## **Original Research Article**

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# A study of correlation of pre-operative fine needle aspiration cytology and ultrasonography with post-operative histopathology in thyroid swellings

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#### **ABSTRACT**

**Background:** Diseases of the thyroid gland can be due to inflammatory and neoplastic causes. Many diagnostic tests like ultrasound, thyroid nuclear scan and fine needle aspiration cytology (FNAC) are available for their evaluation. Histopathologically, they can be adenomas, colloid nodules, cysts, infectious nodules, lymphocytic or granulomatous nodules, congenital abnormalities or hyperplasia, or various types of malignancy. It is therefore crucial to have a clear diagnostic approach to ensure patients are managed appropriately and are not over or under-treated. Present study was done to evaluate FNAC and ultrasonography (USG) as a diagnostic method in thyroid swellings and to plan surgery accordingly.

**Methods:** A prospective observational study was conducted among 60 adult patients undergoing thyroid surgery at Victoria and Bowring and Lady Curzon Hospital. They were investigated with FNAC and USG of thyroid, and were subjected to surgery and subsequent histopathological examination. The histopathological examination reports were correlated with the findings of FNAC and USG in order to evaluate their findings by statistical methods.

**Results:** The sensitivity and specificity of FNAC was 87.5% and 98% respectively. All malignant lesions on FNAC were confirmed by histopathology indicating its excellence. Therefore FNAC helps in planning the correct management and avoids second surgery. And the sensitivity and specificity of USG was 75% and 86% respectively. Therefore combination of both FNAC and ultrasonography will improve the diagnostic accuracy to higher level and helps in better management.

**Conclusions:** FNAC has high sensitivity and specificity, so it is closest to ideal test. However, a combination of both FNAC and ultrasound will give desirable results and so that we can avoid mismanagement.

Keywords: FNAC, Multinodular goitre, Solitary thyroid nodule, Thyroid swelling, Thyroid lesions, USG

#### INTRODUCTION

Diseases of the thyroid gland is a common clinical presentation in general population where the incidence being higher in endemic areas, which is higher in females as compared to males. The prevalence of thyroid swelling ranges from 4% to 10% in general adult population and from 0.2% to 1.2% in children. The disorders of thyroid gland can be due to inflammatory and neoplastic causes. A multitude of non-invasive and invasive diagnostic tests like ultrasound, thyroid nuclear

scan and Fine Needle Aspiration Cytology (FNAC) is available to the clinician for the evaluation of thyroid swellings. Hence there arises the need for a final diagnostic test, that is, histopathological examination (HPE).<sup>3-5</sup> About 70% of discrete thyroid swelling is clinically "isolated" and 30% are dominant.<sup>6</sup> In general, most thyroid nodules are benign and can be classified as adenomas, colloid nodules, cysts, infectious nodules, lymphocytic or granulomatous nodules, congenital abnormalities or hyperplasia. Malignant thyroid nodule include papillary carcinoma, follicular carcinoma, hürthle

cell carcinoma, poorly differentiated carcinoma, medullary carcinoma, anaplastic carcinoma , primary thyroid lymphoma, sarcoma, teratoma, and metastatic tumors. <sup>3,6</sup>

It is therefore crucial to have a clear diagnostic approach to ensure patients, presenting with thyroid swellings, are managed appropriately and are not over or under-treated. Present study was to evaluate FNAC and USG as a diagnostic method in thyroid swellings and to plan surgery accordingly.

#### **METHODS**

A prospective observational study was done from November 2017 to May 2019 on 60 adult patients with thyroid swellings of either sex admitted in surgery department age >18 years in Victoria hospital and Bowring and Lady Curzon Hospital, Bengaluru, who are candidates for thyroid surgery.

#### Inclusion criteria

Patients who have given written informed consent, of either sex age above 18 years and admitted in surgical wards with thyroid swellings which are diagnosed either by clinically or radiologically were included.

#### Exclusion criteria

Patients less than 18 years old, refusing to participate in the study, unfit for the surgery and previous thyroid operation or irradiation were excluded.

After obtaining institutional ethics committee clearance and written informed consent, the patients in the department of surgery fulfilling the inclusion and exclusion criteria were enrolled in the study. Relevant information such as age, sex, history including symptoms duration, and symptoms suggestive hypothyroidism and hyperthyroidism, examination findings were noted down. They were investigated with FNAC and USG of thyroid. These findings were noted and tabulated. All patients were subjected to surgery after euthyroid ensuring state, and subsequent histopathological examination of the specimen obtained.

#### Statistical analysis

The data was tabulated using Microsoft Excel, and analysed using descriptive statistics, such as ratio, percentage, sensitivity, specificity positive and negative predictive values.

### RESULTS

The age of the patients in the present study varied from 20 years being the youngest to 71 years being the oldest. The mean age of all patients was 39.25 years (39.22 years for females and 39.42 years for males). 53 (88%) of the

60 patients were females and 7 (12%) of them were males, with a male: female ratio of 1:7.5. 16 (27%) patients had involvement of only the right lobe, 9 (15%) had involvement of only the left lobe, while the remaining 35 (58%) had involvement of both lobes. (Figure 1).

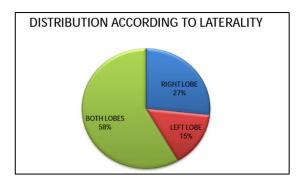


Figure 1: Distribution according to laterality.

The FNAC reports of the patients varied from Colloid nodule, nodular goitre, benign cystic lesion, Follicular neoplasm, papillary carcinoma, medullary carcinoma, to Suspicious of papillary malignancy. On FNAC, 86% of the swellings were benign while 14% were malignant. Figure 2 depicts the distribution of patients by their FNAC reports.

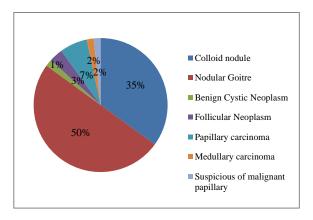


Figure 2: FNAC reports of patients.

The results of ultrasonography report varied from cystic, hyperechoic nodule, multinodular goitre (MNG), mixed and hypoechoic, to suspicious. On USG 78% of thyroid swellings had features suggestive of benign lesions and 22% were malignant. The results are depicted in Figure 3.

The final HPE reports varied from benign follicular adenoma, colloid nodule, benign cyst, hyperplastic nodule, MNG, follicular carcinoma, papillary carcinoma, medullary carcinoma to anaplastic carcinoma (Figure 4). In HPE 87% of clinically diagnosed thyroid swellings were benign and 13% of swellings were malignant. So incidence of malignancy in clinically diagnosed thyroid swellings is 12%, most common benign lesion being

MNG, followed by colloid nodule and most common malignant lesion being papillary carcinoma (10%).

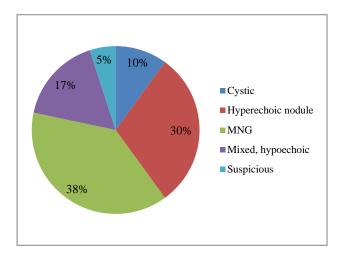


Figure 3: USG findings.

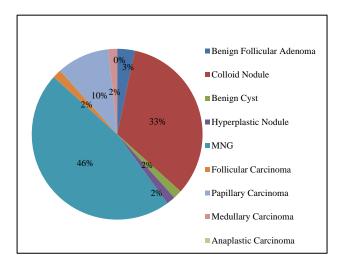


Figure 4: Depiction of HPE reports of patients.

#### Correlation of FNAC and HPE

Out of 52 benign on FNAC only 1 (1.92%) turn out malignant on HPE. Out of 2 follicular neoplasms 1 turn out malignant (follicular carcinoma) on HPE. So incidence of malignancy was 50% in this group. All the malignant aspirates (5) were malignant too in HPE. 1 suspicious lesion turned out malignant, so incidence of malignancy is 100% in this group. The correlation of FNAC with HPE is shown in Table 1.

#### Correlation of USG with HPE

2 out of 47 benign ultrasonography lesions turned out to be malignant on HPE. Incidence of malignancy in suspicious lesion is 33.33%. In total 10 malignant lesion on USG only 5 (50%) turn out malignant, rest 5 (50%) were benign. The correlation of USG with HPE is shown in Table 2.

Table 1: Correlation of FNAC with HPE (n=60).

FNAC	Histopathological diagnosis	No.
Colloid nodule (21)	Benign follicular adenoma	1
Nodular goitre (30)	Colloid nodule	20
Benign cystic lesion	MNG	28
(1)	Benign cyst	1
	Papillary carcinoma	1
	Hyperplastic nodule	1
Follicular neoplasm (2)	Benign follicular adenoma	1
	Follicular carcinoma	1
Papillary carcinoma (4)	Papillary carcinoma	4
Medullary carcinoma (1)	Medullary carcinoma	1
Suspicious of malignancy papillary (1)	Papillary carcinoma	1

Table 2: Correlation of USG with HPE (n=60).

USG report	Histopathological diagnosis	No.
Cystic (6)	Benign cyst	1
Hyperechoic nodule (18)	Colloid nodule	18
MNG (23)	MNG	23
	Hyperplastic nodule	1
	Benign follicular adenoma	2
	Papillary carcinoma	2
Mixed, hypoechoic (10)	MNG	4
	Papillary carcinoma	3
	Follicular carcinoma	1
	Medullary carcinoma	1
	Colloid nodule	1
Suspicious (3)	MNG	1
	Papillary carcinoma	1
	Colloid nodule	1

Sensitivity of FNAC and USG is 87.5% and 75% respectively. Specificity of FNAC and USG is 98% and 86% respectively. Positive Predictive Value of FNAC and USG are 87.5% and 46% respectively. Negative Predictive value of FNAC and USG are 98% and 95% respectively. Diagnostic accuracy of FNAC and USG are 96.6% and 85% respectively.

#### **DISCUSSION**

Thyroid swellings are the common clinical problem though varying in incidence in different geographical regions. In this study a total of 60 patients diagnosed

clinically as thyroid swellings were subjected to FNAC and USG followed by surgery and then the specimen was sent for HPE. And the results of FNAC and USG were compared with that of HPE findings.

A total of 88% patients had benign thyroid lesion which was suggestive of nodular colloid goitre, follicular adenoma, colloid cyst, hyperplastic nodule and multinodular goitre. 12% of the patients had malignant thyroid lesions like papillary carcinoma, Follicular carcinoma and medullary carcinoma of thyroid. According to Prof. R.C. Suryaprakash, adenoma thyroid was the commonest benign lesion and papillary carcinoma was the commonest malignant lesion.<sup>7</sup>

Fine Needle aspiration cytology has been well established as the base line investigation in evaluating the thyroid nodules. It is known for many advantages it provides like, simple technique, safe, rapid turn-around time etc. It provides the primary information and or diagnosis which helps in choosing the further rightful management of the thyroid lesions. Ultrasound (USG) of thyroid gland is a simple cost effective non-invasive diagnostic tool for evaluation of thyroid swellings. USG can differentiate solid from cystic lesion and can identify cysts as small as 2 mm. It is performed using a 12 MHz transducer that is optimal for high resolution imaging. Colour flow Doppler is useful in assessing vascularity. USG is safe inexpensive procedure with quick result and an excellent patient compliance. 9

The diagnosis of papillary thyroid carcinoma by FNAC on the basis of characteristic nuclear changes is reliable and accuracy with sensitivity and specificity both approaching 100%. In present study among 60 cases 4 cases reported as papillary carcinoma and 1 case reported as suspicious. But after HPE report 6 cases are diagnosed as papillary carcinoma. 1 case of papillary carcinoma misdiagnosed in FNAC.

Mundasad et al conducted a study on accuracy of FNAC in diagnosis of thyroid swellings. In their study among 144 patients FNAC revealed 92% benign, 6% malignant and 4% suspicious. But histopathology shows 82% benign, 18% malignancy. The most important factors include experience of the aspirator and criteria used to define a satisfactory sample.

As per Hosseingharib et al nodule size is not predictive of malignancy.<sup>11</sup> They concluded that risk of cancer is not significantly higher for solitary nodular goitre than for glands with multiple nodules. In our study the incidence of carcinoma is more in multinodular goitre than solitary nodular goitre. Watter et al, interpreted an USG report as suggestive of malignancy if the nodule was solid or of a mixed solid-cystic variety and a hypoechoic and nonhaloed lesion.<sup>12</sup> They emphasized that the USG has added advantage of allowing the whole gland to be examined rather than the dominant nodule but was limited by the fact that no features were pathognomic for

malignancy, so that it should be regarded as complementary rather than an alternative investigation to FNAC in the management of thyroid swellings. High resolution real-time USG is far better than clinical examination in detecting thyroid nodularity. Watter et al have shown that the prevalence of multinodularity in clinically solitary thyroid nodules is between 20% and 40%, and it has been observed that for a thyroid nodule to be detected by palpation, it must be at least 1 cm in diameter, while USG detects nodules as small as 3mm in diameter.

Vikas et al has stated in his study that the overall sensitivity of thyroid ultrasound for diagnosing a malignant nodule is  $83.3\%.^{13}$  In this study it was identified that ultrasound has 75% sensitivity and 86% specificity in detecting malignant nodules based on sonographic findings. In this study by ultrasound 47 (78.3%) patients were having benign features and 13 (21.7%) patients were having features of malignancy. Similarly, in a study conducted by Bonovita et al the sample size was 1232 patients.<sup>14</sup> Among these patients malignant cases were only about 3% to 7% rest of the cases were benign lesions. In our study out of 47 benign cases, 2 cases diagnosed as papillary carcinoma on HPE. Similarly, in a study done by Danadia et al on 100 cases in Gujarat shows out of 66 benign cases 2 cases which were diagnosed as benign turned out to be malignant as papillary carcinoma.15

#### **CONCLUSION**

Thus from present study, the following can be concluded. Multinodular goitre is the most common benign condition. Papillary carcinoma is the most common type of thyroid malignancy. FNAC should be used as the initial diagnostic test because of its superior diagnostic reliability and cost effectiveness before USG. FNAC has limitations related to specimen adequacy, sampling technique, skill of performing the aspiration, interpretation of the aspirate and overlapping cytological features between benign and malignant follicular neoplasm.

In present study FNAC has 87.5% sensitivity and 98% specificity. Ultrasound is a better modality of investigating the thyroid gland as a whole and non invasive when compared to FNAC. Ultrasound is the best imaging modality which can characterize the number of nodules, size of each nodule, margins of the nodule and contents of the nodule. In present study USG has 75% sensitivity and 86% specificity.

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