Correlation of fine needle aspiration cytology with histopathology in patients undergoing thyroid surgery

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ABSTRACT:

Introduction: Thyroid swellings are one of the most common swellings in the neck. They pose a major problem in developing countries like India, considering the high endemicity for iodine deficiency disorders. Thyroid gland is affected in many conditions. Out of these, majority are benign while less than 5% are malignant. Multiple noninvasive and invasive diagnostic tests are available for the diagnosis of thyroid swelling. However, at present, FNAC is considered the gold standard investigation. Despite the high sensitivity and specificity, FNAC has its limitations. Histopathological examination of surgically excised thyroid swelling is the confirmatory gold standard to determine the pathology of the thyroid gland.

Material and method: This prospective and observational study was conducted in the Department of Otorhinolaryngology (ENT) in collaboration with the Department of Pathology in a tertiary care hospital and medical school. A total of seventy patients were included.

Results: The diagnosis on FNAC was correlated with histopathology. Statistical analysis showed FNAC had a sensitivity of 83.3%, specificity of 100%, positive predictive value of 100%, negative predictive value of 96.7%. However, the overall accuracy in this study was determined to be 95.71%. Results were found to be statistically significant (P < 0.05).

Conclusions: The diagnostic role of FNAC in thyroid lesions is of utmost importance in making preoperative diagnosis. FNAC was found to be highly sensitive and specific for diagnosing thyroid lesions but the final HPE is considered as a gold standard.

KEYWORDS: FNAC, histopathology, thyroid swelling

ABBREVIATIONS

FNAC – fine needle aspiration
FNAC – fine needle aspiration cytology
HPE – histopathology examination
MNG – multinodular goitre
STN – soft tissue neck
UGS – ultrasonography

INTRODUCTION

Thyroid swellings are one of the most common swellings in the neck. They pose a major problem in developing countries like India, considering the high endemicity for iodine deficiency disorders [1]. Thyroid function is essential for growth, development and metabolic homeostasis in the normal state [2]. The thyroid gland can be involved in many pathological conditions. The principal diseases of the thyroid gland are goitre (nodular or diffuse), hyperthyroidism, hypothyroidism, thyroiditis and neoplasms. Simple (non-toxic) goitre is extremely common and affects more than 200 million individuals worldwide. Iodine deficiency is considered to be the major cause for goitres [3].

Though most of the goitre swellings are benign in nature, many reports have shown that the prevalence of malignancy among the solitary nodule goitre is about 10%. Though thyroid cancer is a relatively rare malignancy, it accounts for more than 90% of all endocrine cancers. Among the various types of malignancies of the thyroid gland, papillary carcinoma is the most common, followed by follicular, medullary, anaplastic cancer and lymphoma [1].

Clinically thyroid swelling presents with a lump in the neck and may cause cosmetic deformity, pressure symptoms over the trachea, esophagus and major vessels [4].

Annual incidence of thyroid carcinoma is 1–2 per 100,000 population and it accounts for 1% of entire human malignancies and 0.5% of total deaths from malignancies. Thyroid malignancies are usually nonaggressive in nature, but they are responsible for more deaths than all other malignancies of the endocrine system [5].

Multiple noninvasive and invasive diagnostic tests are available for the diagnosis of thyroid swelling [6]. Fine needle aspiration (FNA) was developed in 1960 in Sweden to assess the malignant character of thyroid nodules [7]. However, at present, FNAC (fine needle
aspiration cytology) is considered the gold standard investigation [1]. The sensitivity of FNAC has been found to be ranging from 55% to 98% and the specificity from 73% to 100% [8, 9]. Despite the high sensitivity and specificity, FNAC has its limitations related to specimen adequacy, sampling technique, skill of performing the aspiration, interpretation of the aspirate and overlapping cytological features between benign and malignant neoplasm. Histopathological examination of surgically excised thyroid swelling is the confirmatory diagnostic technique to determine the pathology of the thyroid gland [10]. The present study was done to correlate the FNAC findings with the histopathological findings in a tertiary care hospital.

AIMS AND OBJECTIVES

To correlate the fine needle aspiration cytology findings with the histopathological findings in patients undergoing thyroid surgery.

MATERIAL AND METHODS

This prospective and observational study was conducted in the Department of Otorhinolaryngology (ENT) in collaboration with the Department of Pathology in a tertiary care hospital after obtaining an ethical committee clearance vide no. 14592/G. dated 26/11/18.

INCLUSION CRITERIA

All patients of any age group and either sex presenting with thyroid swellings undergoing thyroid surgery.

EXCLUSION CRITERIA

1. Patients not giving consent for the study,
2. Patients unfit for surgery,
3. Patients who had been operated on previously for thyroid swelling,
4. Patients who have received radiotherapy for head and neck cancer.

METHODOLOGY

All the patients attending ENT OPD with thyroid swelling as per inclusion criteria were evaluated with a detailed history and thorough clinical examination. Patient was taken to the Department of Pathology for FNAC.

Postoperative thyroid specimens were preserved in 10% buffered formalin for further processing. On the next consecutive day, the specimen was grossed and representative tissue was taken, which was processed routinely. The section was cut at a 3-mm thickness and stained with hematoxylin and eosin and a final diagnosis was rendered within two weeks. Histopathology report was recorded. Both FNAC and histopathology reports were analysed and correlated.

OBSERVATIONS AND RESULTS

A total of 70 patients were included.

Clinical profile

- Age distribution
  The age distribution of patients was between 19 and 75 years. The highest number of patients was in the age group of 31–40 years (26 patients). Mean ± SD of the study population was 38.99 ± 11.018 with a range of 19–75 years.

- Sex distribution
  Among a total of 70 patients, 81.4%, i.e. 57 patients, were females and 18.6 %, i.e. 13 patients, were males.

Chief complaints

Among a total of 70 patients, the majority presented with a progressive increase of swelling in the anterior part of the neck.

<table>
<thead>
<tr>
<th>TYPES</th>
<th>NO. OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I – Nondiagnostic/unsatisfactory for evaluation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Type II – Benign</td>
<td>60</td>
<td>85.7</td>
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<tr>
<td>Type III – Atypia of undetermined significance</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Type IV – Suspicious for follicular neoplasms/follicular Neoplasms</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Type V – Suspicious for malignancy</td>
<td>4</td>
<td>5.7</td>
</tr>
<tr>
<td>Type VI – Malignant</td>
<td>4</td>
<td>5.7</td>
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</tbody>
</table>

Tab. 1. Division of cases based on the BETHESDA classification.
Seventeen patients had some compression symptoms like discomfort in swallowing. There was a sudden increase in swelling in five patients. Four patients presented with respiratory distress.

### Size of swelling

Among a total of 70 patients, 29 patients had swelling <=5 cm. As many as 27 patients had the swelling size of 5–10 cm. Nine and five patients had swelling size of 10–15 cm and >15 cm, respectively. Mean ± SD of the study population was 7.387 ± 4.8977 with a range of 2.8–24.0.

### Diagnosis suggested by FNAC

In our study, sixty patients out of 70 had benign lesions on FNAC. Among them, 46 (65.9%) had colloid nodule, 17.1% had colloid goiter with cystic change, and 1.4% had lymphocytic thyroiditis and adenomatous goiter each. FNAC was suspicious of follicular neoplasm in 1 patient (1.4%). Out of the 70 patients, 9 had malignant lesions which included papillary carcinoma – 10% and medullary carcinoma – 2.9% (Fig. 1.).

Tab. I shows breakup of cases based upon the Bethesda classification. In the present study, the majority of patients were categorized into type II i.e. 60 (85.9%) followed by type V and VI i.e. 4 each, and 2 cases of Type IV.

### Final diagnosis on histopathology

On final diagnosis on HPE (histopathology examination), we had a total of 58 patients with benign lesions which included 45 patients of colloid goitre, 11 patients of colloid goiter with cystic change, one patient each of lymphocytic thyroiditis and adenomatous goitre (Tab. II.).

Twelve patients had malignant lesions. Among malignant lesions, papillary carcinoma was found in 9 patients, follicular carcinoma, medullary carcinoma and anaplastic carcinoma in one patient each (Fig. 2.).

### FNAC and biopsy comparison

Seventy cases of FNAC and biopsy were compared. Colloid goitre was present in 46 cases (65.71%) in FNAC and 45 cases (64.28%) in HPE. Colloid goitre with a cyst was seen in 12 cases (17.14) of FNAC and 11 cases (15.71%) of HPE. Lymphocytic thyroiditis and adenomatous goitre was seen in one case each (1.42%) in both FNAC and biopsy.

One case of follicular neoplasm was found in FNAC which turned out to be follicular carcinoma on HPE. Papillary carcinoma was found in 7 cases (10%) of FNAC and 9 cases of HPE. Medullary carcinoma was seen in 2 cases, and no case of anaplastic carcinoma was seen in FNAC. One case of anaplastic carcinoma was identified on HPE (Fig. 3.).

### Correlation between FNAC and histopathology

Tab. III. shows a positive correlation of the result of FNAC with the result of histopathology of different thyroid swellings.

Out of 70 cases, a positive correlation was found in 67 cases (Tab. III.). Thus, the diagnostic accuracy was found to be 95.71%.

The diagnosis based on FNAC was correlated with histopathology (Fig. 4.). Statistical analysis showed FNAC had a sensitivity of 83.3%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 96.7%. However, the overall accuracy in this study was determined to be 95.71%. Results were found to be statistically significant (P < 0.05).

- Sensitivity – 83.3%
- Specificity – 100%
- Positive predictive value – 100%
- Negative predictive value – 96.7%
- Diagnostic accuracy – 95.71%
DISCUSSION

The present study of seventy cases was aimed to determine the correlation of FNAC with histopathological findings in patients undergoing thyroid surgery.

Clinical profile

Age distribution

Age of the patients in the present study ranged from 19–75 years. The highest number of patients was in the age group of 31–40 years, i.e. 26%. Mean ± SD of the study population was 38.99 ± 11.018 with a range of 19–75 years. Our finding was comparable with the study carried out by Srirangaprasad et al. [11] with a mean age of 39.6 years.

Sex distribution

The number of males in the present study was 13 (18.66%) and females – 57 (81.42%). Female to male ratio in our study was 4.3:1. It was comparable with Surriah et al. [12] in which a higher incidence of thyroid lesions was observed in females as compared to males.

Affected side

In our study, it was observed that the disease was affecting 29 cases i.e. 41.4% on the right side as compared to 28 cases, i.e. 40%, on the left side. Thirteen cases, i.e. 18.6%, involved both lobes. Our study was comparable with Sengupta et al. [13] in which swelling was located in the right lobe in 43.3% of the cases.

Clinical presentation

In this study the most common clinical presentation was the presence of gradually progressive swelling in the front of the neck – in 91.42% of patients. Also, many patients had some compression symptoms like discomfort in swallowing (24.28%). Sudden increase in the size of swelling was noticed in 7.14%.

In a study conducted by Kurele et al. [14] that analysed 97 patients with thyroid nodules, sudden increase in the size of the lesion was seen in 8% of the patients and difficulty in swallowing was seen in 7% of the patients.

Duration of goiter

We found that most patients, i.e. 42.9%, were suffering from goitre for the last 1–3 years and 25.7% of patients had swelling of the thyroid for less than 1 year while there were 14.3% of patients with goitre for more than 6 years.

Handa et al. [9] studied the thyroid swelling and showed that the highest number of patients (62.2%) had a thyroid lesion with symptoms for more than a year. Bhansali et al. [15] in their study of 1982 found out that most patients, i.e. 49.84%, had symptoms for less than one month. Results of our study are different and not comparable to those studies.

Diagnosis suggested on USG

Ultrasound suggested STN/colloid nodule/cyst in 54.28% of patients, MNG in 20% of patients and malignancy in 11% of patients. One patient (1.42) had thyroiditis on USG.
In FNAC, 46 patients had colloid nodule, 12 had colloid goiter with cystic change, and one patient had lymphocytic thyroiditis and adenomatous goiter each. FNAC was suspicious of follicular neoplasm in 1 patient (1.4%).

Out of 70 patients, 9 had malignant lesions which included papillary carcinoma (10%) and medullary carcinoma (2.9%).

In HPE, a total of 58 patients had benign lesions which included 45 patients with colloid goitre, 11 patients with colloid goiter and cystic change, one patient with lymphocytic thyroiditis and one with adenomatous goiter. Twelve patients had malignant lesions. Among malignant lesions, papillary carcinoma was found in 9 patients, follicular carcinoma, medullary carcinoma and anaplastic carcinoma in one patient each. Two benign cases – one of colloid goitre and the other one of colloid goitre with cystic change – turned out to be papillary carcinoma on HPE. One case of follicular neoplasm which was found on FNAC turned out to be follicular carcinoma on HPE. One case of medullary carcinoma turned out to be anaplastic carcinoma on HPE.

In our study colloid goiter was the most common non-neoplastic lesion. Among the malignant lesions, papillary carcinoma of the thyroid was the most common (75%). In the literature, the incidence of papillary carcinoma ranges from 50% to 80%. Papillary carcinoma is usually accompanied by cystic change [16]. Thus, in our study it may have been diagnosed as colloid goitre with cystic change.

In our study the sensitivity (83.3%) was comparable to the one in the study by Sharma et al. [17] (84%) and Hawkins F. et al. [18] (86.3%). The specificity (100%) and PPV (100%) was found to be comparable to Bagga et al. [19] (100%). NPV (96.7%) was similar to Bagga et al. (96%). The results were not comparable with the studies by Harsolius et al. [20] and Kessler et al. [21] The specificity was similar to the study by Afroze et al. [22] (Tab. IV.).

The diagnostic accuracy was found to be 95.71% which is comparable to Frable and Frable [23] who reported a diagnostic accuracy of 94%. HPE is considered as gold standard in diagnosis of thyroid lesions.

**SUMMARY & CONCLUSION**

The present study was carried out to evaluate patients with thyroid swellings who underwent thyroid surgery. FNAC was performed preoperatively and after surgery the final histopathology report was rendered. Correlation of FNAC and histopathological findings was done.

Out of 70 cases, a positive correlation was found in 67 cases. The diagnosis based on FNAC was correlated with histopathology results. The statistical analysis showed FNAC had a sensitivity of 83.3%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 96.7%. However, the overall accuracy in this study was determined to be 95.71%. Results were found to be statistically significant (P < 0.05). The main drawback of the study is the low number of patients. A study with a bigger sample would throw more light on this comparison.
CONCLUSION

FNAC in thyroid cases is of utmost importance in making the preoperative diagnosis. FNAC was found to be highly sensitive and specific for diagnosing thyroid lesions. However, the final HPE examination is considered as a gold standard.

REFERENCES


