CASE REPORT

Fulminant ischaemic colitis with atypical clinical features complicating sickle cell disease

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Clinically significant ischaemic bowel injury is an exceedingly rare complication of sickle cell disease. It manifests as acute surgical abdomen and may respond to conservative treatment. An unusual fatal case of ischaemic colitis with minimal abdominal findings in a young male during a sickle cell vaso-occlusive pain crisis is described. This case demonstrates that an acute surgical abdomen should be considered in such patients who fail to respond to conservative management as untreated this condition may be fatal.

Chronic haemolytic anaemia and episodic vaso-occlusive pain characterise sickle cell disease.¹ Virtually every organ system in the body is at risk for ischaemic injury, which results in the characteristic multisystem manifestations

of the disease.^{1,2} We describe a case of fatal ischaemic colitis with minimal abdominal findings complicating a sickle cell pain crisis.

CASE REPORT

A 35 year old African-American male with a history of sickle cell anaemia (haemoglobin SS), hypertension, and end stage renal disease and a prior splenectomy and cholecystectomy presented with an acute painful episode involving chest, abdomen, lower back, and extremities. The episode was typical of his previous painful crises and he denied fever, dyspnoea, cough, or diarrhoea. His current medications were enalapril, metoprolol, calcium acetate, and erythropoietin. There was no history of substance abuse. On admission through the emergency department his blood pressure was 186/112 mm Hg, pulse 82/min and regular, respiratory rate 18/min, temperature 37.2°C, and oxygen saturation 99% on 2 litres of

Figure 1 (A) Colonic mucosa with inflammation and necrosis ($\times 40$) and (B) at higher magnification ($\times 100$). (C) Submucosal thrombosed blood vessels and vascular congestion with red blood cells sickling ($\times 100$) and (D) at higher magnification ($\times 600$). (All stained with haematoxylin and eosin.)

oxygen. Physical examination was remarkable for tenderness over the sternum, lower back, and lower extremities and presence of an arteriovenous graft on right forearm. Laboratory evaluation revealed a white cell count of $14.9 \times 10^9/l$, haemoglobin of 100 g/l, absolute reticulocyte count of $0.217 \times 10^{12}/l$ (reference range $0.018\text{--}0.158 \times 10^{12}/l$), and platelet count of $273 \times 10^9/l$. Serum chemistry showed potassium of 5.3 mmol/l, bicarbonate of 29 mmol/l, blood urea nitrogen of 18.56 mmol/l, and creatinine of $954.7 \mu\text{mol}/l$. Liver enzymes were normal and chest radiography revealed a minimal infiltration in the left lower lobe. He was hospitalised and intravenous ceftriaxone and azithromycin were initiated. Hydromorphone was administered for pain control and haemodialysis resulted in normalisation of his blood pressure. Blood cultures were negative and the infiltration on the chest radiograph resolved within 48 hours. He failed to improve and became febrile to 38.3°C . His haemoglobin concentration decreased to 80 g/l and white cell count increased to $26 \times 10^9/l$. Abdominal examination revealed decreased bowel sounds without guarding or rigidity and faecal haemoccult test was negative. He became increasingly lethargic, unresponsive, and required mechanical ventilation and transfer to the intensive care unit. His blood pressure remained stable. Arterial blood gas analysis on 50% fractional inspiratory oxygen revealed a pH of 7.31, carbon dioxide pressure of 3.33 kPa (25 mm Hg) (reference range 4.67–6.00 kPa (35–45 mm Hg)), oxygen pressure 23.5 kPa (176 mm Hg) (10.7–13.3 kPa (80–100 mm Hg)), bicarbonate of 13 mmol/l, and oxygen saturation 99.5%. Serum chemistry demonstrated an anion gap of 30 and lactate level of 11.8 mmol/l. Computed tomography of the head was unrevealing. The computed tomogram of abdomen revealed circumferential inflammation and thickening of the colon with diffuse colonic dilatation consistent with colitis. No free air or perirectal fluid or abscesses were identified. Stool examination was negative for *Clostridium difficile* toxin. Antibiotic coverage was broadened. A diagnostic peritoneal lavage did not reveal faeculent material and demonstrated a white cell count of $595/\mu\text{l}$ and erythrocytes of $8268/\mu\text{l}$. Sigmoidoscopy was performed and demonstrated areas of necrosis and haemorrhage at the rectosigmoid junction consistent with ischaemic colitis. Emergency total colectomy and partial small bowel resection was performed. The patient continued to deteriorate, became hypotensive, and developed a severe coagulopathy and died.

Pathological examination of the resected bowel revealed multiple erosions and ulcers with gangrenous lesions with extensive transmural necrosis consistent with bowel infarction. Microscopic examination of the resected specimen (fig 1) demonstrated inflammation of mucosa and submucosa, atrophic glands, and congested blood vessels with sickling of red blood cells. At several sites thrombosed submucosal blood vessels were seen along with extensive mucosal ulceration and full thickness necrosis. All these features were those of ischaemic colitis.

DISCUSSION

Abdominal pain is a common component of sickle cell pain crisis. It is thought to result from microvascular occlusion, with resulting ischaemia of the mesentery and abdominal viscera.² Usually no precipitating cause is identified and symptoms resolve with conservative measures. Clinically significant ischaemic bowel injury is rare during sickle cell crisis.³

Ischaemic colitis typically manifests as sudden onset abdominal pain, distension, and the detection of maroon blood in stool.^{4,5} The diagnosis relies on a combination of clinical, radiographic, and endoscopic findings. "Thumb printing" on barium enema, attributed to submucosal oedema and haemorrhage, is the classic radiological finding. However, endoscopic examination with its higher sensitivity and poten-

Learning points

- Sickle cell pain crisis can be complicated by fatal ischaemic colitis and it should be considered in the differential diagnosis of abdominal pain.
- Abdominal pain frequently accompanies sickle cell vaso-occlusive crisis and may be difficult to distinguish from acute abdominal disease processes, such as acute cholecystitis, hepatic infarction, splenic sequestration, and appendicitis.
- Severe ischaemic colitis may manifest atypically with minimal abdominal findings.
- Narcotic administration to the patient with acute surgical disease process may mask the progression of signs and symptoms delaying surgical evaluation and appropriate treatment.
- Clinicians should have a low threshold of suspicion for ischaemic bowel in patients with unexplained metabolic acidosis.

tial for tissue biopsy has largely supplanted barium studies.⁵ Angiography is often non-diagnostic as it cannot reliably image the smaller vessels involved in the vascular injury leading to ischaemic colitis.⁴ Treatment is determined by the severity of ischaemia and varies from conservative medical treatment to surgery. Increasing abdominal tenderness, rising temperature, metabolic acidosis, and ileus indicate bowel infarction necessitating emergent laparotomy and bowel resection.^{4,5}

To our knowledge, there is only one previous report of ischaemic colitis in adults complicating sickle cell disease.³ In contrast to the previous report, our case manifested only minimal abdominal findings. The suspicion of acute surgical illness was raised by unexplained metabolic acidosis in the context of diminished bowel sounds and was subsequently supported by imaging studies and endoscopy. The paucity of abdominal findings may be explained to some extent by the masking effect of narcotic administration.

Ischaemic colitis in sickle cell pain crisis is likely to be the consequence of vascular occlusion and impairment of blood flow in the microcirculation which is responsible for other manifestations of sickle cell disease.^{1,2,6} The polymerisation of haemoglobin S at low oxygen tension results in a distorted erythrocyte with decreased deformability leading to vascular occlusion and injury.¹ Furthermore, the complex interaction between endothelium, plasma factors, leucocytes, and rigid sickled red cells play an important part in vaso-occlusion.^{1,2,4} The diffuse ischaemic involvement of large bowel in our case supports small rather than large vessel occlusion. Although the colon with its a relatively low blood flow is considered susceptible to ischaemia, diffuse involvement during sickle cell vaso-occlusive crisis is rare.⁷ This may partially be explained by its abundant collateral blood supply and low degree of oxygen extraction. The bowel can tolerate up to a 75% reduction of mesenteric blood flow for 12 hours with no ischaemic changes.⁸ However, a low perfusion pressure may significantly increase the likelihood of vascular obstruction and ischaemic injury.⁹ Although the specific trigger of the ischaemic colitis in our patient is unknown, it is plausible that predisposing factors may have included end stage renal disease, administration of erythropoietin, a relatively high level of haemoglobin, and a vascular anatomy with poorly developed collaterals.^{4,10–12}

In summary, although ischaemic injury of the colon is rare during a sickle cell crisis it should be considered in the differential diagnosis of abdominal pain. Unfortunately, generalised pain, and the use of analgesics and sedatives may mask the abdominal findings. Progressive clinical deterioration and

unexplained metabolic acidosis should raise the suspicion of an ischaemic bowel injury and prompt surgical evaluation and treatment.

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REFERENCES

- 1 **Wang WC**, Lukens JN. Sickle cell anemia and other sickling syndromes. In: Lee RG, Foerster J, Lukens J, et al, eds. *Wintrobe's clinical hematology*. Baltimore: Williams & Wilkins, 1999: 1346-97.
- 2 **Platt OS**, Thorington BD, Brambilla DJ, et al. Pain in sickle cell disease: rates and risk factors. *N Engl J Med* 1991;**325**:11-16.
- 3 **Gage TP**, Gagnier JM. Ischemic colitis complicating sickle cell crisis. *Gastroenterology* 1983;**84**:171-4.
- 4 **Brandt JL**, Smithline AE. Ischemic lesion of the bowel. In: Feldman M, ed. *Sleisenger & Fordtran's gastrointestinal and liver disease*. 6th Ed. Philadelphia: WB Saunders, 1998: 2009-23.
- 5 **Toursarkissian B**, Thompson RW. Ischemic colitis: mesenteric ischemia. *Surg Clin North Am* 1997;**77**:461-70.
- 6 **Francis RB Jr**, Johnson CS. Vascular occlusion in sickle cell disease: current concepts and unanswered questions. *Blood* 1991;**77**:1405-14.
- 7 **Geber WF**. Quantitative measurements of blood flow in various areas of the small and large bowel. *Am J Physiol* 1960;**198**:985.
- 8 **Boley SJ**, Freiber W, Winslow PR. Circulatory responses to acute reduction of superior mesenteric arterial flow. *Physiologist* 1969;**12**:180.
- 9 **Kaul DK**, Nagel RL, Baez S. Pressure effects on the flow behavior of sickle (HbSS) red cell in isolated (ex-vivo) microvascular system. *Microvasc Res* 1983;**26**:170-81.
- 10 **Flobert C**, Cellier C, Berger A, et al. Right colonic involvement is associated with severe forms of ischemic colitis and occurs frequently in patients with chronic renal failure requiring hemodialysis. *Am J Gastroenterol* 2000;**95**:195-8.
- 11 **Salvati F**, Liani M. Erythropoietin and thrombotic events. *Lancet* 1998;**352**:566-7.
- 12 **Baum KF**, Dunn DT, Maude GH, et al. The painful crisis of homozygous sickle cell disease. A study of the risk factors. *Arch Intern Med* 1987;**147**:123:1-4.

IMAGES IN MEDICINE

A bleeding aortic graft enteric fistula diagnosed by push enteroscopy

Figure 1 Endoscopic view of aortic graft fistula in the fourth part of the duodenum.

A 72 year old man with a previous history of an emergency abdominal aortic aneurysm repair presented with rigors and recurrent episodes of melaena. Both oesophagoduodenogastros-copy and colonoscopy were unremarkable. Computed tomography with contrast failed to show evidence of a leak. He subsequently underwent a small bowel push enteroscopy which clearly demonstrated erosion of the Dacron graft through the distal duodenal wall with active bleeding. Emergency surgery was undertaken and the fistula successfully repaired.

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