Gastric remnant reconstruction with left gastroepiploic artery supercharge after esophagectomy in a patient with an occluded right gastroepiploic artery: A technical and case report

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A B S T R A C T

INTRODUCTION: Gastric remnant reconstruction is commonly used for esophagectomy reconstruction. However, standard reconstruction cannot be performed in some patients with a specific medical history. We report a case of esophagectomy and gastric remnant reconstruction with left gastroepiploic artery (LGEA) supercharge to treat esophageal cancer in a patient in whom the right gastroepiploic artery (RGEA) had previously been occluded.

PRESENTATION OF CASE: A 65-year-old man underwent endoscopic submucosal dissection for thoracic esophageal squamous cell carcinoma. He was diagnosed with pathological T1b cancer with lymphatic invasion and a positive horizontal margin, and needed curative resection. He had previously undergone RGEA embolization to treat a pseudoaneurysm caused by chronic pancreatitis. We successfully performed esophagectomy and gastric remnant reconstruction with preoperative left gastric artery embolization and intraoperative LGEA supercharge.

DISCUSSION: An absent RGEA blood supply is not always a contraindication for gastric remnant reconstruction when the collateral blood flows are well developed and supercharge can maintain the blood supply to the gastric remnant.

CONCLUSIONS: Gastric remnant reconstruction with preoperative selective arterial embolization and intraoperative supercharge represents one of the options for high-risk patients with an altered gastric blood supply.

1. Introduction

One of the standard reconstruction techniques after esophagectomy is gastric remnant reconstruction. The right gastroepiploic artery (RGEA) is crucial for preserving blood supply to the gastric remnant [1]. However, the operation is complicated by certain comorbidities, such as a deficient arterial supply despite an adequate length of stomach [2]. In the present case report, we describe the challenges in treating a patient with esophageal cancer who had no blood supply from the RGEA. We successfully performed esophagectomy and gastric remnant reconstruction with preoperative left gastric artery (LGA) embolization and intraoperative left gastroepiploic artery (LGEA) supercharge.

This work has been reported in line with the SCARE criteria [3].

2. Case presentation

We performed upper gastrointestinal endoscopic follow-up in a 65-year-old man who underwent curative endoscopic resection of early esophageal squamous cell carcinoma in our hospital 4 years ago. His medical history included chronic pancreatitis that caused pseudoaneurysm of the gastroduodenal artery. The pseudoaneurysm was treated by arterial embolization. Endoscopy revealed a 4-cm lesion on the lower third esophagus which was metachronous squamous cell carcinoma (Fig. 1). He had no relevant symptoms or physical findings. Endoscopic submucosal dissection was performed. Histopathological examination revealed the tumor invading the submucosa with lymphatic invasion and a positive horizontal margin. The stage diagnosis was pathological T1b and clinical N0M0 as classified by the TNM 8th [4]. We performed esophagectomy as additional treatment.

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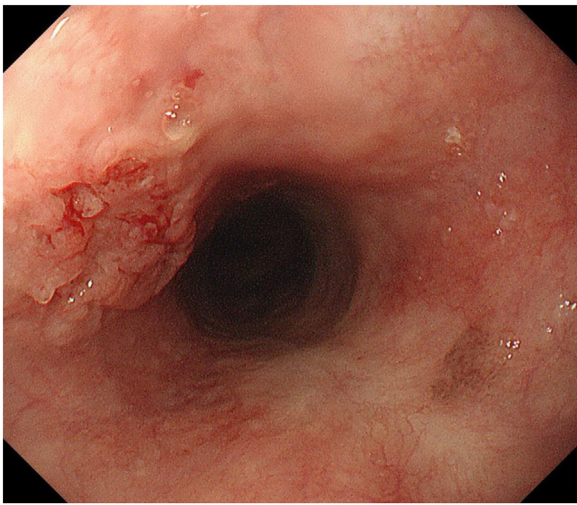 *E-mail address:* kinoshita-yo@keijinkai.or.jp (Y. Kinoshita).

Fig. 1. Upper endoscopy showing a whitish, slightly elevated, lower esophageal lesion with a center depression.

We initially planned to perform a McKeown esophagectomy with lymphadenectomy of the mediastinal and abdominal fields. However, although the RGEA is crucial for gastric remnant blood supply at reconstruction, the RGEA was completely occluded. Thus, our treatment strategy was gastric remnant reconstruction with preoperative selective LGA embolization and intraoperative LGEA supercharge in the neck. The right gastroepiploic vein was intact on computed tomography (image not available) which was main drainage vein of the gastric remnant; therefore, we considered superdrainage unnecessary.

Preoperative angiography showed no perfusion of the RGEA. Selected coil embolization was performed for the LGA. After embolization, angiography from the common hepatic artery revealed that the peripheral area supplied by the LGA was perfused via the right gastric artery (RGA) (Fig. 2). Four days after embolization, upper gastrointestinal endoscopy revealed no ischemia of the gastric mucosa.

Surgery was performed 1 week after embolization. Minimally invasive esophagectomy and lymphadenectomy was performed through a right thoracoscopy in the prone position. Proximal gastrectomy was performed via laparotomy, and the LGEA was ligated at the proximal side in preparation for later cervical supercharge anastomosis. The gastric remnant was pulled up through the retrosternal route. Microvascular anastomosis of the LGEA to the left transverse cervical artery was performed, followed by cervical esophagogastric hand-sewn end-to-end anastomosis (Fig. 3). The arterial anastomosis site was internal to internal jugular vein.

He was discharged on postoperative day 17 without complications. Histopathological examination of the surgical specimen revealed neither remnant lesion nor lymph node metastasis. There were no signs of recurrence or metastasis at the 1-year follow-up.
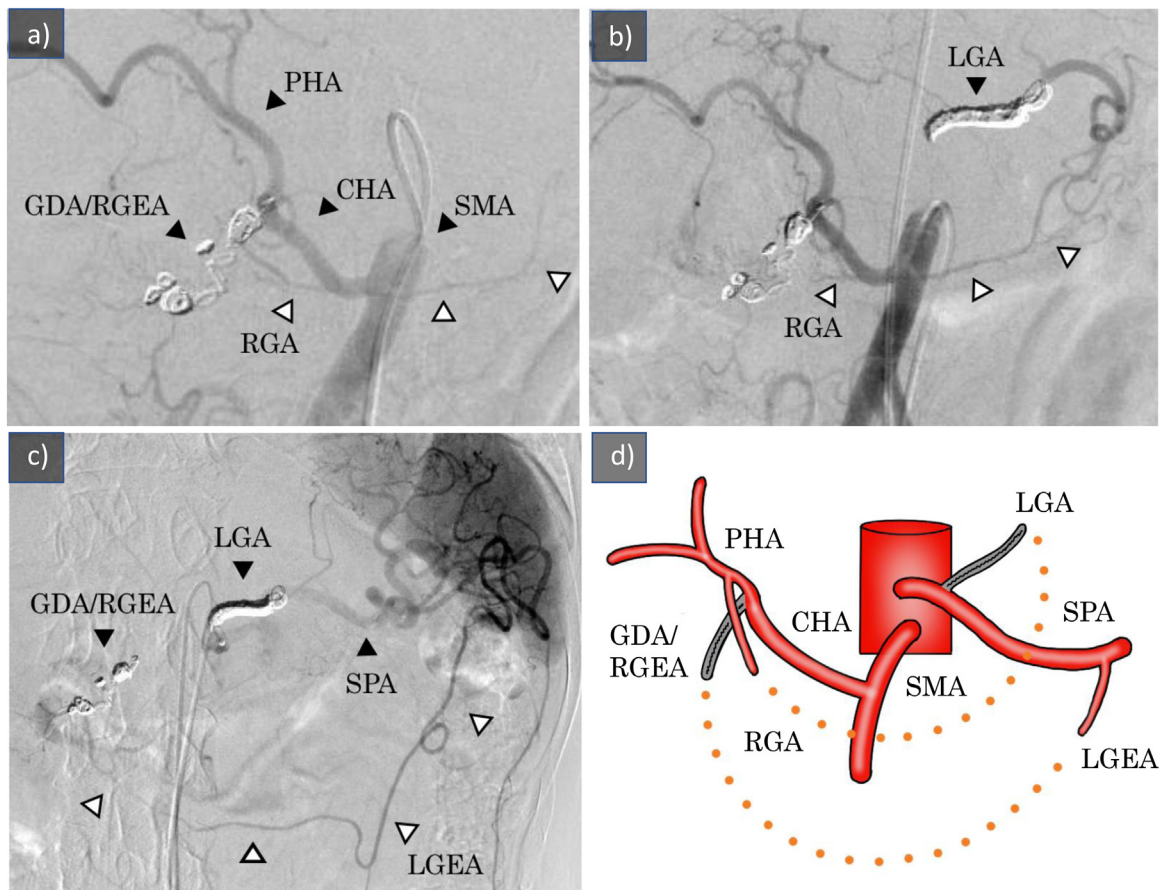

Fig. 2. a) Angiography of the superior mesenteric artery (SMA). The common hepatic artery (CHA) originates from the SMA. The gastroduodenal artery (GDA)/right gastroepiploic artery (RGEA) has no perfusion. b) Angiography of the SMA after left gastric artery (LGA) embolization. The peripheral area of the LGA is perfused via the right gastric artery (RGA). c) Angiography of the celiac artery after LGA embolization. The area of the RGEA is perfused via the left gastroepiploic artery (LGEA). d) Schema of the preoperative arteriography. The CHA originates from the SMA. The RGEA and LGA are embolized; however, their peripheral areas are perfused via the LGEA and RGA, respectively.
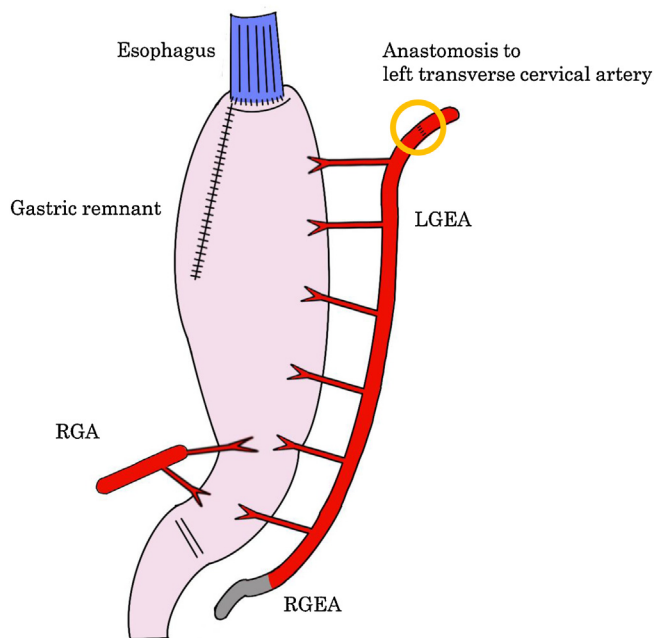
Fig. 3. Schema of the reconstruction and arterial supply of the gastric remnant. We performed microvascular anastomosis of the left gastroepiploic artery (LGEA) to the left transverse cervical artery. RGA, right gastric artery. RGEA, right gastroepiploic artery.

3. Discussion

We performed esophagectomy with gastric remnant reconstruction to treat thoracic esophageal cancer in a patient who had previously undergone RGEA embolization because of a pseudoaneurysm associated with chronic pancreatitis. Most patients without a RGEA blood supply have a history of gastrectomy or pancreaticoduodenectomy [5,6]. In such cases, the gastric remnant cannot be used for reconstruction because of the absence of a RGEA blood supply and the insufficient length of the residual stomach. Successful McKeown esophagectomy and gastric remnant reconstruction has been reported in a patient with a history of right hemicolectomy and RGEA resection [2]. However, the RGA alone might not always maintain sufficient blood supply at the proposed anastomosis site. It is rare to encounter a patient who is lacking only the RGEA blood supply. In the present patient with a completely occluded RGEA, we successfully performed gastric remnant reconstruction after esophagectomy for thoracic esophageal cancer by intraoperative LGEA supercharge following preoperative radiological LGA embolization.

In gastric remnant reconstruction, there are two important blood supplies at the anastomosis site. Firstly, the RGEA supplies blood to the proximal site of the stomach, especially to the greater curvature. Secondly, intramural vascular anastomosis is essential to carry the arterial supply to the tip of the stomach [1].

Kumagai et al. used intravenous indocyanine green fluorescence injection to evaluate the blood perfusion to the tip of the gastric remnant passing through the RGEA via intramural vascular anastomosis [7]. Chronic deficiency of the blood supply through the RGEA is considered to contribute to the development of the other main gastric arteries: the RGA, LGA, and LGEA. If we had performed standard gastric remnant reconstruction in the present case, the blood supply to the reconstructed gastric remnant would have been via the RGA alone. Therefore, we used two strategies to ensure an adequate blood supply; the first was preoperative selective LGA embolization to confirm the safety of the blood supply, and the second was intraoperative LGEA supercharge to maintain the blood supply to the greater curvature of the gastric remnant.

The concept of the preoperative main arterial embolization was derived from the management of distal pancreatectomy with en bloc celiac axis resection for pancreatic body cancer. Common hepatic artery embolization before distal pancreatectomy with en bloc celiac axis resection is strongly recommended for preoperative conditioning to decrease ischemia-related complications [8]. In our case, the arterial supply of the stomach was from the RGA, LGA, and LGEA. We preserved the RGA in situ and supercharged the LGEA by microvascular anastomosis with the transverse cervical artery. This only caused the loss of the LGA blood flow; thus, we preoperatively performed LGA embolization to confirm the safety of its ligation. We chose transverse cervical artery as a donor vessel which was used mostly in cervical supercharge technique [9].

Gastric remnant reconstruction after esophagectomy is highly prevalent in Japan, with a gastric remnant used in 85 % of esophagectomy cases for esophageal cancer [10]. Gastric remnant reconstruction is physiologically ideal in comparison with other types of reconstruction. Although the colon graft has the advantage of not requiring a supercharge, two more alimentary tract anastomoses are needed. Furthermore, anastomotic leakage reportedly occurs in approximately 6% of esophagogastric anastomoses, regardless of whether the anastomosis is hand-sewn or created using a circular stapler [11], while colon interposition has a relatively higher leakage rate of 0–46.4 % [5].

For Stage I esophageal squamous cell carcinoma, the combination of endoscopic resection and chemoradiotherapy (CRT) reportedly has a comparable efficacy to surgery [12]. CRT is less invasive than esophagectomy. However, our patient had some oncological risk factors such as pathological T1b stage cancer, lymphatic invasion, and incomplete resection (positive horizontal margin), while the aforementioned study did not include such high-risk cases [12]. Therefore, we still consider that there is no evidence that additional CRT was necessary in the present case.

4. Conclusions

We successfully performed esophagectomy and gastric remnant reconstruction with preoperative selective arterial embolization and intraoperative supercharge in a patient with an occluded RGEA. This strategy may be an effective choice for patients with an altered gastric blood supply.

Declaration of Competing Interest

All authors have no conflict of interest about this study.

Ethical approval

This study was approved by the Ethics Committee of Teine Keijinakai Hospital.

Consent

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

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