

Postoperative Course after Simple Ligation for Superior Mesenteric Vein Injury Caused by Blunt Abdominal Trauma: Report of a Case

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Abstract

Traumatic injury of the superior mesenteric vein (SMV) by blunt trauma is a rare but frequently fatal injury. Although simple ligation should be considered for a patient in unstable condition, its complications have not been reported in detail. A 47-year-old man was struck on the abdomen during a fight. When he was transferred to a local hospital, he complained of severe abdominal pain. Computed tomography (CT) of the abdomen showed fluid accumulation in the peritoneal cavity and a hematoma around the root of the mesentery, with leakage of contrast material. When the patient was transferred to our emergency department, the hemodynamic status did not improve after rapid fluid resuscitation with 1,500 mL of crystalloid. Emergency laparotomy was performed 4 hours after the injury. Two lacerations of the proximal SMV were observed. The SMV was ligated owing to the unstable hemodynamic status. On postoperative day (POD) 5, abdominal radiography showed dilated loops of bowel, suggesting ileus of the small bowel. A CT scan with contrast enhancement showed that the wall of the small bowel was thickened. On POD 11, a CT scan showed that the collateral vessels that drain the mesenteric circulation had not developed. However, collateral vessels were revealed on a 3-dimensional CT scan, and, on POD 23, a CT scan showed that the collateral vessels had developed. The patient was discharged on POD 37. This case demonstrates that simple ligation of the proximal SMV leads to the development of collateral vessels and is useful for preventing side effects and improving outcomes.

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Key words: blunt abdominal trauma, superior mesenteric vein injury, paralytic ileus

Introduction

Until recently, the benefits of ligation of an injured superior mesenteric vein (SMV) have been controversial. However, simple ligation is recommended if the patient is hemodynamically unstable and in need of damage control^{1,2}. After proximal SMV ligation, collateral vessels maintain sufficient blood flow via the inferior mesenteric vein

and portosystemic collaterals, primarily through the retroperitoneal perforators of Retzius. However, the clinical course and consequences following SMV ligation have not been reported. Here, we report a case of SMV injury caused by blunt abdominal trauma and its postoperative course, as well as abdominal complications and radiographical findings following the ligation of the proximal SMV.

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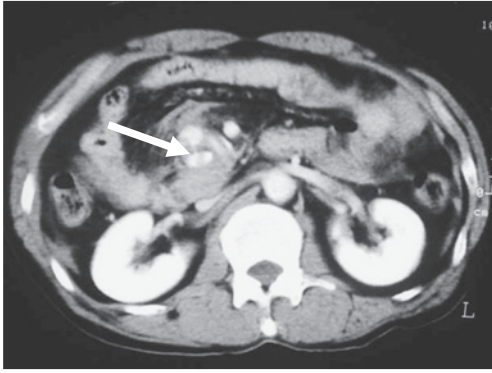


Fig. 1 Abdominal CT scan demonstrating a hematoma around the root of the mesentery and extravasation of contrast material (arrow).

Case Report

A 47-year-old man was struck on the abdomen during a fight. At a local hospital, he complained of abdominal pain, and physical examination revealed a systolic blood pressure of 130 mm Hg and a heart rate of 84 beats/minute. Computed tomography (CT) showed fluid accumulation in the peritoneal cavity and a hematoma around the root of the mesentery with leakage of contrast material (**Fig. 1**). The patient was transferred to our emergency department by ambulance 3 hours after the injury. On arrival, the patient was hemodynamically unstable with a systolic blood pressure of 80 mm Hg, a heart rate of 94 beats/minute, a respiratory rate of 31 breaths/minute, and a Glasgow Coma Scale score of 15. Physical examination revealed abdominal distension and diffuse tenderness. Focused assessment with sonography for trauma showed a large echo-free space in the Morrison pouch and perisplenic space, indicating the presence of a large hemoperitoneum. Resuscitation was started with rapid infusion of 1,500 mL of crystalloid, but the hemodynamic status did not improve. He was then operated on.

At celiotomy, through a midline incision, a large volume of blood was evacuated from the abdominal cavity. Injuries identified included laceration of the small intestine (Grade Ib by the Japanese Association for the Surgery of Trauma's Organ Injury Scale for the Gastrointestinal Tract) and considerable retroperitoneal hematoma around the duodenum and at the base of the mesentery. During exploration of the hematoma at the base of the

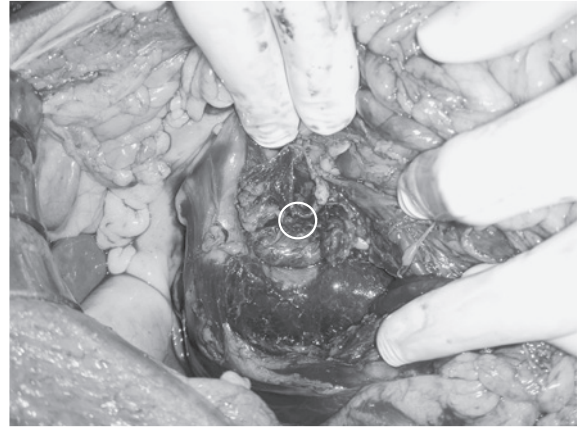


Fig. 2 Intraoperative photograph showing SMV laceration (circle).

mesentery, active bleeding was observed from 2 lacerations of the SMV near the conjunction of the splenic vein (**Fig. 2**). Owing to the uncontrollable hemorrhage and unstable hemodynamic status, despite aggressive resuscitation, and the coagulopathy, despite the body temperature being maintained at 36°C, simple ligation of the SMV was performed just distal and proximal to the lacerations. After SMV ligation, no ischemic or edematous change was observed in the bowel. The Injury Severity Score (which is calculated from the 3 highest scores in predetermined regions of the body), calculated with the Abbreviated Injury Score, was 9. The probability of survival, as determined with the Trauma Score-Injury Severity Score, was 0.987.

On POD 2, the patient's endotracheal tube was removed. On POD 4, the patient was allowed to drink water. However, on POD 5, he complained of abdominal distension. The abdomen became distended, and bowel sounds were diminished. Plain abdominal X-ray films showed dilated loops of small bowel, suggesting ileus of the small bowel. A CT scan with contrast enhancement showed thickening, due to edema, of the wall of the proximal jejunum (**Fig. 3B**). At this time, the patient's intake of water was stopped. On POD 7, the bowel sounds disappeared, and there were no further abdominal symptoms. The patient was allowed to start a regular diet and consumed meals as directed. On POD 11, he vomited. A CT scan with contrast enhancement showed that the walls of the small bowel and ascending colon were thicker than on the previous study. However, a 3-dimensional CT scan showed the presence of collateral vessels (**Fig. 4**). On

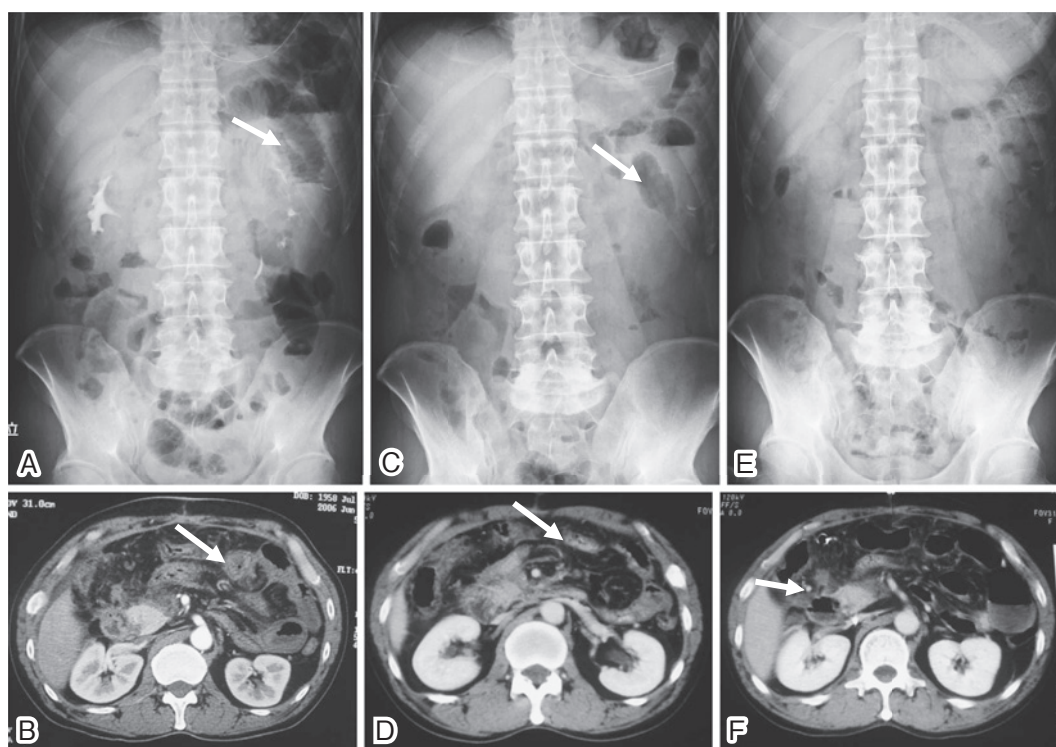


Fig. 3 **A:** Abdominal X-ray film obtained on POD 11 showing dilated loops (**arrow**) of the proximal jejunum. **B:** A CT scan with contrast enhancement on POD 11 showing the thickened wall of the small bowel. **C:** An X-ray film obtained on POD 23 showing no marked change. **D:** A CT scan on POD 23 showing no decrease in the thickening of the wall of the small bowel. On POD 36, an X-ray film **E:** revealed no abnormal signs, and a CT scan **F:** showed the presence of collateral vessels (**arrow**).

POD 16, the patient was permitted to drink water again. At this time, the patient had no abdominal complaints. Meals were restarted on POD 20. On POD 23, abdominal radiography and CT showed a decrease in intestinal gas and the development of collateral vessels (**Fig. 3D**). On POD 36, no abnormal signs were observed on CT scan, except in relation to the collateral vessels (**Fig. 3F**). The patient was discharged on POD 37.

Discussion

Traumatic injury to the SMV by blunt trauma accounts for only 5% to 10% of abdominal vascular injuries² and usually occurs as a result of either car or motorcycle accidents³. The anatomical deformity of the SMV produced at impact generates stretching and shearing forces, resulting in avulsion injuries³. Disruption of the SMV results in massive hemorrhage, despite the relatively low portal venous pressure⁴, because the portal venous circulation is the principal efferent channel of blood from the abdominal viscera. In 1984, Courcy³ et al

recommended that venous injuries should be repaired first to reduce bowel engorgement, especially as venous occlusion is not tolerated as well as arterial occlusion^{5,6}. The specific management of SMV injuries has been controversial. In 1988, Donahue and Strauch⁷ suggested that simple ligation should be considered, especially for a hemodynamically unstable patient with multiple injuries and life-threatening abdominal venous injuries. Abdominal complications did not develop in any patients. In 2004, Coimbra et al⁸ reviewed the mortality rate (50%), which correlated with a low Revised Trauma Score and a high Injury Severity Score. In patients who are hemodynamically unstable, simple ligation should be performed because of the safety of ligation and to avoid the risks of more complicated procedures.

After SMV ligation, collateral vessels maintain sufficient blood flow via the inferior mesenteric vein and portosystemic collaterals, primarily through the retroperitoneal perforators of Retzius^{9,10}. Well-developed collateral circulation following mesenteric venous thrombosis was present after several

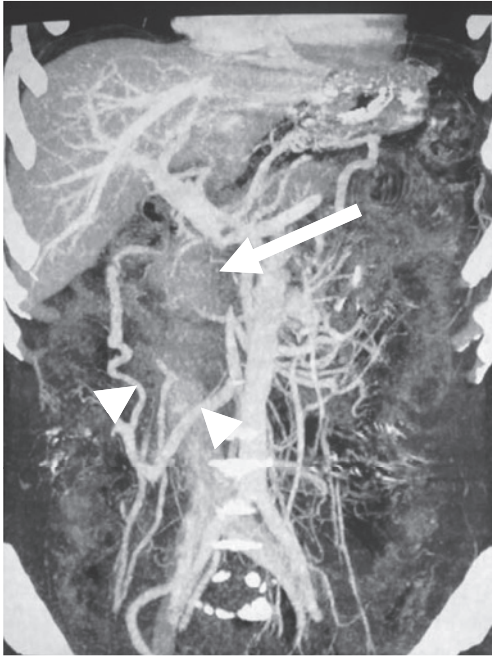


Fig. 4 On POD 11, 3-dimensional CT scan showed that the truncated SMV was not visualized at the point of ligation (**arrow**) and that the diameter of the inferior mesenteric vein had increased (**arrowheads**).

weeks¹¹. Concerning patients with mesenteric venous thrombosis, Scott¹² have suggested that those with a more indolent course have less infarction and, hence, a better prognosis.

When the present patient was permitted to drink water on POD 4, collateral circulation had not yet developed. On POD 11, 3-dimensional CT showed the presence of collateral vessels (**Fig. 4**); however, these collateral vessels that drain the mesenteric circulation were not fully developed because the wall of the small bowel was congested and edematous (**Fig. 3D**). On POD 23, the wall of the small bowel was not thickened, and collateral vessels were confirmed with CT (**Fig. 3F**). More than 3 weeks were needed to develop collateral vessels that could drain the mesenteric circulation. When the collateral circulation was inadequate, venous drainage from a segment of the bowel is compromised. Mortality rates associated with SMV ligation (15%) are reportedly lower than those associated with mesenteric venous thrombosis (20% to 50%)¹³. Coimbra et al⁸ have reported on a patient in whom extensive bowel necrosis developed following resection and end-to-end anastomosis of the SMV, with venous thrombosis progressing into

the portal vein.

In summary, to our knowledge this is the first report of SMV injury treated with simple ligation, in which the clinical course and sequential changes in radiographic findings were documented. Although SMV injury can be managed with simple ligation, 3 weeks are needed for the development of collateral circulation and for the mesenteric congestion-induced bowel edema to subside. Careful observation is required for adequate development of collateral circulation.

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