e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com doi: 10.25258/ijpqa.16.10.70

International Journal of Pharmaceutical Quality Assurance 2025; 16(10); 443-451

Original Research Article

Management Strategies, Associated Complications, and Prognostic Determinants in Thyroid Carcinoma: An observational analysis

Kumar Abhishek[1], Asha Jyoti[2], Richa Mishra[3], Akhilesh Kumar[4]

[1]Senior Resident, Department of General Surgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

[2]Junior Resident (3rd Years) Department of General Surgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

[3]Junior Resident (2nd Years), Department of General Surgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

[4]Junior Resident (2nd Years), Department of General Surgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

Received: 10-08-2025 / Revised: 22-09-2025 / Accepted: 28-10-2025

Corresponding Author: Dr. Asha Jyoti

Conflict of interest: Nil

Abstract:

Background: Thyroid carcinoma is the most common endocrine malignancy, exhibiting diverse histopathological patterns and variable prognostic outcomes. Early detection and risk-adapted management are essential to optimize long-term survival.

Aim: To evaluate the management strategies, associated complications, and prognostic determinants in patients with thyroid carcinoma.

Methodology: A hospital-based observational analytical study was conducted in the Department of General Surgery, IGIMS, Patna, including 90 histopathologically confirmed cases of thyroid carcinoma. Data on demographics, tumor characteristics, surgical and adjuvant treatment, complications, recurrence, and survival were analyzed.

Results: Most patients were middle-aged (31–50 years, 38.9%) with a slight male predominance (55.6%). Papillary carcinoma was the most common type (66.7%), and 44.4% were diagnosed at Stage I. Total thyroidectomy (61.1%) followed by thyroxine suppression therapy (77.8%) was the principal management approach. Postoperative complications were infrequent, with hypocalcemia being the most common (16.7%). Tumor size >2 cm, lymph node involvement, and aggressive histopathological variants were identified as major prognostic determinants. The overall recurrence rate was 10%, while 1-year and 3-year survival rates were 85% and 75%, respectively.

Conclusion: Early-stage tumors, smaller size, absence of nodal involvement, and non-aggressive histology are associated with favorable outcomes. A risk-stratified treatment approach—primarily total thyroidectomy with selective lymph node dissection and appropriate adjuvant therapy—remains essential for optimizing long-term disease control.

Keywords: Thyroid Carcinoma, Papillary Carcinoma, Total Thyroidectomy, Lymph Node Dissection, Prognostic Factors, Recurrence.

Introduction

Thyroid carcinoma is the commonest endocrine cancer that constitutes a significant percentage of head and neck cancer across the world [1]. Despite its minor percentage of all cancer occurrence, it has gained clinical significance because of the increased rate of detection, which has been significantly attributed to the high-resolution imaging modalities and the use of fine-needle aspiration cytology. Thyroid carcinoma has a wide histopathologic spectrum that includes differentiated thyroid carcinomas (DTCs) including papillary and follicular carcinoma, poorly differentiated and anaplastic carcinomas, and medullary thyroid carcinoma (MTC), which have varied biological behaviors, treatment response, and prognostic characteristics [2]. The heterogeneity of thyroid malignancy requires a personalized approach to its management, depending upon the tumor type, the stage, the age of the patient, and comorbidity, in order to maximize the results with minimum morbidity.

Surgical resection, either lobectomy to total thyroidectomy, usually accompanied with dissection

of the central or lateral neck lymph nodes (according to nodal involvement) is the first-line treatment approach in differentiated thyroid carcinoma [3]. The purpose of surgical intervention is to accomplish full tumor resection, postoperative treatment by radioactive iodine (RAI) therapy, and accurate follow-up using serum thyroglobulin levels. Radioactive Iodine ablation is an adjunctive treatment that follows surgery to eliminate remnant microscopic disease and decreases the risk of disease recurrence [4]. Additionally, external beam radiotherapy can be used selectively in cases of patients that have unresectable tumors or high-risk disease. In the case of medullary thyroid carcinoma, the standard treatment is total thyroidectomy with the lymph node excision since the disease is likely to metastasize at an early stage to the lymph nodes and the role of RAI therapy is minimal. New focused therapy, such as tyrosine kinase inhibitors and immune checkpoint inhibitors, has proven itself in advanced, RAI-refractory disease, which offers patients with progressive or metastatic carcinoma an alternative therapy.

Although the overall outlook of differentiated thyroid carcinoma is rather positive, complications associated with the treatment options are still a matter of significant concern [5]. Surgical side effects are recurrent laryngeal nerve damage resulting in vocal cord paralysis, hypoparathyroidism caused by unintentional removals of parathyroid glands, bleeding and wound infection. The effect of radioactive iodine therapy may be sialadenitis, xerostomia, altered taste, and in a few cases, secondary malignancies. External beam radiotherapy has the risks of tissue fibrosis, dysphagia, and the damage of other structures due to radiation. Aggressive tumor biology and low sensitivity to traditional interventions make the treatment of medullary and anaplastic thyroid carcinomas even more difficult, bringing up the necessity of multidisciplinary treatment and thorough risk-benefit evaluation of each treatment option [6].

Thyroid carcinoma is a multifactorial prognostic disease that encompasses the size of the tumor, histological type, extrathyroidal extension, lymph node involvement, distant metastasis and patient-related factors, including age and comorbidities [7]. The papillary thyroid carcinoma is largely characterized by indolent behavior and high rates of survival and anaplastic thyroid carcinoma has a grim prognosis since it progresses rapidly and is resistant to standard treatments. Such molecular markers, such as BRAF, RAS, RET/PTC rearrangements, and TERT promoter mutations, have become the key factors to determine the aggressiveness of tumors, which can be used to predict their progression and apply the personalized treatment regime [8]. Risk stratification using these parameters should be accurately identified to maximize patient outcomes, reduce unnecessary treatments, and select patients to undergo new targeted treatments.

Over the past few years, the management of thyroid carcinoma has undergone changes due to the development of new diagnostic imaging, molecular profiling and minimally invasive surgery methods. Preoperative assessment, staging, and recurrence identification can be done exactly with the use of high-resolution ultrasound, computed tomography, magnetic resonance imaging, and positron emission tomography. At the same time, molecular diagnostics and next-generation sequencing have strengthened the knowledge of tumor biology, making a more personalized approach to therapy possible. Even in light of these developments, there are still difficulties in managing the issue between good treatment and good-of-life, especially in older patients, or patients with comorbidities, and the concept of multidisciplinary management with endocrinologists, surgeons, oncologists, radiologists, and nuclear medicine specialists is essential.

Methodology

Study Design: This study was designed as a hospital-based observational analytical study aimed at evaluating the management strategies, associated complications and prognostic determinants in patients diagnosed with thyroid carcinoma. The study incorporated both retrospective and prospective data collection to provide a comprehensive understanding of treatment outcomes and factors affecting prognosis.

Study Area: The study was conducted in the Department of General Surgery, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India in association with department of surgical oncology team with dedicated facilities for the management of endocrine malignancies, including thyroid carcinoma.

Study Duration: The study was carried out over a period of three years ensure sufficient patient recruitment and follow-up.

Study Participants

Inclusion Criteria:

- Patients of all ages and both sexes with histopathologically confirmed thyroid carcinoma
- Patients undergoing surgical and/or adjuvant treatment at IGIMS
- Patients providing informed consent

Exclusion Criteria:

- Incomplete or missing medical records
- Patients lost to follow-up
- Presence of other concurrent malignancies

- Severe systemic illnesses likely to influence treatment outcomes

Sample Size: A total of 90 patients meeting the inclusion criteria were enrolled consecutively during the study period.

Procedure: All patients underwent a comprehensive preoperative evaluation, including clinical examination, thyroid function tests, ultrasonography, and fine-needle aspiration cytology.

Surgical management followed standard institutional protocols and included total thyroidectomy or hemithyroidectomy, with or without central/lateral lymph node dissection, depending on the AJCC TNM staging system.

- **Postoperative complication management included:**
    - **Hypocalcemia:** managed with oral/IV calcium supplementation and Vitamin D analogs.
    - **Recurrent laryngeal nerve (RLN) injury:** assessed using postoperative laryngoscopy; managed conservatively or referred to ENT as required.
    - **Hemorrhage:** monitored through drain output and clinical examination; surgical re-exploration performed when indicated.
    - **Infection:** treated with empirical or culture-directed antibiotics.
- **Adjuvant therapy administration criteria:**

Adjuvant treatment decisions were made according to:

- American Thyroid Association (ATA) Risk Stratification System (low, intermediate, high risk)
- AJCC 8th edition TNM staging

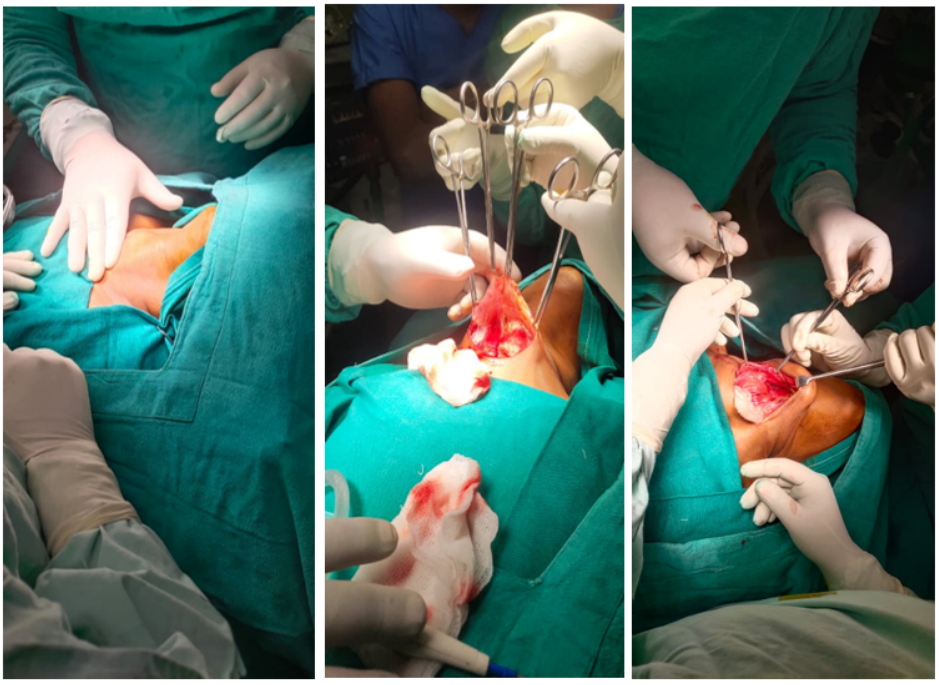
- **Based on risk:**
    - Radioactive iodine (RAI) ablation was offered to intermediate- and high-risk patients.
    - Thyroxine suppression therapy was given to all patients, with TSH targets adjusted according to risk category
- **Follow-up protocol:**

Patients were followed up:

- Every 6 months for the first 2 years, and
- Annually thereafter

Evaluation included clinical examination, ultrasound of the neck, serum thyroglobulin levels (if applicable), and assessment for recurrence or metastasis.

Statistical Analysis: Data were entered and analyzed using SPSS version 27.0. Descriptive statistics (mean, standard deviation, frequency, and percentages) were used to summarize baseline characteristics. Comparative analyses were performed using the Chi-square test, t-test, and ANOVA wherever applicable. Survival outcomes were assessed using Kaplan-Meier survival analysis, and prognostic determinants were evaluated using Cox proportional hazards regression models. A p-value <0.05 was considered statistically significant.



(A) Palpation of thyroid swelling (B) Superficial dissection (C) Identification of arteries and nerves around thyroid

Figure 1:

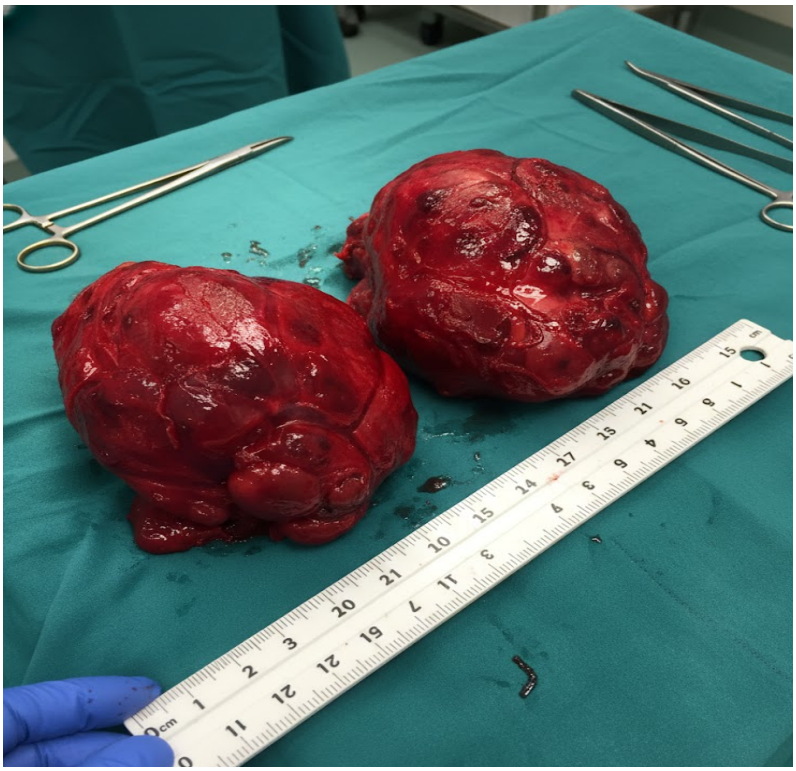


Figure 2: Total thyroidectomy specimen

Result

Table 1 shows that the study population was predominantly middle-aged, with the highest proportion of patients belonging to the 31–50-year age group (38.9%), followed by those aged 51–70 years (33.3%). A smaller fraction included young adults below 30 years (16.7%) and elderly individuals above 70 years (11.1%). There was a slight male predominance (55.6%). Clinically, most patients presented with neck swelling (77.8%), which emerged as the primary complaint, while dysphagia (27.8%) and hoarseness of voice (16.7%) were less common. Only a minority (11.1%) displayed non-specific symptoms such as weight

loss, thyroid dysfunction features, or shortness of breath. Overall, these findings indicate that thyroid malignancy in this cohort predominantly occurred in middle-aged males and typically manifested as visible neck swelling.

Table 1: Demographic and Clinical Characteristics of Study Participants (n = 90)		
Characteristic	**Frequency (n)**	**Percentage (%)**
Age (years)		
<30	15	16.7
31–50	35	38.9
51–70	30	33.3
>70	10	11.1
Sex		
Male	50	55.6
Female	40	44.4
Presenting Symptoms		
Neck swelling	70	77.8
Dysphagia	25	27.8
Hoarseness	15	16.7
Others	10	11.1

Table 2 describes the key tumor-related characteristics of the study population. Papillary carcinoma emerged as the predominant histopathological type, accounting for 66.7% of cases, followed by follicular (16.7%), medullary (11.1%), and anaplastic carcinoma (5.5%), indicating that most patients presented with differentiated thyroid cancer. Tumor size analysis showed that 44.4% of tumors measured between 2.1–4 cm, while 38.9% were ≤2 cm and 16.7% exceeded 4 cm, reflecting a moderate tumor burden in the cohort. Lymph node involvement was identified in 33.3% of patients, whereas 66.7% had no nodal metastasis, suggesting that two-thirds of the tumors were confined without regional spread.

Table 2: Tumor Characteristics		
Tumor Feature	**Frequency (n)**	**Percentage (%)**
Histopathological Type		
Papillary	60	66.7
Follicular	15	16.7
Medullary	10	11.1
Anaplastic	5	5.5
Tumor Size (cm)		
≤2	35	38.9
2.1–4	40	44.4
>4	15	16.7
Lymph Node Involvement		
Present	30	33.3
Absent	60	66.7

Table 3 show age-stratified staging of 90 patients, interpreted as per AJCC 8th edition guidelines, shows a clear distinction between younger and older age groups. Among patients below 55 years (n=50), staging was limited to only two categories, with the vast majority falling under Stage I (94%; 47 patients), reflecting localized disease without distant metastasis, while only 3 patients (6%) were classified as Stage II due to metastatic spread. In contrast, patients aged 55 years and above (n=40) demonstrated a wider distribution across the four staging categories permitted for this age group, indicating more advanced disease patterns with increasing age. In this group, Stage I included 15 patients (37.5%), Stage II comprised 12 patients (30%), Stage III involved 8 patients (20%), and Stage IV accounted for 5 patients (12.5%). Overall, when combining both age groups, 62 patients were categorized as Stage I, 15 as Stage II, 8 as Stage III, and 5 as Stage IV. This distribution highlights that younger patients predominantly present with early-stage disease, while older patients are more likely to exhibit advanced tumor stages, underscoring the prognostic significance of age in differentiated thyroid carcinoma.

Table 3: Age-Specific Staging Distribution of Differentiated Thyroid Carcinoma					
Age Group	**Stage I**	**Stage II**	**Stage III**	**Stage IV**	**Total**
<55 years (n=50)	47	3	—	—	50
≥55 years (n=40)	15	12	8	5	40
Total	**62**	**15**	**8**	**5**	**90**

Table 4 summarizes the management strategies adopted for the 90 patients. Total thyroidectomy was the most frequently performed surgical procedure, accounting for 61.1% of cases, while 38.9% underwent hemithyroidectomy. Lymph node dissection was carried out in 33.3% of patients, whereas 66.7% did not require nodal clearance. Among adjuvant therapies, thyroxine suppression was the predominant modality, administered to 77.8% of patients, reflecting its key role in postoperative management. Radioactive iodine (RAI) therapy was provided to 16.7% of patients, and other supportive or additional treatments were used in 5.5% of cases. Overall, most patients received comprehensive management involving surgery with appropriate postoperative therapy.

Table 4: Management Strategies Adopted		
Management Modality	**Frequency (n)**	**Percentage (%)**
Type of Surgery		
Total Thyroidectomy	55	61.1
Hemithyroidectomy	35	38.9
Lymph Node Dissection		
Performed	30	33.3
None	60	66.7
Adjuvant Therapy		
Radioactive Iodine Therapy	15	16.7
Thyroxine Suppression Therapy	70	77.8
Others	5	5.5

Table 5 presents the postoperative complications observed in the study population. Hypocalcemia emerged as the most common complication, affecting 15 patients (16.7%), likely due to parathyroid gland handling during thyroid surgery. Recurrent laryngeal nerve injury was noted in 8 patients (8.9%), reflecting a significant but expected surgical risk that can impact postoperative voice quality. Wound infection occurred in 7 patients (7.8%), while postoperative hemorrhage was reported in 5 patients (5.5%), both representing important but manageable complications. Additionally, 3 patients (3.3%) experienced other less frequent complications, such as hypothyroidism or airway-related issues, indicating that overall complication rates remained relatively low and largely within expected clinical limits.

Table 5: Postoperative Complications		
Complication	**Frequency (n)**	**Percentage (%)**
Hypocalcemia	15	16.7
Recurrent Laryngeal Nerve Injury	8	8.9
Hemorrhage	5	5.5
Wound Infection	7	7.8
Others	3	3.3

Table 6 presents the prognostic determinants and follow-up outcomes of the study population. Tumor size showed a clear association with recurrence, as only 2 cases recurred among tumors ≤2 cm, whereas 7 recurrences occurred in tumors >2 cm, indicating a higher risk with increasing size. Lymph node involvement also influenced prognosis, with 5 recurrences among node-positive patients, while 4 recurrences were noted even among node-negative cases. Histopathologically aggressive variants i.e. anaplatic, tall cell variant of papillary carcinoma accounted for 16.7% of the cohort, of which 10 patients demonstrated poor prognosis. The overall corrected recurrence rate was 10% (9 out of 90). Survival outcomes were favorable, with 85% survival at one year and 75% at three years, reflecting generally good long-term outcomes despite the impact of tumor size, nodal status, and aggressive histology.

Table 6: Prognostic Determinants and Follow-up Outcomes			
Prognostic Factor	**Frequency (n)**	**Percentage (%)**	**Outcome/Follow-up**
Tumor Size ≤2 cm	35	38.9	Disease-free: 33 (Recurrence: 2)
Tumor Size >2 cm	55	61.1	Recurrence: 7
Lymph Node Involvement: Present	30	33.3	Disease-free: 25 (Recurrence: 5)
Lymph Node Involvement: Absent	60	66.7	Recurrence: 4
Histopathological Aggressiveness	15	16.7	Poor Prognosis: 10
Recurrence Rate	9	10%	—
Survival at 1 year	—	—	85%
Survival at 3 years	—	—	75%

Discussion

The present analysis of 90 patients with thyroid carcinoma highlights important trends in demographic distribution, tumor characteristics, treatment patterns, postoperative outcomes, and prognostic determinants. Consistent with previous studies, our cohort was predominantly composed of middle-aged adults, with neck swelling being the most common presenting symptom, while dysphagia and hoarseness were uncommon. Similar findings were reported by Sebastian et al. (2000) [9], who noted that neck swelling is the typical initial manifestation of papillary thyroid carcinoma (PTC), whereas compressive symptoms arise mainly in advanced disease.

Histopathological evaluation in our study showed that papillary carcinoma was the most prevalent type, followed by follicular, medullary, and a very small proportion of anaplastic carcinoma. Within PTC, the presence of aggressive histological variants such as tall-cell, columnar, and hobnail variants is known to significantly influence prognosis. These subtypes are associated with higher rates of extrathyroidal extension, nodal metastasis, and recurrence compared to classical PTC. Studies by Ito et al. and Lam et al. have documented recurrence rates up to 20–30% in aggressive variants, far exceeding those seen in classical PTC. Although our dataset contained only a limited number of such variants, their recognition remains essential for accurate risk stratification and postoperative planning. The overall pattern of histological distribution in our cohort aligns with Bilimoria et al. (2007) [10], who also reported papillary carcinoma as the predominant global subtype.

Tumor size distribution in our population, with most tumors measuring 2.1–4 cm, and lymph node involvement in one-third of patients, corresponds with established literature. Machens et al. (2005) [11] have previously demonstrated that tumor size (>2 cm) and nodal involvement are major prognostic determinants. Our findings also support observations by Durante et al. (2006) [12], who reported excellent long-term outcomes for patients with small, node-negative differentiated thyroid carcinoma (DTC), reflecting the favorable biology of early-stage disease.

Surgical management in our study primarily involved total thyroidectomy, with hemithyroidectomy performed in selected cases. Patients with nodal metastases underwent selective lymph node dissection, in accordance with contemporary guidelines. Machens et al. (2005) [11] highlighted the superior disease-control benefits of total thyroidectomy in tumors >1 cm or in the presence of lymph node involvement. Conversely, Francis et al. (2015) [13] reported that lobectomy may be adequate for low-risk, small, unifocal tumors without nodal metastasis. Our postoperative complication rate was low, with transient hypocalcemia being the most common—an observation consistent with Sebastian et al. (2000) [9], who reported a similar safety profile in high-volume thyroid surgery centers.

In our cohort, the recurrence rate was 10% (9 out of 90 patients). Recurrence occurred primarily in individuals with larger tumors (>2 cm), nodal involvement, or more aggressive histopathological patterns—reflecting well-recognized high-risk features. This aligns closely with Vorburger et al. (2009) [14], who reported a recurrence rate of approximately 10% in DTC. Similarly, Miyauchi et al. (2023) [15] reaffirmed that tumor size >2 cm and lymph node metastasis significantly increase the risk of recurrence. This reinforces the central role of tumor burden and nodal status in prognostication.

When compared to studies on papillary thyroid microcarcinoma, such as the report by Choi et al. (2020) [16], where lobectomy is often sufficient even with occult nodal metastasis, our cohort represented a group with larger tumors and a higher nodal burden—supporting the need for more comprehensive surgery. Follicular carcinoma, although less common, showed favorable outcomes in our study, consistent with Janovitz and Barletta (2018) [17], who emphasized the effectiveness of appropriate surgical intervention and adjuvant therapy even in certain aggressive variants.

Recently recognized prognostic factors such as total tumor diameter (TTD), tumor multifocality, and their impact on recurrence have received increased attention. Xu et al. (2023) [18] noted that

multifocality increases recurrence risk even when individual nodules are small. Although our study did not extensively evaluate these parameters, the observed recurrence pattern and nodal involvement highlight the importance of assessing complete tumor burden during surgical planning.

Adjuvant therapy plays a crucial role in improving long-term outcomes. Radioactive iodine (RAI) ablation is recommended for intermediate- and high-risk DTC, particularly in the presence of nodal metastasis, extrathyroidal extension, or aggressive histologic variants. Several studies, including those by Sawka et al. and Sacks et al., have demonstrated improved disease-free survival with selective RAI use. Thyroxine suppression therapy also remains a cornerstone in management by lowering TSH levels, thereby reducing recurrence risk. Our treatment strategy, which included adjuvant therapy for selected high-risk patients, is consistent with these established findings.

Overall, our results reinforce the importance of tumor size, lymph node status, histologic subtype, and surgical extent as key prognostic determinants in thyroid carcinoma. Total thyroidectomy with appropriate lymph node dissection, supported by selective use of RAI and TSH suppression, remains effective for disease control and survival in moderate- to high-risk groups. However, less extensive surgery may be suitable for small, low-risk, unifocal, node-negative disease, emphasizing the need for individualized treatment. Study limitations include the relatively short follow-up period and lack of detailed assessment of molecular markers, multifocality, and extrathyroidal extension, which could further refine prognostic accuracy in future research.

Conclusion

This study of 90 patients with thyroid carcinoma demonstrates that early detection and individualized management are pivotal for favorable outcomes. Papillary carcinoma was the most common histopathological type, predominantly presenting as neck swelling in middle-aged adults, with a slight male predominance. Total thyroidectomy, often combined with selective lymph node dissection and thyroxine suppression therapy, proved to be the primary and effective management strategy, with relatively low postoperative complication rates. Tumor size, lymph node involvement, and histopathological aggressiveness emerged as significant prognostic determinants, influencing recurrence and survival. Overall, patients with smaller, node-negative, and less aggressive tumors exhibited excellent disease-free survival, reinforcing the importance of risk-stratified surgical and adjuvant interventions to optimize patient outcomes while minimizing morbidity.

References

1. Pizzato M, Li M, Vignat J, Laversanne M, Singh D, La Vecchia C, Vaccarella S. The epidemiological landscape of thyroid cancer worldwide: GLOBOCAN estimates for incidence and mortality rates in 2020. The lancet Diabetes & endocrinology. 2022 Apr 1;10(4):264-72. DOI: 10.1016/S2213-8587(22)00035-3
2. Cracolici V, Cipriani NA. High-grade non-anaplastic thyroid carcinomas of follicular cell origin: a review of poorly differentiated and high-grade differentiated carcinomas. Endocrine Pathology. 2023 Mar;34(1):34-47. DOIhttps://doi.org/10.1007/s12022-023-09752-6
3. Conzo G, Avenia N, Bellastella G, Candela G, de Bellis A, Esposito K, Pasquali D, Polistena A, Santini L, Sinisi AA. The role of surgery in the current management of differentiated thyroid cancer. Endocrine. 2014 Nov;47(2):380-8. DOIhttps://doi.org/10.1007/s12020-014-0251-9
4. Kim SK, Woo JW, Lee JH, Park I, Choe JH, Kim JH, Kim JS. Radioactive iodine ablation may not decrease the risk of recurrence in intermediate-risk papillary thyroid carcinoma. Endocrine-related cancer. 2016 May 1;23(5):367-76. DOI: https://doi.org/10.1530/ERC-15-
5. Coca-Pelaz A, Rodrigo JP, Shah JP, Nixon IJ, Hartl DM, Robbins KT, Kowalski LP, Mäkitie AA, Hamoir M, López F, Saba NF. Recurrent differentiated thyroid cancer: the current treatment options. Cancers. 2023 May 10;15(10):2692. https://doi.org/10.3390/cancers15102692
6. Molinaro E, Romei C, Biagini A, Sabini E, Agate L, Mazzeo S, Materazzi G, Sellari-Franceschini S, Ribechini A, Torregrossa L, Basolo F. Anaplastic thyroid carcinoma: from clinicopathology to genetics and advanced therapies. Nature Reviews Endocrinology. 2017 Nov;13(11):644-60. DOIhttps://doi.org/10.1038/nrendo.2017.76
7. Trinh NT. Prognostic Factors for Persistent or Recurrent Disease in Differentiated Thyroid Cancer: A Systematic Review. PQDT-Global. 2022.
8. D'Cruz AK, Vaish R, Vaidya A, Nixon IJ, Williams MD, Vander Poorten V, López F, Angelos P, Shaha AR, Khafif A, Skalova A. Molecular markers in well-differentiated thyroid cancer. European Archives of Oto-Rhino-Laryngology. 2018 Jun;275(6):1375-84. https://doi.org/10.1007/s00405-018-4944-1
9. Sebastian SO, Gonzalez JR, Paricio PP, Perez JS, Flores DP, Madrona AP, Romero PR, Tebar FJ. Papillary thyroid carcinoma: prognostic

index for survival including the histological variety. Archives of Surgery. 2000 Mar 1;135(3):272-7.
10. Bilimoria KY, Bentrem DJ, Ko CY, Stewart AK, Winchester DP, Talamonti MS, Sturgeon C. Extent of surgery affects survival for papillary thyroid cancer. Annals of surgery. 2007 Sep 1;246(3):375-84. DOI: 10.1097/SLA.0b013e31814697d9
11. Machens A, Holzhausen HJ, Dralle H. The prognostic value of primary tumor size in papillary and follicular thyroid carcinoma: a comparative analysis. Cancer: Interdisciplinary International Journal of the American Cancer Society. 2005 Jun 1;103(11):2269-73. https://doi.org/10.1002/cncr.21055
12. Durante C, Haddy N, Baudin E, Leboulleux S, Hartl D, Travagli JP, Caillou B, Ricard M, Lumbroso JD, De Vathaire F, Schlumberger M. Long-term outcome of 444 patients with distant metastases from papillary and follicular thyroid carcinoma: benefits and limits of radioiodine therapy. The Journal of Clinical Endocrinology & Metabolism. 2006 Aug 1;91(8):2892-9. https://doi.org/10.1210/jc.2005-2838
13. Francis GL, Waguespack SG, Bauer AJ, Angelos P, Benvenga S, Cerutti JM, Dinauer CA, Hamilton J, Hay ID, Luster M, Parisi MT. Management guidelines for children with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on pediatric thyroid cancer. Thyroid. 2015 Jul 1;25(7):716-59. https://doi.org/10.1089/thy.2014.0460
14. Vorburger SA, Übersax L, Schmid SW, Balli M, Candinas D, Seiler CA. Long-term follow-up after complete resection of well-differentiated cancer confined to the thyroid gland. Annals of surgical oncology. 2009 Oct;16(10):2862-74. DOIhttps://doi.org/10.1245/s10434-009-0592-4
15. Miyauchi A, Ito Y, Fujishima M, Miya A, Onoda N, Kihara M, Higashiyama T, Masuoka H, Kawano S, Sasaki T, Nishikawa M. Long-term outcomes of active surveillance and immediate surgery for adult patients with low-risk papillary thyroid microcarcinoma: 30-year experience. Thyroid. 2023 Jul 1;33(7):817-25. https://doi.org/10.1089/thy.2023.0076
16. Choi SM, Kim JK, Lee CR, Lee J, Jeong JJ, Nam KH, Chung WY, Kang SW. Completion total thyroidectomy is not necessary for papillary thyroid microcarcinoma with Occult Central Lymph Node Metastasis: a long-term serial Follow-Up. Cancers. 2020 Oct 18;12(10):3032. https://doi.org/10.3390/cancers12103032
17. Janovitz T, Barletta JA. Clinically relevant prognostic parameters in differentiated thyroid carcinoma. Endocrine pathology. 2018 Dec;29(4):357-64. DOIhttps://doi.org/10.1007/s12022-018-9548-1
18. Xu S, Huang H, Dong H, Wang X, Xu Z, Liu S, Liu J. Association between surgical extent and recurrence in unilateral intermediate-to high-risk papillary thyroid cancer. BMC cancer. 2023 Sep 18;23(1):880. DOIhttps://doi.org/10.1186/s12885-023-11307-1