Original Article

Cytological study of thyroid lesions by fine-needle aspiration cytology

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Abstract

Background: Thyroid disorders are the most common endocrine disorders worldwide. Thyroid enlargement has to be investigated to rule out a neoplasm. The main purpose of fine-needle aspiration (FNA) is to provide a rational approach for management and determine the correct surgical procedure when surgery is required. Objectives are: (1) To assess the cytologic and morphological features of thyroid swellings by FNA cytology (FNAC), (2) to study the age of occurrence and sex predilection of various thyroid disorders diagnosed by FNAC, and (3) to classify all the thyroid lesions based on The Bethesda System of Reporting Thyroid Cytopathology (TBSRTC).

Methods: In the present study, evaluation of 100 cases of thyroid FNA’s was undertaken and interpreted. All thyroid lesions conventionally diagnosed by FNA were classified according to TBSRTC.

Results: In the present study, a total of 100 cases of thyroid swellings were analyzed, out of which 84 cases were diagnosed as non-neoplastic lesions, 3 cases as suspicious for malignancy, and 13 cases as neoplastic lesions by FNAC. The results were further classified under TBSRTC.

Conclusion: FNAC is a relatively uncomplicated and safe diagnostic method, which is cost-effective. It is a helpful adjunct to pre-operative screening in the diagnosis and management of thyroid diseases.

Introduction

Thyroid disorders are the most common endocrine disorders worldwide, including India. Thyroid nodules cause apprehension because their behavior is unpredictable.¹ Among the available non-invasive screening techniques used to evaluate clinically solitary nodules, thyroid scintiscanning and ultrasonography are of immense help. However, they are inconsistent in distinguishing benign nodules from malignant. Thus, the need of the hour is an investigative modality which can be employed before procedures and can effectively differentiate between benign and malignant nodules.²

With the advent of fine-needle aspiration cytology (FNAC) as a primary investigation for thyroid nodules, the number of patients who are subjected to thyroid surgeries around the world has been halved.³ FNAC is now a well-established, first-line, simple and quick screening test as well as the diagnostic tool for triaging surgical and non-surgical goiters.⁴ There are instances where therapy is prolonged due to diagnostic dilemmas. FNAC is of immense value in identifying such cases of unsuspected thyroid malignancies.⁵ FNAC has proven to be better than other methodologies like clinical examination, radionuclide, or thyroid ultrasound (US) assessment.⁶ FNAC is considerably a safe outpatient procedure. It is a cost-efficient and minimally invasive technique that can be performed in aged and pregnant women.⁷ FNAC is one of the most standard investigative procedures for examining thyroid nodules. It has a high sensitivity and specificity for identifying thyroid malignancies with an average range of 83% and 92% respectively.⁸ FNAC requires careful aspiration technique and interpretation of the cytological findings.⁹ FNAC of thyroid gland is indicated for diagnosing thyroid nodules and diffuse thyroid enlargements due to autoimmune etiology. The primary objective of performing FNAC of thyroid is to distinguish between malignant, or possibly malignant thyroid nodules with those of benign nodules.¹⁰
There was a lack of guidelines regarding interpretation of thyroid FNAC. It was the NCI (National Cancer Institute) Thyroid FNA State-of-the-Science Conference which gave the impetus to publish an atlas and guidelines using a standard taxonomy for the interpretation of thyroid FNAs. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) was an offshoot of this.[12]

There is a vivid description of the six diagnostic categories of thyroid lesions. They are non-diagnostic or unsatisfactory, benign, atypia of undetermined significance/follicular lesion of undetermined significance, follicular neoplasm/"suspicious" for follicular neoplasm, suspicious for malignancy and malignant.[12]

From a study conducted on 284 cases, it was concluded that in children and adolescents with palpable thyroid lesions, FNAC is a good screening test.[13]

This study aims to diagnose and study the cytologic as well as the morphological features of all solitary and diffuse thyroid nodules by FNAC and even to study the age and sex incidence of these disorders and classify them based on TBSRTC.

Materials and Methods

Materials used in this study included a 10 ml or 5 ml syringe which was used to obtain the smears and a 22 gauge needle. For nodules, 1.5 cm or smaller, to and fro movements of the needle into the nodule was done. For larger nodules, peripheral subcapsular parts of nodules were sampled rather than the center. Minimum of three passes were done in the present study. When fluid was obtained, it was completely aspirated.

The present prospective study was done during the period from June 2012 to June 2014 comprising of 100 patients who presented with history of swelling in the neck. All the patients were clinically examined in detail according to the proforma and the site for aspiration was judged precisely by careful palpation of the thyroid gland. The patient was advised to lie in the supine position with the head and neck extended over a pillow. The sight was cleaned by using spirit swab, and it was made sure that the extension of the neck would not interfere with nodule palpation or obstruction with vertebral artery blood flow in the elderly. The needle was then removed and the plunger was withdrawn, after the aspiration. The needle was then reafixed and the aspirate was transferred onto clean labeled glass slides, which was then smeared with another glass slide. A number of multiple smears were made, with a minimum of 4-5 smears. Slides were transferred into fixative alcohol for Papanicolaou staining and air-dried smears were stained with May–Grunwald Giemsa stain.

Diagnostic criteria

An adequate sample must be representative of the lesion (the specimen is taken from the appropriate location) and adequate in amount. Smear is considered “adequate,” when: 5-6 groups of well-preserved follicular epithelial cells with 10 or more cells/ group; 10 large clusters of follicular epithelial cells with more than 20 cells each; 6 groups of follicular epithelial cells on at least 2 of 6 aspirates; and at least 8-10 tissue fragments of well-preserved follicular epithelium on each of two slides, for a total of at least six properly prepared thin cell spreads from multiple punctures of the nodule.[11]

In addition, the smear should be technically well prepared; the aspirate should be promptly thinly smeared to avoid clotting and processed according to the stains used. Last, the smear should be read in the clinical context because certain lesions, such as cysts and colloidal Goiter, yield specimens with very few cells, material that would be considered cytologically non-diagnostic but that is consistent with the clinical impression.

Results

FNAC was performed on a total of 100 cases for cytological evaluation. Age of the patients ranged from 11 to 78 years with a mean age of 33.5 years. The majority of patients were females comprising of 91 cases, and 9 cases were males. The male to female ratio was 1:10. The majority of patients presented clinically with diffuse thyroid enlargement comprising of 58 cases, followed by right lobe swelling comprising of 23 cases and left lobe swelling comprising of 19 cases. Non-neoplastic lesions comprised 84 cases followed by 13 cases of neoplastic lesions and 3 cases comprised suspicious of malignancy [Table 1]. Of the non-neoplastic lesions, 3 cases were non-conclusive, 5 cases were cysts, 50 cases were goiter, 20 cases were thyroiditis and 6 cases were primary hyperplasia [Table 2]. Out of the 4 cases, 3 cases were papillary carcinoma and one case was anaplastic carcinoma. Out of the neoplastic lesions, 9 cases were benign follicular neoplasms

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Number of patients</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Non-neoplastic</td>
<td>84</td>
<td>84</td>
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<tr>
<td>Suspicious of malignancy</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Neoplastic</td>
<td>13</td>
<td>13</td>
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<td><strong>FNAC: Fine-needle aspiration cytology</strong></td>
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<tr>
<th>Lesions</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Inconclusive</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Cysts</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Goiter</td>
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<td>Colloid goiter</td>
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<td>Nodular goiter</td>
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<td>Thyroiditis</td>
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<td>Hashimoto thyroiditis</td>
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<td>de Quervain’s thyroiditis</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Primary hypoplasia</td>
<td>6</td>
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<td><strong>FNAC: Fine-needle aspiration cytology</strong></td>
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and 4 cases were malignant [Table 3]. TBSRTC categorization was done in all the cytologically diagnosed cases. Out of the total 100 cases, 3 cases belonged to non-diagnostic/unsatisfactory - I Category, 81 cases belonged to benign - II Category, no cases were classified under atypia of undetermined significance - III Category, 9 cases belonged to follicular neoplasm/suspicious for follicular neoplasm - IV Category, 3 cases belonged to suspicious for malignancy - V Category, and 4 cases belonged to malignant - VI Category [Table 4]. Cytopathological features of different thyroid disorders were also studied in detail.

**Discussion**

Thyroid nodules cause apprehension because their behavior is unpredictable.[11] Whether thyroid enlargement is diffuse or in the form of nodule; it has to be investigated to rule out the possibility of a neoplasm.[12] FNA has proven to be an effective management tool in patients with thyroid nodules. Its main purpose is to provide a rational approach for management and determine the correct surgical procedure when surgery is required.

Various studies on thyroid diseases have estimated that about 42 million people in India suffer from thyroid disorders.[13] The primary purpose of using FNAC and other available investigative aids like US examination, thyroid function tests, thyroid scan and antibody levels is to handpick the patients who can be treated surgically or conservatively.

The usage of different terminologies and diagnostic criteria is a result of lack of standardized system of reporting. This creates confusion amongst the clinicians pertaining to interpretation of the cytology report. This ultimately hampers a definitive clinical management. To overcome this issue, National Cancer Institute in the year 2007 proposed Bethesda System for Reporting Thyroid Cytopathology comprising of six diagnostic categories.[12]

In the present study, maximum number of cases were seen in the age group 31-40 years - 28 cases (28%). Similar observations were seen by Parikh et al.[14] and Singh et al.[15] which included 57 cases (23.75%) and 41 cases (29.2%), respectively. However, Yassa et al.[16] observed maximum number of cases between age group 41 and 50 years.

In the present study, maximum thyroid swellings were seen in female patients with M:F ratio being 1:10, which correlates with the observations made by Silverman et al.[17] - 1:10, Gupta et al.[18] - 1:11, Parikh et al.[14] - 1:7 and Yassa et al.[16] - 1:7.

According to the study done by Gupta et al.[18] majority of patients presented with right lobe swelling 45 cases (45%) and according to the Godinho et al.[19] maximum number of patients presented with both right and left lobe thyroid swelling 56 cases each (38.8%). Both the studies were discordant with the present study.

In the present study, maximum number of cases was seen in the goiter group i.e., 55 cases (55%). Similar observations were seen in the study concluded by Silverman et al.[17] 175 cases (56.5%), Gupta et al.[18] 45 cases (60%), Swamy et al.[20] 60 cases (50%). However, according to Rangaswamy et al.[21] maximum number of cases belonged to follicular neoplasm 21 cases (44.68%).

In the present study, maximum number of cases belonged to the benign category 84 cases (84%), 3 cases (3%) belonged to suspicious for malignancy and 13 cases (13%) belonged to malignant. However, in the study done by Guhamallick et al.[22] a maximum number of cases belonged to benign 197 cases (79%) which was concordant with our study, whereas in the study done by Singh et al.[14] a maximum number of cases belonged to malignant, i.e., 70 cases (57.3%) which was discordant with our study.

In the present study, 3 cases (3%) were categorized into suspicious for malignancy which was discordant with the study done by Singh et al.[14]

In the present study carcinoma group comprised 4 cases (4%), which were similar to the observations of Handa et al.[23] and Binesh and Salari et al.[24]

Out of the total 100 cases, as per the six tier Bethesda system, 3 cases belonged to non-diagnostic/unsatisfactory - I Category, 81 cases belonged to benign - II Category, no cases were classified under atypia of undetermined significance - III Category, 9 cases belonged to follicular neoplasm/suspicious for follicular neoplasm - IV Category, 3 cases belonged to suspicious for malignancy - V Category, and 4 cases belonged to malignant - VI Category. The majority of cases 81 cases (81%) were categorized into benign Category II in the present study which was concordant with the other studies conducted by Wu et al.[25] Yassa et al.[16] and Mondal et al.[26] The distribution of cases as per the six-tier Bethesda system in our study differed from that of other studies. Jo et al.[27]
Conclusion

FNAC biopsy is regarded as a minimally invasive, cost-effective technique with diagnostic accuracy in the range of 90-99%. The task of convincing clinicians of the value of the technique has been extremely successful since their expectations of a high level of accuracy have been met. FNAC is the test of choice for the triage of patients requiring surgery, thus avoiding approximately 80% of all thyroid surgery. The conclusion drawn from this study implicates FNAC as a useful primary investigative modality for evaluation of palpable thyroid nodules. It also helps in distinguishing lesions based on the treatment required.

TBSRTC aids in accurate cytological diagnosis. An effective implementation of this system would allow consistency in reporting of diagnostic terminologies between the cytopathologists and clinicians. Apart from this, it would also result in formulating a consistent management approach toward various thyroid related lesions.

References
