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タイトル	Superior mesenteric venous thrombosis after revisional open sleeve gastrectomy
別タイトル	修正手術として行った開腹袖状胃切除術後に生じた上腸間膜静脈血栓症の1例
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**Case Report**

# Superior Mesenteric Venous Thrombosis after Revisional Open Sleeve Gastrectomy

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**ABSTRACT:** A 44-year-old man underwent revisional open sleeve gastrectomy for failed vertical-banded gastroplasty. Fourteen days postoperatively, he developed high fever and abdominal pain, and D-dimer level was elevated. Superior mesenteric venous (SMV) thrombosis was diagnosed on the basis of dynamic computed tomography (CT) imaging. Anticoagulation therapy with intravenous heparin and oral warfarin was initiated immediately. The patient's symptoms gradually improved, and his D-dimer level was within the normal range at 1 month. Six months later, he remained asymptomatic, and CT scanning confirmed partial recanalization of the SMV.

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**KEYWORDS:** SMV thrombosis, open sleeve gastrectomy, revisional surgery, anticoagulation therapy

Although mesenteric venous thrombosis (MVT) is a rare clinical condition, it can be a devastating complication of intra-abdominal surgery. MVT is believed to result from a confluence of factors leading to a hypercoagulable state<sup>1)</sup>; however, the extent to which revisional open bariatric surgery itself contributes to MVT risk is unclear. We describe a case of MVT that developed after revisional sleeve gastrectomy and was successfully treated with anticoagulation therapy.

## Case Report

A 44-year-old morbidly obese [body mass index (BMI),

49] man with hypertension, obstructive sleep apnea-hypopnea, and venous stasis and phlebitis in the lower extremities visited our hospital for revisional bariatric surgery, due to inadequate weight loss. He had undergone vertical-banded gastroplasty (VBG) 20 years earlier at another hospital but had regained the lost weight 7 years after the surgery, likely due to staple line disruption, and had been lost to follow-up. Preoperative gastroscopy confirmed staple line breakdown, and we successfully performed open sleeve gastrectomy as revisional surgery. In brief, after adhesiolysis of the band at the left lobe of the liver and anterior surface of the stomach, the band was

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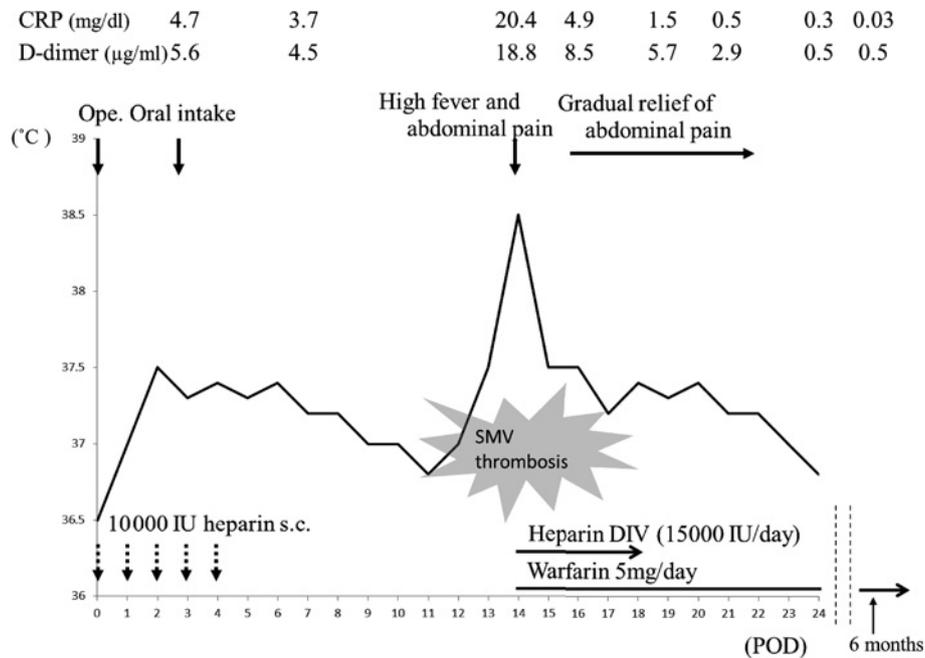


Fig. 1 Clinical course of the present patient.

CRP: C-reactive protein, Ope.: operation, SMV: superior mesenteric venous, s.c.: subcutaneous, DIV: drip infusion of vein, POD: postoperative day

dissected. Next, sleeve gastrectomy was performed using an Endo-GIA™ stapling device (Covidien Japan Inc., Tokyo, Japan) with a 36-Fr bougie in place.

The duration of surgery was 192 minutes, and the amount of blood loss was 211 g. The patient underwent routine thromboprophylaxis using subcutaneous heparin calcium injection (5000 IU preoperatively, followed by 10000 IU daily postoperatively for 3 days). His early postoperative course was uneventful. However, at 14 days after surgery he developed a fever of 38.5°C and vague abdominal pain. C-reactive protein and D-dimer levels were elevated (20.4 mg/dl and 18.8  $\mu\text{g/ml}$ , respectively; Fig. 1). Computed tomography (CT) revealed superior mesenteric venous (SMV) thrombosis and streaking of mesenteric fat, without ischemic changes in the bowel (Fig. 2a). Intravenous heparin (15000 IU/day) and oral warfarin (5 mg/day) were started immediately. Intravenous heparin was withdrawn after 4 days, and oral warfarin was continued thereafter. The patient's symptoms and laboratory data gradually improved after administration of anticoagulant therapy. A follow-up CT scan obtained 10 days after onset showed no further development of thrombosis (Fig. 2b). Thereafter, the patient was given oral warfarin (5 mg per day). A follow-up CT scan obtained at 6 months showed cavernous changes and partial recanalization of the SMV

(Fig. 2c). The D-dimer level has remained within the normal range since 1 month after treatment. At 6 months after surgery, the patient had achieved a weight loss of 30 kg and is doing well.

## Discussion

Although open VBG has been a well-accepted surgical procedure for weight loss since the 1980s, revisional surgery was often necessary after VBG in studies with longer follow-up periods.<sup>2-4</sup> A recent report described the use of laparoscopic revisional gastric bypass and sleeve gastrectomy for patients who had undergone VBG<sup>5</sup>; however, the laparoscopic approach remains challenging and is more technically demanding. In addition, Japanese public health insurance coverage is available only for open surgery, and provision of medical treatment not covered by public health insurance is generally prohibited in Japan at this time. Due to these facts, our patient chose to undergo revisional open sleeve gastrectomy.

Obesity-driven chronic inflammation and impaired fibrinolysis contribute to development of obesity-associated thrombosis. Central obesity predisposes patients to both atherothrombosis and venous thrombosis.<sup>6</sup> However, the effects of abdominal surgery itself on the risk of MVT are uncertain.<sup>1</sup> Various causes of MVT have been proposed;

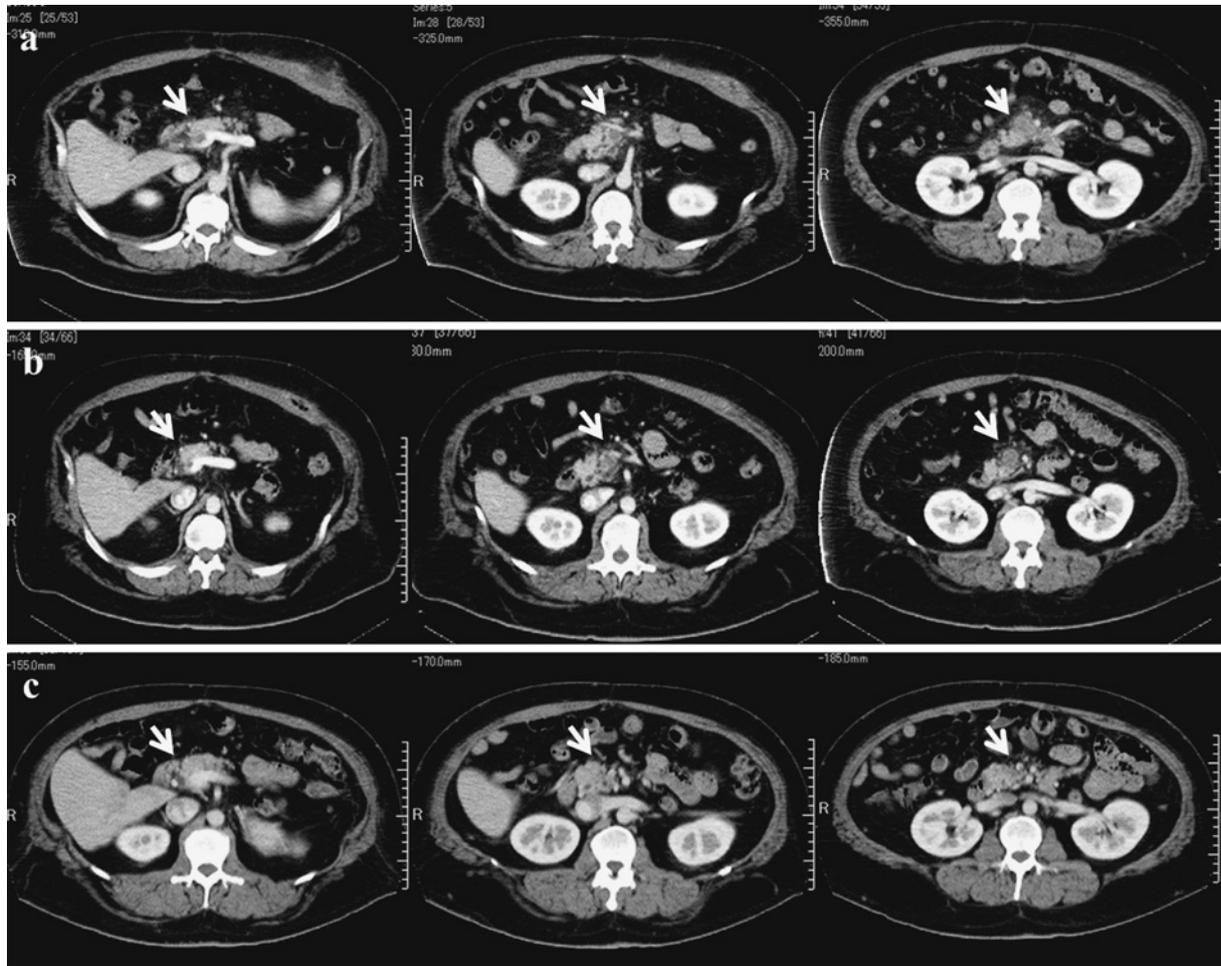


Fig. 2 CT images

- a A CT scan revealed thrombosis of the superior mesenteric vein and streaking of mesenteric fat.  
 b A CT scan showed improvement in the thrombosis and mesenteric panniculitis.  
 c A CT scan showed improvement of superior mesenteric venous thrombosis, and partial recanalization.  
 White arrows show superior mesenteric vein.

however, its precise etiology is unclear because of its low incidence. Because the present patient had no previous or family history of thromboembolism, complex factors, such as his hypercoagulable state (morbid obesity and chronic phlebitis) and intraoperative manipulation, likely contributed to venous stasis. Damage to the splanchnic endothelium may have caused the thromboembolism.

The incidence of MVT after open versus laparoscopic surgery is also uncertain. Some studies reported that capnoperitoneum and hypercapnia during laparoscopic surgery may increase intra-abdominal pressure and mesenteric vasoconstriction, which further reduces mesenteric venous flow.<sup>7-9)</sup> Nevertheless, this does not necessarily mean that patients treated with laparotomy are more susceptible to MVT than those treated using laparoscopic procedures.

As was the case in other reports,<sup>7,8)</sup> MVT symptoms began to manifest clinically at 14 days after revisional surgery in our patient. His D-dimer level gradually increased during the early postoperative period, despite his apparent recovery. The D-dimer test evaluates coagulation, is easily performed, and is highly specific in excluding venous thrombosis. Venous thromboembolism occurs rarely (1%) in patients with a negative result on a D-dimer test.<sup>10)</sup> Immediate use of dynamic CT with contrast medium is indicated when D-dimer level increases. Dynamic CT is the most common imaging technique for diagnosis of MVT and can be readily utilized to evaluate the extent of thrombosis.<sup>7)</sup> Extensive follow-up of patients with increased D-dimer is necessary until the level decreases in conjunction with symptomatic improvement.

The principal treatment for acute MVT is anticoagula-

tion therapy with heparin; long-term warfarin therapy is continued after achieving satisfactory anticoagulation. Prompt initiation of anticoagulation therapy with heparin can lead to complete or partial recanalization in patients with MVT.<sup>7)</sup> We started anticoagulant combination therapy consisting of heparin and warfarin; however, due to the patient's apparent clinical improvement and optimal prothrombin time/international normalized ratio (PT/INR), we withdrew heparin after 4 days and administered only oral warfarin thereafter.

The selection of anticoagulant and the dose and duration of prophylactic perioperative anticoagulant therapy remain controversial, and no recommendations have been established. Our experience suggests that individualized heparin prophylaxis administered during the perioperative period of bariatric surgery is essential in reducing MVT risk. In addition, continuous anticoagulation therapy may be required to prevent MVT in patients with a persistent postoperative hypercoagulable state.

### Conclusion

MVT is a rare condition that should be included in the differential diagnosis for patients who develop abdominal pain after bariatric surgery. Surgeons need to be aware that MVT is a postoperative complication that can occur even under conditions of thromboprophylaxis. Prompt diagnosis and anticoagulant therapy are necessary for favorable outcomes.

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## 修正手術として行った開腹袖状胃切除術後に生じた 上腸間膜静脈血栓症の1例

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**要旨**：44歳，男性．肥満症に対する垂直胃遮断胃形成術後のリバウンドに対する修正手術として開腹袖状胃切除術を施行した．術後14病日目に，高熱を伴う腹痛を呈し，血液検査上D-ダイマーの上昇を認めた．造影 computed tomography (CT)にて上腸間膜静脈血栓症と診断され，速やかにヘパリンの持続注射とワーファリン内服による抗凝固療法が開始された．治療開始後，患者の状態は徐々に軽快し，1カ月以内にD-ダイマー値も正常化した．6カ月後に行った造影CTでは，上腸間膜状間静脈の部分的な開存を認め，以後無症状経過中である．

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