

# Treatment outcomes of elective neck dissection in intrathoracic esophageal carcinoma

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**Abstract.** In the present study, the outcomes of elective neck dissection in patients with intrathoracic esophageal squamous cell carcinoma were investigated. From January 2016 to December 2022, 21 patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma were enrolled. Of these 21 patients, 19 patients were male and 2 were female. A total of 11 patients received concurrent chemoradiotherapy (CCRT) as preoperative treatment. As a result of elective neck dissection at both neck level IV, occult neck metastasis of esophageal squamous cell carcinoma was diagnosed in 3 cases, all of which involved left neck lymph nodes. The incidence of occult neck metastasis was statistically significant in patients with preoperative CCRT, high T stage and high N stage ( $P < 0.05$ ). In addition, 16 out of 21 patients had been under follow-up without disease recurrence after the completion of treatment. However, 3 out of 21 patients succumbed to esophageal squamous cell carcinoma and 2 out of 21 patients were alive with stable disease of esophageal carcinoma. The follow-up period was  $19.2 \pm 18.4$  months. In conclusion, three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma may be necessary in patients with certain phenotypes, such that collaboration between thoracic surgeons and otolaryngologists may help reduce surgical complications.

## Introduction

Esophageal squamous cell carcinoma is one of the most aggressive forms of gastrointestinal carcinomas, where metastasis to lymph nodes is one of the main factors used for determining the severity of the prognosis (1,2). The incidence of cervical lymph node metastasis ranges from 23.4 to 49.5% (2). However, it is impossible to diagnose all cases of occult neck metastasis during preoperative examination (3-8). Therefore, three-field lymph node dissection, including the thoracic, abdominal and cervical nodes, is considered the mainstay of surgical treatment for esophageal squamous cell carcinoma (1-6,9). However, three-field lymph node dissection is controversial due to the risk of complications and because it is not necessary for all patients (1-10).

At Chonnam National University Hwasun Hospital (Hwasun, South Korea), neck dissection of lymph nodes was performed in patients with intrathoracic esophageal squamous cell carcinoma when metastasis into the upper paratracheal nodes was suspected on preoperative imaging examinations or when it was confirmed by frozen biopsy during surgery. Among the three-field lymph node dissections, cervical node surgery, i.e., neck dissection, was performed by an otolaryngologist in all cases. The results were analyzed to investigate the outcomes of elective neck dissection in intrathoracic esophageal squamous cell carcinoma.

## Patients and methods

**Logistics.** The present study received approval from the Institutional Review Board of Chonnam National University Hwasun Hospital (Hwasun, South Korea; approval no. CNUHH-2023-080). From January 2016 to December 2022, 21 patients (Table I) who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma at Chonnam National University Hwasun Hospital (Hwasun, South Korea) were enrolled. The inclusion criteria for this study were intrathoracic esophageal squamous cell carcinoma and no cervical lymph node metastasis detected on PET/CT. The requirement

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Table I. Clinical characteristics of patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma (n=21).

Parameter	Value	P-value <sup>a</sup>
Sex, male:female	19:2	
Age, years (range)	63.4±7.0 (41-73)	
Carcinoma location from the incisor, cm (range)	26.6±4.9 (20-40)	>0.05
Carcinoma size, cm (range)	1.9±1.7 (0-5)	>0.05
T stage, 0:1:2:3:4	6:9:2:4:0	<0.05
N stage, 0:1:2:3	11:4:5:1	<0.05
Histopathologic stage, 0:I:II:III:IV	5:5:5:6:0	>0.05
Perivascular invasion, Yes:No	5:16	>0.05
Extranodal extension, Yes:No	5:16	>0.05
Perineural invasion, Yes:No	2:19	>0.05
Degree of differentiation		>0.05
Well	4	
Moderate	13	
Poor	1	
Not described	3	
Preoperative treatment		<0.05
None	10	
CCRT	11	
Postoperative treatment		>0.05
None	12	
Chemotherapy	5	
CCRT	4	
Patient status		>0.05
No evidence of disease	16	
Succumbed to disease	3	
Alive with disease	2	
Follow-up, months (range)	19.2±18.4 (1-59)	

<sup>a</sup>Comparison of patients who underwent esophagectomy and elective neck dissection (both neck level IV) for intrathoracic esophageal squamous cell carcinoma, divided into groups with and without lymph node metastasis. Values are expressed as the mean ± standard deviation (range) or n. CCRT, concurrent chemoradiotherapy.

for informed patient consent was waived due to this being a retrospective study of case records.

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

A single thoracic surgeon (KJN) performed esophagectomy and an otolaryngologist (DHL) performed the level IV bilateral neck dissection, which included the supraclavicular nodes and internal jugular nodes. Histopathological staging was performed based on the seventh edition of the American Joint Committee on Cancer TNM staging system (5). All surgical specimens were confirmed by histopathological examination.

**Statistical analysis.** Data are presented as n (%) or the mean ± standard deviation. Fisher's exact test and the t-test were used to evaluate the outcomes of elective neck dissection in intrathoracic

esophageal squamous cell carcinoma. SPSS version 27.0 (IBM Corp.) was used for all statistical analyses. P<0.05 was considered to indicate a statistically significant difference.

## Results

**Clinical characteristics.** 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 I. 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).

**Histopathologic results.** 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). 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). In terms of histopathological staging, there were 6, 5, 5 and 5 patients with stage III, 0, I and II disease, respectively. In each result, there were 5 patients with perivascular invasion, 5 patients with extranodal extension and 2 patients with perineural invasion, which was not observed in the remaining patients (Table I). 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.

**Treatment results.** In 21 patients, three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma was performed well without any complications. A total of 11 patients received concurrent chemoradiotherapy (CCRT) as preoperative treatment. Furthermore, 9 patients received postoperative treatment, including chemotherapy alone (n=5) or CCRT alone (n=4). In total, 4/5 patients who received post-operative chemotherapy alone also received preoperative CCRT. The remaining 5 patients, who had not received any treatment other than surgery, were regularly followed up without any treatment before or after surgery. A total of 16 patients (76.2%) had been under follow-up without disease recurrence after the completion of treatment. However, 3 patients succumbed to esophageal squamous cell carcinoma whereas 2 patients were alive with stable disease of esophageal carcinoma. The follow-up period was 19.2±18.4 months (range, 1-59 months).

**Elective neck dissection results.** As a result of elective neck dissection at neck level IV, occult neck metastasis of intrathoracic esophageal squamous cell carcinoma was diagnosed in 3 cases (14.3%), all of which involved left neck lymph nodes (Table II). The incidence of neck occult metastasis was found to be significantly associated with preoperative CCRT, high T stage and high N stage (P<0.05, Table I). The incidence of occult neck 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 total, one of the three patients (male, 58 years old) died within 2 weeks after surgery, resulting in no treatment required. By contrast, one patient (a 66-year-old male) did not receive preoperative treatment but underwent postoperative CCRT, who had been under follow-up without recurrence. The third patient (also a 66-year-old male) underwent CCRT before surgery whilst also receiving additional chemotherapy after surgery, but recurrence was discovered 12 months after surgery, and he was followed up for up to 14 months.

**Discussion**

Three-field lymph node dissection is controversial due to the risk of complications, such as anastomosis leak or vocal cord palsy (1-6,9). In previous studies, superparamagnetic iron oxide-enhanced MRI and real-time PCR were shown to be beneficial for estimating the requirement for three-field lymph node

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

Age, years/ sex	Preoperative treatment	Location from incisor, cm	Tumor size, cm	TN stage	Histopathological stage	Perivascular invasion	Extranodal extension	Perineural invasion	Degree of differentiation	Postoperative treatment	Patient status	Follow-up, months
58/M	CCRT	30	0	T0N2	III	No	No	No	Moderate	None	DOD	1
66/M	None	28	1.8	T2N1	II	No	No	No	Moderate	CCRT	NED	29
66/M	CCRT	40	3.5	T2N3	III	Yes	Yes	No	Moderate	Chemotherapy	AWD	14

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

dissection (1,3). In addition, ultrasonography has demonstrated applicability as a screening imaging method for lymph node involvement in the neck (11). However, it is effectively impossible to diagnose all cases of occult neck metastasis, even with the full array of imaging examination techniques available (3,4,6-8). Therefore, three-field lymph node dissection has been performed for intrathoracic esophageal squamous cell carcinoma at our hospital. In the present cohort, 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, adequate collaboration with an otolaryngologist may also have an important role (10).

In the present study, occult neck 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. The incidence of neck occult metastasis was significantly associated with preoperative CCRT, high T stage and high N stage ( $P < 0.05$ ). Considering the higher stage of the preoperative CCRT group compared with the untreated group, the incidence of occult neck metastasis may be higher in patients with high-stage intrathoracic esophageal squamous cell carcinoma. Therefore, a higher T stage and N stage may indicate a higher likelihood of neck occult metastasis. 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 histopathological stage, even after preoperative CCRT. The incidence of occult neck 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 the present study, 16 patients received chemotherapy or CCRT before and after surgery. Neoadjuvant treatment of esophageal carcinoma has been shown to impact local recurrence and survival (10). In addition, postoperative radiotherapy previously shown to be a potent prognostic factor for overall survival (6). Indications for postoperative radiotherapy in head and neck cancer include extracapsular nodal spread, positive surgical margins, multiple positive nodes, vascular/lymphatic/perineural invasion and pT3 or pT4 primary tumor (6).

In summary, in the present cohort, three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma was performed well without any complications under the leadership of a thoracic surgeon and in cooperation with an otolaryngologist. The incidence of occult neck metastasis of intrathoracic esophageal squamous cell carcinoma was 14.3%, suggesting that three-field lymph node dissection should be considered in certain patients with preoperative CCRT, high T stage and high N stage.

The present study has limitations in that it has a small sample size and was of a retrospective nature. Future prospective studies with larger cohorts will further enhance the impact of the findings.

In conclusion, the incidence of neck occult metastasis was significantly associated with preoperative CCRT, high T stage and high N stage. Three-field lymph node dissection for intrathoracic esophageal squamous cell carcinoma may be necessary in certain patients, where collaboration between thoracic surgeons and otolaryngologists may help reduce complications.

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## Availability of data and materials

The data generated in the present study may be requested from the corresponding author.

## Authors' contributions

DHL and KJN conducted and designed the research. DHL and KJN checked and approved the authenticity of the raw data. DHL, JKL, SCL, JSY and KJN performed the experiments, analyzed data and wrote the manuscript. DHL, DNL, HBJ and KJN provided technical support and designed the tables. DNL and HBJ also contributed to the analysis and interpretation of data. All authors contributed to the article and all authors read and approved the final manuscript.

## Ethics approval and consent to participate

The present study received approval from the Institutional Review Board of Chonnam National University Hwasun Hospital (Hwasun, South Korea; approval no. CNUHH-2023-080). The requirement for informed patient consent was waived due to this being a retrospective study of case records.

## Patient consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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