloch. The cytological diagnosis were as follows: 69% were negative for malignancy, 4% were uncertain, 16% were malignant, and 11% were non-diagnostic, including 29 cases from outside institutions. In 21% of instances, surgical follow-up was available. For instances with confirmed benign or malignant cytodiagnosis, the sensitivity was 92% and the specificity was 84%. Clinicopathological correlation has been shown to significantly minimize false-negative outcomes.

AIM OF THE STUDY:

Clinical evaluation of various forms of thyroid swelling, as well as the relationship between FNAC and thyroid histology.

PATIENT AND METHOD:

The current study is a prospective study that was done on 66

patients from January 2022 to September 2022 at the Postgraduate Department of Otorhinolaryngology and Head & Neck Surgery, S.M.G.S. Hospital, Government Medical College, Jammu. Various neck swellings brought to the Otorhinolaryngology department were clinically investigated after a comprehensive history was taken. They were exposed to FNAC, and only instances with thyroid swelling admitted to a hospital and subsequently operated on were included in this research. They were compared to the preoperative FNAC report after the HP research. This research excluded patients who had additional neck swellings. Prior to surgery, informed permission was obtained in all 66 instances.

Histopathological analysis was performed on the material. A gross and microscopic examination was performed. All data, including patient information, symptoms, investigation results, FNAC and histology reports, surgical technique, and post-operative follow-up, were documented on a proforma.

Procedure of FNAC

After obtaining formal consent and making the patient comfortable on a couch, a tiny pillow is placed beneath the patient's shoulder blades to stretch the neck. A fine gauge (21-23G) hollow needle is linked to a syringe (10 cc). The patient is urged not to swallow after repairing the lesion with his fingers. The needle is placed into the lesion, and suction is applied by drawing back on the syringe plunger. The needle is then moved numerous times back and forth through the lesion. When the aspiration is finished, the suction is released and the pressure within the syringe is allowed to equalize with the surrounding air. The needle is subsequently withdrawn, and the contents are sprayed onto a glass slide for observation. Some smears were stained with Papanicolaou stain after being fixed in methanol, while others were air dried and stained with May-Grunwald-Geimsa stain.

The study evaluated diagnostically excellent specimens with good cellularity, architecture that was not degraded, and few blood clots.

Patients had surgery after pre-operative preparation and anaesthesia check-ups, and the specimen was sent for HPE. The tissue was routinely treated, and paraffin embedded blocks were created. Haematoxylin and Eosin were used to stain sections cut at 4-6 m.

The HPE findings were correlated using FNAC. The following parameters were calculated: sensitivity, specificity, accuracy, positive predictive value, and negative predictive value.

Statistical Analysis

The current study employed descriptive and inferential statistical analysis. Continuous measurement results are reported as Mean SD (Min-Max), while categorical measurement results are displayed as Number (%). The significance is determined at the 5% level of significance. Fisher's chi-square The exact test was used to determine the significance of study parameters on a categorical scale when comparing two or more groups.

To determine the diagnostic properties of FNAC against HPE, the following parameters are computed: sensitivity, specificity, PPV, NPV, and accuracy.

RESULT:

The study included 66 patients who had thyroidectomy procedures. All of the patients had FNAC. Smears were obtained in all cases, and all 66 were available for histopathological examination.

Age Distribution:

Age of the patients ranged from 10 to 60 years. Maximum numbers of patients were in the age group 21-30 years.

Table 1: Age Distribution Of Patients Studied

Age in years	No. of patients	% age
10-20	3	4.6
21-30	25	37.9
31-40	21	31.9
41-51	15	22.6
51-60	2	3.0
Total	66	100

Gender Distribution:

Among 66 patients, 56 were females and 10 were males.

Table 2: Gender Distribution Of Patients Studied

Gender	Clinical duration	% age
Female	56	81.9
Male	10	16.67
Total	66	100

Clinical Duration:

Chief complaints of the all patients were swelling anterior aspect of neck. None of the patients had hyper or hypothyroid symptoms at presentation. None of the patient had symptoms suggestive of malignancy. Average duration of symptoms was 1-2years in 42.5 % of patients.

Table 3: Clinical Duration Of Patients Studied

Clinical duration	Number of patients	% age
1-6 months	13	19.7
6-12 months	3	4.5
1-2 years	28	42.5
2-5 years	17	25.8
>5 years	5	7.5
Total	66	100

Clinical Examination:

Examination revealed the most common presentation to be multi-nodular goitre followed by solitary nodule.

Table 4: Clinical Examination Of Patients Studied

Clinical examination	Number of patients	% age
DG	10	15.1
LT STN	2	3.0
MNG	36	54.6
RT STN	2	3.0
STN	16	24.3
Total	66	100

Thyroid Function Tests:

Thyroid function tests were performed on all patients one month before surgery. TSH levels were normal in all patients prior to surgery. T4 levels were found to be low in two cases. One patient had elevated T3 with normal T4 and TSH. However, none of these patients displayed clinical signs of hypothyroidism or hyperthyroidism.

Ultrasonography:

Ultrasonogram done on patients showed that the most common finding to be MNG followed by CG. No evidence of malignancy was detected in any of the cases.

Table 5: USG Findings

USG	No. of patients	% age
MNG	35	53.00
CG	16	24.4
SNG	11	16.6
NG with cystic degeneration	4	6.00
Total	66	100

Fnac Findings:

Among 66 FNACs done, only two case of papillary thyroid carcinoma was present. 51.6 % were NG, colloid goitre was present in 18 patients, six aspirates showed features of Hashimotos thyroiditis and six showed lymphocytic thyroiditis.

Table 6: Fnac Findings Of Patients Studied

FNAC	No. of patients	% age
NG	34	51.6
Colloid goitre	18	27.4
Hashimotos thyroiditis	6	9.00
PTC	2	3.00
Lymphocytic thyroiditis	6	9.00
Total	66	100

Surgery Performed:

Total thyroidectomy was done in 20 patients and sub total thyroidectomy in 26 patients. And hemi thyroidectomy was done in 20 patients.

Table 7: Surgery Performed

Surgery performed	No. of patients	% age
STT	26	39.4
TT	20	30.4
LHT	10	15.1
RHT	10	15.1
Total	66	100

Histopathology Findings:

All 66 instances were subjected to gross and microscopic examination. According to FNAC, two cases of malignant neoplasms were discovered, one of which was benign. Papillary carcinoma, follicular variation, and micropapillary carcinoma are the three types of papillary cancer. The most prevalent kind of lesion was multinodular goitre. Colloid goiter, Hashimoto's thyroiditis, and lymphocytic thyroiditis were also discovered histologically (table 6).

Accuracy:

The accuracy of FNAC in the diagnosis of goitre cytologically was evaluated by using the predictive value theory. The sensitivity, specificity, predictive value of positive test and accuracy for malignancy were determined (table 7).

Table 8: HPE Findings Of Patients Studied

HPE	No. of patients	% age
MNG	32	48.8
CG	13	19.5
Hashimotos thyroiditis	11	16.7
PTC	04	6.0
Lymphocytic thyroiditis	06	9.0
Total	66	100

Correlation Of FNAC And Histology For Benign And Malignant:

Table 9: Correlation Of FNAC And Histology For Benign And Malignant

Cytology	Histology		Total cytology
	Malignant	Benign	
Malignant (Malignant cells)	2	-	2
Benign (No malignant cells)	2	62	64
Total Histology	4	62	66

Correlation of FNAC and histopathology for benign and malignant lesions, sensitivity of FNAC was found to be 50%, specificity 100%, negative predictive value of 96.94% and positive predictive value of 100%. P value is <0.001

Table 10: Correlation Of Cytology Vs Histology For Benign And Malignant

FNAC vs. HPE	Observation				Evaluation					
	TP	FP	FN	TN	SEN	Sp	PPV	NPV	Accu racy	P value
Malig-nant	2	0	2	64	50	100	100	96.94	97.96	<0.001

Correlation Of Fnac And Histopathology For Benign Swellings:

Each histopathology patterns are correlated with FNAC findings to evaluate the sensitivity, specificity, positive

predictive value, negative predictive value and accuracy of FNAC in benign swellings.

Table 11: Correlation Of Cytology And Histology Of Benign Thyroid Swellings

FNAC vs. HPE	Observation				Evaluation					
	TP	FP	FN	TN	Sen	Sp	PPV	NPV	Accu racy	P value
MNG	22	9	9	26	71.0	78.41	71.0	78.41	74.84	0.032
Colloid Cyst/nodule	14	9	3	40	84.3	84.33	56.0	96.35	84.84	0.001
Hashimotos thyroiditis	7	0	5	54	61.0	100	100	94.5	95.84	<0.001
Lymphocytic thyroiditis	2	0	6	58	67.0	100	100	100	97.03	<0.001

Correlating the FNAC and histopathological findings of MNG revealed that the sensitivity was 71.0%, the specificity was 78.41%, and the accuracy was 74.84%. Similarly, the sensitivity and specificity of FNAC in the diagnosis of colloid goitre were 84.33% and 84.33%, respectively. Sensitivity is 61.0% in Hashimoto's thyroiditis and 67.00% in lymphocytic thyroiditis, whereas specificity is 100% in both.

MNG has a P value of 0.032, indicating a positive association between FNAC and histopathology. In colloid goitre, hashimotos thyroiditis, and lymphocytic thyroiditis, the P value is 0.001, indicating a high positive connection between FNAC and histopathological findings.

Table 12: Positive Correlation Of Result Of FNAC With Result Of Histopathology Of Different Thyroid Swelling

	No. of cytological diagnosis	Correlation with result of histopathology	Accuracy (percent)
MNG	32	22	74.4
CG	20	12	84.5
Hashimotos thyroiditis	6	6	94.4
PTC	2	2	97.2
Lymphocytic thyroiditis	6	6	97.1
Total	66	48	

DISCUSSION:

The purpose of this study was to investigate the various forms of thyroid swellings that presented to the outpatient department, as well as the accuracy of FNAC in diagnosing thyroid swellings.

Age And Sex Distribution:

The majority of patients (37.9%) were between the ages of 21 and 30, followed by 21-40 years (31.9%), 41-50 years (22.6%), 10-20 years (4.1%), and 51-60 years (3.00%). The average age is 37.9%. (Table1). When compared to earlier research, this age range and mean incidence are slightly lower. Gupta et al found a mean age group of 38.7 years, with patients ranging in age from 22 to 58 years.

The bulk of the 66 patients (81.9%) were females. Thyroid swellings were found to be 6.5 times more prevalent in women than in men. This was close to Tabaqchali's research of 239 patients, in which 89.1% of the cases were girls and 10.9% were men.

Histopathological Findings:

The current study reported the greatest number of instances with nodular goitre. According to numerous research, colloid goitre was the most frequent kind of thyroid swelling.

In this investigation, only 3.00% of all cases reported were malignant. According to Khalid et al, nodular and colloid goitre was the most prevalent histological finding (62.8%), with malignancy accounting for 17.7%.

Sensitivity, specificity and Accuracy:

In none of the aspirations was unsatisfactory sampling noted. In Tabaqchali et al's study, the unsatisfactory sample rate was 43.1% on initial aspiration and 32.2% on repeated aspiration. Correlation of FNAC with histology for benign and malignant lesions revealed that the sensitivity of FNAC was 50%, the specificity was 100%, the negative predictive value was 96.94%, and the positive predictive value was 100%. Bagga P K et al. showed a sensitivity of 66% and a specificity of 100%.

According to Zubair et al., a sensitivity of 92% and specificity of 84% were reached, with cumulative false-positive and false-negative rates of 16% and 7.5%, respectively. According to Yoo et al., the diagnostic accuracy of FNAC for thyroid was only 69.5%. In this series, the diagnostic accuracy of FNAC for thyroid swellings was 97.2. This is equivalent to Khageswar et al 49.'s - 96.05%.

Malignant lesions were found in 30 instances (35.3%) in a research done by Pomata M et al 51 with a sample size of 85 patients. There were 14 true positive instances, 48 true negative cases, and 2 and 3 false positive and false negative cases, respectively. Because of the significant number of false negatives, the FNAC's sensitivity was only 51.8%, its specificity was 96%, and its accuracy was 80.5%. They came to the conclusion that FNAC was unquestionably the most important diagnostic technique in thyroid pathology. Its use should be subjected to a centralized diagnostic evaluation in which cytology is assessed with clinical and other instrumental data.

Fine needle aspiration was accurate in 119 (74.3%) of patients, according to Bajaj et al. Fine needle aspiration cytology and histology did not correlate in 32 (20%) individuals, while FNAC was insufficient in nine (5.6%). Failures were mostly observed in follicular neoplasm instances.

False negative results of FNAC:

In this study, the false negative rate for cancer diagnosis was 3.00%. According to several research, false negative readings range from 1 to 11%. Histopathological analysis revealed that the FNAC finding of nodular goitre was MNG with foci of micropapillary cancer. This might be owing to the existence of cystic gaps in papillary carcinoma or to insufficient smears when tiny foci of micropapillary carcinoma aspirate were overlooked.

This can be prevented by

- (1) performing aspirations in multiple locations of the nodule, which would assist to obtaining a more representative specimen.
- (2) FNA follow-up of nodules might be terminated if there are no worrisome clinical changes and at least three FNAs support the cytologic diagnosis of benignity.
- (3) The diagnosis shift from benign to malignant following three repeat FNAs tends to imply that three procedures would be prudent.

False Positive Results:

There were no false positives in this study. Loureds et al. reported a 6% false positive rate. False positives occurred at a lower rate than false negatives. The existence of overlapping cytological characteristics among adenomatous nodules, follicular neoplasms, the follicular variant of papillary thyroid cancer, and hashimoto's thyroiditis explains the 6% false positive rate due to interpretation mistake.

On cytological inspection, five instances were diagnosed as colloid goiter with cystic degeneration; on histological analysis, four of these were classified as follicular adenomas, while one case was described as Hurthle cell adenoma with cystic change. This was explained by sampling cystic change areas rather than cellular areas.

The smear's pronounced cellularity can also be a concern in thyroid FNA cytology. Hyperplastic/adenomatous goiter, adenoma, or carcinoma may have increased cellularity and loss of cohesiveness.

According to Gupta et al., 31 of 32 instances of colloid goiter identified by FNAC were confirmed by histology, while one case was refuted by previous FNAC. Histopathology revealed that it was papillary cancer. FNAC accurately detected the remainder of the colloid goiter. In the current investigation, FNAC properly diagnosed 12 of 13 cases of colloid goitre and 28 of 32 cases of nodular goitre.

CONCLUSION:

With excellent specificity and accuracy, FNAC is a straightforward, safe, and cost-effective preliminary diagnostic technique in the examination of thyroid illness. FNAC is commonly related with decreased complication and more skill. FNAC enables us to identify individuals who may be handled conservatively, avoiding needless procedures. The different research that have been conducted so far indicate that FNAC is a basic, safe, useful, and successful initial investigation of choice for thyroid nodules. The conclusion that we can make from the study that we conducted is consistent with the findings of earlier investigations. As a result, whereas HPE is the ultimate and conclusive diagnostic process, FNAC remains the time-tested preliminary method of choice.

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