Chest injury complicated by shock induced necrosis of the colon

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Many investigators have considered the intestinal vasculature to be a unique and early haemodynamic target in circulatory shock.¹ Colon necrosis has been reported to be of two types²: type 1 develops spontaneously in older patients as a result of occlusive or non-occlusive vascular disease and occurs mostly in patients with congestive heart failure³; type 2 occurs in patients of various ages and appears to be due to a period of documented post-traumatic hypotension; it has been described after multiple injuries and severe lacerations^{2,4} and in two patients with chest injuries.⁵ The purpose of this report is to describe a case of left chest stabbing leading to shock induced necrosis of the colon.

Case report

A 55 year old miner was admitted to hospital after being stabbed in the left chest. He was unconscious and shocked with a systolic blood pressure of 60 mm Hg. He was bleeding from the site of the stab, where the knife was still in place through the left 4th intercostal space 5 cm from the sternal margin (fig 1). He was immediately ventilated, a chest tube was inserted, and he was transfused with plasma and blood.

He continued to bleed excessively and his general condition deteriorated so he was transferred to our hospital. On arrival, four hours after the stabbing, he was comatose and not responding to painful stimuli, his pupils were dilated but reactive, and his systolic blood pressure was 40 mm Hg. A left thoracotomy was immediately performed. The bleeding was coming from the left internal mammary artery and an extensive laceration of the left upper lobe. The divided ends of the internal mammary artery were identified and ligated and a left upper lobectomy was performed. He was ventilated overnight. He was transfused with a total of 30 units of whole blood, 10 units of plasma protein fraction, 6 units of fresh frozen plasma, and 4 litres of dextrose-saline solution. Twelve hours after operation he was extubated. He was well and fully conscious with a normal blood pressure and good urinary output. A chest radiograph showed clear lung fields and a fully expanded left lower lobe.

On the second postoperative day he had abdominal distension without tenderness and bowel sounds were absent. He had a sinus tachycardia of 120 per minute. Abdominal radiographs showed generalised small and large bowel distension. He was treated for paralytic ileus with intravenous

Fig 1 Lateral radiograph of the chest showing the position of the knife, the chest drain, and the partially collapsed left lung.

infusions and nasogastric aspiration, having nothing by mouth. By the seventh day the abdomen was more distended and he had bloody diarrhoea. On the 10th day he had massive abdominal distension with generalised tenderness. Abdominal radiographs showed dilatation of the colon, which measured 17 cm in its widest part, and intramural gas had appeared (fig 2). Laparotomy was performed. The entire colon except for the sigmoid loop and rectum was massively dilated, grey, and featureless. The terminal few centimetres of the ileum were also dilated and grey looking but the rest of the abdominal contents were normal. The inferior mesenteric artery, middle colic artery and right colic artery were all found to be pulsating normally. A subtotal colectomy with fashioning of an ileostomy and sigmoid mucous fistula was performed.

After operation the patient made a good recovery. His histological examination of the excised colon showed multiple areas of ulceration, which penetrated the full thickness of the mucosa. The submucosa looked oedematous with myocytolysis and oedema of the muscularis propria. There

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Fig 2 Supine radiograph of the abdomen showing massive dilatation of the colon with irregularity of the mucosa and intramural gas.

were no microscopic abnormalities of the colonic arteries and no thrombi or atherosclerotic patches. Three months later he was admitted electively for ileorectal anastomosis, after which he made an excellent recovery. When seen one year later he was well and symptom free.

Discussion

Two cases of post-traumatic necrosis of the colon complicating chest injury have been reported by Flynn *et al*, both caused by gunshot wounds.⁵ The possible mechanisms thought to cause this form of ischaemia are: (a) a resistance to blood flow through the gut wall due to adrenergic constriction of arteriolar and venous smooth muscles⁶; (b) redistribution of blood flow away from the mucosa⁷; and (c) the intestinal countercurrent mechanism, which shunts oxygen away from the tips of the villi, compounding the low flow state and leading to tissue necrosis.⁸ Experimentally, shock induced intestinal ischaemia can be prevented if intestinal segments are perfused intraluminally with oxygenated saline.⁹

It is likely that the shock induced intestinal ischaemia in patients with chest injuries will be compounded by hypoxia

due to haemopneumothorax or pulmonary contusion. The biosynthesis of mucin is affected by decreased cellular respiration, exposing the mucosa to the digestive activity of the intestinal pancreatic proteases and leading to the haemorrhagic necrosis and bloody diarrhoea that may occur in these patients.¹⁰

Interestingly, the eight patients with post-traumatic shock induced necrosis of the colon referred to in this report⁵ were all male. In the two cases described by Sakai *et al* the sex was not stated.² Males appear to be more susceptible to the effects of trauma and shock than females. Altura found that oestrogenic hormones play a role in the amelioration of an organism's reaction to systemic stress from severe trauma and control the macrophage and peripheral vascular functions. Inbred females have a greater ability to clear particulate matter from the bloodstream than do males of the same strain. Furthermore, females are more resistant to intestinal ischaemia and whole body trauma.¹¹

In any patient who has been shocked as a result of chest injury or any other injury and who later develops abdominal distension, with or without tenderness, ischaemia of the bowel should be considered, especially if there has been no history of abdominal injury.

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