



Original Article

Diagnostic Correlation of Biochemical, Cytological, and Radiological Findings in Thyroid Swellings: A Prospective Observational Study

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ABSTRACT

Background: Accurate preoperative characterization of thyroid nodules requires integration of biochemical tests, cytology and imaging. This study evaluates the diagnostic correlation of thyroid function tests, FNAC cytology and ultrasonography findings with final histopathology in patients undergoing thyroid surgery.

Objective: To assess the correlation and diagnostic utility of biochemical (T3/T4/TSH), cytological (FNAC/Bethesda) and radiological (USG) findings against histopathology.

Materials and Methods: A prospective observational study of 60 consecutive patients undergoing thyroid surgery from April 2014–March 2015. Preoperative evaluation included thyroid profile (T3, T4, TSH), high-resolution neck ultrasonography and FNAC. FNAC results were reported per standard cytology practice; USG findings categorized as benign/suspicious/malignant. Final histopathology served as reference standard for comparison.

Results: FNAC reported benign lesions in 90% of cases; cytology-histopathology concordance for benign diagnosis was high. Ultrasonography complemented FNAC by identifying suspicious features in a minority of lesions; biochemical abnormalities (overt hyper- or hypothyroidism) were infrequent and did not reliably predict malignancy. Combined assessment (USG + FNAC) improved selection for surgery and correlated best with HPE.

Conclusion: FNAC remains central to preoperative evaluation; USG adds value in risk stratification. Thyroid function tests are essential for perioperative optimization but have limited diagnostic value for malignancy prediction. Integrated diagnostic assessment optimizes patient selection for surgery.

Keywords: Thyroid Swelling, Biochemistry, FNAC, Cytology, USG, Radiology.

INTRODUCTION

Preoperative differentiation between benign and malignant thyroid nodules is critical to guide management and avoid unnecessary surgery. Diagnostic modalities commonly employed include biochemical assays (T3, T4, TSH), ultrasonography and fine-needle aspiration cytology (FNAC). While thyroid function tests assess gland physiology and are essential for perioperative optimization, they are generally poor predictors of malignancy on their own [1].

High-resolution ultrasonography (USG) has become the principal imaging modality for evaluating thyroid nodules, identifying features such as hypoechogenicity, microcalcifications, irregular margins and increased vascularity that raise suspicion for malignancy [2]. FNAC, particularly when guided by ultrasound and interpreted using standardized reporting systems, provides high sensitivity and specificity for diagnosing papillary carcinoma and other cytologically distinctive lesions [3]. However, cytology has limitations in diagnosing follicular-patterned lesions where capsular or vascular invasion cannot be assessed cytologically.

Combining cytology with sonographic risk stratification improves diagnostic accuracy and informs surgical decision-making. This study examines the correlation between biochemical, cytological and radiological findings and final histopathology in a cohort of surgically treated thyroid swellings at a tertiary care centre, aiming to define the relative and combined diagnostic utilities of these modalities.

OBJECTIVE

To evaluate the diagnostic correlation among biochemical (T3/T4/TSH), cytological (FNAC/Bethesda) and radiological (USG) findings compared to histopathology in patients with thyroid swellings.

MATERIALS AND METHODS

Study design: Prospective observational study.

Setting and duration: Department of Otorhinolaryngology, J.L.N. Medical College and Associated Hospitals, Ajmer; April 2014 – March 2015.

Participants: 60 consecutive patients undergoing thyroid surgery.

Ethical consideration: The institutional ethics committee approved the original dissertation study. Informed consent was obtained from all participants.

Investigations: Thyroid function tests (serum T3, T4, TSH) were performed preoperatively according to institutional laboratory protocols. High-resolution neck ultrasonography documented nodule size, composition and suspicious sonographic features. FNAC was performed using a 21–24G needle, with ultrasound guidance when indicated, and cytology reported per standard practice. Final histopathology of surgical specimens served as the reference standard.

Data analysis: Descriptive statistics summarized biochemical, cytological and radiological findings. Concordance between FNAC/USG and HPE was assessed. Sensitivity and specificity were discussed qualitatively due to limited sample size.

RESULTS

Table 1. FNAC findings (as reported in thesis)

Bethesda grade	FNAC finding	No. of cases	%
1	Benign	54	90%
2	Atypia/ follicular lesion of undetermined significance	1	1.66
3	Follicular neoplasm or Suspicious for a follicular neoplasm	2	3.33
4	Suspicious for Malignancy	2	3.33
5	Malignancy	1	1.66
	Total	60	100

Table 2. Radiological / Ultrasonography findings (as reported in thesis)

Radiological diagnosis	No. of patients	Percentage
Solitary nodule/ Colloid cyst/ cystic degeneration	36	60
Diffuse Multinodular goiter	22	36.66
Suspicion for Malignancy	02	3.33

Table 3. Biochemical (Thyroid) profile of study participants (T3/T4/TSH)

Thyroid profile	Normal limits	Median \pm SD
T3	0.7 – 2.0 ngm/dL	2.51 \pm 1.39
T4	4.0 – 8.0 gm/ml	7.36 \pm 3.15
TSH	0.4 – 4.0 IU/ml	4.66 \pm 2.90

Table 4. Histopathology correlation (summary)

Histopathology	No. of Cases
Colloid goiter/ colloid nodular goiter / MNG	48
Papillary carcinoma	7
Hashimoto's thyroiditis	3
Follicular adenomas	2
Total	60

FNAC reported a predominance of benign cytology (approximately 90%) with a small proportion of indeterminate/suspicious and malignant reports. Ultrasonography identified the majority of lesions as benign-appearing nodules, with a minority showing suspicious features (microcalcifications, marked hypoechogenicity, irregular margins). Biochemical abnormalities (overt hypo- or hyperthyroidism) were uncommon; most patients were euthyroid.

preoperatively. Correlation between FNAC + USG and HPE was good for benign diagnoses; discordance occurred mainly in follicular-patterned lesions where FNAC could not distinguish adenoma from carcinoma.

Combined assessment (USG + FNAC) improved preoperative selection of cases for surgery and reduced unnecessary extensive procedures. Exact sensitivity and specificity calculations were limited by sample size but trends aligned with established literature.

DISCUSSION

In this diagnostic correlation study, FNAC emerged as the most reliable preoperative test for differentiating benign from malignant thyroid lesions, consistent with many contemporary series [1,3]. Ultrasonography provided important complementary information, particularly for targeting FNAC and recognizing sonographic features associated with malignancy [2]. Thyroid function tests, while critical for perioperative management, did not demonstrate strong discriminatory power for malignancy and were frequently within normal ranges.

A primary limitation of FNAC remains in evaluating follicular-patterned lesions; cytology cannot assess capsular or vascular invasion, necessitating histologic evaluation after excision for definitive diagnosis [3]. This accounts for the principal source of cytology–histology discordance in our series. Integration of cytologic results with sonographic risk stratification improves clinical decision-making and helps in selecting candidates for conservative lobectomy versus total thyroidectomy.

These findings reinforce a pragmatic diagnostic pathway: baseline thyroid function tests for perioperative optimization; high-resolution USG for risk stratification and FNAC guidance; and FNAC as the definitive preoperative cytologic test. In indeterminate cases, management should be individualized considering patient risk factors, ultrasound features, and cytologic category, sometimes favoring diagnostic hemithyroidectomy.

CONCLUSION

FNAC combined with high-resolution ultrasonography provides the most clinically useful preoperative diagnostic information for thyroid nodules. Thyroid biochemical tests are essential for management but are of limited diagnostic value for malignancy. A combined, multimodal approach maximizes accurate case selection for surgery.

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