Original Article

Pattern of Neck Metastasis in Carcinoma of the Thyroid: A Clinical and Pathological Study

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Abstract

Background: *Differentiated thyroid carcinoma (DTC), comprising papillary and follicular types, is the most common thyroid malignancy, exhibiting diverse clinical and metastatic characteristics.*

Objective: *To assess the clinic-pathological features, FNAC findings, metastatic patterns, and surgical outcomes in patients with DTC.*

Materials and Methods: *A retrospective observational study was performed on 40 patients diagnosed with DTC who underwent thyroid surgery at a tertiary care center between June 2022 to December 2024. Patient records were reviewed for demographic data, clinical presentation, FNAC results, histopathology, lymph node involvement, metastasis, and intraoperative findings.*

Results: *Most patients were aged 31–50 years, with a mean age of 37 years. Papillary carcinoma was predominant (72.5%), followed by follicular carcinoma (27.5%). Thyroid swelling was the chief presenting symptom (91%). FNAC accurately diagnosed papillary carcinoma as malignant in 90% of cases, whereas follicular lesions were frequently reported as adenomas or suspicious. Cervical lymph node metastasis occurred more in papillary carcinoma (41%) compared to follicular carcinoma (11%), while distant metastases were more common in follicular carcinoma (27%). Local invasion was noted in 10% of patients, mainly among follicular carcinoma cases.*

Conclusion: *Papillary thyroid carcinoma predominates among DTC cases with a higher propensity for lymphatic spread, whereas follicular carcinoma is more associated with local and distant invasion. FNAC remains reliable for diagnosing papillary carcinoma but is limited in follicular tumors. Comprehensive surgical and histopathological assessment is essential for accurate staging and management.*

Keywords: *Neck Metastasis, Papillary Carcinoma, Differentiated Thyroid Carcinoma, Follicular Carcinoma.*

Introduction

Papillary thyroid carcinoma (PTC) is the most common form of differentiated thyroid cancer, accounting for approximately 80–85% of all thyroid malignancies worldwide.[1] Although it typically has an excellent prognosis—with 10-year survival rates exceeding 90%—it frequently presents with regional lymph node metastasis, particularly to the central (level VI) and lateral (levels II–V) cervical compartments.[2,3] The incidence of lymph node metastasis in PTC ranges from 30% to 80%, and even higher in microscopic or occult disease.[4]

While regional lymph node metastasis has a limited impact on overall survival, it is associated with an increased risk of local recurrence, necessitating more aggressive surgical management and closer follow-up.[5] Metastasis to the central compartment is often the first site of spread, but skip metastasis—defined as lateral neck node involvement without central node involvement—has been reported in 6–20% of cases and may be more common in tumors located in the upper pole of the thyroid.[6,7]

Understanding the pattern and distribution of cervical lymph node metastases is essential for appropriate surgical planning, including decisions regarding prophylactic versus therapeutic neck dissection. Identifying patients at higher risk of lateral or skip metastasis may help optimize oncologic outcomes and reduce recurrence rates.[8] Therefore, this study aims to evaluate the pattern of neck metastasis in patients with papillary thyroid carcinoma to better guide clinical decision-making and surgical strategies.

Materials and Methods

This retrospective observational study was conducted in the Department of ENT & Head-Neck Surgery at Enam Medical College Hospital. Medical records of 40 patients diagnosed with papillary thyroid carcinoma (PTC) between June 2022 to December 2024were reviewed. All patients had undergone total thyroidectomy with central neck dissection. Lateral neck dissection was selectively performed in cases where clinical examination or imaging (ultrasound or computed tomography) suggested lateral cervical lymph node involvement. Inclusion criteria for the study were histologically confirmed PTC, total thyroidectomy with central ± lateral neck dissection, and availability of preoperative imaging (ultrasonography and/or CT scan). Patients were excluded if they had incomplete clinical records, previous thyroid or neck surgery at another institution, or non-PTC histology. Detailed clinical histories were obtained from all patients. Information was recorded regarding thyroid swelling and its duration, presence of other neck swellings, symptoms such as dysphagia, dyspnea, hoarseness of voice, neck pain, cough, and history of thyroid disease or prior head and neck irradiation. A comprehensive head and neck examination was carried out with particular focus on the thyroid region and cervical lymph nodes. Indirect or fiberoptic laryngoscopy was routinely performed to assess vocal cord mobility. Preoperative investigations included fine-needle aspiration cytology (FNAC) of thyroid nodules and suspicious lymph nodes, thyroid hormone levels, and ultrasonographic evaluation. Additional imaging such as neck or chest X-ray, bone scans, CT scans, or MRI was performed in selected cases to determine disease extent.

Surgical management was individualized based on tumor staging and associated risk factors. Under general anesthesia, intraoperative palpation of the neck was done to identify additional lymphadenopathy. Surgical specimens—including thyroid tissue, lymph nodes, and surrounding soft tissue—were sent for histopathological evaluation. Four patients with distant metastases were subsequently treated with radioactive iodine (RAI) ablation therapy. Data were collected using a structured data form, which included demographic information, tumor size, capsular invasion, lymph node involvement at various neck levels, and the presence of skip metastasis (lateral lymph node metastasis in the absence of central involvement). All data were analyzed using SPSS software version 25.0. Categorical variables were compared using the Chi-square test or Fisher's exact test where appropriate, and a p-value of <0.05 was considered statistically significant.

Results

Results were compiled and presented in tabular and graphical formats.

Table-I: Age Distribution of Patients with DTC (N = 70)

Age Group (Years)	Number of Patients	Percentage (%)
0–10	4	10.0
11–20	2	5.0
21–30	5	12.5
31–40	12	30.0
41–50	11	27.5
51–60	4	10.0
61–70	2	5.0
Total	**40**	**100%**

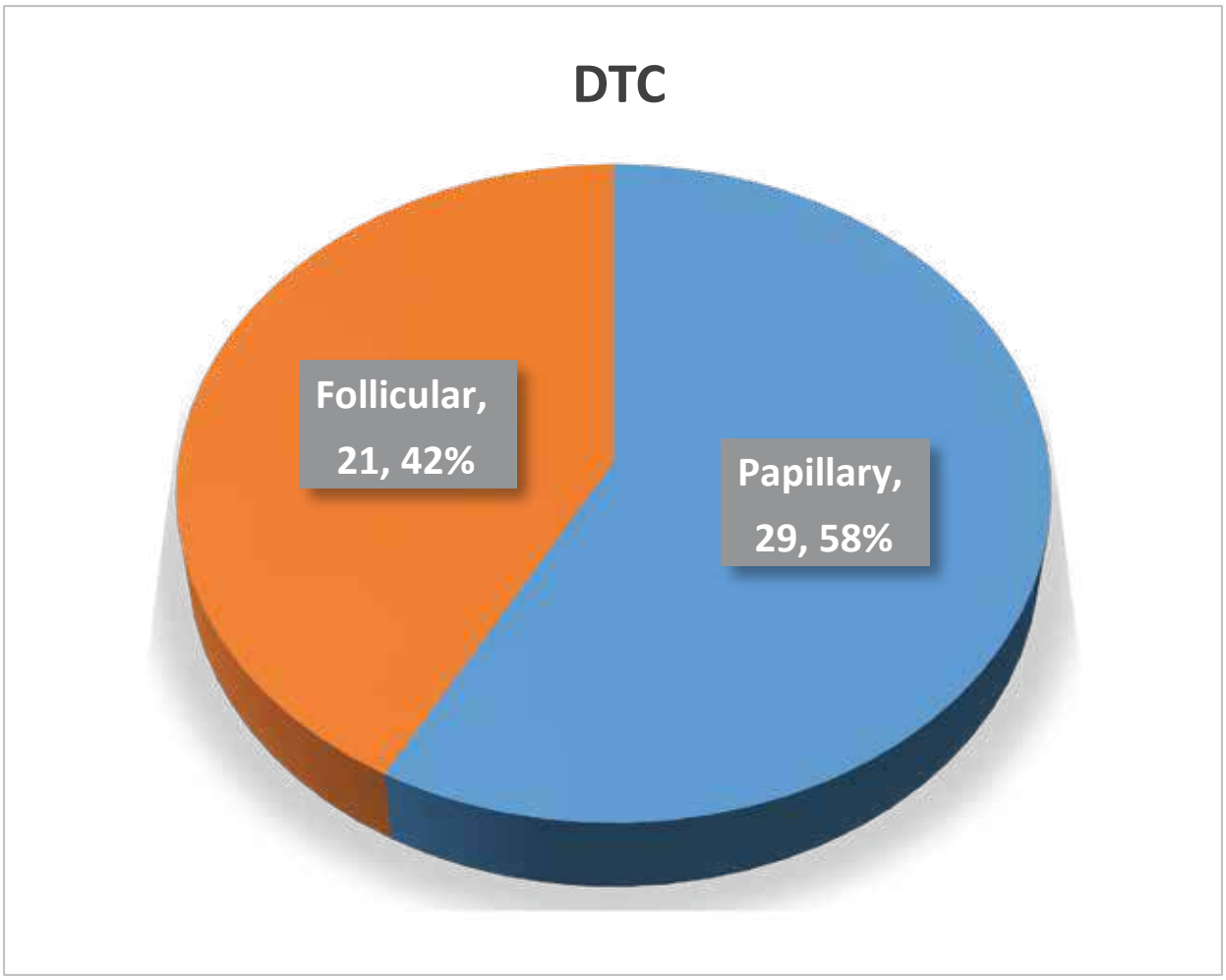

Figure -1: Distribution by Type of DTC (N = 40)

Table-II: Presenting Symptoms of Patients on Admission (N = 40)

Symptoms	Average Duration (months)	Number of Patients	Percentage (%)
Thyroid Swelling	5	37	92.5
Cervical Lymphadenopathy	3	13	32.5
Dysphagia	1	2	5.0
Pain in Neck	1	3	7.5
Bony Swelling	1	1	2.5
Total	–	–	**>100%***

*Percentage exceeds 100% because many patients had multiple presenting symptoms.

Table-III: Histological Type of Differentiated Thyroid Carcinoma (DTC) Based on Postoperative Histopathology (N = 40)

Type of Malignancy	Number of Patients	Percentage (%)
Papillary Type (Total)	**29**	**72.5**
• Pure Papillary	26	65.0
• Mixed Papillary -Follicular	2	5.0
• Follicular Variant of Papillary	1	2.5
Follicular Type (Total)	11	27.5
• Pure Follicular	10	25.0
• Hürthle Cell Variant of Follicular	1	2.5
Total	**40**	**100%**

Table-IV: FNAC Findings of Differentiated Thyroid Carcinoma (DTC) from Thyroid (N = 40)

Type	Malignant	Adenoma	Suspicious	Total
Papillary	27	0	3	30
Follicular	0	8	2	10
Total	**27**	**8**	**5**	**40**

Table V: FNAC Findings of Cervical Lymph Nodes in DTC (N = 40)

Parameter	Number of Patients	Percentage (%)
FNAC performed	13	–
• Positive for malignancy	9	69.2
• Negative for malignancy	1	7.7
• Suspicious	3	23.1
• **Total Patients**	**40**	**100%**

Table VI: Cervical Lymph Node Metastasis in DTC (N = 40)

Type of DTC	Number of Patients	Cervical LN Metastasis Present	No Metastasis	Percentage (%) with Metastasis
Papillary	29	12	17	41.38
Follicular	11	1	10	9.09
Total	**40**	**13**	**27**	**32.5**

Table VII: Distant Metastasis in DTC (N = 40)

Type of DTC	Number of Patients	Distant Metastasis Present	No Distant Metastasis	Percentage (%)
Papillary	29	1	28	3.45
Follicular	11	3	8	27.27
Total	**40**	**4**	**36**	**10.0**

Table VIII: Overall Metastasis (Cervical + Distant) in DTC (N = 40)

Type of DTC	Number of Patients	Metastasis Present	Metastasis Absent	Percentage (%)
Papillary	29	13	16	44.83
Follicular	11	4	7	36.36
Total	**40**	**17**	**23**	**42.5**

Table IX: Levels of Cervical Lymph Node Involvement in DTC (40 → 13 patients)

Lymph Node Level	Pattern of Involvement	Number of Patients	Percentage (%) of Node - positive Patients
Level I	I + II	1	7.7
	Only II	3	23.1
Level II	II + III + IV	3	23.1
	Only III	2	15.4
Level III	III + II + IV + V	4	30.8
	Only IV	1	7.7
Level IV	IV + III + V + VI	2	15.4
	V + III + IV + VI	2	15.4
Level V	Only VI	1	7.7
	VI + III	1	7.7
Level VI	I + II	1	7.7
	Only II	3	23.1

In the 40-patient sample of DTC, 13 patients (32.5%) had cervical lymph node metastasis. Among them, the most commonly involved levels were Level III (alone or in combination), Level II, and Level IV. Multilevel involvement (e.g., II+III+IV, III+II+IV+V) was more frequent than isolated node involvement, indicating a tendency for widespread nodal spread in metastatic cases.

Table X: Local findings during Thyroid Surgery in DTC (N = 40)

Type of DTC	Total Patients	Surgery Done	Local Invasion Found	No Local Invasion
Papillary	29	29	1	28
Follicular	11	11	3	8
Total	40	40	4	36

This table summarizes local invasion findings during thyroid surgery in 40 patients with differentiated thyroid carcinoma (DTC). Among 29 patients with papillary carcinoma, local invasion was found in 1 case, while 28 had no local invasion. In the follicular carcinoma group of 11 patients, local invasion was identified in 3 cases, and 8 had no local invasion. Overall, local invasion was observed in 4 out of 40 surgeries.

Discussion

In this study of 40 patients with differentiated thyroid carcinoma (DTC), the majority were aged between 31 and 50 years, with a mean age of approximately 37 years. This age distribution aligns with global epidemiological patterns indicating peak incidence of DTC, particularly papillary thyroid carcinoma (PTC), in young and middle-aged adults.[9,10]

Papillary carcinoma was most common in the 31–40 years age group (37%), whereas follicular carcinoma peaked in patients aged 41–50 years (36%). This trend is consistent with prior literature describing PTC as more frequent in younger populations and follicular carcinoma (FTC) tending to occur in older patients.[11,12] Age stratification remains important for guiding targeted surveillance strategies.

Thyroid swelling was the predominant presenting symptom, observed in 91% of cases, followed by cervical lymphadenopathy (33%) and neck pain (9%). These findings reflect the typical clinical presentation of DTC, where a painless, slowly enlarging neck mass predominates.[13]The presence of lymphadenopathy or pain warrants further assessment for possible local or regional spread.

Histologically, papillary carcinoma accounted for 73% of cases, while follicular carcinoma comprised 27%, mirroring worldwide reports where PTC represents 75–85% of DTC.[14] Female patients predominated, with a ratio of 1.7:1, supporting known hormonal influences on thyroid carcinogenesis.[15]

Fine-needle aspiration cytology (FNAC) demonstrated a high diagnostic accuracy for papillary carcinoma, correctly identifying malignancy in over 90% of cases. However, follicular neoplasms were often reported as adenomas or suspicious lesions, underscoring FNAC's limited sensitivity in differentiating follicular carcinoma, which requires histopathological confirmation of capsular or vascular invasion.[16]

Among patients undergoing lymph node FNAC, 70% tested positive for malignancy, and 22% had suspicious findings, highlighting the utility of FNAC in preoperative staging, particularly for papillary carcinoma with its propensity for lymphatic metastasis.[7]

Cervical lymph node metastases were noted in 41% of papillary carcinoma cases and 11% of follicular carcinoma cases, consistent with papillary carcinoma's lymphotropic behavior.[5] Distant metastases were rare in papillary carcinoma (2%) but more frequent in follicular carcinoma (26%), reflecting FTC's tendency for hematogenous spread to bones and lungs.[17,18]

Overall metastatic disease—including both cervical and distant metastases—was present in 43% of papillary and 37% of follicular carcinoma patients, illustrating the combined impact of lymphatic and hematogenous dissemination in these subtypes.[19]

Regarding lymph node involvement, level III nodes were most commonly affected (57%), followed by levels II and IV (44% each). Multilevel nodal involvement was frequently observed, consistent with previous studies describing the pattern of central and lateral neck compartment metastasis in advanced or recurrent PTC.[20]

Local tissue invasion was more prevalent in follicular carcinoma (28%) compared to papillary carcinoma (4%), confirming the more aggressive local behavior of FTC. This finding stresses the importance of thorough intraoperative evaluation and may necessitate more extensive surgical intervention.[21]

Conclusion

Differentiated thyroid carcinoma (DTC), particularly papillary type, predominantly affects middle-aged individuals and presents commonly with thyroid swelling. Papillary carcinoma shows a higher incidence of cervical lymph node metastasis, while follicular carcinoma is more prone to distant and local invasion. FNAC remains a valuable diagnostic tool, especially for papillary carcinoma, but has limitations in identifying follicular malignancies. Surgical and histopathological findings confirm the aggressive potential of follicular variants. Early diagnosis and comprehensive evaluation are essential for optimal management and prognosis.

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