Lymphatic Metastases to Level IIb in Hypopharyngeal Squamous Cell Carcinoma

Young-Ho Kim, MD; Bon Seok Koo, MD; Young Chang Lim, MD; Jin Seok Lee, MD; Se-Heon Kim, MD; Eun Chang Choi, MD, PhD

Objectives: To evaluate the prevalence of level IIb lymph node (LN) metastasis and to identify potential clinical risk factors when level IIb metastatic diseases are present in patients with clinically node-negative (N0) and node-positive (N+) necks with hypopharyngeal squamous cell carcinoma (HPSCC). This will provide a basis for determining whether this region can be excluded in elective or therapeutic neck dissection in patients with HPSCC.

Design: Prospective analysis of a case series.

Setting: University hospital.


Main Outcome Measures: The incidences and clinical risk factors for level IIb LN metastasis and regional recurrence according to the presence or absence of pathologic LN involvement in level IIb.

Results: A total of 93 neck dissections were analyzed in this study. Of these dissections, 59 (63%) were elective and 34 (37%) were therapeutic. Three percent (2 of 59) of all N0 necks and 32% (11 of 34) of all N+ necks had level IIb LN metastases. Level IIb nodal metastases were significantly more prevalent in N+ necks (P = .007) than in N0 necks and in the presence of other positive LNs (P = .01) than in the absence of other positive LNs. Of the 35 patients with pathologic LNs, the regional recurrence rate was significantly higher in cases with positive level IIb LNs (33% [4 of 12]) than without (4% [1 of 23]; P = .04).

Conclusions: Level IIb LN pads may be preserved during elective neck dissection in the treatment of patients with clinically N0 necks with HPSCC. This area should be removed during therapeutic neck dissection in the treatment of clinically N+ necks.


Because of the high (65%-80%) nodal metastasis rate, neck dissection is an essential part of the surgical treatment for hypopharyngeal squamous cell carcinoma (HPSCC). In addition, elective neck dissection, including levels II, III, and IV, is recommended for all patients with HPSCC with a clinically node-negative (N0) neck owing to a high incidence of occult cervical metastasis. The ultimate goal of head and neck cancer surgery is to cure the patient by eradicating both the primary and the neck lesions while preserving function and preventing complications. Therefore, even though surgical treatment is safer than other types of oncologic treatment, special care must be taken to minimize permanent sequelae that would have a negative impact on quality of life.

Several reports have reviewed postoperative sequelae following neck dissection, the most significant of which is an impaired shoulder function. Even selective neck dissection can lead to some degree of morbidity, although at a lower incidence than in conventional neck dissection. Dijkstra et al reported that shoulder pain was present in 79% of patients after radical neck dissection, 65% of patients after a modified radical neck dissection with preservation of the spinal accessory nerve (SAN), and 52% of patients after selective neck dissection. Despite SAN preservation, postoperative shoulder dysfunction may occur because of excessive retraction during the clearance of level IIb lymph nodes (LNs) and/or ischemia. This complication may be avoided by preserving level IIb LNs during neck dissection.

Many studies have looked at cervical and occult level IIb LN metastasis in head and neck squamous cell carcinoma (HNSCC). In HPSCC, however, to our

Author Affiliations: Department of Otorhinolaryngology, Yonsei University College of Medicine (Drs Y.-H. Kim, Koo, Lee, S.-H. Kim, and Choi), and Department of Otorhinolaryngology–Head and Neck Surgery, Konkuk University College of Medicine (Dr Lim), Seoul, South Korea.
knowledge, the prevalence of level IIb LN metastasis and the oncologic safety of preserving these nodes have not yet been published.

The purpose of this study was to evaluate the prevalence of level IIb LN metastasis and to identify potential risk factors from the presence of metastatic diseases in level IIb. These data will, hopefully, provide a basis for determining whether this region can be excluded in elective or therapeutic neck dissection in patients with HPSCC.

**METHODS**

**PATIENTS AND TUMOR CHARACTERISTICS**

This study involved 50 previously untreated patients with HPSCC who were treated at the Department of Otorhinolaryngology, Yonsei University Severance Hospital, Seoul, South Korea, from January 1998 to February 2004. Patients undergoing surgical treatment of HPSCC as well as elective or therapeutic neck dissection were included in this study. The exclusion criteria included previous head and neck cancer, head and neck irradiation, or primary HPSCC radiotherapy; and a proven distant metastasis at presentation. This study included 47 men and 3 women (mean age, 60.4 years [range, 37-80 years]).

The cancer stage was determined according to the 2002 guidelines of the American Joint Committee on Cancer.11 Clinical staging of lymphatic metastases was based on a physical examination and preoperative computed tomographic scans or magnetic resonance imaging. A clinically N0 neck was defined as one having no palpable cervical LNs on physical examination and imaging results that met Mancuso’s12 criteria for benign LNs. The distribution of clinical stages is shown in Table 1.

**LOCATION AND SURGICAL TREATMENT OF THE PRIMARY TUMOR**

The primary tumor was in the pyriform sinus in 37 cases (74%), in the posterior pharyngeal wall in 11 cases (22%), and in the postcricoid in 2 cases (4%). Of those 50 subjects, 22 (44%) had larynx-sparing procedures; 16 (32%), total laryngectomy with partial pharyngectomy; 6 (12%), total laryngopharyngectomy; and 6 (12%), total laryngopharyngoesophagectomy. Reconstruction was performed in 45 cases: a forearm free flap in 35 cases, gastric pull-up in 6 cases, jejunal free flap in 2 cases, lateral arm free flap in 1 case, and skin graft in 1 case. The remaining 5 cases were performed with primary closure.

**TREATMENT OF CERVICAL LNS**

Bilateral neck dissection was performed in 43 patients (86%) and unilateral neck dissection in 7 patients (14%). A total of 93 neck dissections were performed throughout the study period.

<table>
<thead>
<tr>
<th>Clinical Tumor Stage</th>
<th>N0</th>
<th>N1</th>
<th>N2a</th>
<th>N2b</th>
<th>N2c</th>
<th>N3</th>
<th>Total, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>10</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>T2</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>T3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>T4</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Total, No.</td>
<td>21</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

**COLLECTION OF NECK DISSECTION SPECIMENS**

Neck dissections were completed prior to primary tumor resection. All dissections were performed to excise levels I to V LNs in a standardized fashion. The contents of level IIb LNs were dissected, labeled, and processed separately from other level II LNs and from the main neck dissection specimen. All surgical specimens were then sent to the pathology department for analysis of the permanent section. Histopathologic metastasis examination included the total number of LNs harvested, their location, and the number and location of LNs with metastatic disease at each nodal stage, including the level IIb LNs.

**POSTOPERATIVE RADIOThERAPY**

Metastasis or a positive surgical margin was observed in 38 patients, all of whom underwent additional postoperative radiotherapy. The mean radiation dose was 60.63 Gy (range, 45.00-70.65 Gy). The other 12 patients did not receive further treatment.

**FOLLOW-UP AND STATISTICAL ANALYSIS**

The mean follow-up period was 27 months (range, 3-89 months) although all survivors were followed up for at least 18 months. The relationships among level IIb LN metastasis and factors such as age, sex, T stage, N stage, and the presence of other positive LNs were analyzed by a $\chi^2$ or Fisher exact test. A $P$ value of less than .05 was considered statistically significant.

**RESULTS**

**HARVESTED LNS AND CERVICAL METASTASIS**

The mean number of LNs collected in each neck dissection was 33 (range, 5-78). The mean number of LNs col-

*Table 1. Clinical Staging for the Overall Population of 50 Patients*

<table>
<thead>
<tr>
<th>Clinical Tumor Stage</th>
<th>N0</th>
<th>N1</th>
<th>N2a</th>
<th>N2b</th>
<th>N2c</th>
<th>N3</th>
<th>Total, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>10</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>T2</td>
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<td>5</td>
<td>2</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>T3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>T4</td>
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<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Total, No.</td>
<td>21</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

*Table 2. Type of Neck Dissection*

<table>
<thead>
<tr>
<th>Type</th>
<th>Ipsilateral Neck</th>
<th>Contralateral Neck</th>
</tr>
</thead>
<tbody>
<tr>
<td>LND</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>MRND</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>RND</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Abbreviations: LND, lateral neck dissection; MRND, modified radical neck dissection; RND, radical neck dissection.
Twenty-five (50%) of the 50 patients had unilateral metastases, and 10 patients (20%) had bilateral metastases. Eight (38%) of the 21 patients with preoperative N0 stage were found to have diseased LNs in the ipsilateral neck only. Thirty-one (91%) of 34 necks preoperatively staged as N0 contained pathologic LNs. Fourteen (24%) of the 59 necks preoperatively staged as N0 were found to be diseased N+ necks. Occult metastatic rates of the ipsilateral and contralateral neck were 38% (8 of 21) and 16% (6 of 38), respectively.

**PREVALENCE OF LEVEL IIb LN METASTASIS AND ITS CORRELATION WITH CLINICAL FACTORS**

**Table 3** shows the LN metastasis distribution. The incidence of occult nodal metastasis to level IIb LNs in patients with N0 HPSCC was 5% (1 of 21). In the patients with N+ necks, 38% (11 of 29) of cases had positive level IIb LN metastasis. The prevalence of metastases in the level IIb LNs was 3% (2 of 59) overall in N0 necks, with 5% (1 of 21) ipsilateral and 3% (1 of 38) contralateral. One case with a clinical stage of cT2 N2b had a pathologic IIb LN with another positive LN in the N0 contralateral neck. Overall, in clinically N+ necks, the prevalence of level IIb LN metastasis was 32% (11 of 34) with 34% (10 of 29) ipsilateral and 20% (1 of 5) contralateral. Overall incidences were 22% (11 of 50) and 5% (2 of 43) in ipsilateral and contralateral necks, respectively. According to clinical T stage, the incidence rates of level IIb LN metastasis were as follows: 7% (1 of 15) in T1, 29% (5 of 17) in T2, 40% (4 of 10) in T3, and 25% (2 of 8) in T4. There was no isolated level IIb LN metastasis unless another positive LN was in the neck dissection specimen. The relationship between level IIb LN metastasis and several clinical factors was analyzed (Table 4). There was no statistically significant correlation with age, sex, or clinical T stage. Level IIb LN metastasis was significantly more prevalent in clinically N+ lesions and in the presence of another positive LN compared with clinically N0 lesions and the absence of another positive LN (P<.05).

**CORRELATION BETWEEN LEVEL IIb LN METASTASIS AND REGIONAL RECURRENCE**

Thirty patients show no evidence of disease to date, 14 died of HPSCC, and 5 died of an intercurrent disease. One patient died of a myocardiac infarction 14 days after the operation. During follow-up, 15 patients (30%) presented with recurrence and/or metastasis. Of these, 3 (20%) were local, 4 (27%) were regional recurrences, 1 (7%) was a regional recurrence and distant metastasis, and 7 (46%) were distant metastases. Of the 5 regional recurrences (10%), 3 cases were in the ipsilateral dissected neck, and 2 cases were in the undissected neck (retropharyngeal and paratracheal node). Unfortunately, all of these patients ultimately died of uncontrolled neck tumors. Only 1 of the 15 patients who pre-
sent with recurrence was successfully treated with surgery and adjuvant radiotherapy. Four (33%) of 12 patients with pathologic level IIb LNs had regional recurrences that caused their deaths. Of the 35 total patients with diseased LNs, the regional recurrence rate (33% [4 of 12]) in those with pathologic level IIb LNs was significantly higher than in those without pathologic level IIb LNs (4% [1 of 23]; \( P = .04 \)).

**COMMENT**

Shoulder dysfunction associated with neck dissection has a profound impact on the health-related quality of life of patients who undergo surgical treatment for head and neck cancer.\(^{1-15}\) It has been demonstrated that more extensive neck surgery is associated with greater postoperative shoulder dysfunction.\(^{14}\) Patten and Hillel\(^{16}\) reported that nearly all patients who undergo radical neck dissection experience pain, weakness, shoulder droop, and disability owing to the SAN being sacrificed.

Even neck dissections in which the SAN is spared are associated with spinal accessory nerve dysfunction.\(^{6,7}\) Sobol et al\(^{18}\) reported the shoulder syndrome in 22% of patients who underwent selective neck dissection. Van Wilgen et al\(^{19}\) observed that 14 of 50 patients who underwent supraomohyoid neck dissection complained of shoulder pain after an average follow-up period of 2.2 years, and of these, 8 patients felt that it was an inconvenience in their daily lives. This dysfunction is usually attributed to stretching the SAN during retraction so that the LNs lying posterior and superior to the nerve (level IIb) can be cleared.\(^{9}\) If these LNs were not removed, however, postoperative shoulder dysfunction could be avoided. It should first be determined whether preserving these LNs would be an advantage.

There have been some previous reports on the prevalence of level IIb LN metastases in HNSCC. Kraus et al\(^{18}\) showed that 47 supraomohyoid N0 neck dissections in the oral cavity for oropharyngeal squamous cell carcinoma (SCC) had an occult LN metastasis rate of level IIb LNs of 2% (1 of 47). Talmi et al\(^{19}\) reported that level IIb LN metastasis occurred in only 4 (4%) of 103 HNSCC neck dissections. These consisted of 80 selective neck dissections and 23 nonselective radical neck dissections. Chone et al\(^{20}\) found that level IIb LNs contained metastases in 2.3% of N0 necks and 16.7% of N+ necks in patients with HNSCC. In a recent study, Lim et al\(^{21}\) reported that only 4 (5%) of 74 oral cavity SCC patients with N0 necks had pathologic involvement of level IIb LNs. Furthermore, this region may be preserved in elective supraomohyoid neck dissection for oral cavity SCC. Coskun et al\(^{22}\) found no occult metastasis for level IIb LNs after performing 71 lateral neck cN0 laryngeal carcinoma dissections.

To our knowledge, all previous studies included various primary sites in the head and neck area, except for the reports by Coskun et al\(^{22}\) on laryngeal carcinoma and by Lim et al\(^{23}\) on oral cavity carcinoma. Because lymphatic metastasis patterns differ based on the site of the primary tumor, these studies are limited in their analyses of the level IIb nodal metastasis rate. To our knowledge, there has not yet been a study examining level IIb LN metastasis for HPSCC alone, although a few patients with HPSCC were included in a heterogeneous study group.\(^{19,20}\)

In our study, the incidence of occult nodal metastasis to level IIb LNs in patients with N0 HPSCC was 5% (1 of 21). Of the patients with N+ necks, 38% (11 of 29) had positive level IIb LN metastasis. This rate was significantly higher than that for patients with N0 necks (\( P = .007 \)). Occult nodal metastasis to level IIb occurred 5% (1 of 21 necks) of the time ipsilaterally and 3% (1 of 38 necks) of the time contralaterally in clinically N0 necks. Of the 59 clinically N0 necks, only 2 necks (3%) had nodal metastasis to a level IIb LN. In addition, none of the N0 necks developed a regional recurrence. Therefore, level IIb LNs may be preserved in elective neck dissection for patients with HPSCC without nodal metastasis according to clinical examination and strict imaging criteria.

However, nodal metastasis to level IIb LNs occurred 34% (10 of 29 necks) of the time ipsilaterally and 20% (1 of 5 necks) of the time contralaterally in clinically N+ necks. Of the 34 clinically N+ necks, 11 necks (32%) had nodal metastasis to a level IIb LN. Moreover, of the 35 patients with diseased LNs, the regional recurrence rate of cases with pathologic level IIb LNs (33%; 4 of 12 patients) was significantly higher than those without pathologic level IIb LNs (4%, 1 of 23 patients; \( P = .04 \)). Plus, all of the previous patients died of HPSCC. These results indicate that this area should be removed during dissection of clinically N+ necks for patients with HPSCC.

Although this study included a limited number of patients, to our knowledge it was the first study on the prevalence of level IIb LNs in N0 and N+ necks in patients with HPSCC. A larger study group is required to assess the feasibility of a clinical trial studying the preservation of level IIb LN pads in elective neck dissection when treating HPSCC.

In conclusion, this study demonstrates that level IIb LN metastases in patients with stage N0 HPSCC rarely occur and provides support for the idea that level IIb LN pads may be preserved in elective neck dissection. By doing so, postoperative SAN dysfunction may be avoided. In contrast, considerable metastasis rates to level IIb LNs were identified in patients with HPSCC with N+ necks. This rate is significantly higher than that of patients with clinically N0 necks. In addition, patients with pathologic level IIb LNs had a high regional recurrence. Therefore, this area should be removed during therapeutic neck dissection in patients with N+ neck.

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**Correspondence:** Eun Chang Choi, MD, PhD, 134 Shinchon-dong, Seodaemun-gu, Department of Otorhinolaryngology, Yonsei University College of Medicine, Seoul 120-752, South Korea (eunchangmd@yumc.yonsei.ac.kr).

**Author Contributions:** All of the authors 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: Choi, Y.-H. Kim, and Lim. Acquisition of data: Y.-H. Kim, Koo, Lee, and S.-H. Kim. Analysis and interpretation of data: Choi, Y.-H. Kim, Koo, Lim, and S.-H. Kim. Drafting of the manuscript: Y.-H.

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