

Acute Embolic Occlusion of the Superior Mesenteric Artery: A Case Report and Discussion of Management

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Abstract

Introduction: We present a case of acute embolus to the superior mesenteric artery (SMA). **Clinical Picture:** A 70-year-old gentleman with atrial fibrillation complained of colicky abdominal pain with clinical signs of tenderness and mild guarding. **Treatment and Outcome:** Laparotomy revealed extensive bowel ischaemia but no overt infarction. The SMA was occluded by an embolus at the root of the mesentery and balloon catheter embolectomy was carried out at once. Bowel resection was deferred in order to allow clear demarcation of gangrene to avoid sacrificing unnecessary length. At second look laparotomy, 1.2 m of bowel from mid-jejunum to mid-ileum was resected, salvaging about 1 m of previously dusky small and large bowel. **Conclusion:** This case illustrates the importance of accurate history taking, the role of early intervention and the usefulness of a second look laparotomy in cases of mesenteric ischaemia to minimise the extent of bowel resection.

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Key words: Acute embolus, Acute mesenteric ischaemia, Embolectomy, Ischaemic bowel, Second look laparotomy

Introduction

Acute ischaemia of the bowel is a devastating condition. Recently published figures on mortality range from 30% to 60%.¹⁻³ The diagnosis is difficult to make and often delayed, by which time irreversible changes and widespread bowel infarction have already occurred. One of the major difficulties in managing this disease is that a diverse group of aetiologies – i.e. acute emboli, acute (on-chronic) thrombosis, mesenteric venous thrombosis and non-occlusive mesenteric ischaemia (NOMI)¹ – constitutes the entity of acute mesenteric ischaemia.

Case Report

Mr KBK, a 70-year-old patient known to have chronic atrial fibrillation due to ischaemic heart disease, presented to the Emergency department with the complaint of a cold and painful left hand for 2 to 3 hours' duration. The pulses in the brachial and radial arteries were absent. A clinical diagnosis of acute embolus to the left brachial artery was made based on the history and clinical presentation. Brachial embolectomy was successfully carried out and he was kept on a heparin infusion.

The next day he complained of colicky abdominal pain. Although he was able to complete his breakfast, he did not have much of an appetite for lunch. Later in the afternoon

the pain worsened and he developed a low-grade fever. Abdominal examination revealed a generally soft abdomen with rebound tenderness in the right lower quadrant. A clinical diagnosis of acute ischaemia of the bowel due to an acute embolus to the mesenteric vessels was made and the patient was brought to the operating theatre (OT) for an emergency laparotomy.

An embolus was found in the mid-superior mesenteric artery (SMA) with dusky, ischaemic bowel extending from the mid-jejunum to the ascending colon. An embolectomy was performed with a balloon embolectomy catheter and mesenteric perfusion was re-established (Fig. 1). Some areas of dusky-looking bowel were revitalised, although not completely. Given the extensive length of bowel that would be sacrificed if the entire ischaemic portion was resected, the decision was made to perform a second-look laparotomy 6 hours later to reassess bowel viability; specifically we were hoping to preserve more of the crucial terminal ileum.

The patient was transferred intubated to the Intensive Care Unit (ICU) and returned to the OT the next morning. At the second-look laparotomy, it was clear that the mid-small bowel was beyond salvage but the terminal ileum and ascending colon appeared to have regained its vigour. 1.2 m of small bowel from mid-jejunum to mid-ileum was resected

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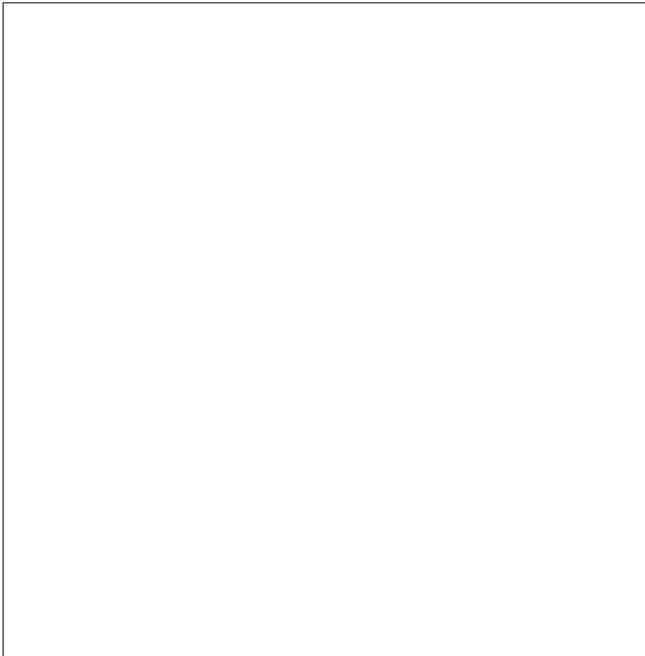


Fig. 1. The superior mesenteric artery controlled with vessel loops. Balloon catheter embolectomy was subsequently carried out through an arterotomy.

and a primary hand-sewn end-to-end jejunio-ileal anastomosis was performed. More than a metre of small bowel and the entire colon was spared.

The patient gradually recovered but developed severe diarrhoea, 10 to 15 episodes per day. Over the next 6 weeks his stool frequency reduced to about 5 times per day. He was given elemental diet supplements to improve nutrient absorption. He was discharged home on sub-cutaneous injections of enoxaparin 6 weeks after the operation.

The patient lost 10% of his body weight during his hospital stay and continued to lose weight for about 2 months after discharge. He was followed up at the outpatient clinic and remained on daily enoxaparin injections. He was cheerful and independent in his daily activities. However, 3 months after discharge, he died from a fatal myocardial infarction.

Discussion

Diagnostic Approach

Ischaemic bowel due to embolic phenomena tends to be of sudden onset. Edean et al⁴ showed that underlying cardiac disease, atrial fibrillation and heart failure were significantly associated with embolic causes of acute mesenteric ischaemia.

The cornerstone of early diagnosis is good history-taking. Clinical examination is classically unremarkable; the old clinical adage – pain out of proportion to the physical signs – is still a useful indicator that on-going bowel ischaemia may be present.

Ultrasonography with colour Doppler analysis to study blood flow in the aorta and mesenteric arteries may be useful to exclude proximal occlusion in the mesenteric vessels but often the presence of bowel gas makes these examinations difficult. Computed tomography (CT) scan revealed positive findings in 16 of 18 patients (89%) with acute mesenteric ischaemia in one study.² Positive CT criteria include mesenteric artery occlusion, pneumatosis intestinalis, bowel wall thickening, ileus and bowel dilatation. However, caution should be exercised as the use of intravenous contrast in an already acidotic patient can tip the patient into acute renal failure.

Mesenteric arteriography is the gold standard investigation to delineate the arterial system, although the availability of suitable equipment, facilities and endovascular training is essential. In experienced hands, instillation of papaverine and thrombolytic agents can be carried out to limit the progression of ischaemia and perhaps even avoid surgery if intervention is performed early enough.^{5,6} However, a purely endovascular approach to treat acute mesenteric ischaemia is limited by the inability to assess for the presence of bowel infarction, which has serious consequences.

In the case of our patient, the history of a concurrent embolic episode and progression of abdominal pain were suggestive of another embolic episode to the mesenteric arteries. Furthermore, the presence of abdominal tenderness, in combination with pyrexia, implied that bowel infarction leading to peritonitis was taking place. Hence, laparotomy was offered immediately to the patient.

Surgical Approach

The principles of treatment are as follows: Firstly, the extent of bowel ischaemia is assessed. Secondly the aetiological factor responsible should be identified and revascularisation performed, if appropriate, to prevent further progression of the ischaemia. Thirdly, all non-viable portions of bowel should be resected.

Balloon catheter thrombectomy/embolectomy remains the most effective treatment for an acute embolus to the SMA.² In a Spanish review of 21 patients with SMA embolus at the origin, both mortality and intestinal viability correlated with the duration of symptoms.⁷ Embolectomy was successful in restoring intestinal viability in 100% of patients who underwent the procedure within 12 hours of onset of symptoms but only in 18% of patients who were operated on after 24 hours.

One of the difficulties with assessment of bowel viability lies in the fact that the mucosa and submucosa of the bowel are most sensitive to ischaemia.¹ Hence, although the outer appearance on the serosal surface may be moist and pink, significant ischaemic changes may have taken place in the

epithelial lining within. Various techniques have been described to assess bowel viability such as Doppler ultrasonography⁸ and perfusion fluorometry.⁹ We have limited experience with these procedures and elected to carry out a second-look laparotomy to confirm the viability of the ischaemic portions of the bowel.

Role of Second-look Laparotomy

The decision to perform a second-look laparotomy should be made prior to closure of the abdomen.¹⁰ In the case of our patient, we were able to salvage about 1 m of bowel by staging the resection 6 hours later, allowing the non-viable and viable portions of the bowel to delineate more clearly. However, despite the pinkish sheen seen on the serosal surface, much of the mucosal surface of the terminal ileum and proximal colon in this patient was not viable as evidenced by the severe diarrhoea he had.

Subsequent Management

In order to allow healthy re-epithelialisation of the mucosa of ischaemic bowel, there may be a role for temporary use of total parenteral nutrition (TPN). This allows not only the gut to rest but supplies adequate nutrition to prevent the development of a catabolic state in the recovery period. Unfortunately, we did not initiate TPN and perhaps early feeding contributed to the prolonged period of diarrhoea which lasted 6 weeks.

The patient was switched to subcutaneous low molecular weight heparin injections because of the difficulty in accurately titrating the warfarin dose. This was largely due to the poor gut absorption of vitamin K following the extensive denudation of the ileal mucosa.

Conclusion

The diagnosis of acute mesenteric ischaemia remains difficult. Accurate history taking is an essential first step in identifying the aetiology of abdominal pain. Although physical examination may only yield subtle signs, such as tachypnoea, tachycardia and abdominal tenderness, these

good clinical practices must not be supplanted by the ready availability of CT scans and other 'high-tech' investigations.

While minimally invasive interventional radiology techniques have been increasingly used in vascular disorders, there remain many situations where surgery is the primary treatment. Acute embolus to the SMA is one such condition. The availability of vascular surgical expertise may alter the outcome in these patients. A second-look laparotomy is mandatory to minimise the extent of bowel resection post-revascularisation as demonstrated in this case.

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