

EJVES Extra 10, 132–135 (2005)

doi:10.1016/j.ejvsextra.2005.08.008, available online at <http://www.sciencedirect.com> on  SCIENCE @ DIRECT®

SHORT REPORT

**Rectal Passage of Full-thickness Infarcted Left Colon
Post-endovascular Stenting of Abdominal Aortic
Aneurysm—Report of a Case**

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We report a case of a full-thickness colonic infarction post-EVAR, manifested by a prolonged period of refractory culture-negative diarrhoea culminating in the passing a 90 cm length of full thickness colon per rectum on the 34th post-operative day. Passage of an infarcted sigmoid colon 'cast' has been reported after open repair of an abdominal aortic aneurysm, but has not been reported after endovascular stent repair.

Keywords: Endovascular stent graft; Colon cast; Abdominal aortic aneurysm.

Introduction

Left colon ischaemia is a rare but well-recognized complication of elective open abdominal aortic aneurysm (AAA) repair.¹ By avoiding aortic cross-clamping and mesenteric traction, endovascular aneurysm repair (EVAR) is generally accepted as less traumatic than open repair with less risk of ischaemic colitis.² Ischaemic colitis may present with refractory diarrhoea and intermittent rectal bleeding. However, colonic ischaemia requiring operative intervention is an infrequent complication of both open and endovascular AAA repair.³ We report a case of full-thickness colonic infarction post-EVAR, manifested by a prolonged period of refractory culture-negative diarrhoea culminating in the patient passing a 90 cm length of full thickness colon per rectum on the 34th post-operative day. Passage of an infarcted sigmoid colon 'cast' has been reported after emergency open repair of an abdominal aortic aneurysm, but has not been reported after endovascular stent repair.

Case Report

A morbidly obese (112 kg; BMI 49) 57-year-old man with a history of previous inferior myocardial infarction, exertional angina, hypertension and a family history of AAA was incidentally found to have a 6 cm asymptomatic AAA on an ultrasound scan of abdomen. Helical CT scan demonstrated a AAA, 5.9 cm in maximum transverse diameter with a 2.4 cm wide by 2.0 cm long neck. The aortic length from renal to aortic bifurcation was 12.8 cm. The tortuous left common iliac artery measured 1.6 cm, the right 2.4 cm. The left external iliac artery measured 1.2 cm, the right 1.4 cm. In view of his father's complicated open repair, which resulted in prolonged hospitalisation, the patient elected for endovascular stent repair. He was fully informed of the operative risks and complications, the lack of evidence for EVAR durability and the necessity for regular post-operative surveillance CT scanning. EVAR was planned with a modular bifurcated stent-graft (Talent, AVE Medtronic, Santa Rosa, California, USA) to be deployed in the proximal part of both external iliac arteries. The original plan was to fenestrate the stent-graft to preserve both internal iliac arteries. Unfortunately, this was technically not

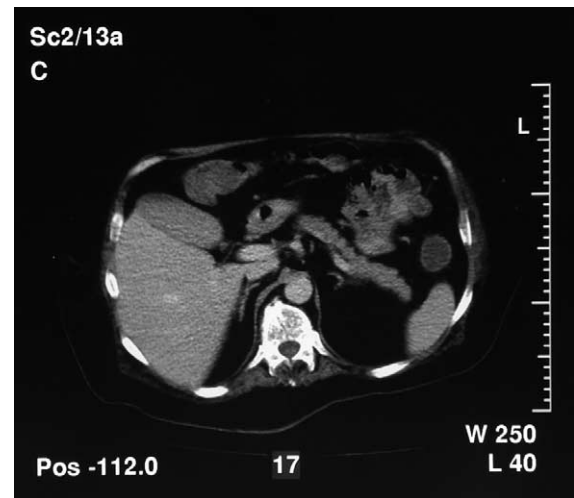
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possible. The stent-graft was 28 mm wide proximally and 170 mm long. The left distal stent diameter was 14 mm, the right 16 mm. Thrombophilia screen revealed a slightly low functional protein S (0.47 IU/ml; normal range 0.6–1.40 IU/ml).

The procedure was initiated under spinal anaesthesia and intravenous sedation, converted to general anaesthesia with endotracheal intubation as intra-operative complications evolved. Despite giving 5000 IU of intravenous heparin followed by a further 10,000 IU, the deployed stent clotted twice necessitating graft thrombectomy and bilateral transfemoral embolectomies. Repeated cannulation of the right common femoral artery resulted in vessel injury requiring a collagen coated polyester (Intervascular, La Ciotat Cedex, France) interposition graft. Total operative blood loss was in excess of 6000 ml. Six units of packed red cells were transfused with fresh frozen plasma. A total of 190 ml of intravenous contrast agent was used. At the end of the procedure, clinically tense bilateral muscle compartments were evident and bilateral four-compartment fasciotomies were performed.

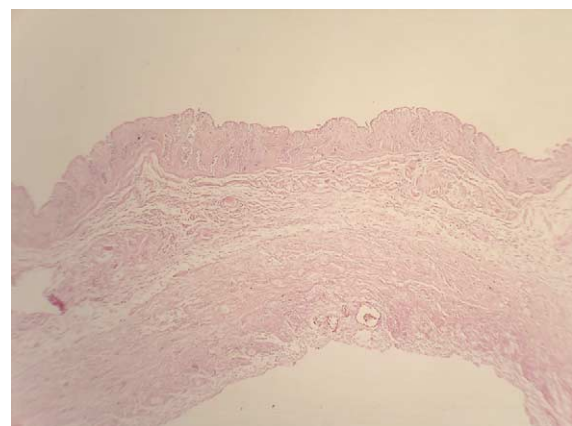
During the first few days in the intensive care unit, the patient became increasingly oliguric, progressing to acute renal failure and haemodialysis. Despite fasciotomies, irreversible ischaemia of the calf muscles necessitated a right below knee amputation. His condition fluctuated over the next 2–3 weeks with intermittent pyrexia and hypotension. Blood cultures isolated both Gram-negative rods and methicillin resistant staph aureus. He was treated with broad-spectrum antibiotics according to culture sensitivities and high doses of inotropics. Persistent culture-negative diarrhoea (with fresh blood observed on two occasions) was refractory to pharmacological anti-diarrhoeal agents. Lactate was measured on several occasions with plasma concentrations ranging from 2.1 to 5.6 mmol/l. A sigmoidoscopy or sigmoid colon tonometry was not carried out. A contrast enhanced abdominal and pelvic CT scan showed no evidence of ischaemic colitis, perforation or obstruction (**Clinical Photograph 1**). The left colon appeared to enhance normally.

On the 34th post-operative day he spontaneously passed per rectum a significant length of, what appeared to be a colonic mucosal 'cast'. However, histological examination revealed a 90 cm length of full-thickness infarcted colon (**Clinical Photograph 2**). There was a degree of skepticism as to the accuracy of the histological report, in view of his general condition gradually improving and absence of clinical abdominal signs. He was transferred to the general ward, despite persistent diarrhoea. On 47th post-operative



Clinical Photograph 1. Contrast enhanced CT scan demonstrating, what appeared to be an enhancing proximal descending colon. In retrospect this was the inflammatory tunnel.

day he became hypoxic and septic with signs of generalized peritonitis. A semi-erect chest X-ray revealed free sub-diaphragmatic air. At laparotomy there was generalized peritoneal contamination, the source being a perforated inflammatory mass in the left iliac fossa. The terminal ileum had fistulated into the distal sigmoid colon. There were two further isolated segments of ischaemic small bowel, densely adherent to the inflammatory mass. The left colon terminated 10 cm distal to the splenic flexure and appeared to be replaced by an 'inflammatory tunnel' distally, to the level of the sacral promontory, where the rectal stump remained. The small bowel fistula was resected and the rectal stump cross-stapled. A transverse colostomy was fashioned in the left upper



Clinical Photograph 2. Histology (haematoxylin and eosin stained paraffin section) of spontaneously passed 90 cm length of colon demonstrating 'ghosting' of all histological layers (mucosa, muscularis mucosa, submucosa, muscularis externa and serosa).

quadrant. Microscopy of a representative segment of the 'tunnel' revealed adipose tissue with reactive fibrosis and granulation tissue with no histological evidence of colon. Recovery from laparotomy was complicated by wound dehiscence. Prolonged bed rest resulted in a sacral pressure sore with sacral osteomyelitis. His condition slowly deteriorated and he died just over 6 months after the original surgery.

Discussion

Colonic infarction is a rare but devastating complication after conventional AAA reconstructive surgery. Milder forms of colonic ischaemia occur more frequently with an incidence of anything up to 7.4% following elective AAA repair.⁴ There are few published reports of colonic ischaemia with endovascular repair of AAA. In a report of 30 patients undergoing endovascular aortic aneurysm surgery, colonic ischaemia was a complication in only one case.⁵ In an experimental study carried out at the same institution, colon ischaemia was indirectly assessed by measuring the partial pressure of CO₂ in a sigmoid colon silicone tonometer. Results revealed a lesser degree of bowel ischaemia during EVAR, compared to conventional open AAA repair.⁶

Colon ischaemia can be difficult to diagnose and easily confused with a range of other abdominal emergencies.⁷ Symptoms and signs are often non-specific and reliance on clinical criteria is likely to delay diagnosis.⁸ Patients may be pain-free but develop insidious abdominal distension, progressive diarrhoea and occasional passage of rectal blood. Leucocytosis, elevated D dimer, metabolic acidosis with increased lactate with associated left sided abdominal peritonism may aid the clinician in establishing the diagnosis.

Intra-operative objective assessment of colonic perfusion is difficult but has been carried out in an experimental setting using intra-luminal rectosigmoidal silicone balloon pH tonometry as a surrogate marker of sigmoid colon perfusion.⁹ Though sigmoid tonometry is a sensitive and specific indicator of mucosal oxygenation,¹⁰ routine clinical use is impractical. Diagnosis can be confirmed by careful bed-side colonoscopy and biopsy, but repeated surveillance colonoscopies are unacceptable to patients. In mild to moderate cases of ischaemic colitis the management is supportive with broad-spectrum antibiotics, gut rest and regular clinical re-evaluation. If the patient's clinical condition deteriorates with evidence of peritonitis, laparotomy and resection of the infarcted colon with exteriorization of the bowel is indicated.

A combination of factors undoubtedly contributed to bowel ischaemia. These included the unintentional sacrifice of both internal iliac arteries, intra-operative recurrent thrombosis of the stent-graft and lower limb arteries and the use of large doses of inotropic agents during and after surgery. 'Auto-dysfunctioning' of the infarcted colon with formation of a protective ileocolic fistula prevented peritoneal contamination, peritonitis and sepsis. Fortunately, an inflammatory tunnel walled off the infarcted left colon until it eventually disconnected and was spontaneously expelled per rectum. A leak from the ileocolic fistula 15 days later resulted in peritoneal contamination, sepsis and clinical abdominal signs necessitating laparotomy.

Though it is well recognized that ischaemic colonic mucosa can slough resulting in bloody diarrhoea, expulsion of a full thickness infarcted colon is rare. Speakman and Turnbull¹¹ reported a case in which a 62-year-old man passed a total 'cast' of the sigmoid colon per rectum on the 16th post-operative day after emergency open reconstruction of a 10 cm AAA, with sacrifice of the inferior mesenteric artery. Histology confirmed a full thickness cast of the colon. A further case reports the spontaneous passage of a complete left hemicolon 'cast'.¹²

Endovascular aneurysm repair, as with open reconstruction, is not without significant complications. Surgeons should have a low index of suspicion of colonic ischaemia in patients with post-operative diarrhoea and take early action to prevent an unfavorable outcome. Passage of a length of full thickness colon per rectum is a rare phenomenon but can happen.

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Accepted 15 August 2005