Section: Pathology

Original Research Article

MALIGNANT THYROID TUMORS: A CASE SERIES STUDY

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ABSTRACT

Background: The aim of the study is to present a case series of malignant thyroid tumors consisting of 9 cases. Malignant thyroid tumors are rare tumors. These represents only 1% of total malignancy. Fine needle aspiration cytology (FNAC) is widely accepted as an accurate and cost effective diagnostic modality in the preoperative diagnosis of all types of thyroid tumors. It is a valuable tool in distinguishing benign from malignant thyroid tumors. Histopathological correlation was done for all the cases as histopathology gives the confirmatory results. **Materials and Methods:** This is a hospital based cross sectional retrospective case series study. Socio- demographic and clinical data were obtained from hospital records. This study was done in the department of pathology at FAKHRUDDIN ALI AHMED MEDICAL COLLEGE AND HOSPITAL, BARPETA, ASSAM in the year 2022. **Result:** The study included 9 cases of malignant thyroid tumors. Out of which 8 were female and 1 was male. Patients presented with neck swelling and symptoms such as dyspnoea, dizziness, pain etc. The diagnoses were established via fine needle aspiration cytology in conjunction with radiological study like high resolution ultrasound examination whenever reports are available. This is confirmed by histopathology after surgery. All patients undergone total thyroidectomy and subsequent follow-up showed favorable outcomes. Malignant thyroid tumors were consisting of 8 cases of papillary thyroid carcinoma and 1 case of follicular carcinoma. In the present study, Follicular carcinoma was diagnosed as follicular neoplasm on FNAC and confirmed as follicular carcinoma on histopathology. Out of 8 cases of papillary carcinoma, 6 cases were correctly diagnosed by cytology and 2 false negative cases which were reported as colloid goiter later on diagnosed as papillary carcinoma on histopathology. **Conclusion:** As Malignant thyroid tumors were rare tumors, diagnosis through FNAC needs lots of experience and which has to be further confirmed by histopathology. Histopathology stands the gold standard but FNAC is also an accurate tool for preoperative diagnosis with some minor limitations. FNAC cannot definitively diagnose a follicular neoplasm into benign follicular adenoma or a malignant follicular carcinoma. Malignant tumors undergoing cystic changes can give rise to false negative result on aspiration. Management of all the cases included in our study was total thyroidectomy and were associated with good survival. Key words: Malignant Thyroid Tumors, FNAC, Histopathology, Total Thyroidectomy.

INTRODUCTION

Thyroid disorders are among the most common endocrine issues encountered in routine clinical practice. With better access to imaging and routine health checkups, the incidental detection of thyroid nodules has risen sharply in recent years. While many of these lesions are benign, a small but clinically important portion can turns out to be malignant. Timely and accurate diagnosis is key to early cancer detection and avoiding unnecessary surgeries in benign cases.[1]

Fine-Needle Aspiration Cytology (FNAC) is now widely regarded as the first-line diagnostic tool for evaluating thyroid nodules. It is minimally invasive, cost-effective, and gives reliable cytological

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information that helps clinicians decide whether a patient needs surgery or can be managed conservatively.[3] Several Indian and international studies have consistently reported high diagnostic accuracy of FNAC, with sensitivity ranging from 80% to 98% and specificity approaching 100%.[4] To improve diagnostic consistency, the Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) was developed. It classifies FNAC findings into six categories, each associated with a defined risk of malignancy and recommended clinical action. However, even with this standardized system, indeterminate categories like Bethesda III (AUS/FLUS) and IV (Follicular Neoplasm) still present diagnostic dilemmas. These cases often require histopathological confirmation for a definitive diagnosis.[5]

In High-resolution ultrasound, sonographic features like microcalcifications, irregular or infiltrative margins, significant hypoechogenicity, and a "taller-than-wide" shape are often red flags for malignancy.[6] When FNAC is combined with ultrasound (especially using TI-RADS classification), diagnostic precision improves notably, particularly in nodules falling in the "gray zones" of cytology.[7]

Ultimately, histopathology remains the gold standard for diagnosis. Comparative studies between FNAC and final histological outcomes have shown that the true malignancy rate in Bethesda III lesions may be higher than traditionally assumed.[8]

Given all these factors, a comprehensive, multimodal approach that combines cytology, radiology, and histopathology offers the most reliable diagnosis. This study to some extent also shows the utility of FNAC in differentiating between neoplastic and non-neoplastic thyroid lesions and to correlate it with histopathological findings.

The thyroid gland is a butterfly-shaped endocrine organ located in the anterior neck, straddling the trachea and just below the larynx. It consists of two lateral lobes connected by a central isthmus and weighs approximately 15–20 grams in adults. Its primary function is the synthesis and secretion of thyroid hormones—T3 (triiodothyronine) and T4 (thyroxine)—which regulate metabolism, thermogenesis, and growth. The gland is richly vascularized and receives innervation from the cervical sympathetic ganglia. Embryologically, it descends from the foramen cecum at the tongue base and follows the thyroglossal duct path, remnants of which can result in midline cysts. Thyroid nodules are discrete lesions within the thyroid that may be palpable or incidentally detected on imaging. Their incidence has surged with widespread use of high-resolution ultrasonography, with prevalence rates ranging from 19% to 68% in the general adult population. Although most nodules are benign, approximately 5–15% may harbor malignancy, necessitating accurate preoperative evaluation to guide clinical management.[21]

Fine-Needle Aspiration Cytology (FNAC) has long been regarded as a frontline diagnostic tool in the evaluation of thyroid lesions. It is cost-effective, minimally invasive, and offers quick preliminary diagnosis, enabling clinicians to triage patients efficiently for surgery or conservative management. A study by Kumar et al. (2023), in a study on 120 patients, reported FNAC sensitivity of 82.4%, specificity of 100%, and diagnostic accuracy of 95.7%, when compared to histopathology.[20]

A study by Ravikumar et al. (2021) at a tertiary care hospital in South India evaluated 150 adult cases and reported FNAC to have a sensitivity of 91%, specificity of 95%, and diagnostic accuracy of 93.33%, underscoring its clinical value in detecting neoplastic thyroid lesions with histopathological correlation.[11]

The adoption of The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) has improved reporting consistency. As mentioned earlier also, this six-tier system categorizes thyroid cytology based on the risk of malignancy and corresponding clinical management, which is particularly helpful in standardizing communication between pathologists and clinicians. However, Bethesda category III (AUS/FLUS) and IV (FN/SFN) remain problematic due to their indeterminate nature—where cytological features alone are often insufficient. A study of Goyal et al. (2020), in a study involving 110 cases, found a malignancy risk of up to 33% in Bethesda III nodules, suggesting a higher-than-expected rate and emphasizing the need for further diagnostic tools.

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Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)[2023][22,23]

Bethesda Category	Diagnostic Title	Updated ROM (2023)	Description / Sub-classification	Suggested Management
I	Nondiagnostic	5–10%	Sample inadequate for diagnosis	Repeat FNAC under US guidance
II	Benign	0–3%	Colloid nodule, thyroiditis	Clinical + US follow-up
III	Atypia of Undetermined Significance (AUS)	10–30%	Subtypes: AUS with nuclear atypia (higher ROM) vs other atypia	Repeat FNAC, molecular testing, or lobectomy
IV	Follicular Neoplasm (FN)	25–40%	Includes Hürthle-cell neoplasm; aligned with WHO 2022	Surgical lobectomy
V	Suspicious for Malignancy	50–75%	Strong features suggestive of malignancy (e.g. PTC)	Lobectomy or total thyroidectomy
VI	Malignant	97–99%	Includes confirmed papillary, medullary, anaplastic carcinoma, lymphoma	Total thyroidectomy ± adjunct therapy

In these case we use high-resolution ultrasound (USG), plays a pivotal role. A study by Rani et al. (2020) have shown that specific ultrasound features like microcalcifications, irregular or lobulated margins, hypoechogenicity, and taller-than-wide nodules significantly raise the suspicion of malignancy.[14]

The American College of Radiology's TI-RADS scoring system provides a structured approach to risk stratification based on these ultrasound features.[6] Combining FNAC with ultrasound enhances diagnostic accuracy.[9] A study by Kalita et al. demonstrated that ultrasound-guided FNAC, particularly when TI-RADS scores were incorporated, helped better predict malignancy and reduce unnecessary surgeries.[16] Similarly, Kumar et al. (2021) analyzed results from over 500 Indian patients and reported that the overall sensitivity and specificity of FNAC for thyroid lesions were 85.6% and 94.3%, respectively showed that integration of ultrasound features with cytological diagnosis improved the management of indeterminate thyroid nodules.[17] Histopathology remains the gold standard for final diagnosis. When FNAC results are correlated with histopathology, the overall diagnostic performance can be measured in terms of sensitivity,

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specificity, and predictive value. In a study by Sood et al. (2021) involving 200 adults, FNAC yielded a sensitivity of 88.3%, specificity of 96.1%, and PPV of 92%, with histopathology serving as the gold standard.[12] Similarly, Saxena et al. (2019) showed that radiological features such as microcalcifications, irregular margins, and hypoechogenicity were significantly correlated with malignancy on histology, especially when nodules fell in Bethesda III and IV.[13] Furthermore, when assessing neoplastic versus non-neoplastic lesions, the sensitivity of FNAC for detecting malignancies in Indian adults has consistently ranged between 85% and 98%, with specificity nearing 100% in many studies.[19] Hence from above literatures, we can say that FNAC is a first-line, minimally diagnostic tool for evaluating thyroid lesions, particularly in resource-constrained settings like India. Despite some limitations, especially in indeterminate categories such as Bethesda III and IV—FNAC remains highly effective when complemented by radiological assessment (e.g., TI-RADS) and confirmed through histopathology (following 2022 WHO Thyroid classification). Multiple Indian studies have demonstrated significant concordance between FNAC and final histopathological diagnosis, underscoring its clinical utility in adult patients. The integration of cytological, radiological, and histopathological data offers a more comprehensive and accurate approach to distinguishing between neoplastic and non-neoplastic thyroid lesions. This review highlights the need for such multimodal studies in local tertiary care settings to refine diagnostic protocols, reduce unnecessary surgeries, and ensure early detection and management of malignancies in patients. Studies have reported that the malignancy risk in Bethesda III can be as high as 30–33%, higher than traditionally assumed.[18] Radiological evaluation with ultrasound enhances diagnostic precision.[15]

Ethical Approval: Approval was taken from the institutional ethical committee. STUDY DESIGN: This is a cross sectional retrospective hospital based case series study.

Consent: Consent has been taken from all the patients and the family of the patients. **Case Series Report:** This is a hospital based cross sectional retrospective case series study. Socio- demographic and clinical data were obtained from hospital records. This study was done in the department of pathology at FAKHRUDDIN ALI AHMED MEDICAL COLLEGE AND HOSPITAL, BARPETA, ASSAM in the year 2022.Radiological investigation like high resolution ultrasound examination was done for all the 9 cases showed same result of heteroechoic nodule suggesting malignant lesion. FNAC and histopathology correlation was asked for final diagnosis.

Table showing details of each patient along with correlation between FNAC finding and histopathology report: (S- Swelling, SP-Swelling Pain, Mixed- Both solid and cystic consistency).

Sl No	Age(Yrs)	Sex	Hosp.No	History	Location	Size(cm)	Consistency	FNAC No	FNAC Diagnosis	HPE No	HPE Diagnosis	Cyto-Histo correlation
1	46	F	88106/20	S	Right	3x2	solid	239/20	Follicular Neoplasm	533/20	Follicular Carcinoma	Correlated
2	30	F	135395/20	S	Left	2.5x2	solid	373/20	Papillary Carcinoma	652/20	Papillary Carcinoma	Correlated
3	28	M	151474/20	S	Right	1.5x1	solid	418/20	Papillary Carcinoma	29/21	Papillary Carcinoma	Correlated
4	40	F	171289/20	S	Bilateral	4.5x3	mixed	426/20	Papillary Carcinoma	782/20	Papillary Carcinoma	Correlated
5	30	F	17154/21	S	Right	3.5x2	solid	005/21	Papillary Carcinoma	166/21	Papillary Carcinoma	Correlated
6	13	F	5344/21	S	Right	1.5x1	solid	13/21	Papillary Carcinoma	153/21	Papillary Carcinoma	Correlated
7	28	F	86693/21	S	Right	3.5x2.5	mixed	237/21	Colloid goiter	1037/21	Papillary Carcinoma	Not Correlaled
8	48	F	110071/21	SP	Left	4x3	mixed	292/21	Colloid goiter	556/21	Papillary Carcinoma	Not Correlated
9	44	F	113621/21	SP	Left	1.5x1	solid	318/21	Papillary Carcinom	305/21	Papillary Carcinoma	Correlated

DISCUSSION

Thyroid disorders are common in India but thyroid malignancy is rare representing only 1% of total malignancy. In the study, 9 malignant thyroid tumours were included, out of which 8 were papillary thyroid carcinoma and 1 was follicular carcinoma. In the study, 8 patients were female and 1 was male, so a definite female preponderance was seen. Preoperative radiological investigation of all the 9 cases suggested malignancy showing heteroechoic nodule and advised for FNAC and histopathology correlation.

The case of follicular carcinoma was diagnosed as follicular neoplasm on FNAC and this is a limitation of FNAC while diagnosing follicular neoplasm. It cannot differentiate between benign follicular adenoma and follicular carcinoma because the distinction relies on identifying capsular and/or vascular invasion, which can only be confirmed by histopathology.

In the present study, 6 cases of papillary thyroid carcinoma were correctly diagnosed on FNAC. But there were 2 false negative cases. These 2 cases were diagnosed as colloid goiter on FNAC which were confirmed as papillary thyroid carcinoma on histopathology. This can be explained as the cytological smear showed follicular cells and cystic macrophages with abundant colloid and the diagnosis of benign lesion was made which was consistent with the study done by Bhartiya R et al.[24] It has been noted that cystic papillary carcinoma can contain abundant colloid. So, the false negative results might be due to the aspiration from the cystic area and not from the cellular area. Both the cases in our study had mixed consistency with both cystic and solid area. These findings are similar to the study done.

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CONCLUSION

As Malignant thyroid tumours were rare tumours, diagnosis through FNAC needs lots of experience and which has to be further confirmed by histopathology. Histopathology stands the gold standard but FNAC is also an accurate tool for preoperative diagnosis with some minor limitations. FNAC cannot definitively diagnose a follicular neoplasm into benign follicular adenoma or a malignant follicular carcinoma. Moreover thyroid malignancy can undergo cystic changes giving rise to false negative result on aspiration. To minimize this, in cystic nodules, fluid should be aspirated completely and FNAC should be done from the residual mass. Management of all the cases included in our study was total thyroidectomy and were associated with good survival.

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