Catheter-Directed Thrombolysis in the Treatment of Acute Portomesenteric Vein Thrombosis After Laparoscopic Sleeve Gastrectomy

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Case report

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Abstract

Background: Portomesenteric vein thrombosis (PMVT) following Laparoscopic Sleeve Gastrectomy (LSG) is an uncommon but potentially debilitating complication. Catheter-directed thrombolysis (CDT) has an evolving role in recanalizing the venous flow and preventing thrombus propagation. It can be used as an alternative or in combination with systemic anticoagulants in selected patients. We report two cases of trans-hepatic and trans-splenic CDT of acute PMVT developed in post LSG. The patient's clinical details, radiological findings, safety, and efficacy are reported.

Cases presentation: Two patients presented to the emergency department (ED) within 14 days of surgery. The presenting complaints were generally nonspecific. The diagnosis of PMVT was established in both patients based on abdominal contrast-enhanced computed tomography (CECT). The two patients received a combined therapy of intravenous (IV) heparinization and CDT using trans-hepatic approach in case 1 and trans-splenic approach in case 2, determined by the extent of thrombosis. Subsequent post-procedure venograms and CECT were performed and showed significant thrombus resolution. Both patients received long-term anticoagulant therapy upon discharge with a successful overall recovery.

Conclusion: PMVT is an infrequent and severe post LSG complication. Various approaches for re-establishing the portal venous flow have been described according to the severity of venous thrombosis. This article describes CDT therapy as a safe and effective option for treating PMVT in symptomatic patients.

Introduction:

Worldwide, laparoscopic Sleeve Gastrectomy (LSG) is currently a recognized dominant bariatric procedure (1). Portomesenteric vein thrombosis (PMVT) became a well-recognized yet rare clinical complication of LSG. According to one study, the incidence of PMVT in LSG appears to be higher than the rates of other bariatric operations, with a total population incidence of 1.1% (2). The late detection and treatment of PMVT can result in devastating complications that can lead to ascites in 62%, esophageal varices in 58%, terminal gastroesophageal bleeding in 47%, intestinal perforation, infarction, and secondary peritonitis (2). Long-term sequelae of portal hypertension are found in 50% of patients with PMVT (3). There is growing attention for endovascular therapy as a practical option in treating patients with extensive PMVT. The purpose of this study was to present cases which developed PMVT after LSG and discuss precisely the effectiveness of catheter-directed thrombolysis (CDT) in the treatment of acute and subacute cases.

Case Report:

Patient # 1:

A 48-year-old female patient with a history of LSG indicated for the treatment of morbid obesity presented to our hospital two weeks after the surgery with abdominal pain with no abdominal tenderness or vomiting. CECT revealed complete thrombosis of the superior mesenteric vein (SMV) extending to the main portal vein, thickened proximal jejunal loops with moderate enhancement, and mild adjacent mesenteric stranding. However, the visceral arteries were patent (Fig.1a). The patient was found to have Factor V Leiden mutation. A combined treatment of IV heparinization with local CDT was commenced. A trans-hepatic approach was performed under ultrasound guidance using an 18-gauge trocar needle. A 5F vascular sheath was inserted over a 0.035-inch hydrophilic guidewire.

The occlusion was then traversed using a 5F angiographic catheter with the same guidewire until reaching the SMV. The angiographic catheter was then replaced by a 5F multi-side-hole infusion catheter. The venogram showed SMV occlusion extended to the main portal vein (Fig.1b). A loading dose of 5mg of tissue Plasminogen Activator (tPA) was given through the catheter, followed by continuous infusion of tPA with a rate of 0.5mg per hour for six hours. Six hours later, the SMV venogram showed partial recanalization of SMV and the main portal vein. Based on these findings, it was decided to continue the tPA infusion at the same rate for 72 hours. The follow-up venogram showed significant recanalization of the PMVT. The tPA infusion was then discontinued, and the catheter with the vascular sheath was removed after performing hepatic tract embolization using an absorbable gelatin sponge. The patient was discharged with long-term anticoagulation therapy. A Follow-up abdominal CECT performed ten days post treatment demonstrated further improvement; however, residual filling defects were still noted in the SMV and main portal vein (Fig.1c). At three months, a follow-up with an abdominal ultrasound showed a patent portal vein.

Patient # 2:

A 35-year-old male patient with ten days of history of LSG presented in ED with diffuse abdominal pain and mild abdominal tenderness. Laboratory results demonstrated a raised white blood cell count. Abdominal ultrasound was performed, and it showed no evidence of flow in the portal vein, suggesting portal vein thrombosis. An abdominal CECT was performed, showing evidence of persistent SMV thrombosis extending to the intrahepatic portal veins with remarkable small bowel thickening (Fig.2a). A systemic (IV) heparinization combined with CDT was decided to be commenced. Due to the total occlusion of intrahepatic portal veins, a trans-splenic approach was selected. Under ultrasound guidance, percutaneous trans-splenic access to the main splenic vein was obtained by puncturing a perihilar splenic vein with a 21-gauge Chiba needle (Cook; Bloomington; IN). A 5F vascular sheath was then inserted over a 0.018-inch guidewire. Next, a 5F angiographic catheter over a 0.035-inch hydrophilic guidewire was used to cross the thrombus until reaching the SMV. The angiographic catheter was then exchanged with 5F multi-side hole perfusion catheter with the tip placed in the SMV. An initial dose of 5mg of tPA was started, followed by continuous tPA infusion with a rate of 0.5mg per hour. The tPA infusion was continued for more than 24 hours, and the follow-up venogram demonstrated partial recanalization of SMV and portal veins (Fig.2b). The tPA infusion was then discontinued, and the splenic tract was

embolized using an absorbable gelatin sponge while pulling back the vascular sheath. The patient underwent limited bowel resection secondary to the mesenteric vein infarction. One week later, an abdominal CECT follow-up was performed and revealed further patency of the partial thrombus involving intrahepatic branches of the main portal vein and SMV with no ongoing evidence of bowel ischemia (Fig.2c). The patient was continued on anticoagulants and discharged after a good recovery.

Discussion:

PMVT has become a potentially severe reported complication of LSG despite its rare frequency (4,5). In our case series, one patient was found to have Factor V Leiden mutation suggesting a secondary underlying cause of PMVT. However, in post LSG, the etiology of PMVT is multifactorial and can have additional intraoperative and postoperative factors (6,7). Unfortunately, the information regarding the thromboprophylaxis measures was not sufficiently provided in our two patients. CECT is considered a gold standard in detecting PMVT and bowel ischemia, with a sensitivity reaching 90 % (8). In our cases, CECT showed high accuracy in detecting the extent of PMVT and the degree of bowel insult, which determined the type of management and allowed us to plan the access to the portal system.

The management of PMVT depends on many factors such as the extension of thrombus, presence or not of bowel ischemia and infarction, and the general condition of the patient. The primary goal is to recanalize the affected veins to prevent secondary complications and further extension of thrombus.

There is remarkable poverty in the studies comparing between the various recanalization modes used in PMVT. This, however, can be achieved through systemic IV anticoagulation, CDT, combination therapy or surgical interventions. Systemic IV anticoagulation should be immediately initiated in all cases. It can solely achieve complete recanalization especially in the nonocclusive non-ischemic bowel.

In up to 80% of cases, it was found that long-term anticoagulation alone for a minimum of six months may also recanalize partial to complete thrombosis (9). While in another study, it was indicated that approximately 30 to 50% of patients would show significant results after systemic IV anticoagulation alone (9). These in contrast to another study (10), which suggested a failure rate of exceeding 65% (10) with heparin anticoagulation alone. Therefore, for a symptomatic patient with occlusive, partial to complete thrombosis bowel more rapid recanalization by adopting a combined therapy of systemic IV anticoagulation and CDT is needed (7,10). This was evidenced in 75 to 100% of PMVT patients with at partial venous recanalization was observed in patients receiving the combined with overall excellent success rates (11,12). However, more critically symptomatic cases can form great clinical challenge necessitating alternative more invasive interventions to reduce the thrombus burden (10). Emergency laparotomy, open thrombectomy and bowel resection, therefore, should not be delayed in suspected infarction or subsequent perforation (13). In our two cases, both patients were hemodynamically stable with the presence of mild abdominal tenderness in case # 2 for whom a limited bowel resection was performed after CDT. Both ultimately received combined therapy with trans-hepatic and trans-splenic approaches, which showed effective and safe results in resolving the thrombosis.

CDT for the treatment of PMVT can proceed in two ways. First, direct trans-venous approach can be combined with mechanical or suction thrombectomy, balloon angioplasty, and stenting. CDT is effective in the setting of symptomatic acute and subacute PMVT with no evidence of bowel infarction. The trans-jugular intrahepatic portosystemic shunt (TIPS), although technically more challenging, is usually recommended (14). This technique can be used in the presence of abnormal deranged coagulation, causing less intraperitoneal bleeding than the trans-hepatic or trans-splenic approaches (14). The percutaneous trans-hepatic technique, usually performed under ultrasound guidance, is a known option to access PMVT. It carries the risk of bleeding, primarily if large catheters or sheaths are being used during thrombolysis or thrombectomy with hemodynamic instability rates of as high as 60% (11). The ultrasound-guided percutaneous trans-splenic technique is another direct way to access the portal system in which the trans-hepatic approach is challenging. It still carries a higher bleeding risk compared to TIPS and trans-hepatic approaches (15). Therefore, the decision for this approach should only be taken if the other options are undesirable. This is why we opted for the trans-splenic approach in case 2, which showed extended intrahepatic portal vein thrombosis in the CECT, making the trans-hepatic puncture of the portal vein branches challenging to obtain under ultrasound guidance. In both patients, the access tracks' embolization using absorbable gelatin sponge was performed to prevent bleeding complications while withdrawing the vascular sheaths (14,16,17).

Moreover, both patients had regular follow-up by venogram, and the vital signs were continuously monitored during tPA infusion. The duration of tPA infusion was based on the results obtained by the venogram and CECT. The infusion was interrupted once partial recanalization of the portomesenteric vein was obtained to reduce the bleeding risk.

The second way to proceed with CDT is by indirect approach using trans-femoral or trans-radial arterial accesses to insert multi-side hole perfusion catheter into the proximal superior mesenteric artery, which allows for thrombolytic agents infusion (14,18). Nevertheless, this method has a significant limitation as the total dose of infused tPA can result in locoregional toxicity. Also, in contrast to the direct methods, only thrombolysis and no other adjunctive interventions are applicable.

Finally, Surgical trans-ileocolic approaches were described, offering access to the portomesenteric vein. However, it is less suitable for mechanical techniques like thrombectomy or balloon angioplasty, or stenting (14).

In conclusion, PMVT is a relatively uncommon complication in patients undergoing LSG. Early detection and treatment based on high clinical suspicion and awareness of clinical presentation and imaging results are necessary to prevent long-term complications. Among the various approaches for recanalizing the portomesenteric vein thrombosis, including thrombolysis and thrombectomy techniques, CDT offers a safe and effective option to restore portal and mesenteric veins patency in symptomatic PMVT patients.

Declarations

Acknowledgment

Not applicable.

Ethics approval and consent to participate

Ethical approval was not required for this retrospective case series.

Consent for publication

Consent from the patient and our institution was obtained for publication

Availability of data and material

Not applicable.

Competing interests

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Not applicable.

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Figures

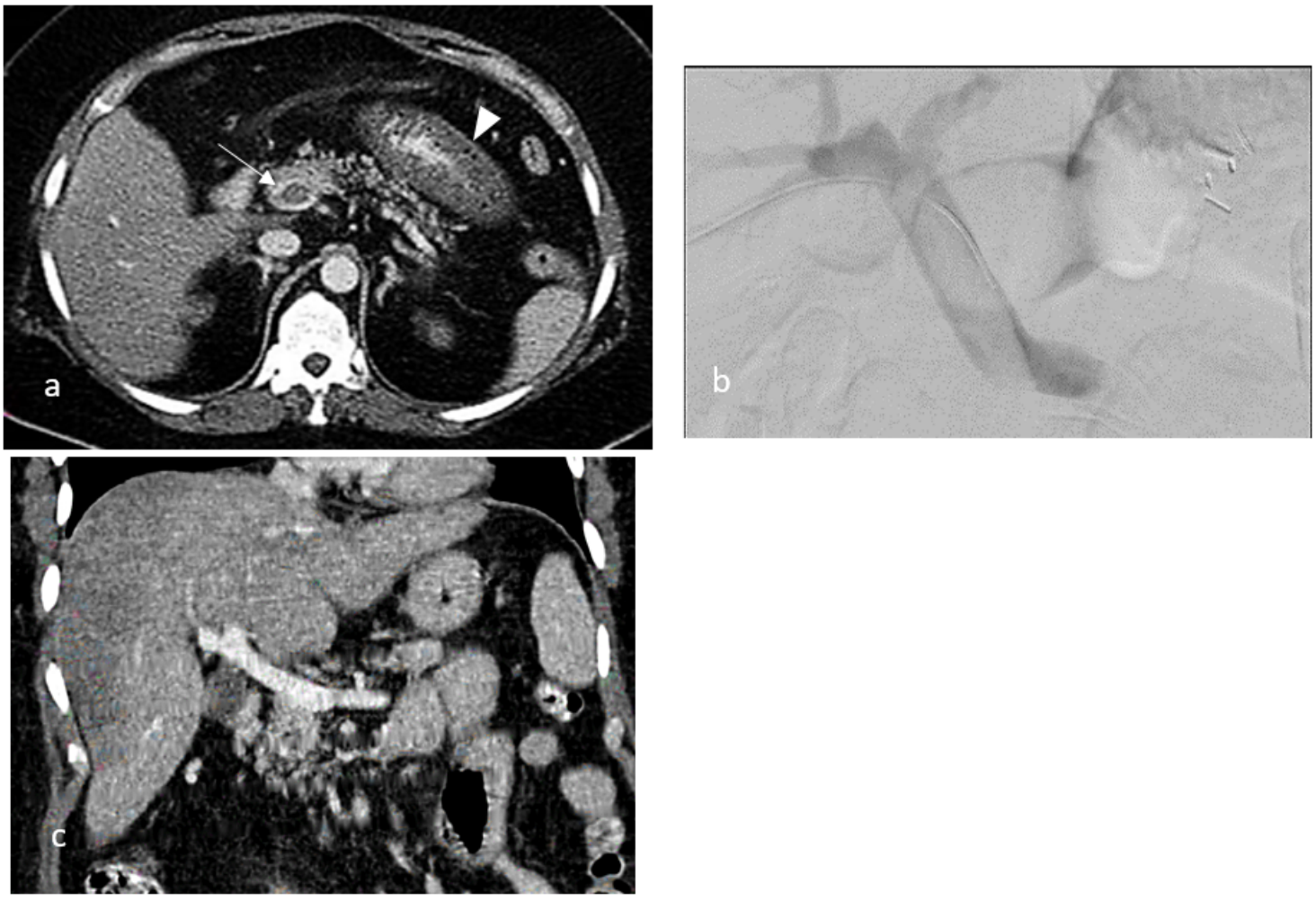

Figure 1

a Pre-procedural CECT showing portal vein thrombosis (arrow) and jejunal wall thickening (arrow-head). b Pre-procedural trans-hepatic portogram showing main portal vein thrombosis with patency of intrahepatic portal branches. c Follow-up CECT demonstrating recanalization of the portal vein.

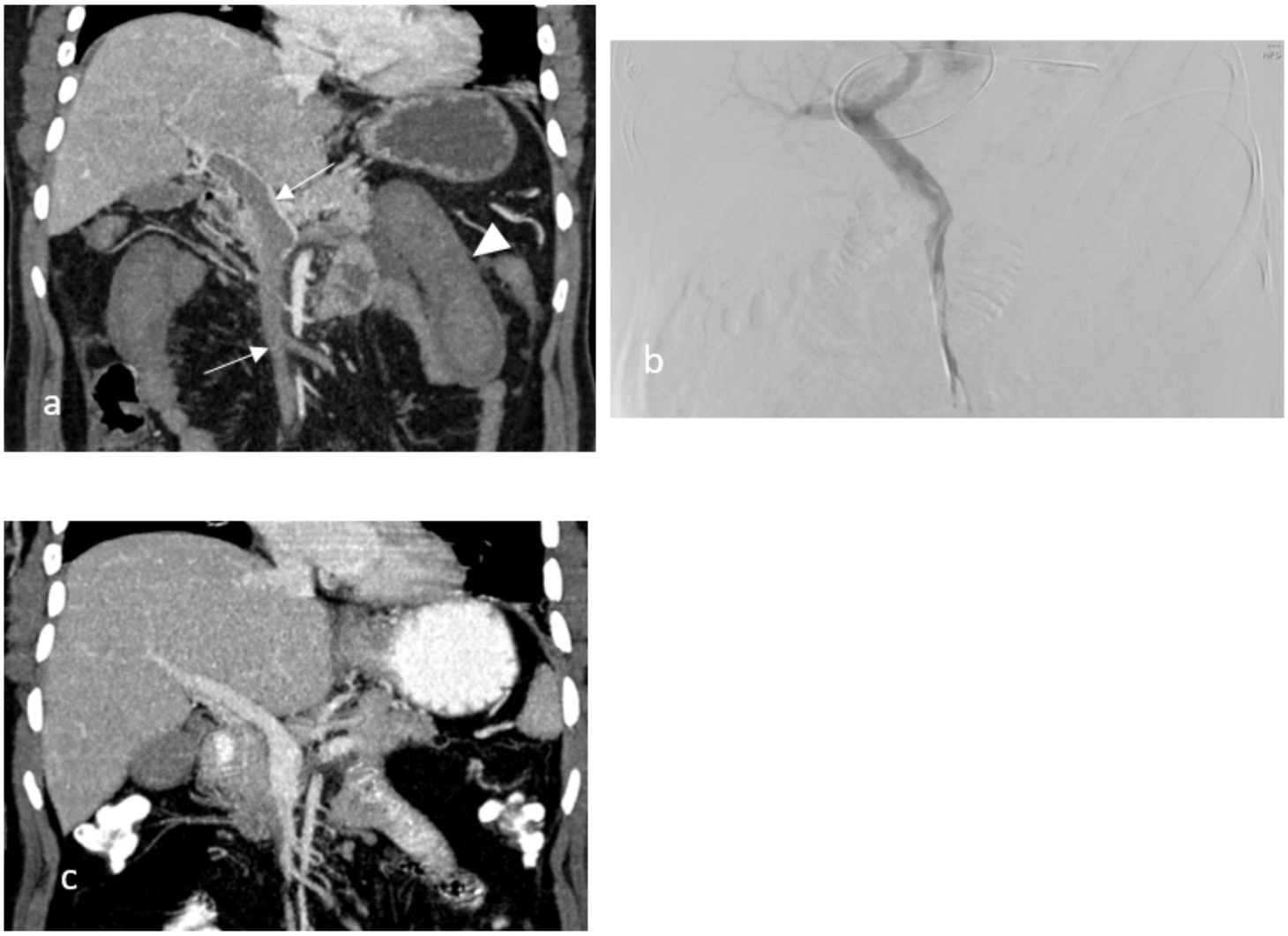

Figure 2

a Pre-procedural CECT showing portomesenteric vein thrombosis (arrows) with small bowel wall thickening (arrow-head) . b Follow-up trans-splenic portogram demonstrating recanalization of the portal vein with persistence partial thrombosis of SMV. c One week post-procedural CECT showing recanalization of the portal vein and SMV .