

# A rare cause of anaemia in an older patient with fractured neck of femur

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**ABSTRACT** Delayed splenic rupture is a rare but well recognised clinical phenomenon with significant morbidity and mortality. We describe an 84-year-old woman with persistent unexplained anaemia requiring transfusion following a fractured neck of femur. One month after hemiarthroplasty, she collapsed and became haemodynamically unstable with profound anaemia. Computed tomography of the abdomen revealed splenic haematoma with haemoperitoneum, with splenic rupture confirmed at the post-mortem examination. This case demonstrates the difficulty in diagnosing delayed splenic rupture in older people with non-specific symptoms, and the need for both comprehensive trauma assessment and a high index of clinical suspicion in patients with persistent anaemia after trauma.

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## INTRODUCTION

Delayed splenic rupture is a rare but well recognised clinical entity with significant morbidity and mortality. It often poses a major diagnostic challenge to clinicians due to its non-specific clinical presentation. This case demonstrates the difficulty in diagnosing delayed splenic rupture in a timely manner, due to the non-specificity of the symptoms and the presence of alternative explanations for anaemia development following hip fracture surgery.

## CASE DESCRIPTION

An 84-year-old woman, previously fit and independent, presented with a fractured neck of left femur following a fall in the street. She had no other clinically apparent injury and no chest or abdominal pain. She had a past history of angina pectoris, gastro-oesophageal reflux disease and osteoarthritis. She was not on regular medication. Her chest, cardiovascular (including blood pressure readings), neurological and abdominal examinations were unremarkable. Her initial blood tests showed a haemoglobin level of 10.8 g/dl and serum sodium 132 mmol/l. Other biochemical tests, platelet count and clotting screen were normal. Her ECG and chest X-ray were normal. Left hip radiography confirmed a displaced intra-capsular fractured neck of femur. She underwent a left Furlong hemiarthroplasty with satisfactory postoperative hip X-ray. Haemoglobin level postoperatively was slightly reduced at 9.0 g/dl.

On day 4 post surgery, she developed mild receptive and expressive dysphasia with no other focal neurology. Computed tomography of the brain showed patchy white matter changes but no discrete area of infarction or haemorrhage. At this stage her haemoglobin had dropped to 6.4 g/dl and she was transfused two units of blood. There was no history of gastrointestinal blood loss and a digital rectal examination was normal. She was not on any non-steroidal anti-inflammatory medications. An abdominal ultrasound was normal and she declined upper gastrointestinal endoscopy at this time. A diagnosis of possible ischaemic stroke was made by the stroke team, who commenced aspirin 75 mg once daily.

Seven days postoperatively, the patient developed pneumonia and stage I acute kidney injury which was treated with intravenous antibiotics and fluids. She slowly recovered and her dysphasia resolved completely. 10 days postoperatively. She was transferred to the elderly care medical ward for ongoing investigation of her anaemia and for further rehabilitation. She agreed to undergo upper gastrointestinal endoscopy, which was performed on day 28 postoperatively; this showed Barrett's oesophagus. Her haemoglobin remained between 8–9 g/dl during rehabilitation and further blood tests demonstrated low serum iron of 6 µmol/l with normal ferritin, B12 and folate.

Twenty-nine days postoperatively, she suddenly collapsed with no history of chest pain, dyspnoea or palpitation. She complained of mild abdominal pain with no overt gastrointestinal bleeding. Her blood pressure was 84/50 mmHg and her abdomen was distended with mild

tenderness over the left iliac fossa. Her haemoglobin was 7.2 g/dl with a normal coagulation screen. She remained haemodynamically unstable despite fluid resuscitation and her haemoglobin continued to fall to 5.2 g/dl over the next few hours. She received five units of blood and a surgical opinion was sought.

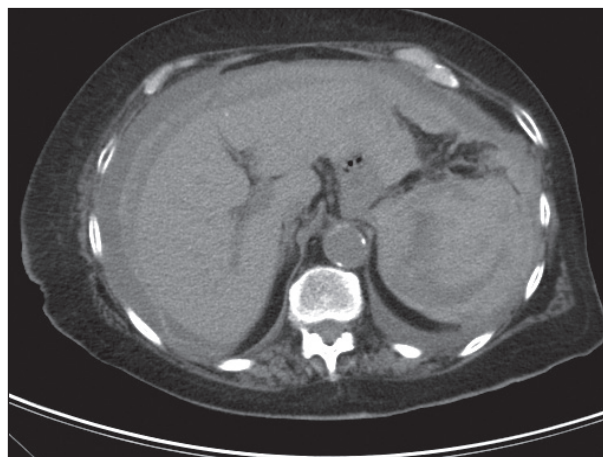
Urgent computed tomography of the abdomen (Figure 1) revealed splenic haematoma with ongoing bleeding and a large amount of blood in the peritoneal space. She underwent angiographic splenic artery embolisation with some initial clinical improvement. However over the next few days her condition rapidly deteriorated with pneumonia, acute kidney injury and ongoing anaemia. The patient and her family decided not to pursue further interventions with curative intent and she eventually died on day 33 postoperatively.

Post-mortem examination showed a ruptured spleen, splenic haematoma and necrotic splenic pulp. The findings were consistent with the patient having sustained a splenic injury at the same time as her hip fracture, and that her splenic injury caused delayed splenic rupture which was the cause of catastrophic late blood loss with haemoperitoneum.

## DISCUSSION

The spleen is the organ most commonly injured in cases of blunt abdominal trauma,<sup>1</sup> accounting for between 40 and 55% of all abdominal organ injuries. The majority of splenic injuries manifest acutely with haemodynamic instability or acute abdomen attributed to haemoperitoneum. However up to 15% present with delayed splenic rupture days to weeks following trauma.<sup>2</sup> This is characterised as the late occurrence of symptoms and signs, usually 48 hours or more after the injury with no initial signs or symptoms of haemodynamic instability or haemoperitoneum.<sup>3</sup> The importance of delayed rupture lies in the relatively high mortality rate of 5–15%<sup>3</sup> as compared to acute splenic rupture (1%).<sup>1</sup> A lesser degree of trauma, such as sustained from falls or assaults, can result in delayed splenic rupture; the initial injuries may be relatively minor and thus not well remembered by patients, particularly if cognitive impairment is present.

Diagnosis of delayed splenic rupture is often difficult due to an unpredictable time lag between the initial injury and development of symptoms, absent or non-specific signs and symptoms during the latent period, and presumed triviality of the precipitating injury.<sup>4</sup> The clinical features of delayed splenic rupture can vary widely from being asymptomatic to presenting with haemodynamic compromise and a drop in haematocrit, depending on the severity of injury. Radiology plays a major role in the diagnosis of delayed splenic rupture. Plain chest radiography may show an elevated left hemi-diaphragm,



**FIGURE 1** CT scan abdomen axial image showing enlarged spleen, subcapsular haematoma, peri-splenic haemorrhage and haemoperitoneum

left basal atelectasis or left sided pleural effusion. Computed tomography of the abdomen remains the gold standard imaging investigation with a diagnostic accuracy of 95–97%.<sup>5</sup>

Approximately 30–40% of patients with fractured neck of femur have haemoglobin levels below the normal range on admission to hospital.<sup>6</sup> Anaemia may then be exacerbated by haemodilution related to intravenous rehydration, by fracture haematoma and intra-operative blood loss, and by undernutrition and anaemia of chronic disease. Surgery itself may induce functional iron deficiency due to humoral suppression of erythropoiesis.<sup>7</sup> The mean fall in haemoglobin between admission and the postoperative nadir is around 2 g/dl;<sup>8</sup> considerably lower than the fall observed in our patient.

Obtaining early diagnosis of a splenic rupture was a particular challenge in this case due to its rarity, the presence of an alternative, common cause of anaemia (fractured neck of femur) and a lack of initial directive history, symptoms or physical signs. Significant bleeding into concealed areas, such as the peritoneal, pleural, or pericardial spaces may occur without obvious warning signs. Haemoperitoneum does not always occur following a blunt trauma to the spleen and contusions and subcapsular haematoma may not cause any appreciable haemoperitoneum.<sup>9</sup> Shanmuganathan et al. found that 27% of patients had no haemoperitoneum, yet 17% of those required surgical or angiographic intervention.<sup>10</sup> Their recommendation was to obtain computed tomography of the abdomen instead of ultrasound in patients with suspected splenic injury.<sup>10</sup> The question of whether all patients with fractured neck of femur should be assessed in the trauma room and screened for other associated injuries first remains debatable. Routine use of a Focused Assessment with Sonography in Trauma (FAST scan) or computed tomography of the abdomen to detect any concealed organ injury related to all older

people with fractured neck of femur at initial presentation is not currently indicated. Emergency ultrasound is not sensitive or specific enough in detecting spleen or other solid organ injury.<sup>11</sup> The overall sensitivity of an ultrasound scan for detecting either fluid or parenchymal injury is quoted to be 80% in one study<sup>11</sup> and 62% to 78% in another,<sup>12</sup> while computed tomography of the abdomen yielded an accuracy of 96.1%.<sup>13</sup> Routine use of such imaging when coexistent injury is uncommon could unjustifiably delay door to theatre time or cause unnecessary radiation exposure.<sup>14,15</sup>

However, clinicians need to maintain a high index of suspicion for occult injury in such cases, particularly when clinical findings (in this case a recurrent fall in the haemoglobin level) are not adequately explained by the initial injury or by investigation results. One explanation for a false negative ultrasound finding in this case could be due to ultrasonography having been performed before haemoperitoneum could accumulate to a detectable amount. Similar cases have been noted previously.<sup>9,10,14,15</sup>

Splenic injuries with minimal or no free fluid on computed tomography examination may not be uncommon and there is a 5% associated risk of bleeding.<sup>16</sup> However, free fluid in the left upper quadrant is significantly associated with splenic injury and such a finding should trigger emergency computed tomography, angiography, embolisation and laparotomy more swiftly.<sup>16,17</sup> In this vulnerable group, when the cause of anaemia remains unexplained or there is a disproportionate decline in haemoglobin during the peri-operative period, clinicians should adopt a high index of suspicion and look for concealed blood loss such as gastrointestinal haemorrhage, retroperitoneal bleeding, aneurysmal leak or delayed splenic rupture. Investigations such as gastrointestinal endoscopy or computed tomography of the abdomen/chest should be considered promptly and this case serves as a reminder that ultrasonography performed soon after blunt injury to the abdomen can be misleadingly normal.

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