

## Circulatory collapse from rupture of splenic artery aneurysm: A case study

### Dear Editor,

Splenic artery aneurysms (SAAs) are uncommon and often asymptomatic. However, ruptured SAAs can be rapidly fatal. We reviewed the literature on SAAs and highlighted the management challenges faced in the emergency department (ED).

**Case report.** A 21-year-old woman, previously healthy, presented to the ED with generalised abdominal pain and vomiting. She was haemodynamically stable. Physical examination revealed mild left upper abdominal tenderness. She was given analgesia and observed. Urine pregnancy test was negative. Initial haemoglobin level was normal (12.1g/dL).

Two hours later, she experienced generalised tonic-clonic seizures and was transferred to the resuscitation room. She developed pulseless electrical activity (PEA). Cardiopulmonary resuscitation and one dose of intravenous adrenaline were administered. Return of spontaneous circulation (ROSC) happened after 3 minutes. Post-ROSC, she was hypotensive (blood pressure [BP] 67/48mmHg) and tachycardic (pulse rate 150/min). She received total bolus infusion of one litre of Hartmann solution. Repeat abdominal examination revealed no peritonitis. Point-of-Care Ultrasound (POCUS) immediately post-ROSC showed no intraperitoneal free fluid. Bedside venous blood gas revealed severe metabolic acidosis (pH 6.97), hyperlactatemia (13.9mmol/L), and acute haemoglobin level decline to 5g/dL. Massive transfusion protocol and the general surgical team were activated. Repeat POCUS 30 minutes later revealed no intraperitoneal free fluid but a 10cm hypo-echoic supra-uterine mass. Her systolic BP remained at 85–90mmHg. We performed rapid sequence intubation (RSI) just before an emergent computed tomographic mesenteric angiography (CTMA).

CTMA showed massive haemoperitoneum and active contrast extravasation near the distal splenic artery (Figs. 1A and 1B). She developed two further episodes of PEA collapse; immediately before and after CTMA. She received a total of 7 doses of intravenous adrenaline with ROSC each time. A dose of intravenous tranexamic acid was also administered.

She underwent emergency laparotomy, splenectomy and distal pancreatectomy. She was monitored in the intensive care unit for 3 days post-operatively. She received routine post-splenectomy vaccinations and was discharged well 10 days after surgery.

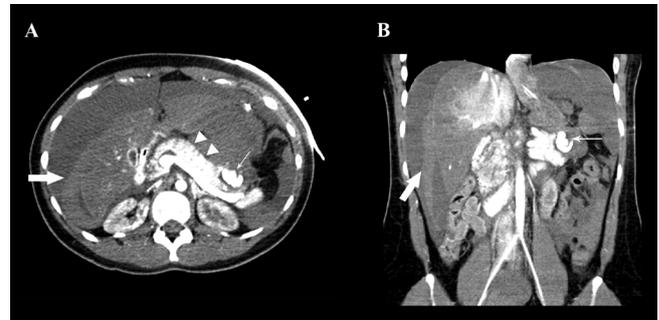
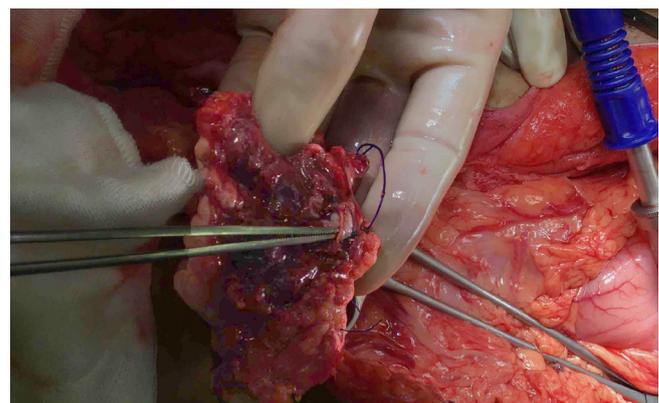


Fig. 1. Transverse axial and coronal sections of computed tomographic (CT) mesenteric angiogram.

(A) Transverse axial view of CT mesenteric angiogram in delayed contrast phase. (B) Coronal view of CT mesenteric angiogram in delayed contrast phase. The thick arrows in these two figures show haemoperitoneum, thin arrows show contrast extravasation near the pancreatic tail, and arrowheads show hyper-enhancing pancreas.



Intraoperative picture of a splenic artery aneurysm. The tip of the surgical forceps indicates the ruptured wall of the splenic artery aneurysm.

**Discussion.** SAAs are the most common visceral artery aneurysms,<sup>1</sup> with an incidence of approximately 0.78%,<sup>2</sup> and female: male ratio of 4:1.<sup>1</sup> The majority (64–78%) of SAAs are located in the distal third of the splenic artery,<sup>3</sup> with 80% asymptomatic and incidental radiological findings.<sup>4</sup> Symptoms include epigastric or left upper quadrant pain,<sup>4</sup> and/or complications of rupture with signs of acute abdomen or circulatory collapse in 10% of SAAs.<sup>5</sup> Aneurysmal rupture occurs more frequently in pregnancy, with reported rates of 20–50%.<sup>6</sup> Other risk factors for rupture include development of symptoms, expanding aneurysms, diameter >2cm, portal hypertension, portocaval shunt and liver transplantation.<sup>3</sup>

Our case highlighted several management challenges in the ED. We first faced an acute diagnostic challenge

in a rapidly deteriorating non-pregnant lady with undifferentiated circulatory collapse.

Our patient did not demonstrate peritonitis on abdominal examination post-arrest even before RSI. This might mislead our diagnostic process. The usefulness of physical signs of peritonitis in active intra-abdominal bleeding has been reported to be dismal in the trauma literature. Poletti et al<sup>7</sup> reported abdominal rebound and guarding had sensitivities of 5% and 26%, respectively, when used as indicators of intra-abdominal injury.

In assessing undifferentiated hypotension, immediate goal-directed POCUS has resulted in a more accurate physician's impression of final diagnosis and fewer viable differentials.<sup>8</sup> We would expect ultrasonographic intraperitoneal free fluid during our assessment; however, our 2 POCUS examinations within 30 minutes post-arrest did not reveal any. This highlighted the limitation of early POCUS in ruptured SAA as initial rupture might be contained within the lesser omental sac of the peritoneum, and would not present immediately as ultrasonographic intraperitoneal free fluid. Eventually, haemorrhage into the peritoneal cavity can occur; after 6–96 hours; and this is known as the double-rupture phenomenon.<sup>9</sup> Retrospectively, the supra-uterine hypo-echoic mass visualised on the second POCUS was likely a haematoma. Our case emphasised that in the early stages post SAA rupture (<6 hours), ultrasonographic intraperitoneal free fluid might not occur and this might present a pitfall in the diagnostic process.

While directed catheter angiography is the gold standard in diagnosing SAAs, tedium and complications involved have rendered multislice abdominal computed tomography with intravenous contrast an acceptable alternative.<sup>10</sup> An enhancing hypo-attenuated mass, with or without peripheral calcification, may be demonstrated, with contrast extravasation in SAA rupture.<sup>11</sup>

We adopted the approach of damage control resuscitation and early use of blood products in the ED management of our patient. We aimed for systolic BP of 80mmHg, restored mentation and palpable radial pulse.<sup>12</sup> Open surgery is preferred in patients with ruptured aneurysms, although endovascular approaches have also been used.<sup>13</sup> A splenectomy is often performed concurrently<sup>14</sup> as it can increase surgical exposure, reduce risk of splenic infarction and rebleeding.<sup>15</sup>

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