

## Original Article

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# Pattern of Nodal Metastases in Papillary Thyroid Carcinoma

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### Abstract

*Objective:* The objective of this study is to determine the pattern of nodal metastases of papillary thyroid carcinoma to regional lymph in patients who have clinically positive nodes.

*Study design:* Cross sectional study.

*Methods:* Between January 2008 and December 2009, a total of 50 consecutive patients (15 male and 35 female) with clinical evidence of cervical lymph node metastases of papillary thyroid carcinoma was analyzed. Patients those with previous neck dissection for non thyroid malignancies and those neck node with follicular and medullary thyroid carcinoma were excluded from the study.

*Results:* The predominant site of metastases was level III (82%), followed by level IV (62%), level II (48%), level VI (18%) and level V (16%). So, patients in the anterolateral group (level II, III and IV) were the greatest risk of metastatic disease, with level III nodes consistently the most frequently involved. No patient exhibited in level I involvement, multiple level involvement was found in 74% (37 of 50) patients.

*Conclusion:* The high incidence of metastatic disease found in level III and IV. The level V and VI involvement were also reasonably high. Which supports the recommendation for posterolateral and anterior neck dissection for patients with papillary thyroid carcinoma with clinically positive nodes.

**Key words:** Papillary thyroid carcinom; Metastases

### Introduction

Thyroid carcinomas constitute less than 1% of all human malignant tumours. The

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incidence of thyroid cancer varies worldwide from 0.5 to 10 per 100,000 populations and in Bangladesh is 2.58%<sup>1</sup>. There is a female preponderance with male female ratio of approximately 1:3. Thyroid cancers can occur almost at any age. The majority of the patients especially those with follicular, medullary and anaplastic cancers are common in elderly. In adolescents and young adults, thyroid cancer is predominantly of the well-differentiated papillary type<sup>2</sup>.

Papillary thyroid carcinoma is the most common thyroid malignancy and accounts for 80% of thyroid malignancy. It is associated

with high incidence of cervical lymph node metastases (about 60%), whereas in follicular and medullary carcinoma the lymph node metastases were found in 10% and 50% respectively<sup>3</sup>.

Thyroid carcinoma may present as nodular thyroid disease. A solitary thyroid nodule in a patient has a 10-20% chance of malignancy and the risk is even higher in at very young and elderly. Of those that are malignant, up to 80% may have cervical lymph-node micrometastases<sup>4</sup>.

Papillary thyroid carcinoma is well known for being a lymphotropic malignancy. The lymphotropic nature of PTC is demonstrated the tendency to spread to regional cervicallymphnodes. Approximately 35% of individuals with PTC will have clinical cervical lymph node involvement at presentations<sup>5</sup>.

Factors associated with lymph node metastases in PTC patients include tumour size (>5 mm) and multifocality<sup>6</sup>. The first site of metastasis from papillary thyroid carcinoma is the regional node basins of the central and lateral neck<sup>7</sup>. Cervical metastases occur first to nodes in the tracheo-esophageal groove and subsequently in the lateral neck<sup>6</sup>.

Several papers have reported on the frequency and pattern of cervical lymph node without a clear understanding of the distribution of central nodes at risk. It is described papillary nodal metastasis in terms of neck level, as has been done for squamous cell carcinoma of upper aero digestive tract by Lindberg and concluded that cervical metastases from papillary thyroid carcinoma commonly present at levels II through V<sup>6</sup>. Other study also reported the antero-lateral group (level II, III & IV) were at greatest risk of metastasis disease, with level III nodes consistently the most frequently involved<sup>7</sup>.

The results of studies in different centres shows that regional lymph node metastases in patients with differentiated thyroid cancer, especially of a papillary type, have been frequent. Central (level-VI), ipsilateral, contralateral and mediastinal (level-VII) lymph nodes have been affected in 42-86%, 32-68%, 12-24%, and 3-20% of patients respectively. In 20% of patients only central lymph nodes have been affected<sup>8</sup>.

In another study revealed the incidence of metastatic disease at level-II, III, IV and V nodes were 60%, 82%, 75% and 20% respectively<sup>9</sup>.

Because of the high incidence of metastasis rate associated with PTC, there is a growing attention focused on the role and outcomes of treatment of the neck of these cases<sup>10</sup>. The prognostic role of Lymph node metastases in PTC remains controversial<sup>11</sup>. Cervical lymph node metastases does not adversely influence in low risk patients but increases the rate of recurrence<sup>12</sup>. But recent studies have shown that positive lymph node have a prognostic value as to recurrence of disease and survival<sup>13</sup>.

In this study an attempt was made to explore the distribution of nodes in respect to level, which helped in the management of neck for patient with PTC and to establish a uniform surgical practice in our country.

#### Hypothesis

Lymph node metastases in papillary thyroid carcinoma is more common at level III & IV.

#### Aims and Objectives

1. To determine the level of lymph node involvement in papillary thyroid carcinoma.
2. To determine the pattern of lymph node metastasis according to the size of primary tumour.

3. To determine the pattern of lymph node metastases according to location of primary tumour.
4. To find out the incidence of systemic metastases with lymph node metastases.

diagnosed pathologically by Fine Needle Aspiration Cytology (FNAC) either from lymph node or thyroid or both.

Ultrasonography and CT scan were done in all cases for evaluation of thyroid swelling as well as cervical lymph node and relative other anatomical landmark.

### Methods

From January 2008 to December 2009 a cross sectional study of 50 cases were carried out in the Department of Otolaryngology and Head–Neck Surgery of BSMMU, DMCH and SSMCH. The patients of both sexes and different ages were included. In all cases detailed history, examination, investigations, management and follow up was done.

Data were recorded in a prescribed data sheet. History was taken in all cases regarding present complaints, treatment history, history of previous operation, history of co-morbidity, personal and family history.

Neck were examined for thyroid gland, its size, shape, position in lobe, consistency, movement with deglutition, relations with deeper structure, condition of overlying skin, margin and surface. Neck was also examined for metastatic neck node. Site, size, number, unilateral or bilateral, consistency, fixity of lymph nodes and levels of lymph node involvement were noted. Preoperative investigations, functional status were evaluated. Papillary thyroid carcinoma was

Surgery was performed and Precise scheme of surgical findings including location and size of all dissected nodes were noted and histopathologically evaluated. During surgery under general anaesthesia neck was palpated to detect metastatic lymph node. Data were analyzed by using standard statistical methods. Results were evaluated by using proper tests of significance.

### Results

**Table-I**

*Age distribution of study population (n=50)*

Age group (years)	No of patients	Percentage (%)
11-20	4	8%
21-30	10	20%
31-40	14	28%
41-50	10	20%
51-60	12	24%

Highest 14(28%) number of cases found in 4<sup>th</sup> decade . Mean age in 38.2 years,

**Table-II**

*Level of lymph node involvement according to size of primary tumour:*

Size	No of patients	Level involved				
		II	III	IV	V	VI
> 1cm (microcarcinoma)	2	0	1(2%)	2(4%)	0	0
1-4 cm	28	14(28%)	25(50%)	20(40%)	5(10%)	6(12%)
> 4cm	20	10(20%)	15(30%)	9(18%)	3(6%)	3(6%)
Total	50	24(48%)	41(82%)	31(62%)	8(16%)	9(18%)

Lymph node involvement between 1-4 cm size and > 4cm size of primary tumour had no statistically significant.  $\chi^2 = 0.392$ ,  $p > 0.05$

**Table-III**  
*Levels of lymph node involvement of study population (n=50).*

Levels	No of patients	Ipsilateral	Bilateral	No of nodal involvement	Percentage (%)
Level III	50	35	6	41	82%
Level IV	50	27	4	31	62%
Total	100	62	10	72	72%
Level II	50	20	4	24	48%
Level V	50	5	3	8	16%
Level VI	50	7	2	9	18%
Total	150	32	9	41	27%

Level III lymphnodes were involved most, 41 (82%) followed by level IV 31(62%), level II 24(48%) , level VI 9(18%) and V was found 8(16%).

**Table-IV**  
*Pattern of neck node involvement of study population (n=50)*

Pattern of involvement	No of group involved	Percentage (%)
Level II	4	8%
Level III	4	8%
Level IV	2	4%
Level V	0	0%
Level VI	3	6%
Level II & III	8	16%
Level III & IV	15	30%
Level II, III & IV	6	12%
Level II, III, IV & V	2	4%
Level III, IV, V & VI	2	4%
Level II, III, IV, V & VI	4	8%
Total	50	100%

Level-III & IV were the most 15(30%) common group of lymphnode involvement followed by level II & III 8(16%). The lowest of lymph node involvement was found at level IV, II-V and III – VI with 2(4%) each.

**Table-V**  
*Involvement of patients according to location of primary tumour (n=50)*

Location of primary tumour	Total No of patients	No of patients involved	II	III	IV	V	VI
Upper third (R/L/both)	50	10	8	5	4	0	0
Middle third (R/L/both)	50	7	2	6	3	0	3
Lower third (R/L/both)	50	6	0	4	2	5	2
Multifocal (R/L/both)	50	25	14	26	22	3	0
Isthmus	50	2	0	0	0	0	4

Maximum involvement of patients 25(50%) were found in multifocal tumour followed by 10(20%) in upper third location.

**Table-VI**  
*Site of distribution of distant metastases (n=4)*

Site of distant metastases	No of patients	No of metastases	Percentage (%)
Lungs	50	3	6%
Skull bone	50	1	2%
Total	100	4	8%

Most of the distant metastases occurred in lungs 3(6%) and 1(2%) in skull bone.

### Discussion

In this study we had assessed 50 patients with papillary thyroid carcinoma with cervical lymphadenopathy to find out the pattern of lymph node metastasis. Age of the patients of papillary thyroid carcinoma with metastatic cervical lymphadenopathy ranges from 14 to 60 years. Maximum number of patients 14(28%) were found in the 4<sup>th</sup> decade which correlates with one study<sup>1</sup>. In other literature it is in 5<sup>th</sup> decade<sup>4</sup>. In this study the lowest age was 14, a boy with papillary carcinoma with bilateral neck node metastases with metastases in the lung and highest age limit was 60 years.

In this study it was observed that young patients (< 45 years) had a higher prevalence of nodal metastases than older patients (> 45 years). This data is supported by Takashima et al. where they found 'greater

the proportion of young patients in a studied population with papillary thyroid carcinoma higher the frequency of nodal metastases'<sup>14</sup>.

Among 50 patients 15 were male and 35 were female. Female were more commonly affected than male. Male female ratio is 1:2.33. Similar sex distribution (1:2.33) have been found in one study<sup>15</sup>. Other studies show the male female ratios 1:2.6<sup>16</sup>, 1:1.6<sup>1</sup>, 1:3<sup>3</sup>.

Papillary thyroid carcinoma may present with primary thyroid swelling, cervical lymphadenopathy and distant metastasis. In this study cervical lymphadenopathy was present in all 50 cases, thyroid swelling in 48 cases and 2 cases were presented as microcarcinoma. 3 patients had associated haemoptysis and 1 patient had associated swelling in skull. In literature most of the

patients may present with nodular thyroid swelling<sup>3</sup>.

In the present study regarding assessment of size of primary tumour according to TNM staging of UICC<sup>3</sup>, T<sub>2</sub> was in 28 (56%) and T<sub>3</sub> in 20(40%) cases. In 2 patients no primary tumour was palpable, probably due to smaller size (< 1cm) which are regarded as microcarcinoma. The findings were similar with findings of another study<sup>17</sup>. Unilateral involvement was found 42 (84%) cases whereas bilateral involvement was found 6 (12%)<sup>6</sup>.

In this study the rate of nodal metastases were higher in level III, 41(82%); followed by level IV, 31(62%); level II, 24(48%); level V, 8(16%) and level VI, 9(18%). No lymph node was found in level I. This results were comparatively similar with some other studies<sup>6,9,17,18</sup>.

In this series lymph node involvement were more in level III and IV, 72(72%), whereas in levels II, V, VI, the lymph node involvement were 41(27%). The difference in involvement of levels III and IV lymph node and others (level II, V, VI) were statistically significant,  $z=7.89$ ,  $p<0.01$ . Thus, the hypothesis of this study was significant. that means level III and IV were at greatest risk of metastatic disease and level III nodes are more frequently involved. Which is similar with many other series<sup>18,9,6,17</sup>.

This pattern of lymph node metastases may be due to close proximity of thyroid gland and major lymphatic drainage to the middle and lower deep jugular chain (level III and IV).

The study shows that the anterolateral nodes (level II, III and IV) were the greatest risk of metastatic disease. Within the anterolateral chain, level III nodes were more frequently involved, followed by level IV and then level II nodes. Similar results observed in another study<sup>7</sup> where the multiple level involved was

found 82% patients with similar pattern of distribution of involvement in level III, IV and II decreasing in order of frequency.

In this study, involvement of lymph node according to location (the location of the primary tumour categorized as upper third, middle third, lower third) was discussed accordingly<sup>9</sup>. Lymph node involvement was found 65 cases in multifocal (ipsilateral / bilateral) tumours followed by 17(34%) in upper third tumours. Rest of the locations middle third, lower third, isthmus showed 14(28%); 13(26%) and 4(8%) respectively. Patients with multifocal tumour was maximum at level III and IV than those with unifocal tumour. Statistically, difference between multifocal tumour and unifocal tumour in the lymph node metastases at level III and IV was statistically significant,  $z=14.23$ ,  $p<0.01$ . These data shows patients with multifocal tumours have more lymph node involvement in lateral neck (level II, III and IV) than unifocal tumour. The findings are similar with the findings of a study<sup>19</sup>. Thus the multifocal tumour has more chance of metastases in lateral neck.

In my present series 4 patients out 50 were found with distant metastases. 3 (6%) were occurred in lungs 3(6%) and 1(2%) in skull bone the frequency of distant metastases in my series was 8%. In our study reported distant metastases 10%<sup>3</sup> which was similar to study of Wada et al<sup>19</sup>.

### Conclusion

Patients with papillary carcinoma and positive nodes show high rate of metastases at level III and IV. The rate of metastases is also high at level II and to a lesser extent to level VI and posterior neck level V. Although high in the neck, level II is frequently involved. Therefore these patients should undergo selective neck dissection including level II to VI. Both tumour size and age of the patients are independent predictors for the extent of metastatic nodal disease in the neck.

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