

Original Research Article

Correlation between fine needle aspiration cytology and histopathological examination in thyroid swellings-a pilot study

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ABSTRACT

Background: Thyroid swellings are an enigma that necessitates either, a partial thyroidectomy and a tissue diagnosis to be followed by completion surgery or straightaway a radical intervention. A preoperative presumptive diagnosis of a thyroid swelling, solitary or otherwise is correlated with the post-surgical histopathological finding in the present study.

Methods: 30 patients of thyroid nodules were selected from the head-neck tumour clinic of Dayanand medical college hospital, Ludhiana. Pre-operative fine needle aspiration cytology (FNAC) was performed and subjects taken for thyroidectomy, partial or total as the case may be.

Results: There were 20 (66.6%) females in the age group 25-65 years and 10 males (33.3%) 19-50 years with thyroid nodules. 86.6%, 26 patients were of follicular adenoma, 10% 3 patients of papillary carcinoma and 3.33% 1 patient of follicular carcinoma. No case in this study was reported as medullary carcinoma. In the cytological diagnosis of follicular neoplasm in 5 cases, 3 were diagnosed as thyroid adenoma, 2 were finally found to be papillary carcinoma. Overall sensitivity of fine needle aspiration was 40%. There was 84.6% agreement in follicular adenoma; 33% in papillary carcinoma and 100% in follicular carcinoma, and overall accuracy was 85.7%.

Conclusion: FNAC is an ideal preoperative investigative modality in thyroid swellings with overall accuracy of 85 % and can differentiate preoperatively a benign from a malignant thyromegaly; and thereby plan extent of surgery, with or without a neck dissection, Maximum cases of follicular adenoma could be easily diagnosed with this aspiration modality.

Keywords: Thyroid nodule, FNAC, Histopathology

INTRODUCTION

Solitary or diffuse swellings of the thyroid beyond the stage of medical management are likely to be taken up for a hemithyroidectomy or a total thyroidectomy with or without a neck dissection as the case may be. FNAC can guide to the likely extent of surgical intervention. Though

there are limitations to this investigative modality, with limited cellular material available to suggest a likely pathology. Suen et al 1983 found good correlation between cytology and histology in the diagnosis of thyroid nodules.¹

Among the 304 cases aspirated, histopathology for comparison was available in 79 cases. Cytology was reported as neoplastic in 70 and non-neoplastic in 9 cases. Histopathology confirmed neoplasia in 67 cases of which 37 were malignant and rest were adenomas.

Among the nine cytologically benign cases, two turned out to be papillary carcinoma. There were six false positive and 2 false negative cases. The incidence of malignancy among surgically excised nodules was 47% in contrast to 14% in the previous studies. They estimated that 268 operations would be required to salvage the same number of malignancies, without the use of fine needle aspiration biopsy. False negative reports were mainly encountered in cystic papillary carcinoma, in presence of chronic thyroiditis, in well differentiated follicular carcinoma, as a result of the needle missing the lesions or an inadequate cell.

Aim of the study was to assess reliability of pre-operative aspiration in the diagnosis of a thyroid nodule and to find the incidence of false positive, false negative and accuracy of FNAC diagnosis.

METHODS

In this prospective study, 30 patients of thyroid nodules were selected from the head neck tumour clinic of Oto-rhino-laryngology services, Dayanand medical college hospital, Ludhiana. The study was undertaken in a period of one and a half years, (June 2007-Dec 2008).

The initial workup included detailed history and clinical examination, signs of toxicity, presence of any enlarged lymph node in the neck etc.

30 cases of aspiration were available for histopathological comparison. The specimens received for histopathology were subjected to routine gross examination, microscopic examination with routine haematoxylin and eosin stains. Stained paraffin section was done. Special stains such as congo red were utilised when required. The specificity and sensitivity of lesions was calculated according to the formulae of Schultenover et al.²

$$\text{Sensitivity: } \frac{(\text{True malignant})}{(\text{True malignant} + \text{false malignant})} \times 100$$

$$\text{Specificity: } \frac{(\text{True benign})}{(\text{True benign} + \text{false malignant})} \times 100$$

{Suspicious}

The criteria for evaluation of overall accuracy is as follows Schwerk et al.³

$$\frac{(\text{TP} + \text{TN})}{(\text{TP} + \text{FP} + \text{TN} + \text{FN})} \times 100$$

Where, TP-True positive, TN-True negative, FP-False positive, FN-False negative.

Inclusion criteria included solitary thyroid nodules and generalised thyromegaly. Exclusion criteria excluded toxic nodules and age less than 15 years.

All statistical calculations were done using statistical package of social sciences (SPSS) 17 version statistical program for Microsoft windows (SPSS Inc. released 2008. SPSS statistic for windows, version 17.0, Chicago). Ethical approval of the study was taken from the institutional ethics committee.

RESULTS

The observations of the study with respect to FNAC and histopathology are tabulated below.

Table 1: Age and gender distribution of thyroid nodules (n=30).

Gender	Number (%)	Age (year)
Male	10 (33.3)	25 to 65
Female	20 (66.6)	19 to 50

There were 20 (66.6%) females in the age group 25-65 years and 10 males (33.3%) 19-50 years with thyroid nodules.

Inconclusive: a few clumps of benign cells insufficient for opinion were found in one case. This case was subjected to histopathology. It was found to be adenoma.

Table 2: Histopathological diagnosis of operated swellings (n=30).

Neoplasia	Number of patients (%)
Follicular adenoma	26 (86.6)
Follicular carcinoma	1 (3.33)
Papillary carcinoma	3 (10)

86.6%, 26 patients were of follicular adenoma, 10% 3 patients of papillary carcinoma and 3.33% 1 patient of follicular carcinoma. No case in this study was reported as medullary carcinoma.

Table 3: Correlation between aspiration cytology and histopathological diagnosis (n=30).

Diagnosis	Cases on aspiration cytology	Cases on histopathology
Follicular adenoma	22	26
Follicular carcinoma	1	1
Papillary carcinoma	1	3
Suspicious/Follicular neoplasm	5 (3 Benign, 2 Malignant)	--
Inconclusive	--	1
Total	30	30

In the cytological diagnosis of follicular neoplasm in 5 cases, 3 were diagnosed as thyroid adenoma, 2 were finally found to be papillary carcinoma.

The specificity and sensitivity were calculated as:

$$\text{Sensitivity: } \frac{(\text{True malignant})}{(\text{True malignant} + \text{false malignant})} \times 100$$

$$\frac{(2)}{(2 + 3)} \times 100 = 40\%$$

$$\text{Specificity: } \frac{(\text{True benign})}{(\text{True benign} + \text{false malignant})} \times 100$$

{Suspicious}

$$\frac{(22)}{(22+5)} \times 100 = 81.4\%$$

$$\text{Overall accuracy: } \frac{(\text{TP} + \text{TN})}{(\text{TP} + \text{FP} + \text{TN} + \text{FN})} \times 100$$

$$\frac{(2 + 22)}{(2 + 3 + 22 + 1)} \times 100 = 85.7\%$$

The diagnostic accuracy for FNAC in the identification of follicular adenoma was 84.6%. In all, false positive diagnosis of malignancy was given in 3 cases. However, no false negative case was given.

DISCUSSION

In this present study, it was found that the overall sensitivity of fine needle aspiration was 40% and specificity of 81.4%. There was 84.6% agreement in follicular adenoma; 33% in papillary carcinoma and 100% in follicular carcinoma, and overall accuracy was 85.7%. The false positive diagnosis of malignancy was given in three cases. However, no false negative diagnosis of malignancy was given.

Papillary fronds, monolayered and multi-layered sheets of cells, intranuclear cytoplasmic inclusions were the characteristic features seen in papillary carcinoma. The American thyroid association and national comprehensive cancer network guidelines imply that FNAC is to be the initial diagnostic test due to its 'superior diagnostic reliability' and cost effectiveness; even prior to ultrasonography and scintigraphy of the thyroid.

Differentiation between benign and malignant lesions is suggested on FNAC, thereby reducing the number of surgical interventions worldwide. FNAC is a standardised procedure undertaken in the outpatient clinics and can be readily repeated if necessary, with excellent patient compliance. High degree of sensitivity, specificity and positive or negative values for FNAC of thyroid have been reported in literature worldwide. More than 90% diagnostic accuracy for malignancy in terms of the predictive value, sensitivity and specificity has been

recorded. The pathologist's experience is a key factor in improved accuracy of this procedure.

The Beneragama et al study 2005 correlated FNAC and histopathological reports of the thyroid showed specificity of 86.74%, sensitivity of 84.05%, positive predictive value of 84.05%, negative predictive value of 86.74% after examining 158 patients.⁸

Colloid goitre was dominant in the non-malignant group while follicular followed by papillary carcinoma were dominant in the neoplastic group. The study by Kumar et al on 89 patients reported an overall sensitivity of 77%, specificity of 100% and accuracy of 97.7%. The study comprised 60 females and 29 males.⁹

The 5-year retrospective study by Bagga et al on 252 subjects, reported 90.5% patients with benign pathology. 6.7% were suspicious for malignancy while 1.2% were confirmed to be malignant. FNAC-histopathological correlation had a diagnostic accuracy of 96.2%, sensitivity of 66% and specificity of 100%.¹⁰ The 7-year retrospective study on 447 patients by Pandey et al 2012 reported 72% benign lesions and 50%, 94.74%, 81.48% sensitivity, specificity and diagnostic accuracy respectively.¹¹

Mehmood et al reported non-neoplastic lesions in 79.49% and neoplastic in 20.51% cases. Follicular adenoma was in 51.85% cases.¹²

Palpable thyroid nodules have an incident rate of 1 to 7% in adults. The number of people with impalpable nodules is tenfold.¹³ Women and people in the geriatric age group and people who have undergone radiotherapy of the head and neck in the past, people with a goitre-genic diet were much more prone to thyroid nodules. Majority of thyroid nodules are benign, however no more than 5% of cases show malignancy.¹⁴

The limitations of FNAC are mainly due to inadequate sample size, vascularity of thyroid, incorrect sampling procedure performed, dexterity of the clinician performing the procedure and experience of the pathologist interpreting the aspirate.¹⁵

The Bethesda system for reporting thyroid cytopathology was introduced in 2007 at the thyroid fine needle aspiration state of the science conference; held in Bethesda, Maryland for unifying the terminology and morphologic criteria along with the corresponding risk of malignancy.¹⁶ Mondal et al reported a higher incidence of benign lesions with the reason that patients usually come directly to the tertiary care centre without any reference.¹⁷ On the other hand, Nayar et al reported a much lower incidence of malignancy.¹⁸ Nandedkar et al have emphasised on utilising the Bethesda system as it represents standardisation and reproducibility in reporting thyroid cytology with improved clinical significance and greater predictive value.¹⁹

CONCLUSION

FNAC is an ideal preoperative investigative modality in thyroid swellings with overall accuracy of 85% and can differentiate preoperatively a benign from a malignant thyromegaly; and thereby plan extent of surgery, with or without a neck dissection, maximum cases of follicular adenoma could be easily diagnosed with this aspiration modality.

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REFERENCES

1. Suen KC, Quenville NF. Fine needle aspiration biopsy of the thyroid gland: A study of 304 cases. *J. Clin. Pathology.* 1983;36:1036-45.
2. Schultenover SJ, Ramzy I, Cakay P, Le Febre P, Cruz S, Anatolio B. Needle Aspiration biopsy. Role and Limitations in surgical decision making. *Am J Clinical Path.* 1984;82:105-410.
3. Schwerk WB, Schitz-Moorman P. Ultrasonically guided fine needle biopsies in neoplastic liver disease. *Cancer.* 1981;48:1469-77.
4. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. *Cancer.* 2007;111:508-11.
5. Orell RS, Sterrett GF, Walfars MN, Whitaker D. Manual and atlas of fine needle aspiration cytology, 3rd ed. UK, London: Elsevier Publication. 1996;110.
6. De la Saravia SC, Cuellar F, Day SE, Harach HR. Accuracy of aspiration cytology in thyroid cancer. A study in 1 institution. *Acta Cytol.* 2006;50:384-6.
7. Cheung YS, Poon CM, Mak SM, Suen MW, Leong HT. Fine-needle aspiration cytology of thyroid nodules - how well are we doing? *Hong Kong Med J.* 2007;13:12-5.
8. Beneragama DH, Jayasuriya W, Samarawickrama RI, Rupasingha RA, Piyasena MG, Dayarathna UH. Validity of fine needle aspiration cytology in the diagnosis of thyroid diseases. *J Diagn Pathol.* 2006;5:19-29.
9. Kumar S, Aquil S, Abdullahahdar. Role of Fine needle aspiration cytology in Thyroid Diseases. *J Surg Pak.* 2008;13:1.
10. Bagga PK, Mahajan NC. Fine needle aspiration cytology of thyroid swellings: How useful and accurate is it? *Indian J Cancer.* 2010;47:437-42.
11. Pandey P, Dixit A, Mahajan NC. Fine-needle aspiration of the thyroid: A cyto-histologic correlation with critical evaluation of discordant cases. *Thyroid Res Pract.* 2012;9:32-9.
12. Mehmood Q, Ahmad B, Dab RH, Ahmad J, Javed A, Zahra K. Role of fine needle aspiration cytology for neoplastic evaluation of nodular goitre. *APMC.* 2010;4:62-7.
13. Faquin WC. Aspiration of the thyroid in Atlas of Diagnostic Cytopathology, BF Atkinson, Saunders, Ed. 2004;460-70.
14. Boucher LD, Swanson PE, Stanley MW, Silverman JF, Raab SS, Geisinger KR. Cytology of angiosarcoma: findings in fourteen fine-needle aspiration biopsy specimens and one pleural fluid specimen. *American journal of clinical pathology.* 2000;114(2):210-9.
15. Gharib H, Goellner JR. Fine-needle aspiration biopsy of the thyroid. *Ann Int Med.* 1993;118:282-9.
16. Cibas ES, Ali SZ. NCI Thyroid FNA State of the Science Conference. The Bethesda system for reporting thyroid cytopathology. *Am J Clin Pathol.* 2009;132:658-65.
17. Mandal S, Barman D, Mukherjee A, Mukherjee D, Saha J, Sinhas R et al. Fine needle aspiration cytology of thyroid nodules-Evaluation of its role in diagnosis and management. *J Indian Med Assoc.* 2011;109:258-61.
18. Nayar R, Ivanovo M. The indeterminate thyroid fine-needle aspiration: Experience from an academic center using terminology similar to that proposed in the 2007 national cancer institute thyroid fine needle aspiration state of the science conference. *Cancer.* 2009;117:195-202.
19. Nandedekar SS, Dixit M, Malukani K, Varma AV, Gambhir S. Evaluation of thyroid lesions by fine needle aspiration cytology according to Bethesda system and its histopathological correlation. *Int J App Basic Med Res.* 2018;8:76-82.

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