

ORIGINAL ARTICLE

Experience and analysis of level VII cervical lymph node metastases in patients with papillary thyroid carcinoma

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Purpose: Papillary thyroid cancer with level VII (anterior superior mediastinal lymph nodes) lymph node metastasis belongs to Stage IV a according to the American Joint Committee on Cancer cancer staging. The aim of our study was to identify clinicopathologic factors that are related to level VII cervical lymph node metastasis and to suggest recommendations for level VII dissection. **Methods:** We reviewed 195 patients with papillary thyroid carcinoma who had their initial operation containing level VII dissection from April 2006 to June 2007. Level VII dissection involved lymph nodes in the anterior superior mediastinum and tracheoesophageal grooves, extending from the suprasternal notch to the innominate artery. Clinicopathologic factors, such as gender, age and lateral neck metastasis, related to Level VII metastasis were analyzed by tumor size, multifocality of tumor, extrathyroidal extension and lymphovascular invasion. **Results:** Nine (4.6%) of 195 patients with papillary thyroid carcinoma had level VII metastasis. Clinicopathologic factors that were related to level VII metastasis included lateral neck metastasis ($P < 0.01$), tumor size ($P < 0.01$) and lymphovascular invasion ($P < 0.05$). **Conclusion:** If preoperatively, the tumor size is over 1.5 cm, or there is lateral neck metastasis, level VII dissection must be considered. If there is lymphovascular invasion pathologic findings postoperatively, special attention should be paid for detection of level VII recurrence.

Key Words: Level VII dissection, Papillary thyroid carcinoma

INTRODUCTION

Significant controversy exists with respect to the prognostic significance of lymph node metastasis (LNM) in papillary thyroid carcinoma (PTC). Although several studies have shown that the presence of LNM has no impact on survival [1-4], previous studies by Mazzaferri and Jhiang [5], Scheumann et al. [6], Hughes et al. [7], and

Lundgren et al. [8] have demonstrated that LNM is an independent predictor of cancer mortality. The N category of TNM stage for PTC according to the American Joint Committee on Cancer (AJCC) cancer staging manual 6th edition (2002) are described as follow: first echelon (central compartment/level VI) or N1a, and lateral cervical and/or superior mediastinal or N1b [9]. Level VII (anterior superior mediastinal lymph nodes) LNM particularly be-

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longs to Stage IVa. The manual defines level VII as lymph nodes in the anterior superior mediastinum and the tracheoesophageal grooves, extending from the suprasternal notch to the innominate artery (Fig. 1) [10]. Because level VII LNM is considered to be an important factor for determination of cancer staging and prediction of prognoses, we attempted to identify clinicopathologic factors that are related to level VII LNM and then to suggest recom-

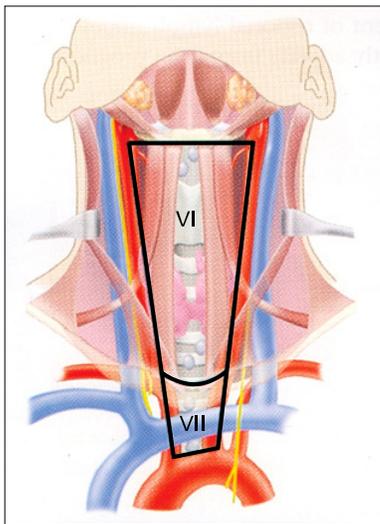


Fig. 1. Anatomical boundaries of nodal levels VI (central compartment group) and VII (superior mediastinal group) (reprinted from Shah JP, Patel SG. Head and neck surgery and oncology. 3rd ed. London: Mosby; 2002. p.355, with permission of Elsevier.) [10].

mendations for level VII dissection.

METHODS

Patients

We reviewed 195 patients with PTC who had an initial operation containing level VII dissection from April 2006 to June 2007. There were 30 males and 165 females. The mean patient age was 47.7 years (range, 25 to 74 years). Thyroid lobectomy with central compartment neck dissection (CCND) was performed on 36 patients, total or near total thyroidectomy with CCND on 144 patients, and total thyroidectomy with CCND and modified radical neck dissection on 15 patients.

Methods of level VII dissection

Level VII dissection is very difficult if the sternum is not opened, but we attempted to perform level VII dissection without opening the sternum. We preferentially dissected anterior superior mediastinal lymph nodes above the innominate artery and vein. After retracting the innominate vessel and the trachea with a Sofield Retractor (long-arm retractor, Medicon Co., Seoul, Korea), we were able to dissect lymph nodes in the tracheoesophageal grooves, extending from the suprasternal notch to the innominate artery (Fig. 2). This technique allowed for level VII dissection

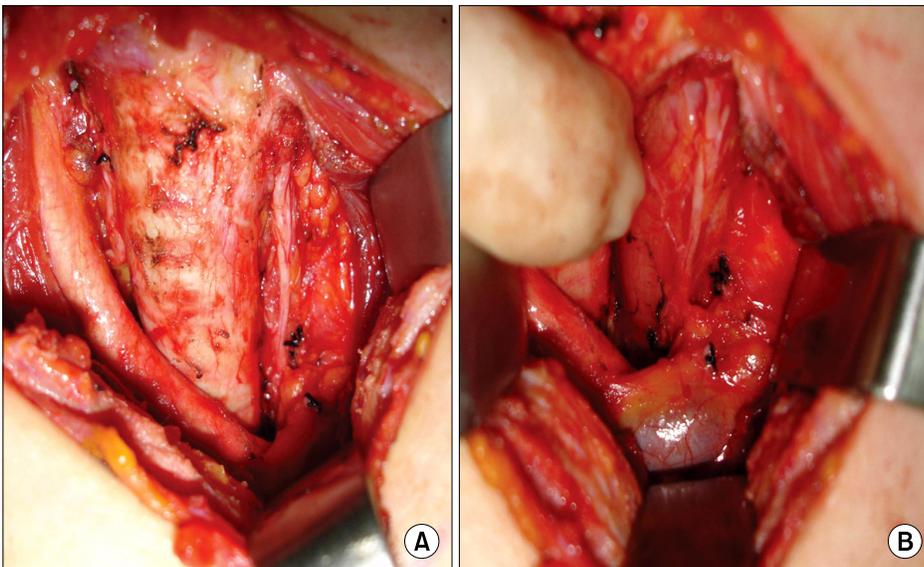


Fig. 2. The surgical field following level VII dissection. (A) The right innominate artery was dissected free from the level VII lymph nodes. (B) The left innominate vein was dissected from the level VII lymph nodes and the left common carotid artery was retracted laterally with a long-arm retractor.

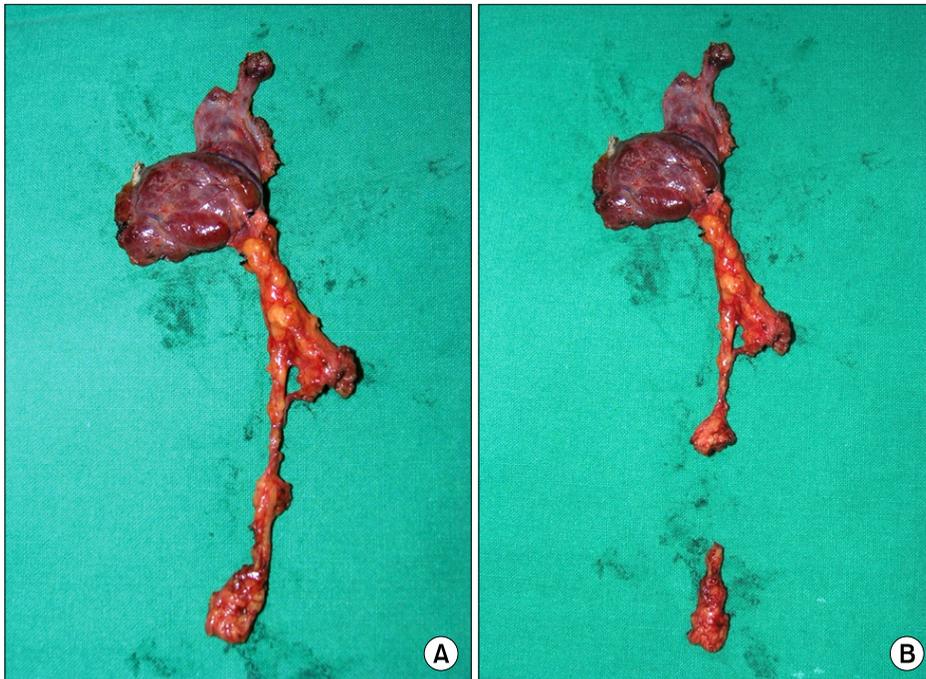


Fig. 3. (A) Right thyroid lobectomy, along with level VI and VII dissection was performed as en bloc dissection. (B) We separated level VII lymph nodes from thyroid and level VI lymph nodes after resection.

without opening the sternum. Thyroidectomy along with level VI and VII dissection was performed as en bloc dissection, and then level VII lymph nodes were separated from the thyroid and level VI lymph nodes (Fig. 3).

Clinicopathologic factors for analysis

Clinicopathologic factors that were to be analyzed in this study level VII LNM were gender, age, lateral neck metastasis, tumor size, tumor multifocality, extrathyroidal extension and lymphovascular invasion.

Statistical analysis

Statistical analyses were performed using SPSS ver. 12.0 (SPSS Inc., Chicago, IL, USA). Comparisons of differences were made with the chi-square test. A P-value of less than 0.05 was considered significant.

RESULTS

Of 195 patients with PTC who had an initial operation involving level VII dissection, 88 (45.1%) showed metastasis to the central compartment, and mean number of dissected central lymph nodes was 12.9, and the mean tu-

Table 1. Patients' demographics

Variable	Value
Gender	
Male	30 (15)
Female	165 (85)
Age	
<45 yr	82 (42)
≥45 yr	113 (58)
Extrathyroidal extension	
Present	66 (34)
Absent	129 (66)
Tumor size	
<1.5 cm	163 (84)
≥1.5 cm	32 (16)
Lateral neck metastasis	
Present	15 (8)
Absent	180 (92)
Multifocality	
Single	138 (71)
Multifocal	57 (29)
Lymphovascular invasion	
Present	56 (29)
Absent	139 (71)

Values are presented as no. of patients (%).

mor size was 11.1 mm. Sixty-six patients (33.8%) had extrathyroidal extension, and 57 patients (29.2%) had tumor multifocality. Fifty-six patients (28.7%) showed lympho-

vascular invasion (Table 1).

Nine patients (4.6%) showed level VII LNM, and we analyzed clinicopathologic factors related to level VII LNM. Table 2 shows relationships between gender, age, multifocality, extrathyroidal extension and level VII LNM. All patients with level VII LNM were females. The level VII LNM rate was 1.2% for patients aged <45 years and 7.1% for those aged ≥45 years. Five patients (8.8%) with multifocal tumor had level VII LNM. The level VII LNM rate was 7.6% for tumors presenting extrathyroidal extension and 3.1% for those whose tumors did not present extrathyroidal extension. All factors in Table 2 were not significantly related to level VII LNM.

Table 2. Relationships between gender, age, multifocality, extrathyroidal extension and level VII lymph node metastasis

Variable	Absent	Present	P-value
Gender			NS
Male	30	0 (0)	
Female	165	9 (5.5)	
Age			NS
<45 yr	82	1 (1.2)	
≥45 yr	113	8 (7.1)	
Multifocality			NS
Single	138	4 (2.9)	
Multifocal	57	5 (8.8)	
Extrathyroidal extension			NS
Present	66	5 (7.6)	
Absent	129	4 (3.1)	

Values are presented as no. of patients with level VII cervical lymph node metastasis (%).
NS, not significant.

Table 3. Relationships between lateral neck metastasis, tumor size, lymphovascular invasion and level VII lymph node metastasis

Variable	Absent	Present	P-value
Lateral neck metastasis			<0.01
Present	15	4 (26.7)	
Absent	180	5 (2.8)	
Tumor size			<0.01
<1.5 cm	163	4 (2.5)	
≥1.5 cm	32	5 (15.6)	
Lymphovascular invasion			<0.05
Present	56	6 (10.7)	
Absent	139	3 (2.2)	

Values are presented as no. of patients with level VII cervical lymph node metastasis (%).

Fifteen patients had lateral neck metastasis, and 4 (26.7%) of the 15 patients had level VII LNM. Of the 180 patients who did not have lateral neck metastasis, 5 (2.8%) had level VII LNM (P < 0.01). The level VII LNM rate was 2.5% for tumors measuring <1.5 cm, 15.6% for those measuring ≥1.5 cm (P < 0.01) (Table 3). The level VII LNM rate was 10.7% for tumors presenting lymphovascular invasion and 2.2% for those whose tumors did not present lymphovascular invasion (P < 0.05) (Table 3). The level VII LNM rate was significantly elevated when there was lateral neck metastasis, tumor size >1.5 cm or lymphovascular invasion.

Complication after level VII LN dissection is that 5 patients (2.6%) had chyle leakage, 4 patients (2%) had right pleural injury, and 1 patient had left innominate vein injury. Four patients (2%) displayed permanent hypoparathyroidism, and 2 patients (1%) displayed unintentional permanent nerve injuries.

DISCUSSION

It has been generally recognized that surgical resection is the most effective treatment modality for thyroid carcinoma. However, the optimal treatment for differentiated thyroid carcinoma controversial with respect to the extent of thyroid resection, extent and technique of nodal dissection, and use of prophylactic radioiodine therapy [11,12]. Several studies have defined different prognostic factors and treatment strategies for papillary thyroid carcinoma [1,3,5]. Central and lateral compartments are representative of regional lymph nodes related to thyroid carcinoma. Since the central compartment can be dissected through the same incision as thyroidectomy, these nodes have been routinely dissected by most endocrine surgeons. A standardized classification system for neck dissection was published in 1991 [13] with a recent update in 2002 [14]. This neck dissection classification did not recommend inclusion of additional levels such as level VII for the superior mediastinum. It is believed that the 6 levels in current use encompass the complete topographic anatomy of the neck. Level VII is considered to be a specific nodal group. However, according to the AJCC cancer stag-

ing, level VII (anterior superior mediastinal lymph nodes) LNM belongs to Stage IVa [9], which means that level VII LNM influences mortality due to PTC. Thus, it is not right that level VII belongs to a specific group, and we should know how many patients with PTC have level VII LNM. Level VII lymph nodes are defined as lymph nodes in the anterior superior mediastinum and the tracheoesophageal grooves, extending from the suprasternal notch to the innominate artery [10]. Level VII nodes have been routinely dissected by most endocrine surgeons, and it has been recognized that level VII dissection is difficult to perform through the same incision as thyroidectomy. Despite the aforementioned results, we were able to dissect level VII lymph nodes through the same incision after retracting the innominate vessel and the trachea with a Sofield Retractor (Medicon Co.) (Fig. 3).

There have been some reports on relations between clinicopathologic factors and LNM. Goropoulos et al. [15] have reported that there is a significant correlation between multicentric tumor and LNM. Hay et al. [16] and Scheumann et al. [6] have reported that there is a significant correlation between tumor size and LNM.

There have been few reports on correlations between clinicopathologic factors and level VII LNM. In this study, we attempted to investigate the feasibility of level VII dissection without opening the sternum rather than the effects of level VII dissection on survival or recurrence in PTC. According to our study, the level VII LNM rate was significantly elevated in patients with lateral neck metastasis, or those with a tumor size > 1.5 cm or lymphovascular invasion. Thus, level VII dissection should be considered in patients with lateral neck metastasis or those with a tumor size of > 1.5 cm. If histopathological examination of surgical specimens reveals that there is lymphovascular invasion, special attention should be paid to the detection of level VII recurrence.

It is thought that there may be a higher rate of permanent hypoparathyroidism, unintentional permanent nerve injury, chyle leakage, pleural injury and vessel injury when level VII LN dissection is performed than for level VI LN dissection alone. But our study is similar other large data [17]. If closed attentional operation is performed, complication is due to level VII LN dissection is

not higher rate than level VI LN dissection alone.

Further studies on the rates of mortality and recurrence are needed to confirm our results.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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