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Original Article

Fine Needle Aspiration Cytology: A Reliable diagnostic tool in Thyroid swellings

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ABSTRACT

Background: Fine needle aspiration cytology can provide a reliable diagnosis in thyroid swellings and has become an investigation of choice due to its simplicity, specificity, accuracy, safety and cost-effectiveness. The objective of the study was to determine the reliability of FNAC in detecting various benign and malignant lesions of thyroid and correlate the results with histopathology, wherever available. **Materials and Methods:** This study was carried out at the Department of pathology, Dr. Hedgewar Arogya Sansthan Hospital, Delhi from June 2009 to September 2010. FNAC was performed on 118 patients of all age group and both sexes who presented with thyroid swellings. **Results:** Out of 118 patients, 105 were females and 13 were males. Majority of the cases were non-neoplastic (110 cases, 93.22%), whereas 8 cases (6.78%) were neoplastic. The most frequently encountered non-neoplastic lesion was the colloid goiter in 74 (62.71%) cases followed by thyroiditis in 29 (24.58%) cases. In the neoplastic group, the most common lesion was papillary carcinoma in 5 (4.24%) cases. The histopathological correlation was available in 26 cases (22.33%). The overall results showed a sensitivity of 87.50%, specificity of 94.44% and diagnostic accuracy of 92.31%. **Conclusion:** FNAC should be performed in all cases of thyroid swellings because of its high sensitivity, specificity and diagnostic accuracy for the benign as well as the malignant lesions of thyroid.

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1. Introduction

Diseases of thyroid are not uncommon in India and present a significant diagnostic dilemma for the treating surgeon. Thyroid nodules are common clinical findings and have a reported prevalence of 4% to 7% of the adult population, however fewer than 5% of adult thyroid nodules are malignant [1,2,3,4]. Thyroid nodules are more common in women, and the incidence increases with age, a history of radiation exposure and a diet containing goitrogenic material [3]. The diagnosis of thyroid lesions using aspiration cytology was first reported by Martin and Ellis in 1930 [5]. Fine needle aspiration cytology (FNAC) is a relatively simple, safe, inexpensive, less time consuming and minimal-invasive technique requiring no anesthesia and not associated with any serious complications. FNAC has high sensitivity in picking up

malignancy in thyroid [6]. Most studies show accuracy rate exceeding 80% [7,8,9]. But like any other test FNAC also has its limitations. The reported pitfalls are those related to specimen adequacy, sampling techniques, the skill of the physician performing the aspiration, the experience of the pathologist interpreting the aspirate and overlapping cytological features between benign and malignant follicular neoplasm [10,11,12].

The objective of the study was to determine the reliability of FNAC in detecting various benign and malignant lesions of thyroid and correlate the results with histopathology, wherever available.

2. Materials and Methods

This study was carried out at the Department of pathology, Dr. Hedgewar Arogya Sansthan Hospital, Delhi from June 2009 to September 2010. FNAC was performed on 118 patients of all age groups and both sexes who presented with thyroid swelling. All the patients underwent complete history taking and physical examination to note the mobility of the thyroid during swallowing and the presence of any enlarged cervical lymph node along with

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thyroid function tests. Hot and toxic nodules and diffuse goitre with hyperthyroidism were excluded from this study and referred for medical treatment.

FNAC was done by cytopathologists in all the cases. The patients were made to lie in supine position with their necks stretched up. A 23-gauge needle was used, either without or with aspiration by a 10 ml disposable syringe. The slides were stained with May Grunwald Giemsa (MGG), hematoxylin and eosin (H&E) and Papanicolaou (Pap) stains. Unsatisfactory slides were excluded from the study. Except for mild pain reported by some patients, no other complications were recorded.

Pre-operative FNAC results were compared with final histopathological diagnosis in 26 patients. Taking histopathology as gold standard criteria, sensitivity, specificity and accuracy were calculated.

Sensitivity was defined on the basis of thyroid cancer detection using FNAC or biopsy (true positive/true positive +false negative). Specificity was defined on the basis of benign thyroid disease detection (true negative /true negative+false positive). Diagnostic accuracy represents combination of sensitivity and specificity. Formula used for detection of sensitivity, specificity and accuracy was as follows

Sensitivity = True positive / True positive + False negative x 100

Specificity = True negative / True negative + False positive x 100

Accuracy = (True positive + True negative) / (True positive + False positive + True negative + False negative) x 100.

Data analysis were carried out using the Statistical Package for Social Science

(SPSS, version 17) for Windows.

3. Results

FNAC was performed on thyroid swelling of 118 patients, which included 13 (11.02%) males and 105 (88.98%) females with M: F ratio of 1:8 (Table 1). The age ranged from 14-68 years with the mean age of 34.5 years. The most common presenting symptom was diffuse and or nodular swelling of the thyroid gland while other symptoms reported by patients were pain in the midline neck, difficulty in swallowing and hoarseness of voice.

The FNAC results revealed 110 cases (93.22 %) as non-neoplastic and 8 cases (6.78 %) as neoplastic (Table 2).

The commonest non-neoplastic lesion in thyroid gland was colloid goiter. Among the malignant neoplasms, the commonest lesion was papillary carcinoma (Figure 1). Anaplastic carcinoma was detected in one case (Figure 2). Out of 118 patients, histopathological diagnosis was available in 26 cases.

The FNAC results were compared with the corresponding histopathological diagnosis as shown in Table 3. The sensitivity, specificity and diagnostic accuracy of FNAC for detection of malignant lesions was calculated and shown in Table 4.

Table 1: Gender distribution of the patients

| Gender | No. of cases (%) |
|--------|------------------|
| Male | 13(11.02%) |
| Female | 105(88.98%) |

Table 2: FNAC results of 118 patients

| FNAC diagnosis | No. of patients (%) |
|-----------------------|---------------------|
| Non-neoplastic | |
| Colloid goiter | 74(62.71%) |
| Adenomatous goiter | 2(1.69%) |
| Thyroiditis | 29(24.58%) |
| Thyroglossal cyst | 5(4.24%) |
| Neoplastic | |
| Papillary carcinoma | 5(4.24%) |
| Follicular neoplasm | 2(1.69%) |
| Anaplastic carcinoma | 1(0.93%) |
| Total | 118(100%) |

Table 3: Results of 26 patients of FNAC with histopathological correlation

| FNAC diagnosis | Histopathological Neoplastic | Findings Non-neoplastic | Total |
|-----------------------|------------------------------|-------------------------|-------|
| Neoplastic | 7 | 1 | 8 |
| Non-neoplastic | 1 | 17 | 18 |
| Total | 8 | 18 | 26 |

Table 4: Sensitivity, specificity and accuracy index

| | |
|--------------------|--------|
| Sensitivity | 87.50% |
| Specificity | 94.44% |
| Accuracy | 92.31% |

Figure 1: Papillary carcinoma thyroid revealing tumour cells arranged in papillary structures with "Orphan Annie nuclei" (H&E 400X).

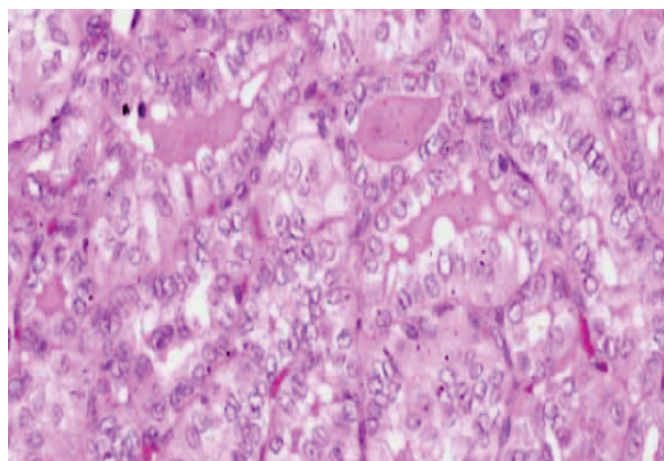
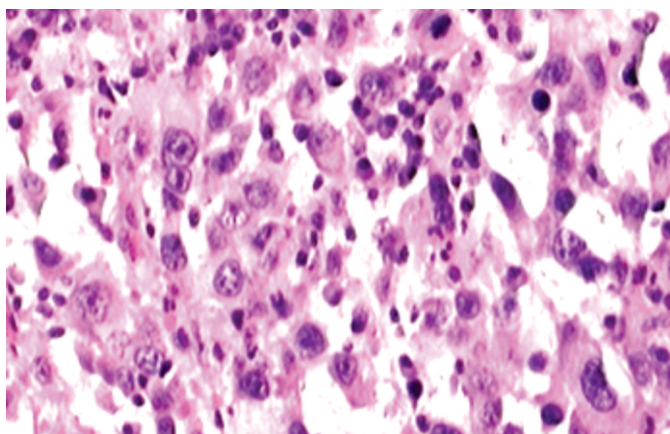


Figure 2: Anaplastic carcinoma thyroid revealing marked nuclear pleomorphism and hyperchromasia (H&E 400X).



4. Discussion

Prehand information of nature of disease alters the treatment options greatly. Malignant lesions of thyroid gland demands total thyroidectomy or radical neck dissection whereas benign lesions can be managed by partial thyroidectomy or lobectomy.

FNAC is usually the first line of investigation and other investigations like ultrasound (US) examination, thyroid function tests, thyroid scan, and antibody levels are done subsequently with an aim to select the patients who require surgery and those that can be managed conservatively [13,14].

The incidence of thyroid nodule is more common in female as is evident in this study with male to female ratio of 1:8. This observation was also made in a study by Hand et al in which male female ratio was 1:6.35 [15]. Russel et al showed male to female ratio 1:3. Mahar et al found 78% of thyroid nodules in females [6].

The sensitivity of thyroid FNAC ranges from 65% to 99% and its specificity from 72% to 100% [16-19]. In our study, the sensitivity for cytological diagnosis of neoplasia was 87.50%, specificity of 94.44%, and diagnostic accuracy was 92.31%. This shows that FNAC is more specific than sensitive in detecting thyroid malignancy. The diagnostic accuracy for cytologic diagnosis was 90% which is comparable with other studies [6, 20, 21].

Ikram et al has reported sensitivity and specificity for malignancy as 100% which is slightly higher than our results as they do not have false positive results in their study due to small number of patients [22].

False negative FNAC results occurred in 1 case (12.5%) of our patients. This case was diagnosed as adenomatous goiter in FNAC. On histopathological examination it was diagnosed as follicular carcinoma. This is consistent with reports in the literature that suggest a false negative rate of 2-50% [23]. The false negative FNAC results may occur because of sampling error or

misinterpretation of cytology, and are of great concern because they indicate the potential to miss malignant lesion [24]. In our study, false positive case was one which was diagnosed as follicular neoplasm on FNAC. But on histopathological examination it turned out to be colloid goiter which was in agreement with other studies [17, 25].

5. Conclusion

Management of patients with thyroid swellings has been radically changed by the routine use of FNAC. It has reduced the number of patients subjected to thyroidectomy for benign diseases of the thyroid. This relatively simple procedure has assumed a key role in determining of patients with thyroid swellings. However, equivocal FNAC results and diagnostic errors could not be avoided due to overlapping cytological features particularly in hyperplastic adenomatoid nodules, follicular neoplasms and follicular variants of papillary carcinomas.

Thus, we conclude by saying that FNAC should be done in all cases of thyroid swellings because it is an invaluable and minimally invasive procedure for pre operative assessment of patients with a thyroid swellings and it has high sensitivity and specificity to diagnose the malignant as well as benign lesion of thyroid.

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