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Correlation Between Fine Needle Aspiration Cytology and Thyroid Function Tests in Thyroid Disorder Patients

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Abstract
Thyroid lesions are common problems encountered in our routine practice. Fine needle aspiration cytology (FNAC) is the most accurate and cost-effective method for evaluating thyroid lesions. FNAC accompanying with the thyroid function tests (TFT) may be helpful in the proper assessment and management of thyroid swellings. This study evaluate the various thyroid lesions by FNAC and correlate with the biochemical thyroid function tests (T3, T4 and TSH). This cross sectional observational study were enrolled a total of 100 patients, aged ≥18 years with thyroid swelling presented in our hospital during the study period. Assessment of cytomorphological features of thyroid lesion by using FNAC and also the thyroid function test (TFT) by using Chemiluminescence immunoassay (CLIA) method. Out of total thyroid disorder cases, the most affected age group (35%) of was 31-40 years, with female predominance (76%). Majority of the patients (97%) presented with neck swelling. On FNAC diagnosis most of the lesion (86%) was benign, 9% was malignant and 5% were undiagnosed. Among non neoplastic lesions most of them (56%) were goiters (both nodular and colloid), followed by thyroiditis in 18% of cases. The most common malignant lesion was papillary carcinoma (6% cases) followed by follicular carcinoma (3%). Majority of the benign and malignant lesion were associated with the euthyroid condition, whereas most of the thyroiditis cases associated with the hypothyroid condition on thyroid function tests. FNAC remains the most accurate and gold standard tool for evaluating thyroid nodules. FNAC accompanying with the TFT profile play a crucial role for early diagnosis and proper management of thyroid lesions.

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].Clinically thyroid swelling presents with a lump in the neck and may cause cosmetic deformity, pressure symptoms over the trachea, esophagus and major vessels[3]. Hashimoto's thyroiditis, a synonym of chronic lymphocytic thyroiditis or autoimmune thyroiditis is the second most common thyroid lesion diagnosed on FNAC after goiter[4]. Goiters are a common endocrine disorder affecting approximately 300 million people worldwide, with more than half of those affected being unaware of their condition[5]. One of the main causes of a goiter is iodine deficiency[6,7], defined by the World Health Organization (WHO) as a population mean urinary iodine (UI) excretion of less than 100µg per liter[8]. The diagnosis of hyperthyroidism and hypothyroidism can be made using different methods but the most common ones are serum TSH levels in conjunction with total and free T4 and T3levels. The challenge facing clinicians dealing with thyroid nodules is to achieve an accurate preoperative diagnosis of malignancy and therefore, fine needle aspiration cytology (FNAC) can play an important role in the diagnostic work up. It is a relatively safe, cost-effective and simple procedure. Although it is less precise than standard histological assessment, it may help avoid invasive and potentially unnecessary surgery[9,10]. Methods for evaluating thyroid nodules include the thyroid palpation exam, thyroid-stimulating hormone (TSH) test, ultrasonography and fine needle aspiration (FNAC). FNAC accompanying with the USG thyroid, thyroid nodule scan, TFT and TPO antibody level are helpful for the selection of thyroid lesion patients manage conservatively or surgically[11].

Aims and Objectives: To evaluate the thyroid lesion by FNAC and determine relationship between cytomorphological findings with the thyroid function tests (TFT).

MATERIALS AND METHODS

This was across sectional study carried out in the Department of Pathology at a tertiary care hospital, central India over the course of 2 years. The Helsinki declaration guidelines for ethical standard were followed.

Inclusion Criteria:

- Patient's ≥18 years of age, both gender.
- Patients had a nodular or diffuse thyroid swelling and had a request for FNAC by the clinician.
- Patients who provided consent for the study.

Exclusion Criteria:

- Patient's <18 years of age.
- Patients had known case of thyroid disorder.
- Patients who not provided consent for the study.

Details of the all patients who applied to the inclusion criteria were pulled from the internal data system at the hospital and arranged as a database. Investigated clinical parameters include age, gender, details of FNAC and final histopathological diagnosis.

Before performing the FNAC procedure it was well explained to the patient and obtained patient informed consent. Prior to aspiration a physical examination of thyroid swelling was done.

FNAC was done with proper aseptic precautions. The samples were then air-dried, stained with Papanicolaou (Pap) stain or Giemsa stain. Presence of at least 6-8 cellular fragments on each of 2 slides was the criteria to be considered for adequate smear. The biochemical thyroid function test (TFT), serum T3, T4, TSH, was performed using a Chemiluminescence immunoassay in all the selected patients

The reference range for T4 was 5-12µg/dl., T3 was 80-180 ng/dl and TSH was0.5-5mU/L.

Statistical Analysis: Statistical analysis was performed using IBM statistical package for the social sciences (SPSS) statistics (version 22.0). $p<0.05$ was considered as statistically significant.

RESULTS AND DISCUSSIONS

A total of 100 patients of thyroid disorder which was clinically diagnosed by physicians were enrolled in our study. Majority of the Patients (35%) were in age 31-40 years age group, followed by (22%) 41-50 years age group. Female preponderance (76%) has been observed in this study (Table 1).

Clinical presentation of thyroid disorder varied from patient to patient. Neck swelling was the predominant (97%) complaint followed by neck discomfort (26%), neck pain (15%) and difficulty in deglutition (8%) (Fig. 1). (Fig. 2) depicts the microscopic appearance of colloid goiter, showcasing enlarged thyroid follicles filled with colloid material. In contrast,

(Fig. 3) illustrates the microscopic appearance of the follicular variant of papillary thyroid carcinoma, characterized by follicular growth patterns with nuclear features typical of papillary thyroid carcinoma.

Out of total cases in the study population, 5 patients (5%) were reported as non-diagnostic or unsatisfactory, 86 patients (86%) as benign and 9 patients (9%) was malignant on the basis of FNAC findings. The most common lesions were goiters (both nodular and colloid), being found in 56% all of cases. Behind them were autoimmune thyroid disorders with 18% all of cases. The most common malignant lesion was papillary carcinoma (6% cases) followed by follicular carcinoma (3%), (Table 2). Malignant neoplasm (follicular and papillary) diagnosed by FNAC also confirmed by histopathology (HPE).

Majority of the benign and malignant lesion were associated with the euthyroid status (76%), whereas most of the thyroiditis cases associated with the hypothyroid status.

Prompt and proper diagnosis of thyroid disorder was necessary for its early appropriate management. FNAC is an essential part in the work-up of thyroid swelling. It can differentiate between benign and malignant nodules with varied, but for the most part, accurate results. Its effectiveness in the guidance of therapy of thyroid nodules led to more operated malignant lesions.

In our study thyroid disorders were predominantly (76%) found in female patients when compared the male patients. male to female ratio in the current study was 1: 3.2, our results correlate well with other studies conducted by., Abou-Foul[12] and Marachapu J[13], reported male to female ratio of 1: 3.1 and 1:3.3 respectively, whereas discordance to that Sood[14] reported very high female to male ratio 10:1 in their study

In the present study, majority of the patients were 31-40 year age group which was quite similar to the study of Ashwin[15] and Bhatia[16] observed that 31-40 year were the commonest age group. The prevalence of autoimmune thyroiditis is higher in women of childbearing age, therefore the diagnosis of subclinical hypothyroidism can be challenging among that age.

Thyroid swelling was the most common presentation observed in the current study, which bears resemblance with studies by Kartha[17] and homogenous to Roy[18].

We have found that the benign (non-neoplastic) thyroid lesions was most predominant (86% cases) in this study, similar observation reported by many other researchers in their studies: Alaus AS[19] and Ranab hat S[20], reported non-neoplastic lesion 85% and 88% respectively.

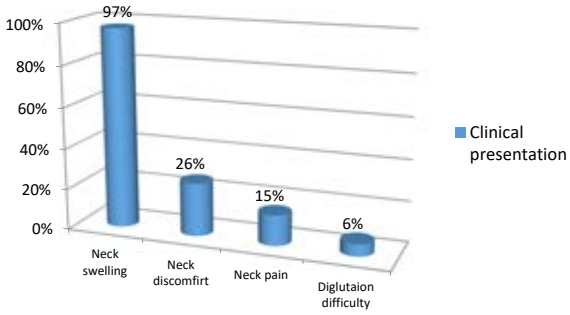

Fig. 1: Clinical presentation of patients with thyroid Disorder

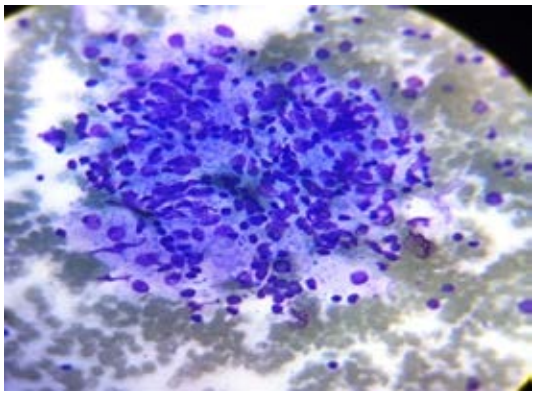

Fig. 2: Lymphocytic thyroiditis

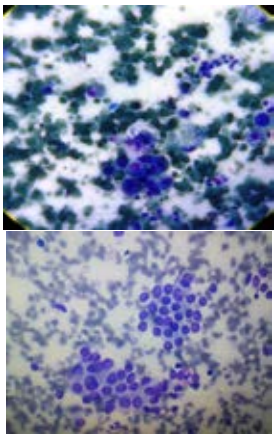

Fig. 3: Colloid goiter

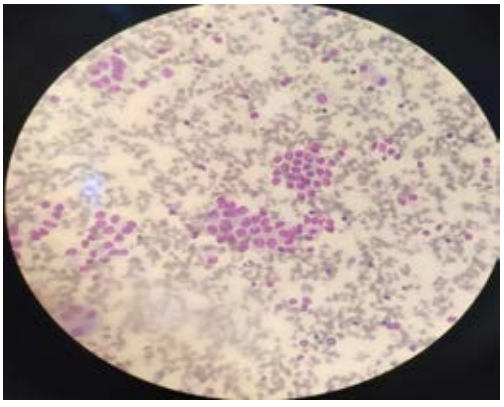

Fig. 4:Follicular Variant of Papillary Thyroid Carcinoma

Table1: Age and gender wise distribution of thyroid disorder cases (n = 100)

Age group (Years)	Male (%)	Female (%)	Total Cases (%)
18-30	4	5	9
31-40	9	26	35
41-50	5	17	22
51-60	4	14	18
61-70	2	10	12
>70	0	4	4
Total	**24 (24)**	**76 (76)**	**100 (100)**

Table2: Distribution of thyroid swelling cases according to the FNAC diagnosis (n = 100)

FNAC diagnosis	frequency	Percentage
Non-neoplastic lesions (n = 86)		
Nodular goiter	30	30
Colloid goiter	26	26
Non-specific thyroiditis	12	12
Cystic lesion	8	8
Hashimoto's thyroiditis	6	6
Follicular Adenoma	4	4
Neoplastic lesions (n = 9)		
Papillary carcinoma	6	6
Follicular carcinoma	3	3
Non-diagnostic (n = 5)	5(5%)	

Table 3: Correlation of thyroid function tests and the FNAC findings among study patients

Cytological Diagnosis	Euthyroid	Hypothyroid	Hyper thyroid
Nodular goiter	26	4	-
Colloid goiter	23	3	-
Non-specific thyroiditis	5	6	1
Cystic lesion	6	2	-
Hashimoto's thyroiditis	1	4	1
Follicular Adenoma	2	2	-
Papillary carcinoma	5	1	-
Follicular carcinoma	3	-	-
Total	76	22	2

Among the benign lesion, nodular goiter was the most common FNAC finding in this study, in accordance to the Gasiorowski[21], Siddegowda[22] and Tamhane[23].

Current study revealed the malignant lesion was found in about 9% of cases confirmed by HPE, a concordant finding with the study of EsmailiHA[24].

Among neoplastic thyroid lesion papillary carcinoma was the predominant in the present study, in agreement with the Esmaili HA[24] and Basharat[25] found papillary carcinoma as a predominant thyroid neoplastic.

We have observed stronger correlation between thyroid function test and thyroid lesions which is as per the guidelines given by ATA for the preliminary assessment of the thyroid lesions.

In our study majority of the benign and malignant thyroid lesion cases was associated with euthyroid (76%) which was comparable with the C.K. Sang[26] and Khatib Y[27].

Amongst thyroiditis cases most of the patients were associated with hypothyroidism in current study concordance to the Mehrotra[28].

In Hashimoto thyroiditis cases most of the patients were associated with the hypothyroidism which was compare with the M Prasannan[29], while correlating the thyroid lesion with the TFT majority of the goiters (nodular and colloid) patients had euthyroidism, which may be because of goiter hampering the denovo production of thyroid hormone and stimulating TSH secretion leading to increase thyroid hormone level and achieving euthyroid status.

The final diagnosis is established by correlating clinical findings with cytological and serologic test results.

CONCLUSION

We have concluded that thyroid disorder was more common in 31-40 years age group, predominantly in female. On the basis of FNAC findings benign lesions are more frequent than malignant. Nodular goiter was the predominant among benign lesion and papillary carcinoma was common among malignant lesion. Majority of the thyroid lesions (benign and malignant) were associated with euthyroid status. FNAC accompanying with thyroid hormone function test (TFT) could be much helpful improper early diagnosis of different thyroid diseases and also to the clinicians to determine the management strategy of patients with thyroid swelling thereby reducing unnecessary surgical intervention.

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