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A Cytohistological Correlation Study of Thyroid Lesions: Our Institutional Experience

Sailendra BK Pokhrel[1]

[1]Department of Otolaryngology Head and Neck Surgery, National Academy of Medical Sciences Bir Hospital, Kathmandu, Nepal., Nepal.

ABSTRACT

Background: Thyroid neck masses are common clinical presentations, encompassing a spectrum of benign and malignant conditions. Fine-needle aspiration cytology (FNAC) serves as an initial diagnostic tool for evaluating these masses, while histopathological examination (HPE) remains the gold standard for definitive diagnosis.

Method: This prospective study reviewed data from 49 patients with thyroid swelling who underwent FNAC followed by surgical resection at our institution. FNAC results were categorized into colloid goitre, papillary thyroid carcinoma, follicular neoplasm, thyroiditis, Hurthle cell adenoma and inconclusive . HPE findings were used to determine sensitivity, specificity, and overall diagnostic concordance.

Result: FNAC demonstrated a high concordance rate (92%) with HPE. Colloid goitre was accurately diagnosed in 97% (33/34) of cases, and thyroiditis in 100% (2/2) of cases. For papillary thyroid carcinoma, FNAC identified 5 cases, with HPE detecting an additional case. Challenges were noted in diagnosing follicular neoplasms, where HPE revealed 3 adenomas and 2 carcinomas. Sensitivity exceeded 90% for colloid goitre and thyroiditis, though specificity was lower for follicular neoplasms due to cytological limitations.

Conclusion: FNAC is an effective and reliable preliminary diagnostic tool for thyroid neck masses; however, it has limitations in differentiating follicular neoplasms and some malignancies. HPE remains indispensable for definitive diagnosis. Combining both methods ensures accuracy and facilitates appropriate management.

Key words: fine-needle aspiration cytology; histopathology; thyroid neck masses; colloid goitre; papillary carcinoma; follicular neoplasm.

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INTRODUCTION

Thyroid lesions are one of the most common causes of neck swellings and include a spectrum of conditions ranging from benign hyperplastic nodules to malignant tumors.[1] Accurate preoperative diagnosis of these lesions is crucial to guide appropriate management and avoid unnecessary surgeries. Fine Needle Aspiration Cytology (FNAC) has been established as an effective, minimally invasive diagnostic procedure that is widely used for evaluating thyroid swellings due to its affordability, ease of use, and high patient acceptability.[2] Despite its advantages, FNAC has certain limitations, particularly in differentiating between benign and malignant follicular neoplasms, as well as diagnosing less common lesions like medullary thyroid carcinoma or Hürthle cell adenomas.3,4 Histopathological Examination (HPE) of surgically excised specimens remains the gold standard for definitive diagnosis. A comparative study of FNAC and HPE findings enables assessment of FNAC's diagnostic accuracy, sensitivity, specificity, and areas of discrepancy. This study was conducted in our institution to evaluate the cytohistological correlation in neck swellings, with a specific focus on thyroid lesions. The results provide insights into the strengths and limitations of FNAC, reinforcing its role in the preoperative evaluation of thyroid swellings.

METHODS

This prospective study was conducted in the Department of ENT & HNS of College of Medical Sciences , Bharatpur, Nepal over a period of Sept 2009 to Feb 2011 after taking informed consent from the all participants. A total of 49 patients who presented with thyroid neck swellings were included. All patients underwent FNAC followed by surgical intervention, and histopathological examination

Correspondence: Dr. Sailendra BK Pokhrel, Department of Otolaryngology Head and Neck Surgery, National Academy of Medical Sciences Bir Hospital, Kathmandu, Nepal. E-mail:drsailendra013@gmail.com, Phone: +977-9851176425.

(HPE) was performed on resected specimens. The patients with previous history of neck surgery and preoperative FNAC unknown status were excluded. FNAC was performed under aseptic conditions using a 22-24 gauge needle. Aspirated material was smeared on glass slides and stained using Hematoxylin and Eosin (H&E) stain, Papanicolaou stain and Giemsa stain (if needed). The surgically resected specimens were fixed in 10% formalin, processed, and stained with H&E stain. Histopathological findings were considered definitive and used as a benchmark to evaluate FNAC results.

The FNAC results were compared with corresponding HPE findings to determine diagnostic accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). Discrepancies between FNAC and HPE were analyzed to identify limitations and false-positive or false-negative cases. The SPSS version 18 was used for analysis.

RESULTS

A total of 49 cases of neck swellings were analyzed, and the findings were summarized in Tables 1 and 2, which detail the results of Fine Needle Aspiration Cytology (FNAC) and Histopathological Examination (HPE).

Table 1. Cytological diagnosis of thyroid swelling. (n =49)

FNAC Dx	Frequency (%)
Colloid goitre	34(69.3)
Papillary thyroid carcinoma	5(10.2)
Follicular neoplasm	4(8.1)
Thyroiditis	2(4.08)
Hurthle cell adenoma	1(2.04)
Medullary carcinoma	1(2.04)
Inconclusive	2(4.08)

Table 2. Histological diagnosis of thyroid swelling. (n = 49)

HPE Dx	Frequency (%)
Colloid goitre	33(67.3)
Papillary thyroid carcinoma	6(12.2)
Follicular neoplasm	
Adenoma	3(6.1)
Carcinoma	2(4.08)
Thyroiditis	3(6.1)
Hurthle cell adenoma	1(2.04)
Medullary carcinoma	1(2.04)

The overall performance of FNAC demonstrated high diagnostic reliability, with a sensitivity of 93.7%, specificity of 97.3%, and accuracy of 95.6%. The Positive Predictive Value (PPV) was calculated at 96.4%, and the Negative Predictive Value (NPV) was 94.9%, indicating the effectiveness of FNAC in accurately diagnosing neck swellings across various categories. In the analysis of colloid goitre, FNAC showed exceptional diagnostic performance with a sensitivity of 97%, specificity of 100%, PPV of 100%, and NPV of 91.3%. The concordance rate for this category was 97% (33/34 cases). Papillary thyroid carcinoma also exhibited strong diagnostic metrics, with a sensitivity of 83.3%, specificity of 98%, PPV of 83.3%, and NPV of 98%. The concordance rate for papillary thyroid carcinoma was 83.3% (5/6 cases). For follicular neoplasm, the diagnostic performance was somewhat limited due to the overlap between adenoma and carcinoma subtypes, yielding a sensitivity of 60%, specificity of 95%, PPV of 75%, and NPV of 90.5%. Thyroiditis cases were diagnosed with perfect accuracy, achieving 100% sensitivity, specificity, PPV, and NPV, with a concordance rate of 100% (2/2 cases). Similarly, Hurthle cell adenoma also demonstrated perfect diagnostic performance with sensitivity, specificity, PPV, and NPV all at 100%, and a concordance rate of 100% (1/1 case). These findings highlight the high diagnostic accuracy of FNAC in detecting various types of neck swellings, especially for colloid goitre, thyroiditis, and Hurthle cell adenoma, while emphasizing the need for careful evaluation in cases of follicular neoplasm due to diagnostic overlaps.

DISCUSSION

Thyroid lesions constitute a significant proportion of neck swellings and vary widely from benign disorders such as colloid goitre and thyroiditis to malignant neoplasms such as papillary carcinoma, follicular carcinoma, and medullary carcinoma. Fine Needle Aspiration Cytology (FNAC) is widely regarded as the first-line diagnostic investigation due to its simplicity, minimal invasiveness, and cost-effectiveness. However, despite its merits, FNAC has limitations, particularly in differentiating certain histological subtypes. This study highlights the cytohistological

correlation of thyroid lesions diagnosed in our institution to evaluate the efficacy, accuracy, and limitations of FNAC in thyroid pathology. The findings of this study reaffirm the critical role of FNAC in the initial evaluation of thyroid lesions. Its high sensitivity, specificity, and overall diagnostic accuracy make it an invaluable tool in differentiating benign from malignant thyroid nodules. However, several diagnostic challenges remain, particularly in distinguishing follicular neoplasms, where cytological features alone are insufficient. The overall concordance rate of 92% in our study is consistent with previous literature, which reports FNAC concordance rates ranging from 85% to 95%.[5,6] For benign lesions such as colloid goitre and thyroiditis, FNAC demonstrated near-perfect sensitivity and specificity, underscoring its reliability in routine clinical practice. The ability to accurately diagnose benign lesions allows clinicians to avoid unnecessary surgeries and provide reassurance to patients.[7] Despite its strengths, FNAC showed limitations in diagnosing follicular neoplasms, with a sensitivity of 60% and specificity of 95%. This is primarily due to the inability of FNAC to distinguish between follicular adenomas and carcinomas, as both shares overlapping cytological features. Histopathological evaluation of capsular and vascular invasion remains the gold standard for differentiating these entities.[8] Molecular diagnostic tools, such as gene expression classifiers and next-generation sequencing, have been proposed as adjuncts to FNAC to improve diagnostic accuracy.[9] FNAC identified most cases of papillary thyroid carcinoma (PTC) with a sensitivity of 83.3%. However, one case was missed due to sampling limitations or interpretative challenges. The Bethesda System for Reporting Thyroid Cytopathology has standardized the interpretation and reporting of thyroid FNAC, improving its diagnostic performance for PTC.[10]

The results highlight the importance of FNAC as a frontline diagnostic tool, particularly in resource-limited settings. However, the inherent limitations of FNAC in diagnosing follicular-patterned lesions necessitate a multimodal diagnostic approach, combining cytological, molecular, and intraoperative findings to guide clinical decision-making.[11]

CONCLUSIONS

FNAC remains a cornerstone in the diagnostic evaluation of thyroid lesions, offering high diagnostic accuracy for most benign and malignant conditions. While its limitations in distinguishing follicular-patterned lesions persist, advancements in molecular diagnostics hold promise for addressing these challenges. Our findings reinforce the need for a tailored, multimodal approach to optimize the management of thyroid nodules.

Conflict of Interest: None

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