Treatment outcomes of elective neck dissection in intrathoracic esophageal carcinoma

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Abstract

OBJECTIVE:
We investigated the outcomes of elective neck dissection in intrathoracic esophageal squamous cell carcinoma.

PATIENTS and METHODS:
From January 2016 to December 2022, a total of 195 patients underwent esophagectomy for esophageal carcinoma at our institution. Among them, 21 patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma were enrolled.

RESULTS:
Of the 21 patients, 19 patients were male, and 2 patients were female. A total of 11 patients received treatment before surgery, and all of them received concurrent chemoradiotherapy (CCRT). As a result of elective neck dissection at both neck level IV, neck occult metastasis of esophageal squamous cell carcinoma was diagnosed in 3 cases (14.3%), all of which involved left neck lymph nodes. Preoperative CCRT, T stage, and N stage were risk factors for neck occult metastasis of intrathoracic esophageal squamous cell carcinoma ($p < 0.05$). A total of 16 patients (76.2%) had been under follow-up without disease recurrence after the completion of treatment. However, 3 patients died of esophageal squamous cell carcinoma, and 2 patients were alive with esophageal carcinoma. The follow-up period was $19.2 \pm 18.4$ months.

CONCLUSION:
Three-field lymph node dissection may be necessary for intrathoracic esophageal squamous cell carcinoma. Preoperative CCRT, T stage, and N stage were risk factors for neck occult metastasis of intrathoracic esophageal squamous cell carcinoma.

INTRODUCTION
Esophageal squamous cell carcinoma is usually treated with surgery; however, the extent of lymph node dissection remains controversial.\textsuperscript{1–10} Recently, three-field lymph node dissection, including the thoracic, abdominal, and cervical nodes, is considered the mainstay of surgical treatment for esophageal squamous cell carcinoma.\textsuperscript{1–6,9}

Three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma was performed at our hospital. The results were analyzed to investigate the outcomes of elective neck dissection in intrathoracic esophageal squamous cell carcinoma.

PATIENTS and METHODS
This study protocol was approved by the Human Ethics Review Committee of Chonnam National University Hwasun Hospital (approval number: CNUHH-2023-080). All experiments were conducted in compliance with the rules for investigation on human subjects, as defined in the Declaration of Helsinki. Informed consent was obtained from all the patients. From January 2016 to December 2022, a total of 195 patients underwent esophagectomy for esophageal carcinoma at our institution. Among them, only patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma were enrolled. The inclusion criteria for this study were intrathoracic esophageal squamous cell carcinoma and no cervical lymph node metastasis on computed tomography (CT) and positron emission tomography (PET).

Clinical data obtained from the patients were reviewed, including gender, age, preoperative treatment, location, size, T stage, N stage, final histopathologic results after surgery, postoperative treatment, postoperative complications, current status, and follow-up.

A single thoracic surgeon (Na KJ) performed esophagectomy, and an otolaryngologist (Lee DH) performed bilateral neck level IV dissection, which included the supraclavicular nodes and internal jugular nodes. Histopathologic staging was based on the seventh edition of the American Joint Committee on Cancer TNM staging system.\textsuperscript{5} All surgical specimens were confirmed by histopathological examination.

Fisher’s exact test was used to evaluate the outcomes of elective neck dissection in intrathoracic esophageal squamous cell carcinoma. SPSS version 27.0 was used for all statistical analyses. Statistical significance was defined at a $p$-value of $< 0.05$. 
RESULTS

The clinical characteristics of 21 patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma are summarized in Table 1. Of the 21 patients, 19 patients were male, and 2 patients were female. The mean age of the patients was 63.4 ± 7.0 years (range, 41–73 years). The location of esophageal squamous cell carcinoma was 26.6 ± 4.9 cm (range, 20–40 cm) from the incisor. The size of the carcinoma was 1.9 ± 1.7 cm (range, 0–5 cm). A total of 11 patients received treatment before surgery, and all of them received concurrent chemoradiotherapy (CCRT). The incidence of neck occult metastasis was statistically significant among patients who underwent preoperative CCRT (p < 0.05).

Table 1
Clinical characteristics of patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma

<table>
<thead>
<tr>
<th>Patients (n = 21)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (male : female)</td>
<td>19 : 2</td>
</tr>
<tr>
<td>Age (years)</td>
<td>41–73 (63.4 ± 7.0)</td>
</tr>
<tr>
<td>Carcinoma location from the incisor (cm)</td>
<td>20–40 (26.6 ± 4.9)</td>
</tr>
<tr>
<td>Carcinoma size (cm)</td>
<td>0–5 (1.9 ± 1.7)</td>
</tr>
<tr>
<td>T stage (0 : 1 : 2 : 3 : 4)</td>
<td>6 : 9 : 2 : 4 : 0</td>
</tr>
<tr>
<td>N stage (0 : 1 : 2 : 3)</td>
<td>11 : 4 : 5 : 1</td>
</tr>
<tr>
<td>Histopathologic stage (0 : I : II : III : IV)</td>
<td>5 : 5 : 5 : 6 : 0</td>
</tr>
<tr>
<td>Degree of differentiation</td>
<td></td>
</tr>
<tr>
<td>Well differentiated</td>
<td>4</td>
</tr>
<tr>
<td>Moderately differentiated</td>
<td>13</td>
</tr>
<tr>
<td>Poorly differentiated</td>
<td>1</td>
</tr>
<tr>
<td>Not described</td>
<td>3</td>
</tr>
<tr>
<td>Postoperative treatment</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>12</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>5</td>
</tr>
<tr>
<td>Concurrent chemoradiotherapy (CCRT)</td>
<td>4</td>
</tr>
<tr>
<td>Patient status</td>
<td></td>
</tr>
<tr>
<td>No evidence of disease</td>
<td>16</td>
</tr>
<tr>
<td>Death of disease</td>
<td>3</td>
</tr>
<tr>
<td>Alive with disease</td>
<td>2</td>
</tr>
<tr>
<td>Follow-up (months)</td>
<td>1–59 (19.2 ± 18.4)</td>
</tr>
</tbody>
</table>

The T staging of esophageal squamous cell carcinoma revealed that T1 was the most common (n = 9), followed by T0 (n = 6), T3 (n = 4), and T2 (n = 2). A higher T stage was significantly associated with neck occult metastasis (p < 0.05). The N staging of esophageal squamous cell carcinoma revealed that N0 was the most common (n = 11), followed by N2 (n = 5), N1 (n = 4), and N3 (n = 1). A higher N stage was significantly associated with neck occult metastasis (p < 0.05). Based on the histopathologic stage, there were 6, 5, 5, and 5 patients with stage III, 0, I, and II disease, respectively. There were 5 patients with perivascular invasion, 5 patients with extranodal extension, and 2 patients with perineural invasion. Evaluation of the degree of differentiation of esophageal squamous cell carcinoma showed that moderately differentiated carcinoma was the most common (n = 13), followed by well differentiated (n = 4) and poorly differentiated (n = 1) carcinomas. The remaining 3 patients had no record of differentiation.
A total of 9 patients (42.9%) received postoperative treatment, including chemotherapy (n = 5) or CCRT (n = 4). The remaining 12 patients underwent periodic follow-up without any treatment. A total of 16 patients (76.2%) had been under follow-up without disease recurrence after the completion of treatment. However, 3 patients died of esophageal squamous cell carcinoma, and 2 patients were alive with esophageal carcinoma. The follow-up period was 19.2 ± 18.4 months (range, 1–59 months).

As a result of elective neck dissection at neck level IV, neck occult metastasis of intrathoracic esophageal squamous cell carcinoma was diagnosed in 3 cases (14.3%), all of which involved left neck lymph nodes (Table 2). One of the three patients died within 2 weeks after surgery; thus, there was no further treatment. One patient who did not receive preoperative treatment underwent postoperative CCRT and had been under follow-up without recurrence. Another patient who underwent CCRT before surgery received additional chemotherapy after surgery but showed relapse and had been under follow-up.

Table 2
Clinical characteristics of 3 patients diagnosed with neck occult metastasis of intrathoracic esophageal squamous cell carcinoma

<table>
<thead>
<tr>
<th>Age / sex</th>
<th>Preoperative treatment</th>
<th>Location from incisor (cm)</th>
<th>Tumor size (cm)</th>
<th>TN stage</th>
<th>Histopathologic stage</th>
<th>Degree of differentiation</th>
<th>Postoperative treatment</th>
<th>Patient status</th>
<th>Follow-up (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>58/M CCRT</td>
<td>30</td>
<td>0</td>
<td>T0N2</td>
<td>III</td>
<td>Moderate</td>
<td>None</td>
<td>DOD</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>66/M</td>
<td>28</td>
<td>1.8</td>
<td>T2N1</td>
<td>II</td>
<td>Moderate</td>
<td>CCRT</td>
<td>NED</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>66/M CCRT</td>
<td>40</td>
<td>3.5</td>
<td>T2N3</td>
<td>III</td>
<td>Moderate</td>
<td>Chemotherapy</td>
<td>AWD</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

M, male; CCRT, concurrent chemoradiotherapy; DOD, death of disease; NED, no evidence of disease; AWD, alive with disease.

DISCUSSION

Three-field lymph node dissection is controversial due to the risk of complications such as anastomosis leak or vocal cord palsy. In recent studies, superparamagnetic iron oxide-enhanced magnetic resonance imaging (MRI) and real-time polymerase chain reaction have been shown to be helpful for estimating the need for three-field lymph node dissection. However, it is impossible to diagnose all cases of neck occult metastasis even with various imaging modalities such as CT, MRI, and PET. Therefore, three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma was performed at our hospital. There were no notable surgical complications after three-field lymph node dissection. The observed outcomes may be mainly attributed to surgery by a skilled thoracic surgeon; however, good collaboration with an otolaryngologist may also play an important role.

In this study, neck occult metastasis of intrathoracic esophageal squamous cell carcinoma was found in 3 patients (14.3%). All 3 patients had metastasis to the left cervical lymph nodes. Preoperative CCRT, T stage, and N stage were risk factors for neck occult metastasis of intrathoracic esophageal squamous cell carcinoma (p < 0.05). Considering the higher stage of the preoperative CCRT group compared with the untreated group, the incidence of neck occult metastasis may be high in patients with high-stage intrathoracic esophageal squamous cell carcinoma. In addition, the higher the T stage and N stage, the higher the likelihood of neck occult metastasis. Therefore, three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma should be performed more thoroughly for patients with advanced T stage, N stage, and histopathologic stage, even after preoperative CCRT. The incidence of neck occult metastasis was not significantly different according to location, size, histopathologic stage, perivascular invasion, extranodal extension, perineural invasion, and degree of differentiation of intrathoracic esophageal squamous cell carcinoma (p > 0.05).

In summary, our hospital successfully performed three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma without complications under the leadership of a thoracic surgeon and in cooperation with an otolaryngologist. Given that the incidence of neck occult metastasis of intrathoracic esophageal squamous cell carcinoma could be as high as 14.3%, three-field lymph node dissection should be performed.

CONCLUSION

Three-field lymph node dissection may be necessary for intrathoracic esophageal squamous cell carcinoma, and neck lymph node dissection should be performed by an otolaryngologist familiar with the anatomy of the neck to reduce complications. Preoperative
CCRT, T stage, and N stage were identified as risk factors for neck occult metastasis of intrathoracic esophageal squamous cell carcinoma.

**Declarations**

**DATA ABAILABILITY**

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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**References**


