

Thyroid FNAC: Practice and Pitfalls

Sujatha R.¹, Gayathri J.^{2,*}, H.T. Jayaprakash³

¹Associate Professor, ²P.G. Student, ³Professor & HOD, Dept. of Pathology, Dr. B.R. Ambedkar Medical College, Bengaluru

***Corresponding Author:**

Email: drgayathri2000@gmail.com

Abstract

Introduction: Thyroid swellings are a common clinical problem, with an estimated prevalence ranging from 4-8%. Most of the thyroid nodules are benign with small fraction of them harbour malignancy. Fine needle aspiration cytology (FNAC) is a widely employed and gold standard tool in the investigative work-up of patients with thyroid nodules with its diagnostic accuracy approaching 95%. Although its advantages are well documented, there are limitations and problems in interpretation of this technique.

Aims and Objectives: The aim of this study is to document the diagnostic difficulties and to determine the accuracy of FNAC in evaluation of thyroid nodules, highlighting the pitfalls of this technique.

Materials and Method: A total of 110 patients were studied between August 2014 to November 2015 in the Dept. of pathology Dr. B.R. Ambedkar medical college Bangalore. All patients underwent FNAC of thyroid nodule after prior consent. Material obtained analysed and interpreted

Results and Conclusions: The procedure has two major limitations: non-diagnostic yield and indeterminate results. Inadequate specimen rate of 22.7% which declined with increasing experience. Overall accuracy was 85%, with sensitivity of 98% and specificity of 82%. Markedly haemodiluted smears & combination lesions are often problems in cases of MNG. Follicular carcinomas could not be differentiated from follicular adenomas by cytology. Difficulties may arise in the detection of papillary carcinomas in cystic lesions, mixed papillary and follicular carcinomas. In view of these cytologic limitations, care must be exercised in interpreting cytological results.

Keywords: Thyroid Nodule, Papillary Carcinoma, Nodular Goitre, WHAFFT Lesions.

Introduction

Thyroid nodules are a common clinical finding and have a reported prevalence of 4–8%⁽¹⁾ in the general population. The vast majority of these nodules are non-neoplastic lesions. Out of all palpable thyroid nodules only 4-10% of them are malignant. Higher incidence is reported in women. "Incidence of malignancy in paediatric thyroid nodules is high and the risk of surgical complication significant".⁽²⁾ FNAC has shown to be able to categorise many lesions and hence guide therapeutic protocols.⁽³⁾ FNAC is relied upon to distinguish benign from malignant thyroid nodules and therefore has led to a dramatic decrease in thyroid surgeries. Nevertheless, Fine needle Aspiration has some limitations like specimen inadequacy, sampling techniques and WHAFFT changes.^(4,5) Cytopathologist should be aware of these potential limitations and pitfalls of FNA interpretation.

The present study was performed with the aim to evaluate the value of FNA in differentiating benign and malignant lesions of thyroid and to analyze the false positive and false negative diagnosis so as to highlight the pitfalls of FNA and probable reasons for the same.

Methodology

It's a prospective study undertaken in the dept. of pathology Dr. B.R. Ambedkar medical college between August 2014 to November 2015. Total of 110 patients are included in the study. Prior consent was obtained for the procedure.

Fine needle aspiration was performed by the using a 23 gauge needle attached to a disposable 10ml syringe. The aspirated material was expressed onto slides and smears were prepared. Half of the smears were immediately fixed in 95% ethyl alcohol for subsequent Papanicolaou and Haematoxylin and Eosin staining. The remaining smears were air-dried and stained by May-Grunwald-Giemsa Stain. Material obtained analysed and interpreted.

The FNAC results were categorized according to Bethesda classification⁽⁶⁾

- Non-diagnostic or Unsatisfactory
- Benign
- Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance
- Follicular Neoplasm or Suspicious for a Follicular Neoplasm,
- Suspicious for Malignancy
- Malignant.

Results

110 thyroid FNAs were done between August 2014 to November 2015. Most of the patients were in the age group 20-40 years (Table 1).

Table 1: Age group Number Percentage

| | | |
|--------------|----|-------|
| < 20 years | 18 | 16.2% |
| 21- 40 years | 70 | 63.6% |
| 41-60 years | 15 | 13.6% |
| >60 years | 7 | 6.3% |

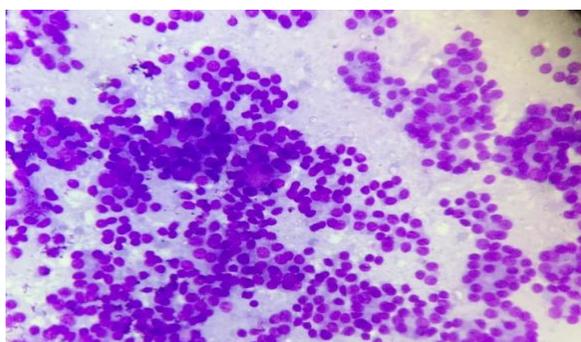
There were 96% female and 4% male patients (Table 2).

Table 2: Gender No. of cases Percentage

| | | |
|--------|-----|-------|
| Male | 5 | 4.5% |
| Female | 105 | 94.5% |

Out of these 110 cases, the FNA sample was inadequate in 8(7.27%) cases.

Lesions in the various categories were Non-diagnostic –7.2%, Benign- 86.5%, Atypical cellular lesions – 0.9%, Follicular Neoplasm–1.8% (Fig. 1), Suspicious for Malignancy –0.9% and Malignant – 2.7%. (Table 3)

**Fig. 1****Table 3: Lesions in the each category**

| | |
|---------------------------|-------|
| Nondiagnostic | 7.2% |
| Benign | 86.5% |
| Atypical cellular lesions | 0.9% |
| Follicular Neoplasm | 1.8% |
| Suspicious for Malignancy | 0.9% |
| Malignant | 2.7% |

The sensitivity was found to be 90%, specificity 93.5%.

Histopathology correlation was available for 20 cases. Among the 20 cases 17 (85%) which were reported as benign on cytology and 16 cases were confirmed on histopathology, 1 reported as Nodular Goitre turned out to be follicular adenoma. 3 cases out of 20 were diagnosed as suspicious for malignancy/malignant on cytology. Of these, 2 cases were reported as Papillary Thyroid Carcinoma and 1 was follicular adenoma.

**Fig. 2**

Discussion

Thyroid nodular disease comprises a wide spectrum of disorders, including a solitary nodule, multinodular goiter, nodular goiter observed in autoimmune thyroiditis and thyroid neoplasms.⁽⁷⁾

Medical historians have traced needle biopsy to a report in 1847 by Kun.⁽⁸⁾ The technique of FNA had its pioneering start at Sloan-Kittering Memorial hospital in New York, where its creators foresaw the advantages of establishing morphologic diagnosis in a small sample. Frable WJ and Frable MAS employed thin needle aspiration biopsy for diagnosis of head and neck lesions and found it valuable in their management. Aspiration biopsy cytology of the thyroid is found to be a valuable adjunct to pre-operative screening in the diagnosis of thyroid nodules.⁽⁸⁻¹¹⁾

In adults, FNAC has become a part of the routine evaluation of thyroid nodules.

Chang et al.,⁽¹²⁾ noted in their study that since its introduction, the percentage of patients that have undergone thyroidectomy has decreased by 25% to 50% with the use of FNAC.⁽¹³⁾

The value of any diagnostic test lies in its ability to detect the presence of disease when it is present (sensitivity) and reliably verify the absence of disease when it is not present (specificity). In Ridgway CE. Clinical review sensitivity of the FNAC for thyroid nodules ranges from 65 to 99% and its specificity from 72 to 100.⁽¹⁴⁾ In our study the sensitivity was found to be 90%, specificity 93.5%.

Although many studies have reported diagnostic accuracy of FNAC in detecting neoplasms, there have been few studies where the role of FNAC in the diagnosis of goiter along with their diagnostic pitfalls have been evaluated.⁽¹⁵⁻¹⁸⁾

Inadequate FNA specimen may be results of inadequate sampling or focal lesions. Thyroid nodules that are sclerotic or, calcified and those with large areas of cystic degeneration or necrosis are extremely difficult to aspirate. The inadequacy rate of 9.09% of the current study is comparable to Shenovi SR, Nadkarni NS, Wiseman RG and other study which range from 0 to 25%.^(19,20)

False positive rates are 1.81% in this study comparable to other reports 0-9%.^(21,22) Papillary hyperplasia and hyperplastic nodules are common in adenomatous goiters could have been responsible for incorrect diagnosis of follicular neoplasia in 2 cases among follicular patterned smears.

The false negative FNAC results may occur because of sampling errors or misinterpretation of cytology result in missing malignant lesions. False negative rates in literature of 6.6 to 25% are comparable to 5.88% in the present study. The high rate of failure to diagnose cancer is attributed to the failure of aspiration from precise locations.

Papillary thyroid carcinoma (PTC) is the most common malignant tumour of the thyroid. Smears may show syncytial aggregates with nuclear crowding and overlapping and papillary tissue fragments. Its classic nuclear features mostly cellular smears, flat sheets and papillae, nuclear crowding and enlarged nuclei, dusty, powdery, ground glass chromatin, intra nuclear inclusions, transpolar nuclear grooving, dense cytoplasm, characteristic colloid, macrophages, "metaplastic cells", psammoma bodies. The presence of three out of the following five features facilitate the diagnosis – papillae, psammoma bodies, nuclear grooves, INCI and fine powdery chromatin. The presence of grooves and INCI in high frequency is most dependable.⁽²²⁾ (Fig. 3)

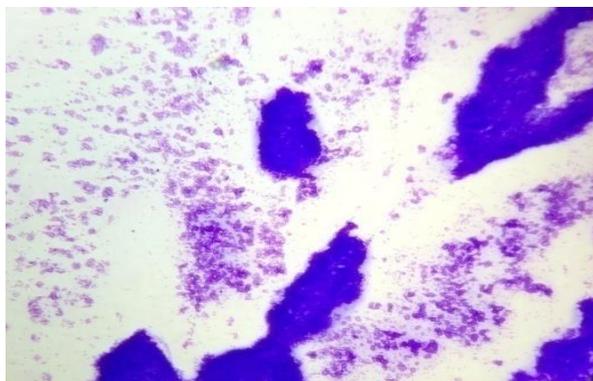


Fig. 3

Cystic changes, marked hurthle cell changes, variant of papillary carcinoma, hyalinizing trabecular adenoma are the common difficulties in PTC.⁽²³⁾

Diagnostic criteria for medullary thyroid cancer (MTC) includes: a). cellular smears. Cells loosely dispersed, some in groups b). Wide variety of cell pattern c). Characteristic chromatin "salt and pepper" d). Anisonucleosis, binucleate and multinucleated cells e). Granular cytoplasm f). Amyloid.

Pitfalls in diagnosis of MTC are a). Variants of medullary carcinoma b). Hurthle cell neoplasms c). Colloid mistaken as amyloid d). Paraganglioma.

An attempt is made to find out FNAC as an expedient, effective and safe diagnostic method for defining thyroid disorders and finding the level of

cytological concordance. Understanding the pitfalls in FNAC of thyroid like inadequate specimen, inaccurate selection of specimen site, inaccuracy in interpretation, interpretation errors, cysts, follicular lesions, Hurthle cell lesions and lymphocytic lesions and correcting them by getting aspirate from different portions of the nodule, Ultra sound guided FNA, use of immune histochemical and molecular markers and reported by an expert cytologist may improve the FNA accuracy.

Conclusion

FNAC is a highly reliable and accurate tool to differentiate a malignant lesion from a benign one with accuracy as high as 98%. However, certain pitfalls of FNAC should be kept in mind while reporting. Cystic lesions of thyroid should undergo surgical excision or close follow up as these can harbor papillary carcinoma, which can be missed as FNA smears may not be representative. Ultrasound guided biopsy is advised in case of small lesions to avoid giving false negatives.

Essential to the success of FNAC is an experienced and competent cytopathologist who is prepared to give an opinion. Strict adherence to adequacy criterion and extensive sampling are of paramount importance in reducing false positive and negative cases.

We hope that a better understanding of these pitfalls would help avoiding them in future and correlating clinically and radiologically will contribute to better patient care.

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