International Journal of Otorhinolaryngology and Head and Neck Surgery
Sorathiya R et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Feb;11(1):28-33
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20250115

Original Research Article

Radiological, cytological and histopathological correlation in patients undergoing thyroid surgery at a tertiary care hospital in western Gujarat: a cross-sectional study

Rashmi Sorathiya, Sharvil Nimavat*, Narendra Hirani, Ajeet Kumar Khilnani, Ayush Tank, Mansi Patel

Department of Otorhinolaryngology, Gujarat, Adani Institute of Medical Sciences, Bhuj, Gujarat, India

Received: 27 November 2024
Revised: 26 December 2024
Accepted: 27 December 2024

***Correspondence:**
Dr. Sharvil Nimavat,
E-mail: sharvilnimavat5@gmail.com

ABSTRACT

Introduction: Thyroid gland is affected by various pathologies ranging from diffuse enlargement (goiter) to nodular lesions, thyroiditis, and malignancies. Fine needle aspiration cytology (FNAC) is a simple & most cost-effective method to diagnose neck mass located superficially. Ultrasonography (USG) is the initial imaging modality in the evaluation of the neck swellings. The objective of the study being to correlate cytology, radiology and histopathology of patients undergoing thyroid surgery in our tertiary care center.
Methods: All patients who were operated for thyroid gland surgery at our tertiary care hospital of western Gujarat at Ear, Nose, and Throat Department between October 2022 to March 2024 were analysed using statistical software. This study included 54 patients.
Results: Out of the fifty-four (54) individuals who showed signs of thyroid enlargement, forty-five (45) were women and 9 were men. The average age of the participants in this research was 43.25±15.50 years. In our research, 79.67% of patients were classified as benign, 12.96% as malignant, and 7.4% were considered suspicious for malignancy. Only 10% were moderately suspicious of cancer (category IV). No patient was identified as highly suspicious of cancer (category V). FNAC specificity for benign was 95.24% and for malignant 93.02%. For TIRADS specificity was 93.33% for benign and 95.45% malignant.
Conclusions: Most of the times it is easy to diagnose a thyroid swelling by clinical, radiological, cytological and histo-pathological examinations. Our study analyses FNAC with Bethesda, USG with TIRADS as a most important aspect for early diagnosis carcinoma of thyroid.

Keywords: Bethesda, Cytology, Histopathology, TIRADS, Thyroid, Ultrasonography

INTRODUCTION

Thyroid gland is affected by different pathologies ranging from diffuse enlargement (goiter) to nodular lesions, thyroiditis, and malignancies. The incidence of thyroid diseases is showing rapid increase in recent years due to goitrogens and changing food habits.[1] The prevalence of thyroid swelling ranges from 4% to 10% in the general adult population and from 0.2% to 1.2% in children.[2] In day-to-day surgical practice, thyroid lesions are very common in about 4-7% of the population and affecting women more commonly than men. Excising all the thyroid lesions is impracticable and associated with risk.[3] Fine needle aspiration cytology (FNAC) is a simple, rapid and most cost-effective method to sample superficial masses of neck. Masses found inside the head and neck and salivary organs and thyroid masses can be classified utilizing this method as non-diagnostic, benign, atypia of undetermined significance/follicular injury or lesion of undetermined significance, follicular neoplasm

or suspicious for a follicular neoplasm, suspicious for malignancy and malignant aetiology likely.[4] Ultrasonography (USG) is the single most valuable imaging modality in the for evaluating neck swellings. The sonographic point of consideration for evaluation are internal composition, echogenicity of swelling, margins of swelling, echogenic foci and the shape of the nodule.

TIRADS Scoring is determined by complete evaluation of all these criteria. Higher the total TIRADS score more resulting into thyroid nodule to be malignant.[5] TIRADS 1: Normal thyroid gland. TIRADS 2: Benign thyroid lesions. TIRADS 3: Probably benign lesions. TIRADS 4: Suspicious lesions. TIRADS 5: Probably malignant lesions (more than 80% risk of malignancy). Many times, there is discrepancy between clinical, radiological and pathological findings resulting in delay in management. By this study we can know the incidences when the clinical, radiological and pathological findings do not match. Such discrepancies can be solved by inter-departmental meetings and case discussions to correlate these factors in order to make diagnosis of neck swellings in patients more accurate.

The present study was conducted with the objectives to study and correlate the clinical, radiological and pathological findings of anterior neck swellings. The great variety of types and the wide range of aggressiveness of thyroid cancers continue to complicate both diagnosis and management. Thyroid cancers are becoming uncommon so diagnosis is becoming necessity.

METHODS

Study type

This study was a prospective study.

Study place

This study was conducted at Department of Otorhinolaryngology at a tertiary care center in Western Gujarat.

Study duration

The study period was from October 2022 to March 2024 after taking IEC consent.

Sample size

This study consisted of 54 patients (calculated using formula $z = 4pq /L^2$ for qualitative data) who came in Department of Otorhinolaryngology, in tertiary care hospital in Western Gujarat.

Inclusion criteria

All patients undergoing thyroid surgery at our hospital were included in this study.

Exclusion criteria

Patients unfit for surgery, previously operated or who were not willing to participate were excluded.

Workup investigations

Complete blood count, Ultrasonography (according to TIRADS score), Thyroid function tests, Fine needle aspiration cytology (FNAC– according to Bethesda score) was be done on all patients. After admission, routine blood investigations (CBC, RFT, LFT, S. Electrolytes, HIV, HBsAg, PT with INR), X-ray 65 chest PA view and electrocardiogram of each patient were done. Systemic evaluation and fitness for surgery were obtained. Surgical treatment and planning Patients presenting with euthyroid glandular enlargement on FNAC and USG underwent thyroid surgery depending upon the extent of thyroid involvement. Patients with malignant disease underwent total thyroidectomy with central compartment or modified neck dissection

If only one lobe was involved Hemithyroidectomy was done, if Both lobes were involved then subtotal, near total or total thyroidectomy was done.

Statistical analysis

Data Management and statistical Analysis of the collected data was done with Microsoft Excel 2020. The interpretation of obtained results was carried out using frequency or percentage.

RESULTS

Out of the fifty-four individuals who showed signs of thyroid enlargement, forty-five were women and 9 were men, resulting in a ratio of females to males of 5.22:1. The highest number of cases occurred specifically in the fifth decade of life. The average age of the participants in this research was 43.25±15.50 years, with ages ranging from 17 to 70. Table 1 shows demographic details and age and gender wise distribution of patients undergoing thyroid surgery.

Table 2 shows categorization on FNA (Follicular Needle Aspiration) performed on 54 individuals, with 43 (80%) showing non-cancerous growths and 11 (20%) showing cancerous growths.

Non-cancerous disease is further divided down into goiter, adenoma, MNG (Mucinous Neoplasm of the Thyroid), thyroiditis, colloid cyst, benign nodule, and nodular hyperplasia. Cancerous growths are further categorized into benign, malignant, and potentially malignant.

Among them 11 patients had cancer, 4 had follicular growths and 7 had papillary carcinoma. In this study there are 79.96% patients who have benign aetiology,

12.96% as malignant, and 7.4% were considered suspicious for malignancy. Atypical but undetermined significance was observed in 6.67% of patients, and 4.44% were suspected of having follicular neoplasm. Table 2 shows Bethesda categorisation of all the patients undergoing thyroid surgery.

In our research, as illustrated in Table-3: 41% of the patients fell into the benign-not suspicious (category I and II) group. Another 41% were classified as possibly benign (category II). A further 18% were mildly suspicious of cancer (category III). Only 10% were moderately suspicious of cancer (category IV). No patient was identified as highly suspicious of cancer (category V). A total of 41% of the patients were in the benign category (TIRADS-I and II), while another 41% were classified as possibly benign (TIRADS-II). Finally, 10% of the patients showed signs of cancer suspicion (TIRADS-III).

As shown in Table 4 there is comparative analysis of study design in our study, we came to result taking histopathology as gold standard FNAC &TIRADS both are reliable. FNAC accuracy is 90.74% and precision is 81.82%.

Table 5 shows specificity for clinical, cytological and radiological diagnosis with HPE as gold standard for thyroid neck swelling and it shows FNAC specificity for benign to be 95.24% and for malignant to be 93.02%. For TIRADS specificity shows 93.33% for benign and 95.45% malignant.

Table 1: Demographic details of the participants.

Age group (in years)	No. of Male	No. of Female	Total
Less than 20	0	4	4
20-30	0	7	7
30-40	3	12	15
40-50	2	11	13
50-60	2	7	8
More than 60	2	4	7
Total	9	45	54

Table 2: Classification of patients as per Bethesda score.

Type of lesion	Bethesda score	Number of patients	%
Non diagnostic/unsatisfactory	1	0	0
Benign	2	32	59.25
Atypia of undetermined significance	3	7	13
Follicular neoplasm	4	4	7.50
Suspicious of malignancy	5	6	11.11
Malignant	6	4	7.50
Total	-	53	100

Table 3: Classification of patients as per TIRADS score.

Tirads score	Number	%
1 (Non-suspicious)	1	2
2 (Benign)	21	39
3 (Mildy suspicious)	22	41
4 (Moderately suspicious)	10	18
5 (Highly suspicious)	0	0
Total	54	100

Table 4: Sensitivity of cytology and radiology taking histopathology as gold standard.

	Histopathological		Radiological (TIRADS)		FNAC (Bethesda)	
	True positive	Sensitivity	True positive	Sensitivity	True positive	Sensitivity
Benign	42	100%	42	95.45%	40	93.02%
Malignant	12	100%	7	77.78%	9	81.82%
Overall sensitivity	54	100%	52	96.29%	49	90.74%

Table 5: Specificity of cytology and radiology taking histopathology as gold standard.

	Histopathological		Radiological (TIRADS)		FNAC (Bethesda)	
	True negative	Specificity	True negative	Specificity	True positive	Sensitivity
Benign	42	100%	42	93.33%	40	95.24%
Malignant	12	100%	9	95.45%	9	93.02%
Overall sensitivity	54	100%	51	93.75%	49	95.24%

DISCUSSION

In this study 54 patients were operated for thyroid swelling. As shown in Table 1 the maximum number of patients in present study was of 30-40 years (30%). Of the fifty-four patients who presented with thyroid swelling, forty-five were females and 9 were males, with a striking female preponderance. The minimum age was 17 years. The maximum age was 70 years. In this study cases were 45 females and 9 were males and peak age of incidence was in 5th decade of life decade of life. The male to female ratio being 1:5.[22]

Research was done by UP Santosh et al which showed maximum number of patients in 21–30 years (37.4%).[6] According to study conducted by Kumari et al, also showed incidence was more in 30's and 40's of life age ranging from 31-40 years in about 44.4% patients of that study falling in this category the reason might be due to increased hormonal requirements in perimenopausal women's in this age group. In study done by Wani et al, Rout et al, Amjad et al and Gupta et al F:M ratio was 3.11:1, 2.3:1, 6.5:1 &11.5:1 respectively.[7-11]

FNAC done in 54 patients in thi study shows non-neoplastic benign lesions were present in 43 (80%) patients and 11 (20%) patients had neoplastic lesions. Non neoplastic (benign) is further divided into Goitre, Multinodular goitre, thyroiditis, colloid cyst, benign nodule, Adenoma, & nodular hyperplasia. Out of 11 patients with malignancy, 4 had follicular neoplasm and 7 had papillary carcinoma.

Patients with a benign report of cytology do not have cancer and may show a normal thyroid, a colloid nodule, lymphocytic thyroiditis, subacute thyroiditis, or other non-cancerous conditions. In contrast, patients with a suspicious (indeterminate) cytodiagnosis present specimens with hypercellularity and patterns indicative of follicular or Hurthle cell neoplasms, or atypical features that suggest malignancy but are not definitive. Patients with a malignant fnac has presence of malignant cells which can be characteristic for primary or metastatic thyroid carcinoma. This study is comparable to the one conducted by Padmawar et al, which shows their findings, they had 51 cases (89.47%) which were classified as benign, while 6 cases (10.52%) were identified as malignant from total of 57 patient studied.[12]

Our study is similar to the research done by Kaur et al, who examine 50 patients whose FNAC was benign in 32 (64%) patients, suspicious in 10 (20%) patients, malignant in 5 (10%) patients and inadequate in 3 (6%) patients.[13] Dorairajan et al and Jayashree N et al in their study of 100 cases showed in a solitary thyroid nodule FNAC has a significant role.[14] So as per their suggestion pre-operative fine needle aspiration cytology is a must for the diagnosis and deciding the line of treatment. The incidence of malignancy was highest in Gharib and Goellner et al series being 26.35%.[15] The incidence of benign thyroid swelling in retrospective research done by Looty et al was 76% (Table 6).[16]

After performing FNAC, we conducted an ultrasound (USG) in our study and analysed the results based on various sonographic factors to determine the TIRADS scoring for the nodules. Subtotal thyroidectomy was performed in one case. Our findings mark upto 0% malignancy risk for TIRADS 1 and TIRADS 2. The malignancy risks in our study were 2.2% for TIRADS 3, 38.5% for TIRADS 4, and 77.8% for TIRADS 5. Another analytical research done by Kwak et al, have showed 0%, 1.7%, 3.3-72.4% and 87.5% percentage of risk in TIRADS 2, TIRADS 3, TIRADS 4 & TIRADS 5 respectively.[17]

Moifeau et al, conducted a cross-sectional study aiming at evaluating the reliability and accuracy of the modified TIRADS classification by Ross et al for predicting thyroid severity (Table 7).[18]

They assessed 430 nodules, of which 23 (5.3%) were malignant. The malignancy risks for the TIRADS categories in their study were 0% for TIRADS 2, 2.2% for TIRADS 3, 5.9–57.9% for TIRADS 4, and 100% for TIRADS 5. Another Indian literature by Srinivas et al19 concluded that the malignancy risks for TIRADS categories 1, 2, 3, 4A, 4B, 4C, and 5 were 0%, 0%, 0.64%, 4.76%, 66.67%, 83.33%, and 100%, respectively. Our results align with the ranges reported by Horvath et al20, Kwak et al.17, Moifeau et al18, and other studies conducted in the Indian population (Table 7).

There were 14 patients having colloid goitre 11 patients has multinodular goitre, 2 patients had thyroiditis and 3 patients having benign nodule 4 have colloid cyst and 1 had nodular hyperplasia. Accounting to about 40%, 32%, 6%, 8%, 4% & 3% respectively for aforementioned

disorders. Among the benign cases, 4 patients (80%) had follicular adenoma, while 1 patient (20%) had Hurthle cell adenoma. In the group of 14 patients with malignant disease, 9 patients (65%) were diagnosed with papillary carcinoma, and 5 patients (35%) had follicular carcinoma.

Table 6: Comparison of cytology of our study with other studies.

FNAC	Present study	Gharib and Goellner et al[15]	Looty Hooft et al[16]	Kaur et al[13]
Benign	79.15%	69%	76%	64%
Malignant	8%	4%	1%	10%
Suspicious	11%	10%	16%	20%
Non-diagnostic	1.85%	17%	6%	6%

Table 7: Comparison of radiological outcomes of our study with other studies.

	Our study	Horvath et al[20]	Kwak et al[17]	Moifo et al[18]
TIRADS 1	0	0	0	0
TIRADS 2	0	0	0	0
TIRADS 3	9.25%	14.1%	1.7%	2.2%
TIRADS 4	74.07%	45%	3.3-72.4 %	5.9-57.9%
TIRADS 5	88%	89.6%	87.5%	100%

Table 8: Incidence of malignant thyroid lesions as seen in various studies.

Author	Year	Incidence
Fenn et al [21]	1980	12%
Gharib et al [15]	1984	26%
Yeung et al[25]	2007	5%
Park et al [26]	2015	17.30%
Patel et al [27]	2020	24.07%
Present study	2024	25.95%

The most frequent histopathological finding in our study was identified as colloid goiter, which accounted for 26% of the total cases. This finding was found to be consistent with the results of Fenn et al and Basharat et al, where 55.5% of patients were diagnosed with colloid goiter on histopathology.[21,22]

In research by Jena et al, involving 162 patients, the histopathological diagnoses shows 77 patients (52.7%) to have nodular goitre, 10 (6.8%) were showing to have Hashimoto's thyroiditis, 1 (0.7%) with toxic goitre, follicular carcinoma in 9 (6.3%), papillary carcinoma in 46 (31.5%), and medullary carcinoma in 3 (2.1%). Of the 146 patients with papillary carcinoma, 15 had the follicular variant.[23]

Furthermore, a study conducted by Borgohain reported 18% patients with nodular goitre, 5% showed to have Hashimoto's thyroiditis follicular carcinoma was seen in about 4%, papillary carcinoma in 10%, and only 3% showed to have medullary carcinoma of thyroid.[24]

The incidence of malignancy was highest in Gharib and Goellner 15 series being 26.35%, while the least being 5% Meei J Yeung 25 series. The incidence of malignancy in this study was 25.95% (Table 8). The incidence of malignancy in research done by Park et al, was 17.3% and Patel et al, was 24.07%.[26,27]

This shows that incidence of malignant aetiology and carcinoma cases increases day by day might be due to better facility and early recognition.

CONCLUSION

In general, thyroid swelling is easy to diagnose with clinical, radiological, cytological and histopathological tests. However, if there is any abnormality or confusion, a clinical-pathological and clinical-radiological discussion should be done to complete the diagnosis. Our study shows the importance of FNAC and Bethesda, USG and TIRADS as important tools for early detection of thyroid swelling and probable malignant aetiology. Recent trends in thyroid surgery show significant reduction of common laryngeal nerve and parathyroid problems. Therefore, we can provide a good quality of life for patients having thyroid swelling.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Prabha V, Bhuvaneswari MG. A study of histopathological spectrum of thyroid lesions: an observational study. Int J Sci Stud. 2019;7(1):1-4.
2. Kopperundevi V. Histopathological review of thyroid swellings a retrospective study. Int J Med Health Res. 2016;2(5):10-3.
3. Ramteke DJ, Mulay PS. Cyto-histopathological correlation of thyroid lesions. Int J Res Med Sci. 2017;5:1425-9.
4. Haugen BR, Alexander EK, Bible KC. American thyroid association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American thyroid association guidelines task force on thyroid nodules and differentiated thyroid cancer. Thyroid. 2016;26(1):12–6.
5. Mendes GF, Garcia MR, Falsarella PM, Rahal A, Cavalcante Junior FA, Nery DR, Garcia RG. Fine needle aspiration biopsy of thyroid nodule smaller than 1.0 cm: accuracy of TIRADS classification system in more than 1000 nodules. Br J Radiol. 2018;91(1083):20170642.
6. Santosh UP, Kumar SKB, Trupthi MC, Bobobalan S. A comprehensive approach to thyroid swellings: clinical, cytological, sonological and histopathological correlation. Otolaryngol Clin Int J. 2014;6(1):5-8.
7. Kumari K, Mrudula R. Solitary thyroid nodule: cytopathology and histopathology. Eur J Biomed Pharmaceut Sci. 2014;1(2):482-90.
8. Wani KA, Mustafa GH, Wani RA, Hussain Z, Arif SH, Malik AA, et al. Clinical study of neoplastic thyroid swellings with reference to surgical management. JK Pract. 2007;14(1):19-21.
9. Rout K, Ray CS, Behera SK, Biswal R. A comparative study of FNAC and histopathology of thyroid swellings. Indian J Otolaryngol Head Neck Surg. 2011;63(4):370-2.
10. Amjad KM, Abdul M, Moosabba MS, Manjula S, Pushpalatha P. A clinicopathological study and management of thyroid swelling. J Adv Res Biol Sci. 2011;3(1):1-5.
11. Gupta M, Gupta S, Gupta V. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodules. J Thyroid Res. 2010;1:37905.
12. Padmawar MR, Kher K, Kakade A. Clinicopathological study of multinodular goiter at AVBRH. Int J Biomed Adv Res. 2014;5(1):10-3.
13. Kaur K, Sonkhya N, Bapna A, Mital P. A comparative study of fine needle aspiration cytology, ultrasonography and radionuclide scan in the management of solitary thyroid nodule: a prospective analysis of 50 cases. Indian J Otolaryngol Head Neck Surg. 2002;54(2):96-101.
14. Dorairajan N, Jayashree N. Solitary thyroid nodules and role of fine needle aspiration cytology in diagnosis. J Indian Med Assoc. 1996;94(2):50-2.
15. Gharib H, Goellner JR. Fine needle aspiration biopsy of thyroid: an appraisal. Ann Intern Med. 1993;119:282-9.
16. Looty H. Practice, efficacy, cost of thyroid nodule evaluation, a retrospective study in a Dutch University Hospital. Thyroid. 2004;14(4):287-93.
17. Kwak JY, Han KH, Yoon JH, Moon HJ, Son EJ, Park SH, et al. Thyroid imaging reporting and data system for ultrasound features of nodules: a step in establishing better stratification of cancer risk. Radiol. 2011;260:892-9.
18. Moifo B, Takoeta EO, Tambe J, Blanc F, Fotsin JG. Reliability of thyroid imaging reporting and data system (TIRADS) classification in differentiating benign from malignant thyroid nodules. Open J Radiol. 2013;3:103.
19. Srinivas MN, Amogh VN, Gautam MS, Prathyusha IS, Vikram NR, Retnam MK, et al. A prospective study to evaluate the reliability of thyroid imaging reporting and data system in differentiation between benign and malignant thyroid lesions. J Clin Imaging Sci. 2016;6:5.
20. Horvath E, Majlis S, Rossi R, Franco C, Niedmann JP, Castro A, et al. An ultrasonogram reporting system for thyroid nodules stratifying cancer risk for clinical management. J Clin Endocrinol Metab. 2009;94(5):1748-51.
21. Fenn AS. Solitary nodule of thyroid gland. Indian J Surg. 1980;42:175-7.
22. Basharat R, Bukhari MH, Saeed S, Hamid T. Comparison of fine needle aspiration cytology and thyroid scan in solitary thyroid nodule. Patholog Res Int. 2011;2:7540-1.
23. Jena A, Patnayak R, Prakash J, Sachan A, SureshV LA. Malignancy in solitary thyroid nodule: a clinicoradiopathological evaluation. Indian J Endocr Metab. 2015;19(4):498-503.
24. Borgohain R, Lal RK, Chatterjee P, Brahma N, Khanna S. A study of cytohistological correlation in the diagnosis of thyroid swelling. IOSR J Dent Med Sci. 2014;13:46-9.
25. Yeung MJ, Serpell JW. Management of the solitary thyroid nodule. Oncologist. 2008;13(2):105-12.
26. Kim YA, Park YJ. Prevalence and risk factors of subclinical thyroid disease. Endocrinol Metab (Seoul). 2014;29(1):20-9.
27. Patel KN, Yip L, Lubitz CC, Grubbs EG, Miller BS, Shen W, et al. The American association of endocrine surgeon's guidelines for the definitive surgical management of thyroid disease in adults. Ann Surg. 2020;271(3):21-93.

Cite this article as: Sorathiya R, Nimavat S, Hirani N, Khilnani AK, Tank A, Patel M. Radiological, cytological & histopathological correlation in patients undergoing thyroid surgery at a tertiary care hospital in western Gujarat: a cross-sectional study. Int J Otorhinolaryngol Head Neck Surg 2025;11:28-33.