

CASE REPORT

Endovascular Repair of Superior Mesenteric Arteriovenous Fistula Causing Early Mesenteric Steal Syndrome Following Abdominal Gunshot Injury

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Introduction: Superior mesenteric arteriovenous fistulae (SMAVF) are rare, usually secondary to trauma or iatrogenic injury and typically present sometime after the initial insult.

Report: A 30 year old male underwent immediate laparotomy for abdominal gunshot injury. The small bowel mesentery contained a large haematoma and a palpable thrill. CT demonstrated a large SMAVF. At re-look laparotomy, small bowel ischaemia was noted and following this endovascular SMA stent graft insertion was performed, with excellent angiographic and clinical results.

Conclusion: The first report of immediate traumatic SMAVF leading to acute mesenteric steal syndrome and successful management with endovascular stent insertion is presented.

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INTRODUCTION

Superior mesenteric arteriovenous fistula (SMAVF) formation is a rare complication of penetrating abdominal trauma. Clinical presentation of SMAVF typically occurs in a delayed fashion after the initial injury.¹ A previously unreported case of acute mesenteric ischaemia because of an extensive SMAVF, developing immediately after abdominal gunshot injury is presented, and the subsequent successful management is outlined.

REPORT

A 30 year old male underwent immediate laparotomy at his local emergency centre for a single gunshot wound (GSW) to the abdomen. Intra-operative findings were consistent with the bullet entering the anterior abdominal wall, passing through the root of the small bowel mesentery and exiting in the left lumbar region. The root of the small bowel mesentery contained a large haematoma with a palpable thrill, raising the suspicion of SMAVF. An urgent computed tomography (CT) scan was performed immediately after laparotomy, which demonstrated a large SMAVF arising from proximal SMA, close to the origin of several early

jejunal branches, and communicating with the cranial aspect of the SMV (Fig. 1). The patient remained unstable and therefore returned for further laparotomy, which demonstrated impaired small bowel perfusion, prompting immediate transfer to the regional major trauma centre with interventional radiology capability. Following transfer, it was noted that decompression of the bowel through the laparotomy wound significantly improved perfusion of the SMA territory, indicating possible long-term bowel viability.

Open repair of such a large, complex fistula in the acute setting was felt to carry an unacceptably high risk of morbidity and mortality and an endovascular approach was favoured. Percutaneous access was gained from the right common femoral artery (CFA) with a 7F 45 cm Destination (Terumo, Tokyo, Japan) sheath which was subsequently advanced into the proximal SMA. Initial angiograms showed a large SMAVF from the proximal SMA to SMV, with absent flow to the distal SMA branches. Three ADVANTA V12 Atrium balloon mounted stent grafts (Macquet, Rastatt, Germany) were required to completely exclude the SMAVF, landing in the distal main SMA trunk (5 mm × 22 mm, 6 mm × 22 mm, and 6 mm × 38 mm) (Fig. 2).

Post-procedure angiography confirmed complete exclusion of the SMAVF and brisk flow of contrast to the entire SMA territory. At subsequent laparotomy the entire small bowel markedly improved in appearance with palpable pulses in distal mesenteric branches. Temporary abdominal closure was maintained in the early period to ensure bowel viability and allow resolution of post-reperfusion oedema. A repeat CT 4 days after stent insertion confirmed a patent

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Figure 1. Axial post-intravenous contrast computed tomography showing arterialised enhancement of the superior mesenteric vein with a large fistula from the adjacent superior mesenteric artery.

SMA, SMV, and portal vein with no evidence of persistent SMAVF (Fig. 3). The abdomen was closed using a large collagen sheet (SurgiMend, Integra LifeSciences, Plainsboro, NJ, USA) on Day 8 after the initial injury. The patient was maintained on long-term antiplatelet therapy, and 6 months after the injury was well and reported no long-term gastrointestinal problems.

DISCUSSION

SMAVFs are most often the result of traumatic or iatrogenic injury, although other causes include ruptured aneurysms, infections, or congenital malformation.^{2,3} In traumatic SMAVF the clinical presentation is usually delayed, with some patients remaining asymptomatic for many years. Presenting symptoms typically comprise abdominal pain, nausea, vomiting, and diarrhoea, presumably due to a combination of intestinal ischaemia and portal congestion.



Figure 3. Cinematic volume rendered technique using computed tomography angiogram performed four days after stent placement and showing complete patency of superior mesenteric artery branches and exclusion of the superior mesenteric arteriovenous fistula.

Less commonly, increased portal venous pressure gives rise to hepatic congestion, variceal haemorrhage, ascites, and right heart failure.³

The management options for SMAVF include surgical disconnection of the fistula or endovascular intervention. In

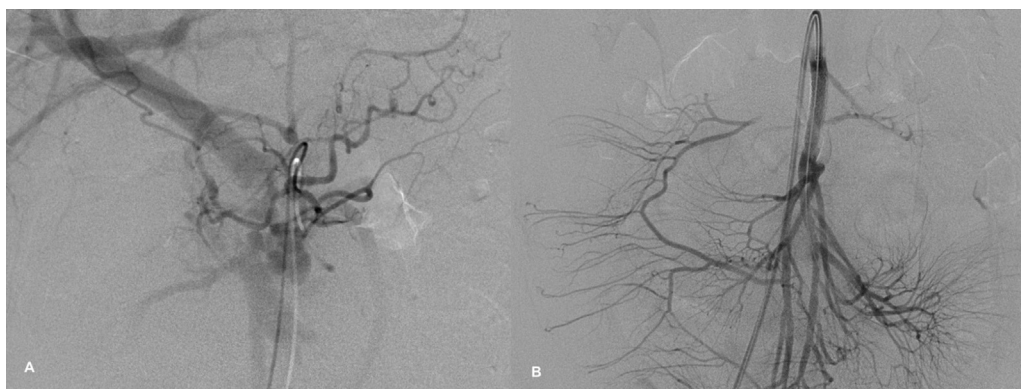


Figure 2. Digital subtraction superior mesenteric artery (SMA) angiogram showing (A) rapid shunting to the portal vein via a large superior mesenteric arteriovenous fistula (SMAVF), with no flow into distal SMA branches, and (B) following stent grafting of the proximal SMA, exclusion of SMAVF and much improved flow into the distal SMA branches.

most cases, radiological intervention is preferred as it is associated with reduced mortality, lower cost, allows repeated access for further intervention, and can be used for fistulae deemed too large for surgical intervention.^{4,5} Early attempts at endoscopic intervention for SMAVF used coil embolisation of the aberrant tract. However, use of covered stents is recommended as embolisation in this context carries a significant risk of coil migration, distal enteric arterial occlusion, or porto-mesenteric venous thrombosis.^{2,3} Endovascular stent placement carries an increased risk of thrombosis, and therefore requires the patient to take long-term anticoagulant or antiplatelet therapy.

CONCLUSION

Herein, a case of extensive SMAVF caused by a single GSW to the abdomen is reported. In this case, the SMAVF resulted in acute, position dependent bowel ischaemia noted at emergency trauma laparotomy. A major enterectomy was avoided by bowel decompression at open laparotomy and exclusion of the fistula with endovascular placement of multiple covered stents. This is the first reported case of an SMAVF causing acute mesenteric steal syndrome, and it is important to highlight that this can be managed successfully with a combination of open surgery and endovascular intervention.

CONFLICT OF INTEREST

None.

FUNDING

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