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Salvage esophagectomy under bilateral thoracotomy after definitive chemoradiotherapy for aorta T4 thoracic esophageal squamous cell carcinoma: Report of a case



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ABSTRACT

INTRODUCTION: The surgical technique for esophagectomy to treat esophageal malignancies has been improved over the past several decades. Nevertheless, it remains extremely difficult to surgically treat patients with locally advanced T4b tumors invading the aorta or respiratory tract.

PRESENTATION OF CASE: A 37-year-old Japanese man was diagnosed with T4b (descending aorta) N2M0, Stage IIIc middle thoracic esophageal squamous cell carcinoma. He was initially treated with definitive CRT followed by 3 courses of DCF. After the DCF, CT showed that the main tumor had shrunk and appeared to have separated from the descending aorta. Therefore we decided to perform a salvage esophagectomy. Because we needed the ability to closely observe the site of invasion to determine whether aortic invasion was still present, half the esophageal resection was performed under right thoracotomy, but the final resection at the invasion site was performed under left thoracotomy. Consequently, the thoracic esophagus was safely removed and aortic replacement was avoided. The patient has now survived more than 30 months after the salvage esophagectomy with no additional treatment for esophageal cancer and no evidence of recurrent disease.

DISCUSSION: Because this and the previously reported procedures, each have particular advantages and disadvantages, one must contemplate and select an approach based on the situation for each individual patient.

CONCLUSION: Salvage esophagectomy through a right thoracotomy followed by careful observation of the invasion site for possible aortic replacement through a left thoracotomy is an optional procedure for these patients.

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1. Introduction

The surgical technique for esophagectomy to treat esophageal malignancies has been greatly improved over the past several decades [1,2]. Nevertheless, it remains extremely difficult to surgically treat patients with locally advanced tumors invading the aorta or respiratory tract. The exclusive treatment strategy for these patients is definitive chemoradiotherapy (CRT), and some good responders achieve clinically complete response (CR), as evaluated using esophagography, CT, FDG-PET and/or biopsy after upper gastrointestinal endoscopy [3]. Unfortunately, the incidence of locoregional recurrence is quite high, even among clinical CR patients [4–6]. Because the diagnostic tools available are not suf-

ficient to ensure microscopic extinction of viable cancer cells in submucosal scar tissue, salvage esophagectomy appears to be the sole curative treatment option for these patients [4]. This procedure is associated with high morbidity and mortality, but if it is performed safely, it has the potential to provide cancer free long-term survival for these patients [4].

The following case report describes the therapeutic course of a patient diagnosed with advanced thoracic esophageal squamous cell carcinoma invading the descending aorta. This is the first report of a salvage esophagectomy through a right thoracotomy followed by observation of the aortic invasion site through a left thoracotomy in a patient with T4b locally advanced esophageal squamous cell carcinoma.

2. Case presentation

A 37-year-old Japanese man was seen in a clinic because of progressive dysphagia. He was diagnosed with thoracic esophageal squamous cell carcinoma, based on esophagogastrosocopy, and was then referred to our department for further management. He had

Abbreviations: CRT, chemoradiotherapy; DCF, docetaxel plus 5-fluorouracil and cisplatin; PET-CT, positron emission tomography-computed tomography; SUV, standardized uptake volume.

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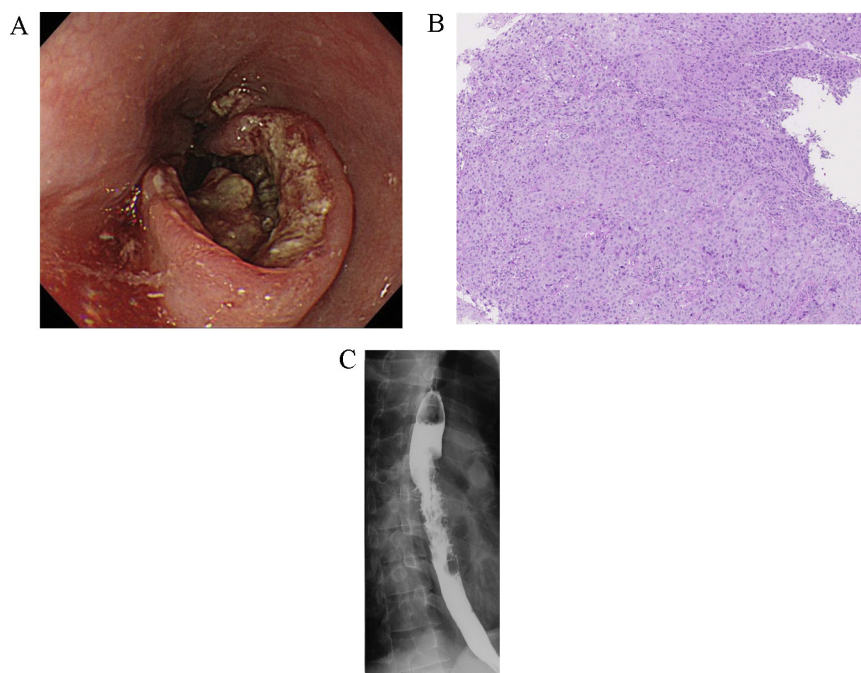


Fig. 1. Findings on examination: (A) Esophagogastroscopy showing a nearly circumferential type 3 tumor 25 cm from the incisors. (B) Histological examination of a biopsy specimen showed well-differentiated squamous cell carcinoma. (C) Barium contrast esophagography revealed a 10 cm-long tumor mainly in the middle of the esophagus.

a past medical history of hospital treatments for alcohol dependence, and his father passed away from esophageal cancer while he was in his 40s. Esophagogastroscopy showed the presence of a nearly circumferential type 3 tumor 25 cm from the incisors (Fig. 1A). Histological examination of a biopsy specimen showed well-differentiated squamous cell carcinoma (Fig. 1B). Barium contrast esophagography revealed a ~10 cm-long tumor situated mainly in the middle of the esophagus (Fig. 1C). In addition, computed tomography revealed that the main tumor had invaded the descending aorta (Fig. 2A) and that lymph nodes in the upper mediastinum were enlarged. ^{18}F -fluorodeoxy glucose PET-CT identified a tumor with a SUVmax of 19.5 (Fig. 2B). Based on these results, this patient was diagnosed with T4b (descending aorta) N2M0, Stage IIIC middle thoracic esophageal squamous cell carcinoma.

The patient was initially treated with definitive CRT: 61.2 Gy and 2 courses of cisplatin plus 5-fluorouracil [7,8]. After the CRT, the main tumor and lymph node metastasis were reduced, which was deemed a partial response. However, CT and PET-CT findings indicated that the main tumor was still invading the descending aorta. Therefore, 3 courses of docetaxel plus 5-fluorouracil and cisplatin (DCF) were then administered [9].

After the DCF, CT showed that the main tumor had shrunk and appeared to have separated from the descending aorta (Fig. 3A). Moreover, the enlarged lymph nodes in the upper mediastinum were still reduced and no other lymph nodes showed enlargement. On the other hand, barium contrast esophagography revealed that there was a deep ulcer on left dorsal wall of middle esophagus (Fig. 3B). Upper gastrointestinal endoscopy also showed the ulcer, and there was no evidence of residual cancer cells, even in biopsy specimens (Fig. 3C). Based on these results, and after much consultation with the patient and his family, we decided to perform a salvage esophagectomy.

In performing this salvage esophagectomy, the following issues had to be addressed. We needed the ability to closely observe the site of invasion to determine whether aortic invasion was still present. Therefore, half the esophageal resection was performed under right thoracotomy, but the final resection at the invasion site was performed under left thoracotomy. In addition, we pre-

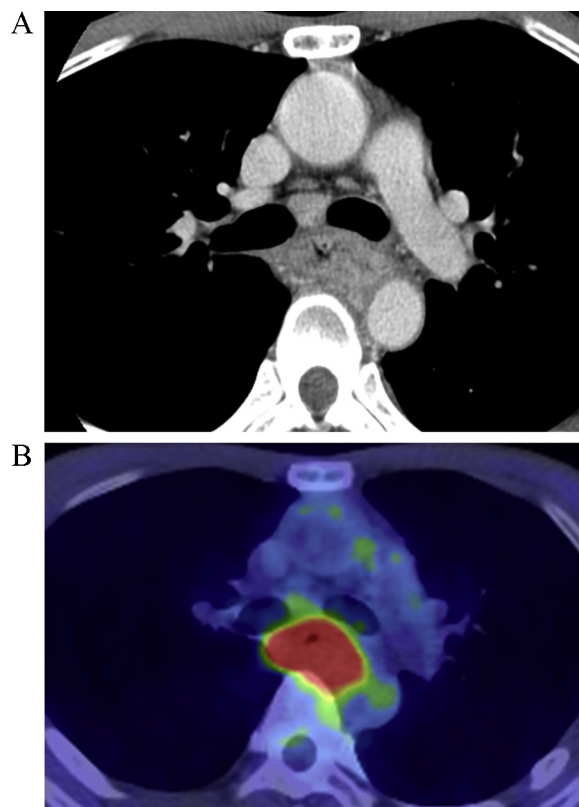


Fig. 2. Pretreatment imaging findings: (A) CT showing the main tumor and suggesting direct invasion of the descending aorta. (B) FDG-PET showing a SUVmax of 19.5 in the main tumor.

pared an extracorporeal circulation system with administration of heparin for the possible aortic replacement and monitored motor evoked potentials (MEPs) to detect spinal cord infarction.

Twelve months after beginning the initial definitive CRT, the salvage esophagectomy with bilateral thoracotomy was performed. A

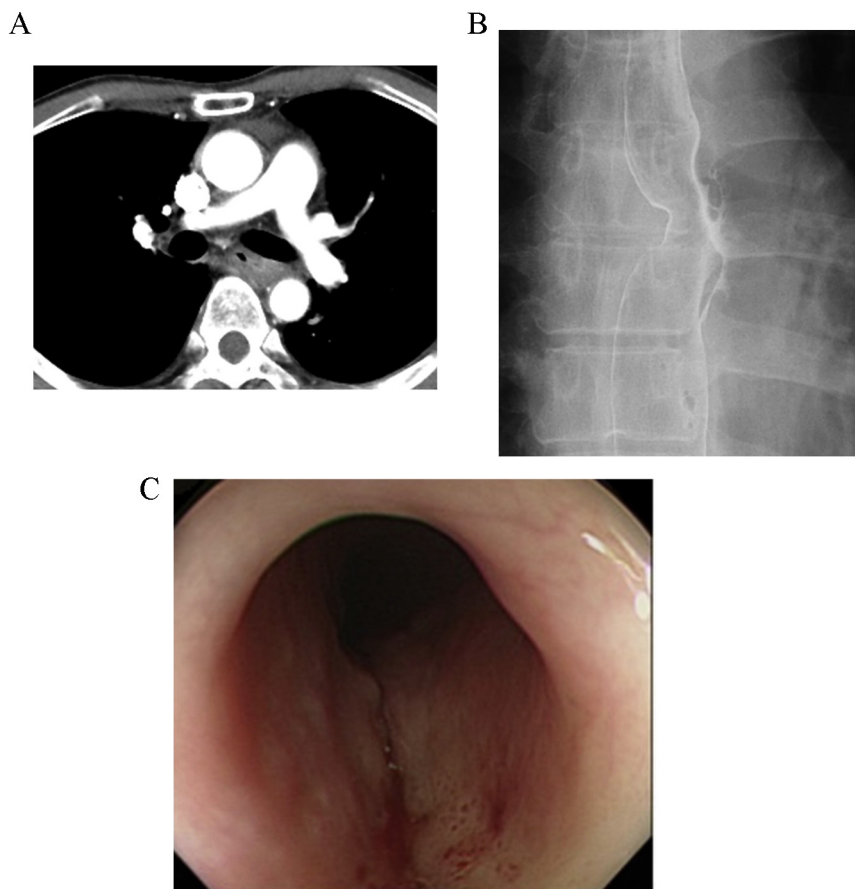


Fig. 3. Post treatment CT imaging findings: (A) After CRT and DCF, the main tumor had shrunk and appeared to be separated from the descending aorta. (B) Barium contrast esophagography revealed a deep ulcer on the left dorsal wall of the middle esophagus. (C) Upper gastrointestinal endoscopy showing the ulcer. There was no evidence of residual cancer cells in biopsy specimens.

single-lumen spiral tracheal tube with bronchial blocker was used for one-lung ventilation. Initially, the chest was opened through a right posterolateral incision in the fifth intercostal space with the patient in the left decubitus position. After thoracic esophageal separation and upper-to-lower mediastinal lymph node dissection, esophageal transections were done at the aortic arch and diaphragmatic levels using a curved cutter stapler (Ethicon, NJ). Detachment of the main tumor from the descending aorta was not done in this operative field. After closing the right thoracic wall, the patient was moved to the right decubitus position, and the chest was opened through a left posterolateral incision in the fifth intercostal space. The descending aorta was encircled with tape at the proximal and distal sites of the main tumor. Within this operative field, we were able to observe the invasion site directly (Fig. 4). Because the area of the invasion site was difficult to separate with blunt dissection and was smaller than expected, we determined it could be resected using sharp dissection. Sharp dissection of hard scar tissue with forceps was done with meticulous care, and the thoracic esophagus was safely removed. Intraoperative histopathological investigation revealed that there was only scar tissue and no esophageal cancer cells in the resected margin. Therefore, aortic replacement and administration of heparin were not needed. After closing the left thoracic wall, the patient was moved to a supine position. Abdominal lymph node dissection and construction of the gastric conduit was then done concomitantly with bilateral neck lymph node dissection. The gastric conduit was pulled up to the left neck via the subcutaneous route, and esophago-gastric conduit anastomosis was accomplished through layer-to-layer hand sewing. Finally, an 8 Fr feeding tube was inserted through anterior wall of the gastric

conduit into the jejunum. The operation time was 11 h 43 min, and the blood loss was 289 g with no blood transfusion.

Following the salvage esophagectomy, the patient stayed in the ICU for 5 days. Tube feeding was started on POD 3 and oral intake was started on POD 9. Temporal left recurrent nerve paralysis was seen but improved gradually during the patient's hospital stay. Because the patient developed central venous catheter fever, his hospital stay after the salvage esophagectomy was 60 days.

Final histopathological diagnosis was pT1(pTis), ly0, v0, pN0, pStage0 with CRT efficiency grade 2. Residual cancer tissue was observed only in the epithelium of the main tumor site (Fig. 5). The patient has now survived more than 30 months after the salvage esophagectomy with no additional treatment for esophageal cancer and no evidence of recurrent disease.

3. Discussion

Several attempts to surgically treat patients with T4b locally advanced tumors invading the descending aorta have been reported previously. Cong et al. reported on 47 patients with esophageal carcinoma invading the descending aorta who underwent radical esophagectomy combined with off-pump aortic replacement through a left thoracotomy [10]. Among these patients, only 5 [10.6%] received preoperative CRT. Although all 47 patients showed acceptable long-term overall survival, complications were observed in 28 patients [59.6%], including one patient with aorta-graft anastomotic bleeding. Moreover, there is a high likelihood that this procedure would have a higher complication rate following definitive CRT. It is also difficult to perform upper

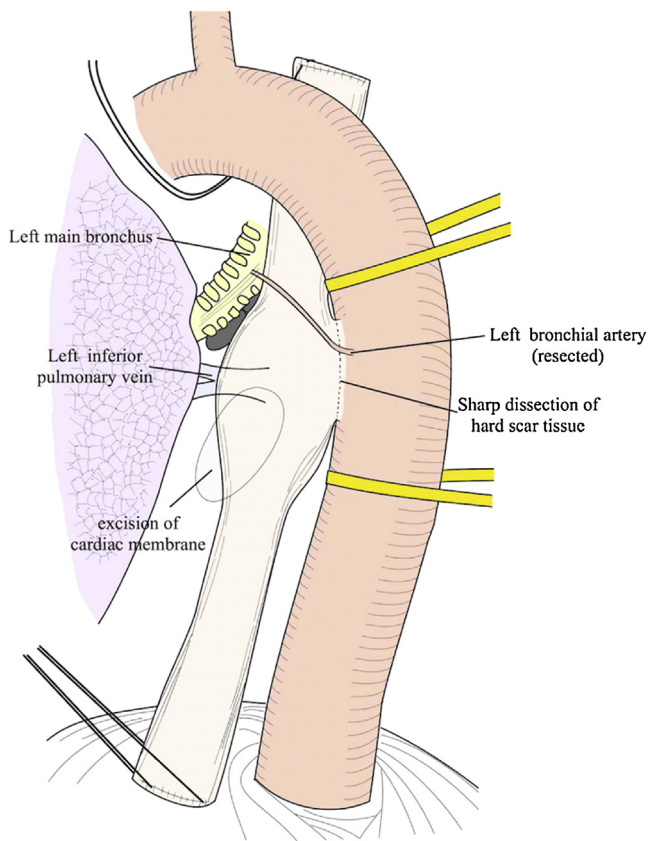


Fig. 4. A Frame format of surgical field: Through the left thoracotomy, we were able to observe the aortic invasion site directly. Because the area of the invasion site was difficult to separate using blunt dissection and was smaller than expected, it was our evaluation that the invasion site could be resected with sharp dissection without aortic replacement.

mediastinal lymph node dissection using only a left thoracotomy due to the position of the aortic arch.

Kabuto et al. performed resection of the aortic wall using a temporary aorta-aorta bypass in combination with a radical

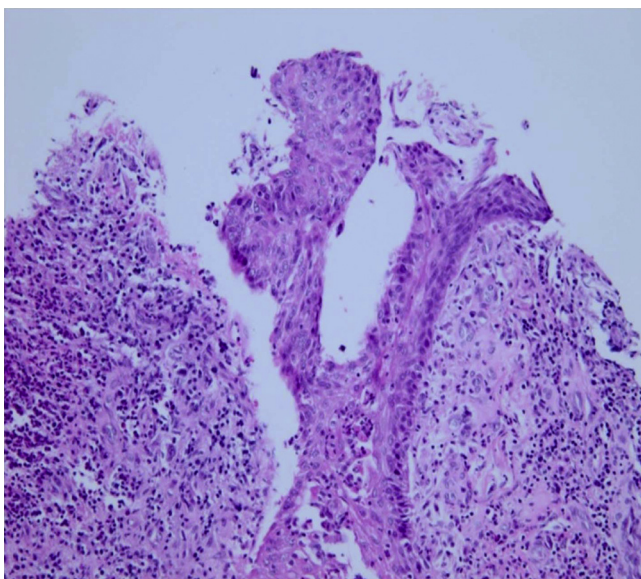


Fig. 5. Final histopathological diagnosis: pT1(pTis), ly0, v0, pN0, pStage0 with CRT efficiency grade 2. Residual cancer tissue was observed only in epithelium of the main tumor site.

esophagectomy through a right thoracotomy in 4 patients [11]. These 4 patients achieved longer survival times without particular complications after the surgery. However, they too had not received any preoperative treatment. In addition, the view through a right thoracotomy makes it difficult to observe the aortic invasion site because it is on the opposite site of the esophageal cancer. What's more, a right thoracotomy also makes it difficult to observe the descending aorta in patients where it tends to be behind of vertebral column.

Kawahara et al. reported a 2-stage operation consisting of aortic replacement through a left thoracic approach, followed by radical esophagectomy through a right thoracic approach [12]. This procedure has the benefit that surgeons are able to closely observe the invasion site at the beginning of the surgery. In cases where aortic replacement is inevitable, radical esophagectomy with lymph node dissection through a right thoracic approach should be performed after the aortic replacement and administration of heparin.

In the present case, we performed the opposite procedure: radical esophagectomy through the right thoracotomy followed by observation of the aortic invasion site through a left thoracotomy. Fortunately, with careful observation through the left thoracotomy, aortic replacement was avoided and curative salvage esophagectomy was accomplished. Because this and the previously reported procedures each have particular advantages and disadvantages, one must contemplate and select an approach based on the situation for each individual patient.

4. Conclusion

Salvage esophagectomy through a right thoracotomy followed by careful observation of the invasion site for possible aortic replacement through a left thoracotomy is an optional procedure for these patients.

Conflicts of interest

All authors state that they have no financial competing interests to disclose.

Sources of funding

This work was supported by Takeda Science Foundation.

Ethical approval

This study was approved by the Ethics Committee of Akita University School of Medicine. All of the participants provided informed consent and signed a human subject institutional review board consent form.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Author's contributions

YN made substantial contributions to acquisition of data and to draft the manuscript. YS participated in its design and coordination and helped to draft the manuscript. SM participated in the design of the study. KY, TS and AW helped to draft the manuscript. HS and YM participated in the design of the study.

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