Annals of Medical Research

DOI: 10.5455/annalsmedres.2019.03.159 2019;26(9):2011-6

Original Article

Surgical technique and short-term outcomes in esophageal squamous cell carcinoma : A single center experience

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Abstract

Aim: Esophagus cancers are the 8th most commonly seen cancers worldwide and the 6th cause of cancer-related mortality. By the time they are diagnosed they are generally not resectable and therefore have a poor prognosis. This is a complex disease that requires a multi-disciplinary approach. Apart from early stage tumors, surgery is recommended following chemoradiotherapy. Squamous cell carcinomas are seen more frequently and several surgical methods are applied for curative resection. The aim of this study was to present the surgical techniques applied to patients who underwent surgery for esophagus squamous cell carcinoma and to discuss the postoperative outcomes.

Material and Methods: A retrospective review was made of the records of 14 patients with esophagus squamous cell carcinoma who underwent surgery in Samsun Training and Research Hospital between June 2016 and September 2018. Patients' demographic data, diagnoses, tumor characteristics, postoperative complications, mortality, and clinical findings during follow-up were recorded.

Results: The study included 14 patients, comprising 9 females and 5 males with a median age was 65.3 years (range, 39-80 years). Transhiatal esophagectomy was applied to 12 patients and thoraco-laparoscopic (TL) esophagectomy to 2 patients. No intra-operative complications developed in the patients applied with TL esophagectomy. In 3 of the patients applied with transhiatal esophagectomy, pneumothorax developed. No early or late postoperative complications developed in the patients applied with TL esophagectomy. In the transhiatal esophagectomy group, anastomosis leakage was observed in 2 patients and wound site infection in 1. The median length of hospital stay was 14 days (range, 7-39 days), and median postoperative follow-up was 12.5 months (range, 4-22 months).

Conclusion: Despite small number of patients and short follow up, our study suggest that surgery-related morbidity and mortality will be lower in minimally invasive esophagectomy.

Keywords: Surgical technique; esophagus; squamous cell carcinoma.

INTRODUCTION

Squamous cell carcinoma (SCC) and adenocarcinoma are the most common cancers of the esophagus . SCC is more common in developing countries, while adenocarcinoma associated with Barrett's esophagus is more common in developed countries (1). Globally, esophageal cancer is the eighth most common cancer and the sixth leading cause of cancer deaths (2). Mortality and morbidity result from the fact that patients seek medical treatment after developing dysphagia due to narrowing of the esophageal lumen, and the tumor resectability rate at that stage of disease is generally low (3). There is still no consensus on treatment planning for such patients, whose cancer is already locally advanced at time of diagnosis. These patients undergo surgery following neo-adjuvant chemotherapy, radiotherapy, or both (4). However, surgery is the gold standard for treatment of tumors detected at early stages. The 2019 National Comprehensive Cancer Network (NCCN) guidelines recommend surgery alone for carcinoma *in situ* and T1a tumors, and surgery is also the primary recommendation for T1b and T2 tumors that are less than 2 cm in size and well-differentiated with no lymph node metastasis (5). Curative resection can be performed using various esophagectomy techniques. Some studies have reported similar outcomes between these different methods, while others have reported significant differences in outcome (6, 7). Therefore, it has

Received: 24.03.2019 **Accepted:** 15.07.2019 **Available online:** 01.10.2019
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not been possible to identify the best surgical method, and procedures are chosen based on which is most appropriate for the tumor's structural features and the surgeon's experience.

In the present study, we evaluated the surgical techniques, postoperative complications, recurrence rates, and early survival outcomes of esophageal SCC surgeries performed in our center.

MATERIALS and METHODS

Ethical committee approval was obtained from the local ethics committee of our hospital with the number of 2019/6 and informed consent was given by all patients. The medical records of 14 patients who underwent surgery for esophageal SCC between June 2016 and September 2018 in Samsun Training and Research Hospital were retrospectively evaluated. Tumor size and degree of invasion, lymph node involvement, and stage were determined according to the American Joint Committee on Cancer (AJCC) TNM system (8). Patients who received radiotherapy simultaneously with three courses of cisplatin and 5-fluorouracil (5-FU) therapy prior to surgery were classified in the neoadjuvant chemoradiotherapy (CRT) group. Complications were evaluated as perioperative (those occurring during surgery), early postoperative (≤1 month after surgery), and late postoperative (>1 month after surgery) complications. Postoperative complications are classified according to Clavien-Dindo classification (9). Endoscopy and positron emission tomography scans were performed at postoperative 6 and 12 months to monitor for recurrence. Recurrence was categorized as early (≤1 year after surgery) or late (>1 year after surgery).

In statistical analysis, categorical data were presented as median and range (minimum-maximum). Continuous variables were presented as counts and percentages.

SURGICAL TECHNIQUE

Transhiatal esophagectomy was performed in supine position. After an upper midline laparotomy, greater curvature was separated from omentum while preserving right gastroepiploic artery and its branches to gastric wall. Gastrohepatic ligament was divided. Left gastric artery was ligated and lymph nodes were swept toward to stomach. Kocher maneuver was performed. Peritoneum was divided at diaphragmatic hiatus and esophagogastric junction was mobilized. Mediastinal mobilization of esophagus was carried out by blunt finger dissection. Gastric tube was created by surgical stapler (Figure 1) and upper edge of conduit was sutured to distal part of the specimen to facilitate pulling up the gastric tube. In first 10 patients, pyloroplasty was performed and all these patients underwent transhiatal esophagectomy. Cervical step was performed with a left cervical incision. Sternocleidomastoid muscle was retracted laterally and thyroid was retracted medially. Middle thyroid vein was ligated. Recurrent laryngeal nerve was visualized and protected. Cervical esophagus was freed. Specimen extracted via cervical incision and the gastric tube was subsequently pulled up through the mediastinal route. Esophagogastrostomy was performed by 25 mm circular stapler.

We used prone position for thoracoscopic step of minimally invasive esophagectomy. Double lumen endotracheal tube was used for single lung ventilation. Ports were inserted into 4th (10 mm), 6th (5 mm and 10 mm) and 8th (10 mm) intercostal space on the right side of the patient. Esophagus was mobilized with the paraesophageal lymph nodes. The azygos vein was ligated with a polymer ligating clip and transected (Figure 2, 3, 4). At the end of the procedure a 28 F chest tube inserted and the patient was ruined to supine position. Peritoneal cavity was insufflated with a Veress needle through the umbilicus and a 10 mm trocar was inserted for camera. A subxiphoidal liver retractor was placed. A 12 mm trocar and a 10 mm trocar were located at the right and left midclavicular line respectively. Additionally, a 5 mm right subcostal trocar was used. Gastrocolic ligament transected and right gastroepiploic artery was preserved. Left gastric artery was ligated and lymph nodes were swept toward to stomach. Kocher maneuver was performed to mobilize stomach. Gastric tube was created with linear laparoscopic staplers. Peritoneum was divided at diaphragmatic hiatus and the specimen was completely mobilized. Cervical phase was carried out as mentioned above (Figure 5). We did not use feeding jejunostomy routinely.

Figure 1. Gastric tube prepared in transhiatal esophagectomy

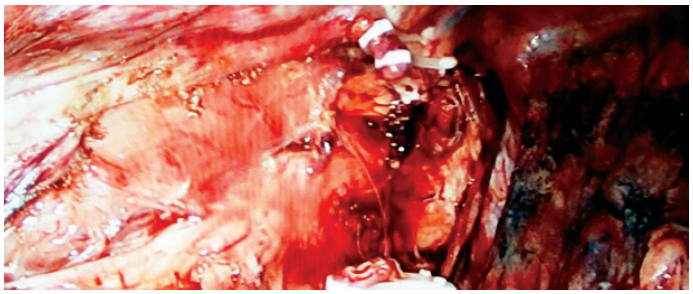

Figure 2. Vena azygos

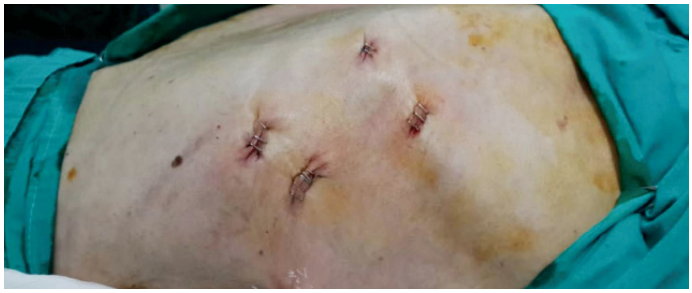

Figure 3. Thoracoscopy trocar placement

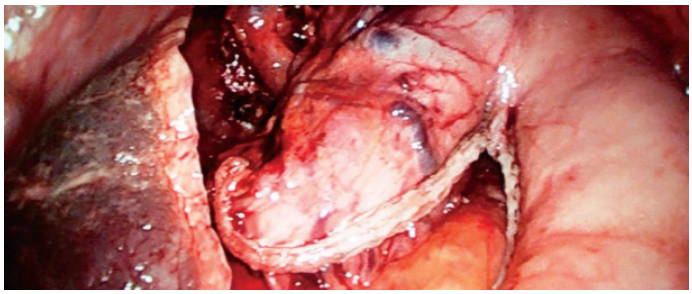

Figure 4. Gastric tube preparation in TL

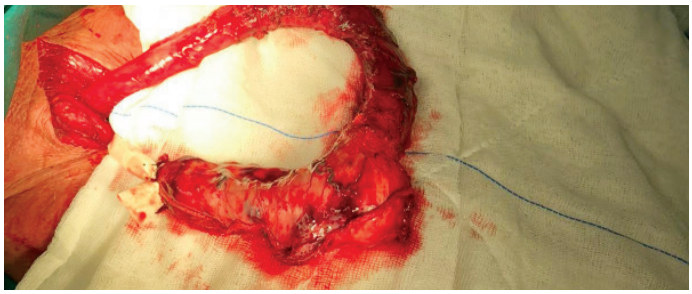

Figure 5. Specimen in TL

RESULTS

The study included 9 women and 5 men with a median age of 65.3 (39–80) years. Tumor location was determined using upper gastrointestinal system (GIS) endoscopy as the lower portion of the esophagus in 11 patients and the middle part of the esophagus in 3 patients. Computed tomography (CT) screening revealed lymph node involvement in 3 patients and stage T2 disease without lymph node involvement in 3 patients. Median tumor size was 32 mm. These 6 patients were given neoadjuvant CRT. Transhiatal esophagectomy was performed on 12 patients and thoraco-laparoscopic (TL) esophagectomy was performed on 2 patients (Figure 1-5). Neoadjuvant CRT was given to patients who underwent TL esophagectomy.

No perioperative complications were observed in patients who underwent TL esophagectomy. Pneumothorax occurred in 3 patients who underwent transhiatal esophagectomy and chest drains were placed. The patients were mobilized at postoperative 8 hours and nasogastric catheter was removed after 24 hours. The median length of hospital stay was 14 (range, 7–39) days. There were no early complications in patients who underwent TL esophagectomy. One of the patients who underwent transhiatal esophagectomy developed evisceration due to surgical site infection and underwent relaparotomy with fascial repair. Anastomotic leak occurred in 2 patients, who underwent re-exploration and feeding jejunostomy. One of these patients died due to mediastinal lymph node metastasis and distant organ metastasis at postoperative month 11. In the other patient, the anastomotic leak was treated but stenosis occurred as a late complication and was managed with bougie dilation.

No surgery-related late complications occurred in patients who underwent TL esophagectomy, whereas upper GIS endoscopy performed at postoperative month 3 revealed stenosis in 2 patients who underwent transhiatal esophagectomy. These patients were treated with bougie dilation and their symptoms resolved. Postoperative complications were assessed as grade I for one patient, grade IIIa for 2 patients and grade IIIb for 5 patients (Table 1).

Tumor stage was reported as T1 in 1 (7.1%), T2 in 2 (14.3%), T3 in 9 (64.3%), T4 in 1 (7.1%) and tumor negative in one patient. The median number of lymph nodes dissected was 12.9 (1–25); the number of metastatic lymph nodes detected was 0 in 7 patients, 1 in 5 patients, 2 in 1 patient, and 3 in 1 patient. According to TNM staging (8), 7.1% of

Table 1. Features and outcomes of the patients

	n = 14
Age (years), median	65.3
Gender	
Male	5 (35.7%)
Female	9 (64.3%)
Tumor localization	
1/3 middle part of the esophagus	3 (21.4%)
1/3 lower part of the esophagus	11 (78.6%)
Neoadjuvant therapy	6 (42.8%)
Surgical treatment	
Transhiatal oesophagectomy	12 (85.7%)
Thoraco-laparoscopic oesophagectomy	2 (14.3%)
Tumor stage	
T1	1 (7.1%)
T2	2 (14.3%)
T3	9 (64.3%)
T4	1 (7.1%)
Tumor negative	1 (7.1%)
Complication	
Clavien-Dindo classification	
Grade I	1
Grade IIIa	2
Grade IIIb	5
Early period	3
Pneumothorax	2
Anastomosis leakage	1
Wound site infection	
Late period	
Stricture	2
Median hospital stay (days)	14
Median follow-up time on average (months)	12.5

the tumors were stage 1, 21.5% were stage 2a, 35.7% were stage 2b, and 35.7% were stage 3.

The patients were followed for a median of 12.5 (4–22) months postoperatively.

Patients' detailed data was given in Table 2. Two patients underwent TL esophagectomy. One of the patients who had TL esophagectomy died in postoperative month 4 due to respiratory problems following surgery in postoperative month 3 to repair a femur fracture due to bone metastasis. The other patient is in postoperative month 6 and is under follow-up. Three of 12 patients who underwent transhiatal esophagectomy died during follow-up. One of them died due to cardiac failure. Mediastinal recurrence was detected in 2 patients who underwent transhiatal esophagectomy; one of these patients died due to disease in postoperative month 11 and the other in 14.

Table 2. Detailed data of the patients

patients	age (years)	gender	tumor location	neoadjuvant CRT	procedure of esophagectomy	complications	hospital stay (days)	lymph node metastasis	Pathological T stage	follow-up (months)
1	59	male	middle 1/3	no	transhiatal	pneumothorax, wound site infection	21	negative	T1	21
2	70	female	lower 1/3	received	transhiatal		8	negative	T3	16
3	78	male	lower 1/3	no	transhiatal	stricture	8	positive	T3	19
4	64	male	lower 1/3	received	transhiatal		9	negative	T3	19
5	66	female	lower 1/3	no	transhiatal		11	positive	T2	18
6	61	male	middle 1/3	no	transhiatal	pneumothorax, anastomotic leak	39	positive	T3	10
7	65	female	lower 1/3	no	transhiatal	anastomotic leak	21	positive	T3	13
8	39	female	lower 1/3	received	transhiatal		7	positive	T2	15
9	80	male	lower 1/3	no	transhiatal	stricture	10	positive	T3	10
10	61	male	lower 1/3	received	transhiatal	pneumothorax	10	negative	tm negative	8
11	72	male	middle 1/3	no	transhiatal		12	negative	T3	6
12	75	male	lower 1/3	no	transhiatal		10	negative	T3	11
13	59	male	lower 1/3	received	thoraco-laparoscopic		13	negative	T3	4
14	66	female	lower 1/3	received	thoraco-laparoscopic		15	positive	T4	5

DISCUSSION

Despite definitive treatments, esophageal cancer is still associated with high mortality due to recurrence and metastases (3). Because most patients are diagnosed after becoming symptomatic, the likelihood of having resectable disease at presentation is 30–40% and they are treated with neoadjuvant therapy. However, surgery is the standard treatment for tumors detected at early stages (10-12). Although T1a tumors can be removed by endoscopic resection, the general approach for T1–T3 tumors is to perform esophagectomy. Preferred esophagectomy technique varies based on tumor size, tumor location, and perhaps most importantly, the surgeon's experience (13). While resection is preferred for tumors located in the thoracic esophagus and abdominal esophagus 5 cm distal to cricopharyngeus, definitive CRT is recommended for cervical and proximal thoracic esophageal cancers located within the first 5 cm from the cricopharyngeus. Resection is not preferred for esophageal cancers more than 8 cm in length, but surgery should be the primary consideration in tumors shorter than 4 cm (14).

Although numerous techniques are used in esophagectomy, the most common approaches are transthoracic and transhiatal esophagectomy (6). Of the transthoracic approaches, the Ivor Lewis procedure is usually preferred, though the McKeowan procedure is also used. Both procedures start with right thoracotomy and laparotomy; however, the Ivor Lewis technique involves an esophagogastric anastomosis with the upper thoracic esophagus, while the McKeowan technique uses a cervical anastomosis (15,16). As both techniques require thoracotomy, they cause postoperative pain and pulmonary complications (17,18). Pulmonary complications vary from atelectasis, which can be easily managed postoperatively, to potentially fatal pneumonia. In a series of transthoracic esophagectomies, pulmonary complications were shown to be responsible for 55% of

postoperative deaths (18). Transhiatal esophagectomy involves laparotomy to open the hiatus, blunt dissection to release the esophagus, and left cervical esophagogastric anastomosis. Because this approach does not involve thoracotomy, pulmonary complications and morbidity rates are lower than with transthoracic esophagectomies (19). However, there is higher risk of injuring the adjacent organs, as this dissection approach does not provide adequate exposure compared to transthoracic esophagectomy. Injury to the pneumothorax, trachea, and azygos vein can occur and may require chest tube placement or even thoracotomy for damage control. Pneumothorax occurred in 3 of the 12 patients in our series who underwent transhiatal esophagectomy, which was the most commonly preferred approach in our study. These patients were managed using chest tubes.

Minimally invasive esophagectomies (MIE) have been done more frequently in recent years in order to reduce the complication rate in both transthoracic and transhiatal esophagectomies. The minimally invasive approach utilizes simultaneous laparoscopy and thoracoscopy. The basic principle of MIE is to reduce morbidity by using a small incision, which is an advantage of thoracoscopy/laparoscopy over open surgery, and to thereby reduce postoperative pain, surgical site infections, need for intensive care, and length of hospital stay. Minimally invasive Ivor Lewis esophagectomy (laparoscopic and thoracoscopic thoracic anastomosis) and minimally invasive McKeowan procedure (laparoscopic and thoracoscopic left cervical anastomosis) are used for these purposes. MIE is recommended for selected cases due to the lower rates of postoperative pulmonary complications and shorter recovery time reported in the literature (19-22). Although there are no randomized studies comparing the long-term outcomes of MIE and open surgery, they seem to be similar in terms of oncologic follow-up (23). In our clinic, minimally invasive McKeowan procedure was performed in 2 patients with end-stage cancer, and no postoperative complications were detected. Our small patient number precludes statistical analysis, but we observed a trend toward higher rate of surgery-related complications in patients who underwent transhiatal surgery.

Although neither transhiatal nor transthoracic esophagectomy is superior in terms of survival and prognosis, we believe that morbidity and surgery-related mortality rates are lower overall with MIE. Therefore, MIE should be preferred more frequently in centers with the necessary equipment and experience in laparoscopic surgery (24).

Competing interests: The authors declare that they have no competing interest.
Financial Disclosure: There are no financial supports
Ethical approval: Ethics committee approval was received from Karatay University Faculty of Medicine. 2019/0036

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