Case report

Successful robotic proximal gastrectomy with side overlap esophagogastrostomy following preoperative chemotherapy: A case report

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ABSTRACT

Introduction and importance: Adenocarcinoma of the esophagogastric junction (AEJ) has been on the rise in recent years, but the technical aspects of reconstruction and reflux prevention are unsolved problems. This case report aimed to illustrate the usefulness of preoperative chemotherapy for tumor shrinkage and the advantage of robotic surgery for stable reconstruction with reflux prevention.

Case presentation: A 69-year-old male patient was diagnosed with AEJ cT3N0M0 cStage IIB. Three courses of doublet chemotherapy with 80 mg/m²/day of S-1 on days 1–14 and 100 mg/m² of oxaliplatin on day 1 were administered every 3 weeks before surgery. After chemotherapy, the tumor shrunk, and the proximal margin changed from 1.5 cm above the esophagogastric junction (EGJ) to be the gastric side of the EGJ. A radical robotic proximal gastrectomy with D2 lymphadenectomy was performed. Since sufficient length of the esophagus was secured in the hiatus due to tumor shrinkage, reconstruction was performed by the side-overlap esophagogastrostomy (mSOFY) method. The postoperative course was uneventful with no reflux symptoms two months after surgery, even without medication.

Clinical discussion: Preoperative chemotherapy is expected to improve the rates of complete resection and survival. In the present case, preoperative treatment with SOX resulted in tumor shrinkage, which enabled reconstruction using the mSOFY method. Robotic surgery may be useful for such complex reconstruction procedures.

Conclusion: To our knowledge, this is the first report of robotic reconstruction using the mSOFY method after proximal gastrectomy for AEG tumors. This work was reported in line with the SCARE 2020 criteria.

1. Introduction

Despite a decrease in the incidence of gastric adenocarcinoma over the last decade, adenocarcinoma of the esophagogastric junction (AEJ) has been on the rise in recent years [1,2]. Intrathoracic or transhiatal approaches are needed for the reconstruction of Siewert type II tumors; however, researchers are divided on which procedure is the best, especially for Siewert type II tumors [3,4]. Furthermore, in recent years, several surgical procedures involving anti-reflux techniques have been developed for Siewert type III tumors, but applying these methods remains problematic in terms of the technical aspects of reconstruction and reflux prevention. Here, we report a case in which preoperative chemotherapy resulted in tumor shrinkage, thus enabling robotic proximal gastrectomy with side-overlap esophagogastrostomy to prevent postoperative reflux. The work has been reported in line with the SCARE 2020 criteria [5].

2. Case report

A 69-year-old male was referred to our department for AEJ detected during a regular medical examination. The patient had no significant medical or treatment history. As for his family history, the patient's brother had died of gastric cancer.

On upper gastrointestinal endoscopy, a 30 mm-sized ulcerative lesion in the esophagogastric junction (EGJ) was revealed (Fig. 1a), and biopsy indicated a well-differentiated adenocarcinoma. The proximal end was found to be 1.5 cm above the EGJ (Siewert type II) on gastric fluoroscopy (Fig. 1b). On computed tomography (CT) of the thorax and
abdomen, the main lesion was visualized as a lesion with a contrast effect, and there were no lymph node or distant metastases (Fig. 1c). Serum carcinoembryonic antigen and carbohydrate antigen 19-9 levels were normal. The patient was diagnosed with AEG, GE, AntPost, Type 2, cT3N0M0M0, cStageIIB. We decided to perform preoperative chemotherapy to secure an oral free margin for the cancer and enable intra-peritoneal esophagogastric anastomosis. We initiated preoperative chemotherapy with oxaliplatin 100 mg/m$^2$ on day 1 in combination with S-1 80 mg/m$^2$/day for days 1–14 every three weeks (SOX regimen).

He was generally going well after chemotherapy except for anorexia (Grade 1) and leukopenia (Grade 1). After three courses of preoperative chemotherapy as planned, gastrointestinal endoscopy and fluoroscopy revealed that the main tumor had shrunk, and the proximal stump appeared to be near the gastric side of the EGJ (Fig. 2a, b). The tumor was difficult to identify on CT thorax and abdomen, with no evidence of metastasis (Fig. 2c). Therefore, radical robotic proximal gastrectomy was performed using the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA, USA) along with D2 lymphadenectomy, according to the Japanese gastric cancer treatment guidelines [6]. The surgery was performed by a qualified surgeon accredited with the Endoscopic Surgical Skill Qualification System with surgical experience of more than 40 robotic surgeries.

Intraoperatively, the esophagus was transected 2 cm above the EGJ, and the specimen was removed from the abdomen via a small, expanded wound at the umbilical port to confirm that the proximal stump was properly excised. Since about 5 cm of the esophagus can be pulled into the abdominal cavity, we decided to reconstruct it robotically by side-overlap esophagogastrostomy, the so-called modified side overlap with fundoplication by Yamashita (mSOFY) method devised by Yamashita Y [7] (Fig. 3). After the central apex of the remnant stomach was fixed to the crus of the diaphragm on the dorsal side of the esophagus, the right side of the esophageal stump and the center of the remnant gastric wall were anastomosed using a SureForm® linear stapler. The entry hole was closed by robotic surgery, and the left side of the esophagus was fixed to the gastric wall with three sutures so that the esophagus was opposed flat against the gastric wall. The operative time was 438 min, and the amount of blood loss was 30 ml.

After the absence of leakage was confirmed on postoperative fluoroscopy, oral ingestion was initiated on postoperative day 5. Esophagogastrography showed no anastomotic stenosis or regurgitation of the

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**Fig. 1.** Pretreatment findings. (a) Endoscopic findings: A type 3 lesion is noted in the esophagogastric junction (EGJ). (b) Gastric fluoroscopy findings: The tumor was classified as Siewert type II (yellow arrow) and the proximal margin of the tumor was considered 1.5 cm above the EGJ. (c) Abdominal contrast-enhanced computed tomography findings: The tumor was visualized as a lesion with a contrast effect (yellow arrow).
contrast agent into the esophagus. Histopathological examination of the resected specimens revealed a well-differentiated adenocarcinoma with submucosal invasion. No metastasis was observed in any of the retrieved lymph nodes. The final stage was ypT1bN0M0, ypStage I according to the Japanese Classification of Gastric Carcinomas. The pathological effects of chemotherapy were classified as grade IB.

The patient was satisfied with the series of treatments and was discharged from the hospital on the 10th postoperative day with good postoperative recovery. He had not experienced heartburn even without medication. Upper gastrointestinal endoscopy showed no reflux and CT showed no recurrence 2 months after the surgery.

3. Discussion

The goals of AEJ treatments not only include oncological safety but also better quality of life (QOL). Here, we report a case of robotic proximal gastrectomy done using the mSOFY method. Additionally, tumor shrinkage following preoperative chemotherapy enabled safe reconstruction with an anti-reflux mechanism.

The optimal surgical procedure for AEJ remains unclear, especially for Siewert type II tumors. Gastric surgeons prefer an abdominal approach with transhiatal gastrectomy (THG), while esophageal surgeons prefer thoracoabdominal esophagectomy (TAE) [8–10]. The Japan Clinical Oncology Group (JCOG) conducted a multicenter trial (JCOG9502) in Japan to evaluate the survival benefits of the TAE approach compared to the THG approach for Siewert type II and III AEJ tumors [11]. This study revealed that the TAE approach did not improve overall survival and disease-free survival. Furthermore, the morbidity was worse after TAE than after THG. Therefore, the authors concluded that the TAE approach should be avoided for Siewert type II and III tumors.

The THG approach includes total gastrectomy and proximal gastrectomy. There are various reconstruction methods available for both procedures, but proximal gastrectomy is better than total gastrectomy in terms of body weight loss as per many reports. However, there are still problems in terms of the postoperative QOL, including the presence of reflux [12–14]. Therefore, total gastrectomy is often performed instead of proximal gastrectomy. Many reconstruction procedures to improve the QOL after proximal gastrectomy have been attempted. Esophagogastrectomy is the simplest method, but reflux esophagitis frequently occurs without ingenuity [15]. Double-tract and jejunal interposition methods are also used; however, it is not clear whether these methods

![Fig. 2. Post-chemotherapy findings. (a) Endoscopic findings: The tumor significantly shrunk by chemotherapy. (b) Gastric fluoroscopy findings: The proximal margin of tumor changed to be around the esophagogastric junction. (c) Computed tomography findings: The tumor lost its contrast effect and became difficult to point out.](image-url)
have any advantages in terms of QOL and postoperative nutrition. In recent years, promising esophagogastronomy methods have been developed to prevent reflux [16–18]. These procedures prevent reflux by increasing the intragastric pressure as food enters the stomach. However, they require advanced techniques in laparoscopic surgery, especially at more proximal locations in the esophageal hiatus.

The mSOFY method can be performed relatively easily using the laparoscopic approach and a solid valve structure to prevent reflux. When PubMed was searched with the keywords “side overlap esophagogastrectomy,” “SOFY,” and “side overlap with fundoplication,” no
reports of robotic reconstruction with mSOFY were found. At present, there are also no reports of long-term postoperative QOL; however, we chose this technique because we thought it would be useful for reconstruction after AEJ tumor resection. It also required many sutures, but it seems that robotic surgery enabled reliable and faster suturing.

Several randomized trials have assessed the role of preoperative chemotherapy in improving the rate of complete resection and survival rate in patients with advanced AEJ tumors. The Magic trial [19] compared overall survival between perioperative chemotherapy and surgery alone in those with Stage II tumors and above. The perioperative chemotherapy and surgery group showed higher overall survival (hazard ratio for death, 0.75; 95% confidence interval, 0.60–0.93; P = 0.009; 5-year survival rate, 36%–23%). The subsequent FLOT trial showed promising results as well. This study showed the superiority of the FLOT regimen over the EC regimen that was used in the MAGIC trial [20]. The JCOG is currently conducting a randomized trial, JCOG1509. This study was designed to investigate the efficacy of the preoperative SOX regimen in patients with stage III (cT3-4N1-3) tumors [21]. SOX is the standard regimen for stage IV gastric cancer in Japan, with a response rate as high as 55.7% [22]. Thus, in this report, we used SOX as the preoperative chemotherapy regimen.

To be able to perform mSOFY reconstruction, the esophagus needs a relative length of 5 cm in the esophageal hiatus. In this case, tumor shrinkage due to preoperative chemotherapy likely ensured that a sufficient esophageal length was available. Thus, robot-assisted mSOFY reconstruction is one of optimal procedures that can be safely performed to maintain the QOL in patients with AEJ with an esophageal infiltration length of ≤2 cm.

4. Conclusion

We report a surgical case in which function-preserving proximal gastrectomy was successfully performed robotically following preoperative chemotherapy.

Informed consent

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

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CRediT authorship contribution statement

Kazuaki Tanabe, the corresponding author, performed the surgery and wrote the manuscript. Yoshihiro Saeki and Hiroshi Ohta participated in the surgery. Yoshikiko Saeki and Hideki Ohdan supervised the writing of the manuscript. All authors have read and approved the final manuscript.

Declaration of competing interest

The authors declare no conflicts of interest associated with this manuscript.

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