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Full Length Article

Diagnostic accuracy of fine needle aspiration cytology of thyroid and evaluation of discordant cases

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KEYWORDS

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Abstract *Introduction:* The main role of fine needle aspiration cytology (FNAC) lies in differentiating between a malignant and benign thyroid nodule. It greatly influences the treatment decision. The current study was undertaken to evaluate the cytology–histopathology correlation and to analyze the cause of diagnostic errors with an eventual aim to improve diagnostic accuracy.
Materials and Methods: This is a retrospective study comparing cytology and corresponding histopathology report in 724 thyroid cases. The statistical analysis included false positive rate, false negative rate, sensitivity, specificity, positive predictive value, negative predictive value and accuracy.
Results: On cytological examination, 635/724 were reported as benign, 68 malignant and 21 suspicious. On histopathological examination, 626/635 cases were confirmed as benign but there were 9 discordant cases. Among the other cases histopathology diagnosis of malignancy matched in 66/68 and 11/21 cases. Diagnosis correlated in 703/724 cases (97%) [$p < 0.001$].
False positive and false negative rates were 1.9% and 10.5%, respectively. The sensitivity and specificity were 89.5% and 98%, respectively. The positive predictive value was 84.6% and negative predictive value was 98.6%. Accuracy of FNA was 97%.
Conclusion: In spite of high accuracy of FNAC in differentiating between a benign and malignant lesion, certain pitfalls should be kept in mind. The common false negative diagnoses were follicular pattern cases which constitute a 'gray zone', cystic papillary thyroid carcinoma (PTC) and papillary microcarcinoma. The reason for false positive diagnoses was the occurrence of nuclear features characteristic of PTC in other thyroid lesions. Awareness of pathologist regarding these pitfalls can minimize false negative/positive diagnoses.

Introduction

Thyroid Fine Needle Aspiration Cytology (FNAC) was introduced in Scandinavian countries in 1950s and became popular in the United States in 1970s and then worldwide in the 1980s

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[1] Today it remains the mainstay of diagnostic workup for thyroid pathologies. Thyroid FNA is a safe and relatively simple test that is widely recognized as the critical, primary diagnostic procedure of first choice for the evaluation of patients presenting with thyroid nodules [2–7]. One of the major advantages is that FNAC can be done as an out-patient procedure.

Thyroid nodules are a common clinical finding and have a reported prevalence of 4–7% in the general population [2,8,9]. The vast majority of these nodules are non-neoplastic lesions or benign neoplasms. FNAC is relied upon to distinguish benign from neoplastic or malignant thyroid nodules and therefore has lead to a dramatic decrease in thyroid surgeries [10]. Nevertheless, Fine needle Aspiration has some limitations like specimen inadequacy, sampling techniques and WHAFFT changes [11–14]. 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. Our another aim was to analyze the false positive and false negative diagnosis so as to highlight the pitfalls of FNA and probable reasons for the same are discussed. We hope that a better understanding of these pitfalls would help avoiding them in future and will contribute to better patient care.

Materials and methods

This is a retrospective review of all thyroid FNAs done at our institution between January 2010 and December 2014. Data were retrieved from the institutional database and analyzed. There were 945 thyroid FNAs done during this period. Ultrasound guided FNAs at our institution are very infrequent and most of the FNAs in the present study were without ultrasound guidance. This cytological study was based on evaluation of FNA smears. In patients with multiple nodules, even if one nodule was malignant and the other benign it was reported as malignant in cytology and considered in the malignant category.

Cytological diagnosis of thyroid lesions at our institution is influenced by the guidelines of Royal college of Pathologists [15]. The cytological results were categorized into 5 categories: unsatisfactory; benign; follicular pattern lesions; suspicious (includes atypical) and malignant.

Samples were considered ''unsatisfactory'' if there was insufficient cellularity; cellularity was obscured by blood, poor quality smears or delayed/inadequate fixation. For cystic lesions, smears with insufficient cellularity i.e. if there were less than six groups of thyroid follicular epithelial cells across all the submitted slides, each with at least 10 well visualized epithelial cells and which contain mostly macrophages but without abundant colloid were included in the unsatisfactory category [15].

Cystic lesions which were not unsatisfactory by the above definition were considered satisfactory and considered for this correlation study. As per the Royal College guidelines [15], these include:

- Cystic lesion fluid samples which have sufficient thyroid follicle cells to achieve the adequacy criterion, irrespective of any possible colloid and/or macrophage content
- Cystic lesion specimens which consist predominantly of colloid and macrophages, even if too few follicular epithelial cells are present to meet the adequacy criteria outlined above, can be considered to be 'consistent with a colloid cyst' in the appropriate clinical setting.

At our institute, all the cystic lesions with 'atypia' are reported as ''suspicious'' of malignancy. As this paper was specifically aimed to find out the efficacy of FNA in ruling out malignancy; to keep the comparisons clear we have included all the cysts without atypia in the benign category and those reported as ''suspicious'' in malignant category.

'Follicular pattern lesion' forms a 'gray zone' in cytology and it is difficult to rule out malignancy on cytology in these lesions [16,17] We report these lesions as 'follicular pattern lesions' and advice excision of the lesion followed by HPE for confirmation.

If atypical cells are seen it is mentioned additionally in the report to provide a clear picture to the surgeon. For the purpose of this study the follicular pattern lesions with atypical cells are classified in 'suspicious category' as they are managed is the same way i.e. surgical excision and HPE. In follicular pattern lesions without atypia clinical judgment should play a large role in deciding to watch, repeat FNA or even excise in certain circumstances. Since there was no evidence of malignancy on cytology in these cases we have grouped them in benign category for this study.

As the present study aims to correlate the accuracy of the FNA in detecting the malignant/benign lesions on cytology the follicular lesions without atypia were categorized as benign and follicular lesions with atypia as 'suspicious'. Suspicious lesions have been clubbed with malignant ones as both are treated as same as far as treatment is concerned. Such lesions are advised surgery followed by histopathological examination for definite diagnosis.

The corresponding histopathology report was available for 724 cases. The patients who underwent either of the two tests in any other institution were excluded from the study. The FNA samples which were inadequate for evaluation were also excluded. A total of 724 cases who had both cytology and histopathology reports available formed the study group to analyze the value of FNA in thyroid pathologies. The statistical analysis included false positive rate, false negative rate, sensitivity, specificity, positive predictive value, negative predictive value and accuracy.

Results

945 thyroid FNAs were done in our institute between 2010 and 2014. Most of the patients were in the age group 30–50 years (Fig. 1). There were 82% female and 18% male patients (Fig. 2). Out of these 945 cases, the FNA sample was adequate in 870 cases. Histopathology correlation was available for 724 cases, which formed the study population. Among the 724 cases 635 (87.7%) were reported as benign on cytology and the diagnosis were as follows: 324 (44.8%) cases were nodular goiter, 232 (32.0%) were Hashimoto's thyroiditis, 48 (6.6%) were follicular lesions and 44 (6.0%) were cystic lesions of thyroid (Fig. 3). 68 cases out of 724 were diagnosed as malignant on cytology. Of these, 62 (8.6%) cases were reported as PTC and 6 (0.8%) as medullary carcinoma (Fig. 3). 21 (2.90%)