# Thoracoscopic retrosternal gastric conduit resection in the supine position for gastric tube cancer

Horie, Kazumasa ; Oshikiri, Taro ; Kitamura, Yu ; Shimizu, Masaki ; Yamazaki, Yuta ; Sakamoto, Hiroki ; Ishida, Sonoko ; Koterazawa,…

(Citation)
Asian Journal of Endoscopic Surgery,13(3):461-464

(Issue Date)
2019-10-03

(Resource Type)
journal article

(Version)
Accepted Manuscript

**Title page**

**Manuscript category:** SURGICAL TECHNIQUE

**Manuscript title:** Thoracoscopic retrosternal gastric conduit resection in the supine position for gastric tube cancer

**A short running title:** TRGR-S for gastric tube cancer

**Authors and their affiliations:** Kazumasa Horie, MD[1], Taro Oshikiri, MD[1], Yu Kitamura, MD[1], Masaki Shimizu, MD[1], Yuta Yamazaki, MD[1], Hiroki Sakamoto, MD[1], Sonoko Ishida, MD[1], Yasufumi Koterazawa, MD[1], Taro Ikeda, MD[1], Masashi Yamamoto, MD[1], Shingo Kanaji, MD[1], Yoshiko Matsuda, MD[1], Kimihiro Yamashita, MD[1], Takeru Matsuda, MD[2], Tetsu Nakamura, MD[1], Satoshi Suzuki, MD[4], and Yoshihiro Kakeji, MD[1]

1. Division of Gastrointestinal Surgery, Department of Surgery, Graduate School of Medicine, Kobe University, 7-5-2, Kusunoki-cho, Chuo-ku, Kobe, Hyogo, 650-0017, Japan
2. Division of Minimally Invasive Surgery, Department of Surgery, Graduate School of Medicine, Kobe University, 7-5-2, Kusunoki-cho, Chuo-ku, Kobe, Hyogo, 650-0017, Japan
3. Division of Community Medicine and Medical Network, Department of Social Community Medicine and Health Science, Graduate School of Medicine, Kobe University, 7-5-2, Kusunoki-cho, Chuo-ku, Kobe, Hyogo, 650-0017, Japan

**Address correspondence and reprint requests to:**

Horie Kazumasa, MD

Division of Gastrointestinal Surgery, Department of Surgery, Graduate School of Medicine, Kobe University, 7-5-2, Kusunoki-cho, Chuo-ku, Kobe, Hyogo, 650-0017, Japan

Telephone: 81-78-382-5925

Fax: 81-78-382-5939

E-mail: khorie@med.kobe-u.ac.jp

Co-authors:

Taro Oshikiri MD, PhD oshikiri@med.kobe-u.ac.jp

Yu Kitamura MD iliboos.hageboos.y@gmail.com

Masaki Shimizu MD xcxkq350@icloud.com

Yuta Yamazaki MD zaki.yymzk@gmail.com

Hiroki Sakamoto MD hiroki3_21@yahoo.co.jp

Sonoko Ishida MD snkishida@gmail.com

Yasufumi Koterazawa, MD ya.kote1128@gmail.comww

Masashi Yamamoto MD, PhD m0125@med.kobe-u.ac.jp

Shingo Kanaji MD, PhD kanashin@med.kobe-u.ac.jp

Yoshiko Matsuda MD, PhD yoshmat@med.kobe-u.ac.jp

Kimihiro Yamashita MD, PhD kiyama@med.kobe-u.ac.jp

Takeru Matsuda MD, PhD tmatsuda@med.kobe-u.ac.jp

Tetsu Nakamura MD, PhD tetsun@med.kobe-u.ac.jp

Satoshi Suzuki MD, PhD ss147@med.kobe-u.ac.jp

Yoshihiro Kakeji MD, PhD kakeji@med.kobe-u.ac.jp

**Authors' Contributions:**

(1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work.

Conception or design of the work: Kazumasa Horie, Taro Oshikiri, and Yoshihiro Kakeji

Acquisition of data: Yu Kitamura, Masaki Shimizu, Yuta Yamazaki, Hiroki Sakamoto, Sonoko Ishida, Yasufumi Koterazawa, and Taro Ikeda, Interpretation of data for the work: Masashi Yamamoto, Shingo Kanaji, Yoshiko Matsuda, Kimihiro Yamashita, Takeru Matsuda, Tetsu Nakamura, and Satoshi Suzuki.

(2) Drafting the work or revising it critically for important intellectual content.

Drafting the work: Kazumasa Horie, Taro Oshikiri, and Yoshihiro Kakeji.

Revising the work critically for important intellectual content: Yu Kitamura, Masaki Shimizu, Yuta Yamazaki, Hiroki Sakamoto, Sonoko Ishida, Yasufumi Koterazawa, Taro Ikeda, Masashi Yamamoto, Shingo Kanaji, Yoshiko Matsuda, Kimihiro Yamashita, Takeru Matsuda, Tetsu Nakamura, and Satoshi Suzuki.

3) Final approval of the version to be published.

All authors.

4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

All authors.

**Conflicts of interest**: Kazumasa Horie, Taro Oshikiri, Yu Kitamura, Masaki Shimizu, Yuta Yamazaki, Hiroki Sakamoto, Sonoko Ishida, Yasufumi Koterazawa, Taro Ikeda, Masashi Yamamoto, Shingo Kanaji, Yoshiko Matsuda, Kimihiro Yamashita, Takeru Matsuda, Tetsu Nakamura, Satoshi Suzuki and Yoshihiro Kakeji have no conflicts of interest or financial ties to disclose.

**Abstract**

【Introduction】Recent advances in treatment for esophageal cancer have improved prognosis after esophagectomy, but they have led to an increased incidence of gastric tube cancer. In most patients who underwent retrosternal reconstruction, median sternotomy is performed, which is associated with a risk of postoperative bleeding and osteomyelitis; pain often negatively affects respiration. We report the first case of thoracoscopic retrosternal gastric conduit resection in the supine position (TRGR-S). 【Materials and Surgical Technique】A 75-year-old male patient was placed in the supine position. Four ports were placed in the left chest wall. The gastric tube was separated from the epicardium, sternum, and left brachiocephalic vein. Due to adhesions between the gastric tube and the right pleura, combined resection of the right pleura was performed. With dissection of the dorsal side of the gastric tube prior to the ventral side, it was suspended from the back of the sternum, making it easier to expose the surgical field. Next, pediculated jejunal reconstruction via the presternal route was performed. There were no post-operative complications. The pathological diagnosis was signet ring cell carcinoma (pT1b, pN0, M0, pStage I), indicating R0 resection. 【Discussion】This approach does not require sternotomy, so it has less risk of postoperative bleeding and osteomyelitis. Due to fewer adhesions, this approach is safe and provides a good surgical view. TRGR-S is a safe, ergonomic, and reliable procedure for resection of retrosternal gastric tube cancer.

**Key words**

gastric tube cancer, retrosternal route, thoracoscopic surgery

## Introduction

Esophageal cancer is associated with multiple synchronous or metachronous cancers.[1)2)] Among them, gastric cancer and head and neck cancer is common.[3)] In terms of subsequent metachronous cancer after esophagectomy, Okamoto et al report that gastric tube cancer occurred in 8 of 414 patients who underwent esophagectomy.[4)]

Surgical resection for gastric tube cancer is invasive. Periodic surveillance is important because early diagnosis enables endoscopic resection.[5)] However, gastric tube cancer that invades the submucosa and slips through surveillance can occur. In such instances, surgical resection of the gastric tube is required.

The surgical approach for gastric tube cancer resection depends on the reconstruction route used for prior esophagectomy. If a retrosternal route was used, median sternotomy has traditionally been performed, which is invasive and carries a risk of osteomyelitis.[6)]

We present thoracoscopic retrosternal gastric conduit resection in the supine position (TRGR-S), a new endoscopic procedure via the left thoracic cavity that we developed to resect the retrosternal gastric tube without sternotomy.

## Materials and Surgical Technique

The patient was a 75-year-old man who underwent an open esophagectomy via the right thoracic cavity with retrosternal gastric tube reconstruction for esophageal cancer in 2000. In 2018, he presented with back pain and epigastric distress. Esophagogastroduodenoscopy showed a 15mm 0-IIa+IIc lesion in the distal gastric tube. Biopsy revealed signet ring cell carcinoma (group V). Computed tomography (CT) and positron emission tomography (PET)-CT showed a locally thickened and enhanced gastric tube wall without lymph node or distant metastasis. We diagnosed gastric tube cancer (cT1b, cN0, cM0, cStage IA),[7)] and planned total resection of the gastric tube with D1 lymph node dissection.

Under general anesthesia, the patient was placed in the supine position. Four ports were placed in the left third, fourth, sixth, and eighth intercostal spaces on the anterior axillary line (figure 1). There were no adhesions in the left thoracic cavity. To mobilize the gastric tube, we separated it from surrounding structures. We established three landmarks: ① the epicardium and left brachiocephalic vein, ② sternum, and ③ right mediastinal pleura (figure2). We separated the gastric tube from these landmarks in that order. On the right, the lesser omentum and stapled line of the lesser curvature adhered to the pleura, so combined resection of the right pleura was performed after cutting the gastric tube and completing the dissection. Next, incisions were made in the neck and upper abdomen. The proximal and distal portions of the divided

gastric tube and lymph nodes were pulled from the incisions. Next, pediculated jejunal reconstruction via the presternal route was performed under direct vision and the digestive tract anastomosis with vascular anastomosis was performed in the neck manually (figure 3). Total and thoracic operative times were 671 and 270 minutes, respectively. Blood loss was 230 ml.

Histopathological examination showed signet ring cell carcinoma: type 0-IIc, 14 x 13 mm, pT1b (SM2: 1 mm), INFb, ly0, v1, pN0 (0/14), pPM0 (165 mm), pDM0 (75 mm), M0, and pStage IA.[7)]

On postoperative day (POD) 3, we removed the right thoracic and cervical drainage tubes. On POD 7, we removed the left thoracic tube. Oral intake began on POD 9. The patient was discharged on POD 24 without complications, and survives more than 13 months without recurrence.

**Discussion**

Patients with gastric tube cancer that cannot be treated with endoscopic resection are candidates for surgical resection. Partial resection, subtotal gastrectomy, and total gastrectomy have been reported for gastric tube cancer.[8)11)] Given the patient's clinical status and surgical invasiveness, partial or subtotal resection is sometimes performed.[9)10)] However, for tumors invading the submucosa or deeper or cancer with lymph node metastases, total gastrectomy with regional lymphadenectomy should be recommended.

In the case of retrosternal reconstruction, a sternotomy has traditionally been necessary.[11)] This approach has the advantage of good handling and visibility because of direct visualization of the gastric tube, but there is a higher risk of postoperative bleeding and osteomyelitis.[10)12)] In addition, postoperative pain often negatively effects respiration.[13)]

To reduce surgical stress, several reports have described surgical procedures without sternotomy. The first involves a method to lift the sternum with a Kent retractor before separating the gastric tube from surrounding tissues with videoscopic assistance.[12)14)15)] The second is a hand-assisted thoracoscopic surgery via the right pleural cavity[6)]. The third is to approach the gastric tube laparoscopically[16)].

We performed dissection of the gastric tube using thoracoscopy via the left pleural cavity in the supine position. Besides avoiding the risks and pain associated with sternotomy, this procedure has several advantages. First, because there are few adhesions in the left thoracic cavity, this approach provides safety and a good surgical view. It is easy to recognize the appropriate cutting line and resect the appropriate tissue. Second, there are few restrictions on the operative angle for the forceps and operability is quite ergonomic, which is the advantage of this procedure compared to laparoscopic mediastinal approach. Moreover, the lungs can be noninvasively contracted via an artificial

pneumothorax. In addition, by performing dissection of the dorsal side of the gastric tube prior to the ventral side, the gastric tube is suspended from the back of the sternum, which makes it easier to expose the surgical field.

Because of the brachiocephalic vein on the dorsal side of the gastric tube, careful dissection is necessary. Furthermore, adhesions between the stapled line and the pleura make dissection difficult. In our patients, we achieved en bloc lymph node dissection with the right mediastinal pleura.

We reported the first case of TRGR-S. This new procedure is safe and reliable for gastric tube cancer via the retrosternal route.

**Acknowledgements**

No ethical approval was required for this case report. Informed consent was obtained from the patient for the publication of this case report and any accompanying images. Patient anonymity was maintained.

**References**

1) Kokawa A, Yamaguchi H, Tachimori Y, Kato H, Watanabe H, Nakanishi Y. Other primary cancers occurring after treatment of superficial oesophageal cancer. Br J Surg. 2001; 88:439–43.

2) Nagasawa S, Onda M, Sasajima K, Takubo K, Miyashita M. Multiple primary malignant neoplasms in patients with esophageal cancer. Dis Esophagus. 2000; 13:226–30

3) Kumagai Y, Kawano T, Nakajima Y, et al. Multiple Primary Cancers Associated with Esophageal Carcinoma. Surg Today (2001) 31: 872.

4) Okamoto N, Ozawa S, Kitagawa Y, Shimizu Y, Kitajima M. Metachronous gastric carcinoma from a gastric tube after radical surgery for esophageal carcinoma. Ann Thorac Surg. 2004;77: 1189–92

5) Hirayama Y, Fujisaki J, Yoshimizu S, et al. Efficacy and safety of endoscopic resection for gastric tube cancer after surgical resection of esophageal squamous cell carcinoma. Esophagus (2019) 16: 194.

6) Kato T, Ohtani H, Ueki H, Mori T. Curative resection of gastric tube cancer by hand-assisted thoracoscopic surgery. Esophagus (2013) 10: 123.

7) Japanese Gastric Cancer Association. Japanese classification of gastric carcinoma: 3rd English edition. Gastric Cancer (2011) 14: 101. https://doi.org/10.1007/s10120-011-0041-5

8) Saito T, Yano M, Motoori M, et al. Subtotal gastrectomy for gastric tube cancer after esophagectomy: A safe procedure preserving the proximal part of gastric tube based on intraoperative ICG blood flow evaluation. J Surg Oncol. 2012 Jul 1;106(1):107-10.

9) Shirakawa Y, Noma K, Maeda N, et al. Clinical characteristics and management of gastric tube cancer after esophagectomy. Esophagus (2018) 15:180–189

10) Shigemitsu K, Naomoto Y, Shirakawa Y, Haisa M, Gunduz M, Tanaka N. Five Cases of Early Gastric Cancer in the Reconstructed Gastric Tube after Radical Resection for Esophageal Cancer. Japanese Journal of Clinical Oncology, Volume 32, Issue 10, October 2002, Pages 425–429

11) Koyanagi K, Ozawa S, Ando N, et al. Case report: metachronous early gastric carcinoma in a reconstructed gastric tube after radical operation for oesophageal carcinoma. J Gastroenterol Hepatol. 1998; 13:311–5

12) Hosoya Y, Hirashima Y, Hyodo M, et al. A new operative technique for the resection of gastric tube cancer by means of lifting the anterior chest wall and videoscope-assisted surgery. Diseases of the Esophagus, Volume 21, Issue 3, 1 May 2008, Pages 275–278

13) Tulla H, Takala J, Alhave E, Huttunen H, Kari A, Manninen H: Respiratory changes after open-heart surgery. Intensive Care Med 1991 ;17 :365-369

14) Shiozaki A, Fujiwara H, Ichikawa D, et al. Video-assisted surgery for gastric carcinoma arising in a gastric tube reconstructed retrosternally. Surg Today. 2012; 42:209–13.

15) Kimura M, Shibata Y, Mizuno K, et al. Resection of the Gastric Tube Reconstructed through the Retrosternal Route without Sternotomy. Case Reports in Surgery, Volume 2017, Article ID 5862871, 4 pages

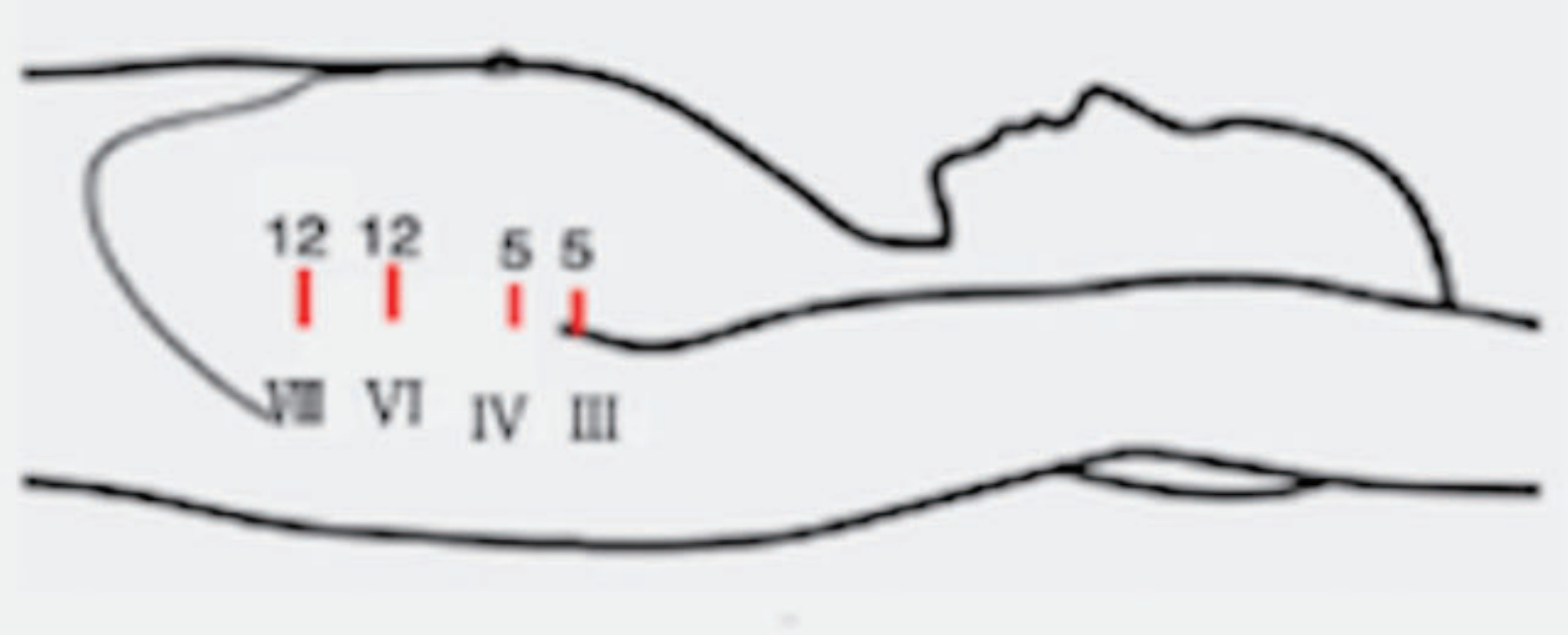
16) Hanada K, Hata H, Saji M, et al; Resection of gastric tube cancer after retrosternal reconstruction: Usefulness of laparoscopic mediastinal approach. Journal of Japan Society for Endoscopic Surgery, 22: 347-353, 2017

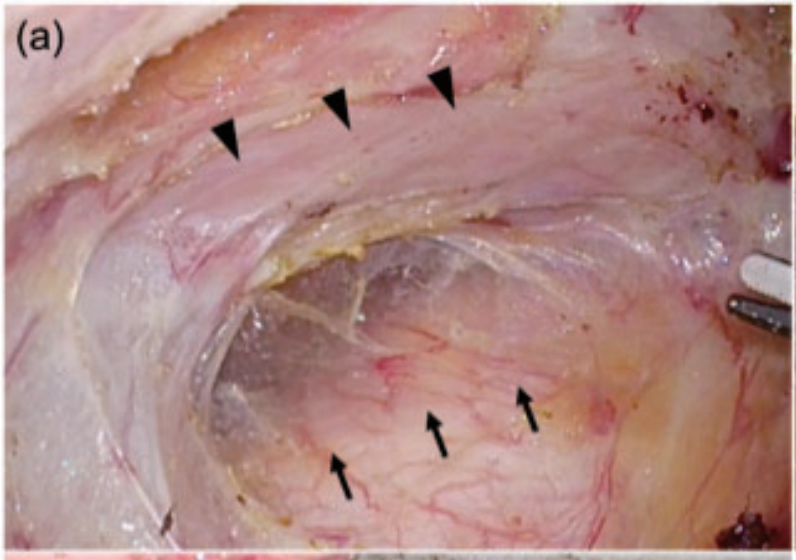
**Figure Legend**

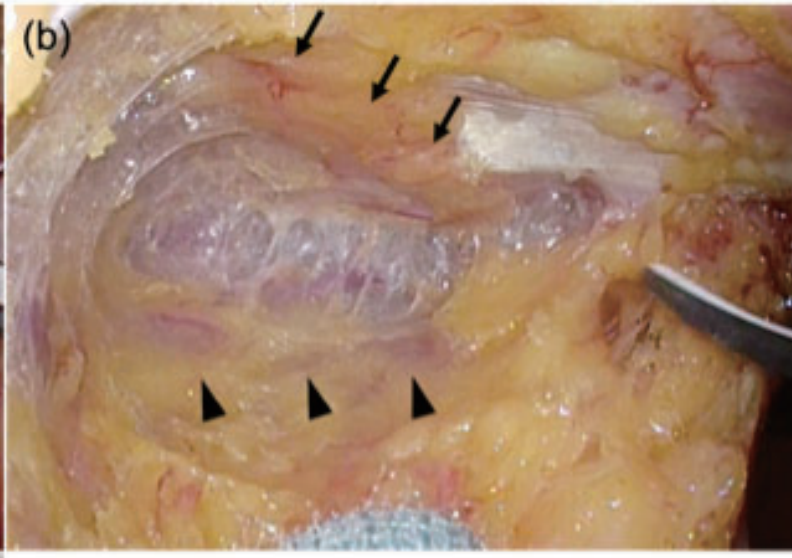
Figure 1. Four ports were placed in the left chest wall

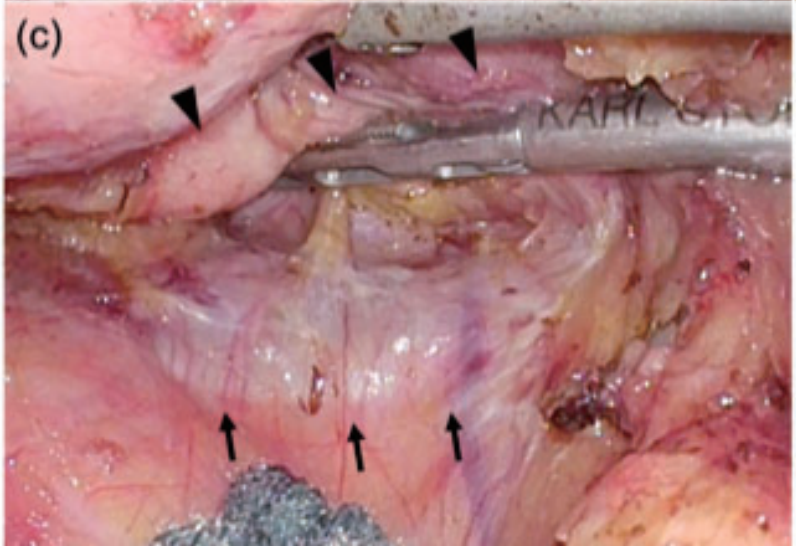
Figure 2. Three landmarks in the retrosternal gastric tube resection via the left thoracic cavity. (a) ↑epicardium, ▲gastric tube, (b) ↑sternum, ▲gastric tube, (c) ↑left brachiocephalic vein, ▲gastric tube

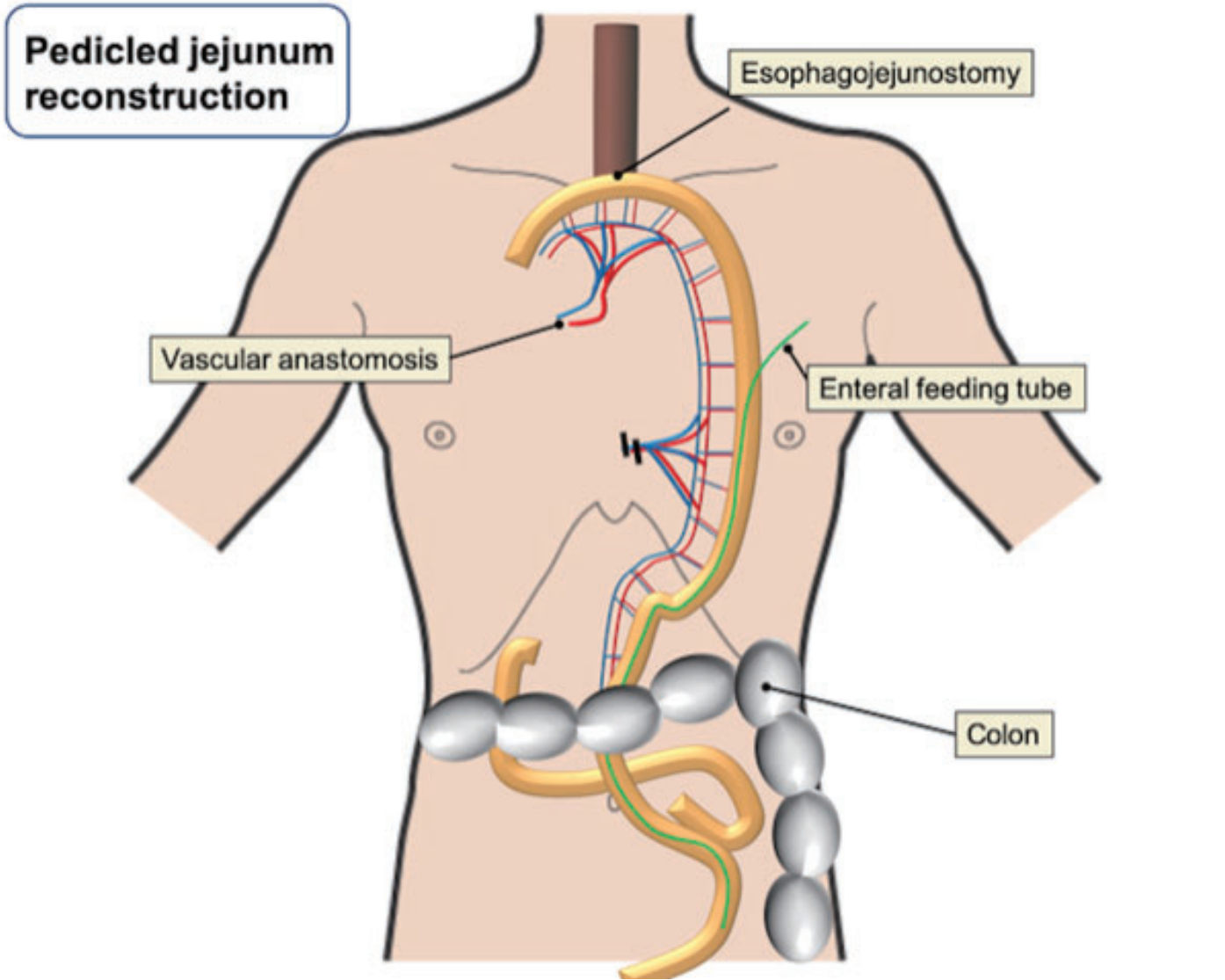
Figure 3. Pediculated jejunal reconstruction with vascular anastomosis.


12
12
5
5
VIII
VI
IV
III


(a)


(b)


(c)


Pedicled jejunum reconstruction
Esophagojejunostomy
Vascular anastomosis
Enteral feeding tube
Colon