

Case and Review

Single-Port Laparoscopic Duodenojejunostomy Employing Semi-Kocherization for a Young Female with Superior Mesenteric Artery Syndrome

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Keywords

Superior mesenteric artery syndrome · Single-incision laparoscopic surgery · Kocherization · Duodeno-jejunostomy

Abstract

Single-port laparoscopic duodenojejunostomy employing semi-Kocherization performed for a patient with superior mesenteric artery (SMA) syndrome is presented in this report. A 24-year-old woman missed meals due to work pressure, and her body weight decreased from 42 kg to 27 kg within 6 months. After this severe weight loss, she suffered from postprandial abdominal pain. An enhanced computed tomography revealed that the aortomesenteric angle was 11° (narrow), and the distance was short at 4.5 mm. Duodenography also revealed dilatation of the proximal duodenum. These findings led to a diagnosis of SMA syndrome, and we performed single-port laparoscopic duodenojejunostomy. We first dissected the fusion between the duodenum and transverse mesocolon, such as Kocherization, enough to mobilize the duodenum; this procedure was termed semi-Kocherization. A gauze was placed in the dissected space for a landmark from the transverse mesocolon side. We confirmed the gauze at the duodenum's lateral side, then opened the transverse mesocolon, and pulled the duodenum out. We performed side-to-side duodenojejunostomy. The postoperative course was unremarkable, and she gained 4 kg within 2 months of discharge. Semi-Kocherization is shown to be an effective technique to increase duodenal mobility for performing anastomosis, and single-port laparoscopic surgery can reduce wounds and increase cosmesis.

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Introduction

Superior mesenteric artery (SMA) syndrome is a rare cause of duodenal obstruction. Rokitsansky first described the condition in 1861; however, it is sometimes known as Wilkie's syndrome because he first reported a related case series in 1927 [1]. The mechanism behind SMA syndrome is the compression of the third part of the duodenum due to a low aortomesenteric angle. SMA syndrome is characterized by postprandial abdominal pain, nausea, vomiting, anorexia, and weight loss [2].

To treat SMA syndrome, conservative therapies such as nasogastric tube placement, placing the patient in the prone or left lateral decubitus position, and providing nutritional support are administered; however, due to the anatomical abnormalities of SMA syndrome, these conservative therapies are not effective [2]. For these patients, duodenojejunostomy is the most frequently performed surgical procedure, and laparoscopic duodenojejunostomy has been accepted as a standard procedure for treating SMA syndrome [3, 4]. In this report, we describe single-port laparoscopic duodenojejunostomy employing semi-Kocherization performed for a patient with SMA syndrome.

Case Presentation

A 24-year-old woman missed several meals due to work pressure, and her body weight drastically decreased from 42 kg to 27 kg within 6 months. After such a severe weight loss, she suffered from postprandial abdominal pain, and, at first, psychiatric disorders, such as anorexia nervosa and depression, were suspected after an inquiry into her background. She was admitted for pain control and nutrition support therapy. Various drugs and epidural block could not relieve her symptoms, and finally, neurectomy of Th10 was performed as a diagnosis of anterior cutaneous nerve entrapment syndrome. However, her symptoms did not improve. Thus, an enhanced computed tomography (CT) was performed to investigate her symptoms further. CT images revealed that the aortomesenteric angle was narrow at 11° , and the distance was 4.5 mm, which is short (Fig. 1a, b). In addition, duodenography also revealed dilatation of the proximal duodenum and stagnation of contrast at the third portion of the duodenum (Fig. 2). From these findings, SMA syndrome was diagnosed, and her symptoms frequently returned when a conservative therapy regime was followed; therefore, we decided to perform single-port laparoscopic duodenojejunostomy via intraumbilical incision to reduce scars and to maintain cosmesis.

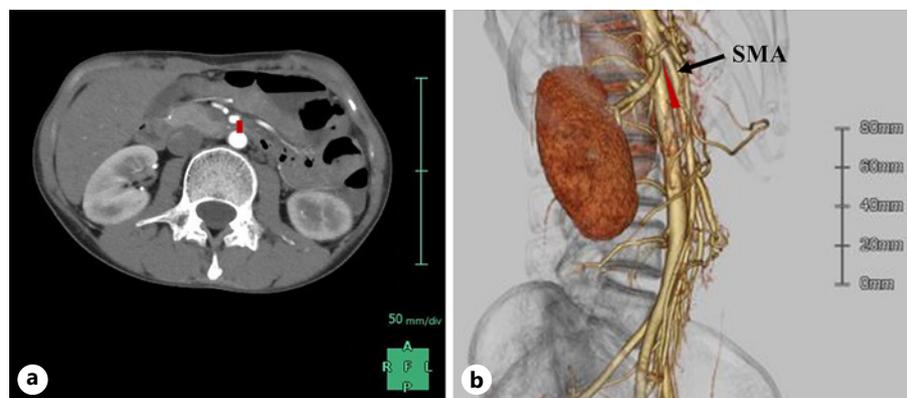


Fig. 1. CT images of SMA syndrome. **a** A small red line indicated the aortomesenteric distance. **b** The aortomesenteric angle was measured as 11° by 3-dimensional reconstructed vascular images (red triangle).

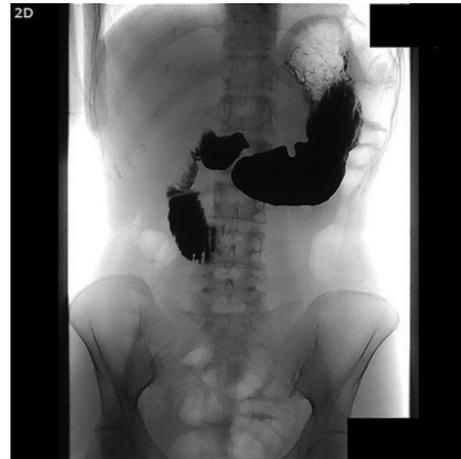


Fig. 2. Preoperative duodenography. Dilatation of the proximal duodenum and stagnation of contrast at the third portion of the duodenum was observed.

The patient was placed in the supine position under general anesthesia. We made a 3-cm intraumbilical incision and attached a GelPOINT Advanced Access Platform (Applied Medical Resources, Rancho Santa Margarita, CA, USA). Then, three trocars were inserted from the platform, and a 10-mm Hg carbon dioxide pneumoperitoneum was initiated. First, we confirmed the second portion of the duodenum at the cranial side of the transverse colon and performed duodenal mobility. The fusion between the duodenum and transverse mesocolon was dissected, such as Kocherization; this was enough to mobilize the duodenum. Therefore, the procedure has been called semi-Kocherization (Fig. 3a). A gauze was placed in the dissected space to serve as a landmark from the transverse mesocolon side. We retracted the transverse mesocolon cephalad and confirmed the presence of the gauze at the lateral side of the duodenum (Fig. 3b). Then, we opened the transverse mesocolon and pulled the duodenum out. The Treitz ligament was intracorporeally identified, and the proximal jejunum, running about 40 cm from the Treitz ligament, was moved toward the third portion of the duodenum without tension. Next, we made entry holes, and side-to-side anastomosis was performed using EndoGIA™ 45 mm camel cartridge (Medtronic plc, Dublin, Ireland) (Fig. 3c). The combined entry hole was closed by Albert-Lembert running sutures using STRATAFIX™ Symmetric PDS plus (Johnson & Johnson, New Brunswick, NJ, USA) (Fig. 3d). The operating time and blood loss were 160 min and 4 mL, respectively. Figure 4 shows the postoperative scar.

The postoperative course was unremarkable, and an upper gastrointestinal contrast examination on postoperative day 2 showed good patency and passage of duodenojejunostomy (Fig. 5). The patient was discharged on postoperative day 6, who then gained 4 kg within 2 months of discharge. In addition, she has never complained of her preoperative severe symptoms such as postprandial pain and anorexia after discharge. She has returned to her previous job, and she does not need to receive psychiatric care anymore.

Discussion

SMA syndrome is an uncommon but well-recognized clinical entity. It is seen more commonly in females, older children, and adolescents due to their sensitivity to mental stress, environmental changes in every life stage, and the prevalence of anorexia nervosa in these populations [5]. Excessive weight loss may induce the loss of the fatty tissue that surrounds the SMA and its neurovascular pedicle. Without an appropriate fatty scaffolding, the aortomesenteric angle and space become narrow and cause duodenal compression [6].

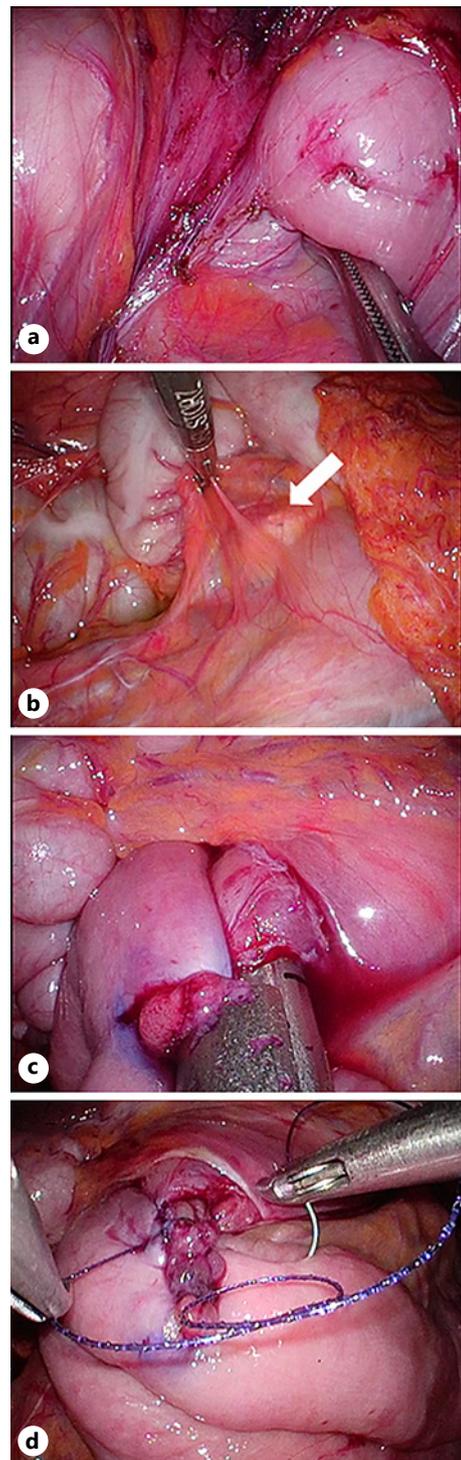


Fig. 3. Surgical procedure. **a** The second portion of the duodenum was mobilized to prepare for the transverse-mesocolon approach. **b** The gauze was confirmed via retracted transverse mesocolon. **c** Side-to-side duodenojejunostomy was performed (white arrow). **d** The entry hole was closed by intracorporeal sutures.

Furthermore, some important factors are related to excessive weight loss: one is the coexistence of median arcuate ligament syndrome, which usually causes celiac trunk stenosis [7], and the other is postoperative weight-loss effects after bariatric procedures [8]. These mechanisms are generally applicable in elderly patients, not young ones.

Regarding radiological findings of SMA syndrome, the most informative diagnostic tool is dynamic contrast-enhanced CT with 3-dimensional reconstructed vascular images.



Fig. 4. Postoperative scar. Intraumbilical incision was cosmetically good, and the operation scar of neurectomy was also shown.



Fig. 5. Postoperative duodenography. An upper gastrointestinal contrast examination showed good patency and passage of duodenojejunostomy.

The normal anatomy of the aortomesenteric angle and distance is 38–65° and 10–28 mm, respectively [9]. However, those of SMA syndrome are reported as 6–25° and 2–8 mm, respectively [2, 9]. Therefore, dynamic contrast-enhanced CT may be a strong modality for screening SMA syndrome in patients who experience excessive weight loss in a short period.

Table 1. Reported cases of SMA syndrome treated by single-incision laparoscopic duodenojejunostomy

Year	First author	Gender	Age, years	Symptoms	Aortomesenteric angle/distance	Operating time, min	Blood loss	Hospital stay, days	Weight gain/periods, kg/months
2014	Kim et al. [12]	Male	75	Bowel obstruction Weight loss (7 kg/2 months)	15°/8.0 mm	180	–	5	6/1
2015	Shinji et al. [13]*	Male	77	Vomiting Abdominal distension Weight loss (5 kg/12 months)	11°/5.0 mm	125	Little	8	–
2015	Yao et al. [5]	Female	17	Vomiting Abdominal distension Weight loss (10 kg/36 months)	10°/5.5 mm	148	Little	6	3/2
2021	Our case	Female	24	Postprandial abdominal pain Weight loss (15 kg/6 months)	11°/4.5 mm	160	4 mL	6	4/2

*Single-incision laparoscopy-assisted duodenojejunostomy.

Laparoscopic duodenojejunostomy for SMA syndrome is a simple procedure that achieves satisfactory decompression of the third portion of the duodenum and a functional bypass [4]. We did not choose conventional multiple port but rather single-port laparoscopic procedures because lesser scarring would be more beneficial for the patient [10]. We have previously reported the efficacy of single-incision laparoscopic surgeries for various diseases, and cosmetic satisfaction was the most important factor for patients [10, 11]. Thus, from our clinical evidence and experience, single-incision laparoscopic duodenojejunostomy was selected. Furthermore, we employed semi-Kocherization to increase duodenal mobility for performing anastomosis; therefore, we believe that this technique is very useful. A search of PubMed (<https://pubmed.ncbi.nlm.nih.gov>) from 1950 to September 2021 using the combined terms of “SMA syndrome,” “single-incision laparoscopic surgery,” or “single-port laparoscopic surgery” revealed that only 4 cases have been reported, including ours (Table 1) [5, 12, 13]. One of these 4 cases underwent single-port laparoscopy-assisted duodenojejunostomy, which means that the closure of the entry hole was performed via mini-laparotomy [13]. There were two old males and two young females, and the weight loss range was from 5 to 15 kg before the diagnosis of SMA syndrome. Operating time, blood loss, and hospital stay were similar in every case, and each patient promptly gained weight after the operation.

However, we have to mention the limitation of single-port laparoscopic duodenojejunostomy. First, internal and external conflicts between devices and scope are very cumbersome; in addition, the third portion of the duodenum is close to the intraumbilical wound. In this platform setting, a long operating time is required as compared to conventional laparoscopic duodenojejunostomy. Second, usual ergonomics are sacrificed for single-incision, triangular formation is lost, and a coaxial approach is forced [5, 9]. However, expert surgeons can safely perform the single-port laparoscopic surgical procedure, and fewer scars can prompt early recovery and cosmetic satisfaction.

We described single-port laparoscopic duodenojejunostomy employing semi-Kocherization for a patient with SMA syndrome. Laparoscopic duodenojejunostomy is the current standard surgical procedure for SMA syndrome. Semi-Kocherization is an effective technique to increase duodenal mobility for performing anastomosis, and employing single-port laparoscopic surgery can reduce wounds, leading to potentially higher cosmetic satisfaction, especially in young female patients.

Statement of Ethics

Written informed consent was obtained from the patient to publish this case report and the accompanying images. This case report was exempted from the Institutional Review Board of the Iwate Medical University Hospital as per its policy.

Conflict of Interest Statement

The authors declare that they have no competing interests.

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Author Contributions

Akira Umemura, Hirokatsu Katagiri, Shoji Kanno, Daiki Takeda, Hayato Nagase, Satoshi Aamano, and Koji Kikuchi performed clinical treatments, surgical procedures, and perioperative managements. Naoto Yamada performed pain control and clinical diagnosis. Akira Umemura drafted the manuscript. Hiroyuki Nitta and Akira Sasaki undertook a dedicated review and contributed to the discussion, and read and approved the final manuscript. Each author has read and approved the final version of the manuscript.

Data Availability Statement

Data sharing is not applicable to this case report due to legal grounds. Further enquiries can be directed to the corresponding author by email. The corresponding author replies to enquiries within the confines of the law.

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