Level IIb Lymph Node Metastasis in Neck Dissection for Papillary Thyroid Carcinoma

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Objective: To determine the patterns of lateral cervical metastasis and the incidence of level IIb lymph node metastasis in papillary thyroid carcinoma.

Design: Retrospective medical record review.

Setting: Academic medicine.

Patients: From March 1, 2000, to April 30, 2006, 46 consecutive patients (38 women and 8 men) with papillary thyroid carcinoma.

Interventions: Patients underwent 55 modified radical neck dissections for the management of lateral cervical metastasis.

Main Outcome Measures: All patients had preoperative evidence of a metastatic cervical lymph node. All specimens were labeled and mapped by the operating surgeon to identify their levels.

Results: Among 55 specimens, 82% (45 specimens) exhibited nodal disease at multiple levels. The incidences of metastases at level II, III, IV, and V nodes were 60% (33 specimens), 82% (45 specimens), 75% (41 specimens), and 20% (11 specimens), respectively. Skip metastases were present at a low rate (6% [3 specimens]). Among 12 specimens (22%) with metastatic lymph nodes at level IIb, 92% (11 specimens) had disease at level IIa. The rate of level IIb lymph node involvement in patients with metastatic lymph nodes at level IIa was 34% (11 of 32).

Conclusions: Tumor involvement at multiple nodal levels usually occurs when patients have lateral cervical lymph node metastasis. Neck dissection should include the level IIb lymph node whenever level IIa lymph node metastasis is found. Level IIb dissection is probably unnecessary when level IIa lymph nodes are uninvolved because the incidence of metastasis to level IIb is low if level IIa is not involved.

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The primary objective of this study was to assess the patterns and incidence of lateral neck metastasis in patients with papillary thyroid carcinoma.
eral cervical lymph node metastasis, including level IIb.
We also determined whether resection of the lymph node at level IIb is necessary during neck dissection in patients with lateral cervical lymph node metastasis in PTC.

### METHODS

We reviewed the medical records of patients who underwent a modified radical neck dissection for PTC at the Department of Otolaryngology, Pusan National University Hospital, Pusan, Republic of Korea, from March 1, 2001, to April 30, 2006. Fifty-five comprehensive neck dissections were performed on 46 consecutive patients (38 women and 8 men; mean age, 37.8 years [age range, 12-86 years]) with PTC. Nine patients required bilateral neck dissection. Operations included unilateral or bilateral modified radical neck dissection performed with concurrent total thyroidectomy and central compartment neck dissection. Procedures for follicular, medullary, and anaplastic thyroid carcinoma were excluded from this analysis. Patients who underwent neck dissection for recurrent lateral cervical lymph node metastasis after thyroidectomy were also excluded. Preoperative assessment for lateral cervical lymph node metastasis included high-resolution ultrasonography, fine-needle aspiration cytologic investigations, and computed tomography.

In all cases, a modified radical neck dissection was performed through a McFee incision with concurrent total thyroidectomy and central compartment neck dissection. The analysis of central compartment node involvement was excluded from this study, because this issue will be addressed in a separate study. Bilateral neck dissections were performed on patients who exhibited bilateral nodal involvement clinically.

A modified radical neck dissection that involved complete removal of level II through V lateral cervical lymph nodes was performed in all patients. In 48 neck dissections, the spinal accessory nerve, the sternocleidomastoid muscle, and the internal jugular vein were preserved, while the removal of 1 of these structures or more was required in 7 neck dissections. The node location was classified by the operating surgeon (B.-J.L. or J.-C.L.) using the system proposed by the American Head and Neck Society and the American Academy of Otolaryngology–Head and Neck Surgery. Patients were considered to have a positive level when 1 node or more in the particular level were reported to contain a tumor.

### RESULTS

Assessment of the primary tumor stage revealed T1 lesions in 13 patients (28%), T2 lesions in 11 (24%), T3 lesions in 15 (33%), and T4 lesions in 7 (15%). The number of resected lymph nodes per specimen ranged from 20 to 75 (median, 41.4).

Patients underwent 55 modified radical neck dissections for the management of lateral cervical metastasis. Forty-five specimens (82%) exhibited nodal disease at multiple levels. The distribution of lymph node metastases by neck level was 33% (19 of 55) at 2 levels of involvement, 38% (21 of 55) at 3 levels of involvement, and 9% (5 of 55) at 4 levels of involvement (Table). Skip metastasis (an intervening node level without disease) was seen in 3 specimens (6%) (1 at levels II and IV, 1 at levels II and V, and 1 at levels II, IV, and V). Of 10 specimens (18%) with single-level disease only, 5 had level III involvement, 4 had level IV involvement, and 1 had level II involvement. Level V nodes were not found to have been involved in isolation.

### Table. Distribution of Lymph Node Metastasis by Neck Level in 55 Specimens

<table>
<thead>
<tr>
<th>Neck Level</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solitary</td>
<td>1</td>
</tr>
<tr>
<td>II</td>
<td>5</td>
</tr>
<tr>
<td>III</td>
<td>4</td>
</tr>
<tr>
<td>IV</td>
<td>2</td>
</tr>
<tr>
<td>V</td>
<td>0</td>
</tr>
<tr>
<td>2 Levels</td>
<td></td>
</tr>
<tr>
<td>II and III</td>
<td>6</td>
</tr>
<tr>
<td>II and IV</td>
<td>1</td>
</tr>
<tr>
<td>II and V</td>
<td>1</td>
</tr>
<tr>
<td>III and IV</td>
<td>9</td>
</tr>
<tr>
<td>IV and V</td>
<td>2</td>
</tr>
<tr>
<td>3 Levels</td>
<td></td>
</tr>
<tr>
<td>II, III, and IV</td>
<td>17</td>
</tr>
<tr>
<td>II, III, and V</td>
<td>1</td>
</tr>
<tr>
<td>I, IV, and V</td>
<td>2</td>
</tr>
<tr>
<td>4 Levels</td>
<td></td>
</tr>
<tr>
<td>I, III, IV, and V</td>
<td>5</td>
</tr>
</tbody>
</table>

Among 55 specimens, the incidences of lymph node metastasis according to neck level were 60% (33 specimens) at level II, 82% (45 specimens) at level III, 75% (41 specimens) at level IV, and 20% (11 specimens) at level V. Within the lateral cervical lymph node chain, level III nodes were consistently the most frequently involved, followed by level IV and then level II nodes.

Among 55 specimens, the incidence of lymph node metastasis at level IIb was 22% (12 specimens). Of 12 specimens with metastatic lymph node at level IIb, 11 (92%) also had disease at level IIa. The rate of level IIb lymph node involvement in patients with metastatic lymph nodes at level IIa was 34% (11 of 32).

### COMMENT

The prognostic value of neck metastasis in PTC, as well as the necessity of a modified radical neck dissection vs selective node removal in a clinically positive neck, is controversial. Nodal involvement in older patients increases the risk of recurrence, although no statistically significant difference in survival is observed relative to age. The value of postoperative radioactive iodine in preventing nodal recurrence or cancer death is debated. Although the initial surgical strategy and treatment can positively influence disease-free survival and overall survival, the extent of surgical resection for adequate removal of metastatic lymph nodes is unclear.

In this study, 82% (45 of 55) of specimens with lateral cervical lymph node metastasis had multiple-level nodal involvement. The lateral deep cervical lymph nodes (levels II, III, and IV) are at greatest risk of metastatic disease, with level III nodes being the most frequently involved. The results of this study correspond with the results of previous studies in which level III involvement was most common. However, Ducci et al reported that level VI nodes are the most frequent metastatic lymph nodes.

Ten specimens (18%) contained disease on only a single level. Level V nodes were not found in isolation and were...
always associated with disease at multiple levels. The results of this study are in agreement with those of a previous study. However, Kupferman et al reported that metastatic disease was confined to a single nodal level in 20 of 51 specimens (39%). Ducci et al reported that the incidence of single-nodal level involvement was high (64%). These rates are higher than that found by Sivanandan and Soo (18%) and in the present study (18% [10 of 55 specimens]). The reason for these differences is that patients who had undergone previous thyroidectomy or lateral cervical surgery were included in the studies by Kupferman et al and Pingpank et al.

In the present study, 22% (12 of 55) of the specimens had metastatic involvement of level IIb lymph nodes. The rate of level IIb lymph node involvement in patients with metastatic lymph nodes at level IIa was 34% (11 of 32). Neck dissection should include the level IIb lymph node whenever level IIa lymph node metastasis is found. Our results are consistent with the findings by Pingpank et al that metastatic lymph nodes above the spinal accessory nerve are common. However, in our study, only 1 specimen had a metastatic lymph node at level IIb without the metastasis of a level IIa lymph node, and skip metastasis was present at a low rate (6% [3 of 55]). Therefore, our results are different from those of Pingpank et al, who concluded that skip metastasis is common (18.4% [7 of 38]). Again, the reason for this difference is that patients who had undergone previous thyroidectomy or lateral cervical surgery were included in this study. We believe that there are limitations regarding the accuracy of the evaluation of the patterns and incidence of lymph node metastasis in the study by Pingpank et al.

Morbidity associated with spinal accessory nerve damage in neck dissection in which the spinal accessory nerve was preserved has been reported. When the spinal accessory nerve is spared, temporary shoulder disability and progressive improvement of shoulder pain has been observed. Koybasioğlu et al reported temporary functional deterioration of the spinal accessory nerve even when level IIb lymph nodes were not dissected. They found no statistically significant differences between patients who underwent level IIb dissection and those who did not in terms of spontaneous electrical discharge on electromyography and motor unit potentials during the late postoperative period.

In this study, the rate of level IIb lymph node involvement in patients with metastatic lymph nodes at level IIa was 34% (11 of 32). Among 12 specimens with metastatic lymph nodes at level IIb, 11 specimens (92%) had disease at level IIa. When the spinal accessory nerve is preserved, shoulder pain and disability are temporary. Therefore, neck dissection should include the level IIb lymph node whenever level IIa lymph node metastasis is found. Furthermore, the risk of shoulder dysfunction by reoperation if recurrence occurred at the level IIb lymph node is higher than that associated with primary dissection in this area.

In summary, tumor involvement at multiple nodal levels usually occurs when patients have lateral cervical node metastasis. Metastatic lymph nodes at level IIb are common. Neck dissection should include the level IIb lymph node whenever level IIa lymph node metastasis is found. Level IIb dissection is probably unnecessary when level IIa lymph nodes are uninvolved because the incidence of metastasis to level IIb is low if level IIa is not involved.

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Author Contributions: Drs Wang and B.-J. Lee had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: B.-J. Lee and Wang. Acquisition of data: Son and Y.-K. Kim. Analysis and interpretation of data: J.-C. Lee and I.-J. Kim. Drafting of the manuscript: Son. Critical revision of the manuscript for important intellectual content: B.-J. Lee, Wang, J.-C. Lee, I.-J. Kim, and Y.-K. Kim. Statistical analysis: I.-J. Kim. Administrative, technical, and material support: B.-J. Lee and Wang. Study supervision: Son and Y.-K. Kim.

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REFERENCES