

# Level V Lymph Node Dissection in PTMC Patients: Is This Necessary?

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**Purpose:** Cervical lymphadenectomy is frequently performed in papillary thyroid carcinoma (PTC) patients with lateral node metastasis to improve regional control, but the cervical levels that require dissection remain controversial. We conducted this study to investigate the necessity of the routine dissection of level V in papillary thyroid microcarcinoma (PTMC). **Methods:** To identify the relation between PTMC and level V metastases, we analyzed 90 patients who underwent lateral neck dissection (ND). Twenty-five patients underwent lateral ND when metastasis was detected during follow-up, whereas the other 65 patients underwent total thyroidectomy with central and lateral ND at initial surgery. **Results:** There were 18 PTMC patients and 72 patients with a PTC of >1 cm. Metastasis at level III or IV was detected in 80.0% and 78.9%, respectively, whereas metastasis at level V was only detected in 12.2%, and metastasis at level II occurred in 30%. In PTMC patients, metastatic rates at levels II, III, IV, and V were 11.1%, 61.1%, 61.1%, and 5.6%, respectively, and in patients with a PTC of >1 cm, metastatic rates at levels II, III, IV, and V were 34.7%, 84.7%, 83.3% and 13.9%, respectively. PTMC was not found to be significantly associated with level V metastasis ( $P=0.452$ ). **Conclusion:** The level V metastatic rate in PTMC was no different from that of PTC>1 cm statistically. However, the metastatic rate was only 5.6% in PTMC. Therefore, we recommend that care be taken when deciding whether to perform level V dissection when dissecting the lateral cervical nodes in PTMC.

**Key Words:** Papillary thyroid microcarcinoma, Cervical lymph node dissection, Cervical lymph node metastasis, Level V lymph node metastasis

## INTRODUCTION

Cervical lymph node metastases occur frequently in papillary thyroid carcinoma (PTC), and it is known that the incidence of lymph node metastasis at time of diagnosis ranges from 30% to 90%.<sup>(1-5)</sup> Management of lymph node metastasis in the lateral cervical area involves neck dissection (ND) at levels II to V. In cases with nodal disease evident clinically by preoperative ultrasonography (USG) or pathologically proven by fine needle aspiration cytology (FNAC) of the affected lymph node, many surgeons perform therapeutic ND at level II to V.<sup>(6)</sup>

However, it is of concern that the spinal accessory nerve is

located at level V and the main cause of injury to this nerve is cervical lymph node surgery. After loss of spinal accessory nerve function, paralysis of sternocleidomastoid and trapezius muscles ensues. The symptoms of paralysis of these two muscles are pain and limited abduction of the shoulder, incomplete passive range of motion, and anatomic deformities, such as, scapular flaring, droop, and protraction.<sup>(7,8)</sup>

In this regard, several studies have been conducted to determine whether or not level V must be included in lateral ND range in papillary thyroid microcarcinoma (PTMC) patients.<sup>(9,10)</sup> The routine dissection of level V in PTMC is a time consuming procedure due to the risk of injuring the spinal accessory nerve. Therefore, we reviewed the results of therapeutic lateral lymph

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node dissections undertaken in PTC patients at our hospital and compared the results of PTMC patients and patients with a PTC > 1 cm.

## METHODS

Between December 2008 and March 2012, ninety cases of lateral ND at levels II to V were performed for primary or recurrent PTC at the Division of Endocrine Surgery at Gachon University Gil Medical Center, Incheon, South Korea. Of these 90 patients, 25 underwent lateral ND when lateral neck node metastasis was detected during follow-up after thyroidectomy with central ND and 65 patients received total thyroidectomy with central and lateral ND at initial surgery. Average time from initial surgery to lateral ND in the 25 patients was 32.96 months (range: 4~105). Follow-up studies in these 25 comprised routine cervical USG and thyroid function testing. At six and 12 months postoperatively, cervical USG and thyroid function testing were performed. Subsequently, semiannual thyroid function testing and annual cervical USG were carried out on a regular basis.

Thyroid function testing and thyroid USG were performed in all 90 patients preoperatively, and neck computed tomography (CT) was performed in 31 patients. Additional FNAC was performed to detect any possible recurrence or metastasis at lateral cervical lymph nodes in 69 cases. ND was performed in patients suspected of having lymph node metastasis by USG, CT, FNAC, or a radioactive iodine ablation scan.

We dissected levels II-V routinely when performing ND in PTC patients. Lateral lymph node compartments were separated into levels. Level II, III, and IV nodes are bordered anteromedially by level VI and laterally by the posterior border of the sternocleidomastoid muscle. Level III nodes are bordered superiorly by the hyoid bone, and inferiorly by the cricoid cartilage; levels II and IV are above and below level III, respectively. On the other hand, level V nodes are located in the posterior triangle, lateral to the lateral edge of the sternocleidomastoid muscle.(11) After lateral ND, we classified dissected lymph nodes into four groups, and we documented the status of metastasis level by level.

Patients were divided into two groups based on tumor size. One group (the PTMC group; n=18) consisted of patients with a tumor <1 cm. The other group (the PTC > 1 cm group; n=72) consisted of patients with a tumor >1 cm. We retrospectively evaluated medical records, pathologic reports, operation records, and radiologic findings suggesting possible lymph node metastasis.

For statistical verification, the chi-square test, Fisher's exact test, and the independent t-test were used to determine the rela-

tion between PTMC and level V lymph node metastasis. Statistical significance was accepted for P values of <0.05.

## RESULTS

### 1) Patient characteristics and surgical parameters

The clinicopathologic characteristics of the 90 study subjects are summarized in Table 1. Mean patient age was 46.6 years and mean tumor size was 2.00±1.36 cm. The frequency of multifocality was 43.3% and the mean number of tumors per patient was 4.08 and up to 21 in cases with multifocality. Most patients had lymph node metastasis at presentation. No distant metastasis occurred during follow-up. However, a reoperation was performed in 25 patients found to have lateral neck node metastasis during follow-up. Of these 25 patients, 24 had undergone total thyroidectomy and central ND and 1 patient thyroid lobectomy and central ND. Lateral ND was conducted in cases of suspected lymph node metastasis: confirmed lymph node metastasis by FNAC in 66 patients, suspicious by CT in 19, suspicious by USG in 4,

**Table 1.** Clinicopathologic characteristics of 90 papillary thyroid carcinoma patients

Variables		Results, n=90
Age (yr)	Mean (range)	46.6 (19~76)
Sex	Male	25 (27.8%)
	Female	65 (72.2%)
Tumor size (cm)	Mean (range)	2.0 (0.2~8.1)
Extrathyroidal extension	Positive	79 (87.8%)
	Negative	11 (12.2%)
Multifocality	Positive	39 (43.3%)
	Negative	51 (56.7%)
T stage	T1	9 (10.0%)
	T2	2 (2.2%)
	T3	64 (71.1%)
	T4a	15 (16.7%)
N stage	N0	1 (1.1%)
	N1a	25 (27.8%)
	N1b	64 (71.1%)
M stage	M0	90 (100.0%)
	M1	0 (0.0%)
Stage	I	43 (47.8%)
	III	11 (12.2%)
	IVa	36 (40.0%)
Initial operation method	Lobectomy with CND	1 (1.1%)
	Total thyroidectomy with CND	24 (26.7%)
	Total thyroidectomy with CND and LND	65 (72.2%)

CND = central lymph node dissection; LND = lateral lymph node dissection.

**Table 2.** Clinicopathologic variables of 90 papillary thyroid carcinoma patients according to tumor size

Variables		PTMC n=18	PTC > 1 cm n=72	P value
Age (yr)	Mean ( $\pm$ SD)	50.7 $\pm$ 11.5	45.6 $\pm$ 13.6	0.143
Sex	Male	4 (28.6%)	21 (29.2%)	0.556
	Female	14 (71.4%)	51 (70.8%)	
Tumor size (cm)	Mean (range)	0.73 (0.2 ~ 1.0)	2.30 (1.1 ~ 8.1)	< 0.05
Extrathyroidal extension	Positive	14 (77.8%)	65 (90.3%)	0.220
	Negative	4 (22.2%)	7 (9.7%)	
Multifocality	Positive	9 (50.0%)	30 (41.7%)	0.523
	Negative	9 (50.0%)	42 (58.3%)	
T stage	T1	4 (22.2%)	5 (6.9%)	0.051
	T2	0 (0.0%)	2 (2.8%)	
	T3	14 (77.8%)	50 (69.4%)	
	T4a	0 (0.0%)	15 (20.8%)	
N stage	N0	1 (5.6%)	0 (0.0%)	0.131
	N1a	5 (27.8%)	20 (27.8%)	
	N1b	12 (66.7%)	52 (72.2%)	
Stage	I	7 (38.9%)	36 (50.0%)	0.079
	III	5 (27.8%)	6 (8.3%)	
	IVa	6 (33.3%)	30 (41.7%)	
Initial operation method	Lobectomy with CND	1 (5.6%)	0 (0.0%)	0.266
	Total thyroidectomy with CND	5 (27.8%)	19 (26.4%)	
	Total thyroidectomy with CND and LND	12 (66.6%)	53 (73.6%)	

PTMC = papillary thyroid microcarcinoma; PTC = papillary thyroid carcinoma; CND = central lymph node dissection; LND = lateral lymph node dissection.

and positive by radioactive iodine ablation scan in one.

## 2) Differences between clinicopathologic characteristics in the PTMC and PTC > 1 cm groups

To determine whether PTMC patients had a lower rate of level V lymph node metastasis, we divided the 90 study subjects into a PTMC or a PTC > 1 cm group. Table 2 summarizes the clinicopathologic characteristics of these two groups. No differences were found for age or sex. Average numbers of multifocal lesions in the PTMC and PTC > 1 cm groups were 1.75 $\pm$ 1.00 and 2.39 $\pm$ 3.14, respectively ( $P=0.421$ ). Although there were more T1 lesions in the PTMC group, this was not statistically significant. Regarding initial operation method, lateral ND was performed at similar rates in the two groups (66.6% vs. 73.6%).

## 3) Status of lateral lymph node metastasis in the study cohort

The results of lateral lymph node metastasis are summarized in Table 3. In all study subjects, the most common metastatic compartment was level III, in which the metastatic rate was 80.0%. In descending order, metastatic compartments were; level IV (78.9%), level II (30.0%), and level V (12.2%) in the 90 cases.

**Table 3.** The status of lateral lymph node metastasis in 90 papillary thyroid carcinoma patients and the difference according to tumor size

Level	Total n=90	PTMC n=18	PTC > 1 cm n=72
II	27 (30.0%)	2 (11.1%)	25 (34.7%)
III	72 (80.0%)	11 (61.1%)	61 (84.7%)
IV	71 (78.9%)	11 (61.1%)	60 (83.3%)
V	11 (12.2%)	1 (5.6%)	10 (13.9%)*

PTMC = papillary thyroid microcarcinoma; PTC = papillary thyroid carcinoma. \* $P=0.452$ .

Likewise, in the PTC > 1 cm group, the most common metastatic compartment was level III and the order was the same as that of all study subjects. In the PTMC group, metastatic rates were the same for level III and IV compartments (61.1%). Metastasis rates at level V was 5.6% (1/18) in the PTMC group and 13.9% (10/72) in the PTC > 1 cm group, however, these were not significantly different ( $P=0.452$ ). Most of the 11 patients with a metastatic lymph node at level V did not show suspicious lymphadenopathy in level V during preoperative imaging studies. Only one patient exhibited suspicious lymphadenopathy at level V and later

FNAC of the lymph node revealed metastatic papillary carcinoma. A patient in the PTMC group with a metastatic lymph node in level V was suspected of lymphadenopathy in level IV and later FNAC of the lymph node revealed metastatic papillary carcinoma.

#### 4) Predictors of level V lymph node metastasis in papillary thyroid carcinoma

To evaluate the features associated with level V lymph node metastasis, we compared differences between patients positive and negative for level V lymph node metastasis (Table 4). Tumor size was larger in the positive group (2.73 cm vs. 1.90 cm), and the level V lymph node metastasis positive group contained a greater proportion of PTC > 1 cm patients (90.9% vs. 78.5%). However, as mentioned above, this difference was not significant ( $P=0.452$ ). Furthermore, although there were more multifocal lesions in the lymph node metastasis positive group (4.09 vs. 2.01,  $P=0.272$ ), this was not significant, either. Metastatic statuses at levels II, III, and IV were not found to be associated with level V lymph node metastasis. Therefore, no significant differences

were found between the positive and negative groups with respect to level V lymph node metastasis. No specific predictor of level V lymph node metastasis was identified in this study.

## DISCUSSION

The issue as to whether lateral ND of level II to level V must be performed for complete resection of metastatic lymphadenopathy in PTC remains controversial. Kupferman et al.(12) reported level V metastasis is common (53%) in PTC patients and concluded that routine dissection of level V lymph nodes should be performed in the setting of comprehensive ND for patients with lateral neck metastasis from well-differentiated thyroid cancer. As cervical metastasis from PTC was found to occur commonly at level V (21%), they suggested that comprehensive ND, including removal of transverse cervical and spinal accessory nodes, is necessary for the complete clearance of metastases.(13)

However, Sivanandan and Soo(14) found level V metastasis was never present in isolation, and that when present, it was in-

**Table 4.** Comparison of clinicopathologic variables between positive and negative of level V lymph node metastasis

Variables		Level V lymph node metastasis		P value
		Positive, n=11	Negative, n=79	
Age (yr)	Mean ( $\pm$ SD)	44.0 $\pm$ 15.0	47.0 $\pm$ 13.2	0.493
Sex	Male	4 (36.4%)	21 (26.6%)	0.490
	Female	7 (63.6%)	58 (73.4%)	
Tumor size (cm)	Mean (range)	2.73 $\pm$ 1.10	1.90 $\pm$ 1.36	0.056
PTMC or not	Yes	1 (9.1%)	17 (21.5%)	0.452
	No	10 (90.9%)	62 (78.5%)	
Extrathyroidal extension	Positive	10 (90.9%)	69 (87.3%)	0.735
	Negative	1 (9.1%)	10 (12.7%)	
Multifocality	Positive	7 (63.6%)	32 (40.5%)	0.198
	Negative	4 (36.4%)	47 (59.5%)	
T stage	T1	1 (9.1%)	8 (10.1%)	0.958
	T2	0 (0.0%)	2 (2.5%)	
	T3	8 (72.7%)	56 (70.9%)	
	T4a	2 (18.2%)	13 (16.5%)	
N stage	N0	0 (0.0%)	1 (1.3%)	0.685
	N1a	2 (18.2%)	23 (29.1%)	
	N1b	9 (81.8%)	55 (69.6%)	
Stage	I	6 (54.5%)	37 (46.8%)	0.877
	III	1 (9.1%)	10 (12.7%)	
	IVa	4 (36.4%)	32 (40.5%)	
Lateral neck metastasis	level II	5 (45.5%)	22 (27.8%)	0.295
	level III	10 (90.9%)	62 (78.5%)	0.452
	level IV	7 (63.6%)	64 (81.0%)	0.235
Initial operation method	Thyroidectomy with CND	2 (18.2%)	23 (29.1%)	0.721
	Thyroidectomy with CND and LND	9 (81.8%)	56 (70.9%)	

PTMC = papillary thyroid microcarcinoma; CND = central lymph node dissection; LND = lateral lymph node dissection.

involved with level III and IV metastasis. Many authors that have investigated lateral neck lymph nodes by sublevel have recommended downscaling level V ND. In a study of prophylactic lateral ND in clinically N0 PTC, the incidence of lymph node involvement in level Vb was 5.7% and no case of level Va involvement was detected, that is, no occult metastasis was detected at level Va. Accordingly, the authors concluded, in the setting of prophylactic lateral ND, that level Va dissection is unnecessary.(15) In a study of range of level V dissection, Farrag et al.(16) recommended that routine level Va dissection is unnecessary. Cervical lateral neck metastases in PTC were found to occur in a predictable pattern, and levels III, IIa, and IV were most commonly involved. Furthermore, no patient showed metastasis in level Va. The authors concluded that elective dissection of level Va is unnecessary. Roh et al.(17) reported a rate of level V metastasis of 16.7%: 13.0% at Vai, 3.7% at Vb, and 0% at Vas, respectively, and suggested that sublevels Vas and Vb could be excluded from dissection to reduce rates of postsurgical morbidities, such as shoulder dysfunction and chronic neck pain. Furthermore, in a recently issued report it was recommended that comprehensive ND of at least nodal levels IIa, III, IV, and Vb should be performed when indicated to optimize disease control.(18)

In the studies of lateral lymph nodes not classified into sublevels, several authors have commented that the dissection of level V lymph nodes is not mandatory. Lim et al.(19) failed to find any isolated positive level V lymph nodes, and that all patients with positive level V lymph nodes (16%) had positive level IV lymph nodes or a suspicious metastatic lymph node at level IV by preoperative USG. They recommended that level V lymphadenectomy be omitted in PTC, if no positive node is found during histologic examination (frozen section analysis) or by USG in level IV. Caron et al.(20) found that the recurrence rate was only 1% when resection had not been previously performed, and thus, suggested that level V does not require resection unless there is clinical or radiological evidence of disease. Nam et al.(21) concluded that in the absence of evidence of level V lymph node involvement, therapeutic lateral ND can be confined to levels II to IV based on a 10% rate of level V metastasis. Zhang et al.(22) found the rate of occult metastasis at level V was 14.3%, and that positive lymph node involvement at level III+IV independently predicts level V lymph node metastasis. They also recommended that prophylactic level V lymph node dissection could be omitted in PTC patients without suspicious lymph node at level IV by preoperative USG.

In a study of PTMC patients, the incidence of level V metastasis was found to be 3.1% (10.5% in a therapeutic ND group and 1.8% in a prophylactic ND group), and it was concluded that

the ipsilateral mid-lower site be focused on to avoid recurrence, based on knowledge that level V lymph node metastasis is uncommon.(9) On the other hand, Kim(10) reported that level Va or level Vb lymph node metastasis was observed in 6.7% (1/15) and 6.7% (1/15), respectively, of PTMC patients. The author asserted that the extent of dissection should include the upper spinal accessory lymph nodes if lymph node metastasis is suspected during surgery.

In this series, the rate of level V lymph node metastasis was 12.2% in PTC patients, which concurs with previous results (10 ~ 16.7%).(15,17,19,21,22) The rate of level V lymph node metastasis was only 5.6% in PTMC patients, and therefore, we suggest that level V dissection be excluded in patients with PTMC but without a suspicious lymph node by preoperative USG at level V.

Several studies have attempted to identify predictors of level V lymph node metastasis. Some concluded that clinical or pathological level IV lymph node metastasis predicts metastasis at level V,(14,19,22,23) whereas others found that multifocal disease and ipsilateral level II or III metastases are significant predictors.(12) To date, neither tumor size nor PTMC have been reported to predict level V lymph node metastasis. In the present series, the rate of level V lymph node metastasis was 12.2% in PTC and 5.6% in PTMC, and the metastatic rate in PTMC was only 5.6%, although no significant difference was found between the PTMC and PTC > 1 cm groups in this respect. We suggest that tumor size or PTMC be investigated as possible predictors of level V metastasis in a larger scale investigation.

Postoperative complications depend on the extent of ND. Patients that underwent selective ND experienced less spinal accessory nerve injury and shoulder dysfunction than patients that underwent modified radical neck dissection (MRND).(24,25) Types of lymph node operations in PTC and disease nature largely determine the complications. Lymph node dissection is tailored to meet the challenges posed by disease over four decades.(26) In the 1990s, lymph node cherry picking and MRND were conducted to achieve loco-regional disease control. However, around a decade later, this was achieved by selective ND in the majority of cases. In their study, the extent of selective ND was determined by assessing the disease clinically, ultrasonographically, or intraoperatively. Selective ND with total thyroidectomy can be performed to achieving loco-regional disease control with minimal additional morbidity. In a previous study on PTC recurrence, the recurrence rates for level V disease were 5% and 1% if previously resected or not resected, respectively.(20) Caron et al.(20) showed that careful preoperative and intraoperative assessments usually accurately determined the levels should be included in se-

lective ND. Formal MRND, including levels I, II, III, IV, and V, is unnecessary in all patients with PTC nodal metastasis, but extreme care must be taken when selecting levels to be excised using cervical USG findings. Recently, therapeutic ND has been used even in head and neck malignancies to reduce unnecessary operative procedures and perioperative complications and to preserve neck levels that are infrequently involved. Furthermore, many surgeons try to perform "selective" or "super-selective" ND.(27)

## CONCLUSION

Summarizing, in the present study, the rate of level V lymph node metastasis was 13.9% in PTC>1 cm group and 5.6% in PTMC group, and despite the lack of significant difference between the two groups, the metastatic rate found was only 5.6% among our PTMC patients. Our findings caution that the issue of level V dissection should be approached carefully when dissecting lateral cervical nodes in PTMC patients. Furthermore, we recommend the omission of level V dissection in the setting of PTMC without a suspicious lymph node at level V by preoperative imaging.

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