

## ED QUICK QUIZ

### WHAT IS THE DIAGNOSIS?

#### BACKGROUND

A father brings his 15-year-old son to the emergency department because of a large bruise over the son's lower left ribs from being struck by a lacrosse ball during an inter-high school game.



In addition to complaining of pain in the upper portion of his left abdomen, the patient also has pain in his left shoulder, which movement seems to aggravate. He is ambulatory and in no acute distress. A triage CXR is normal and he is brought to Majors.

On examination, the patient has a BP of 125/78 mm Hg, HR 106 bpm, and a RR of 12 breaths per minute. Temp and SaO<sub>2</sub> are normal. He has no trouble walking, but he seems to have a lot of pain while positioning himself on the bed. Findings from cardiorespiratory examination are unremarkable. He has diffuse abdominal tenderness that is most pronounced in the left upper quadrant. No rebound or guarding is observed. The patient has no tenderness to palpation over the left shoulder or clavicle, and he has full range of motion in that joint.

#### QUESTIONS

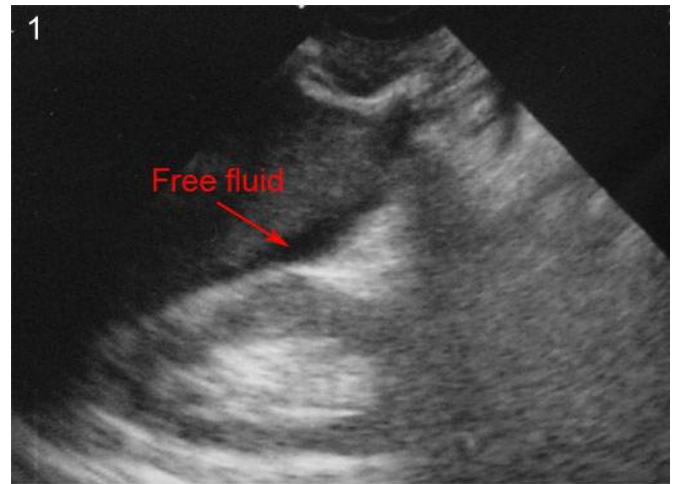
1. What is the diagnosis?
2. What would be your first and second choice investigations?

## ANSWERS & DISCUSSION

### 1. Diagnosis

**Splenic laceration:** The injury is directly over the patient's spleen. The shoulder pain is from irritation of the diaphragm.

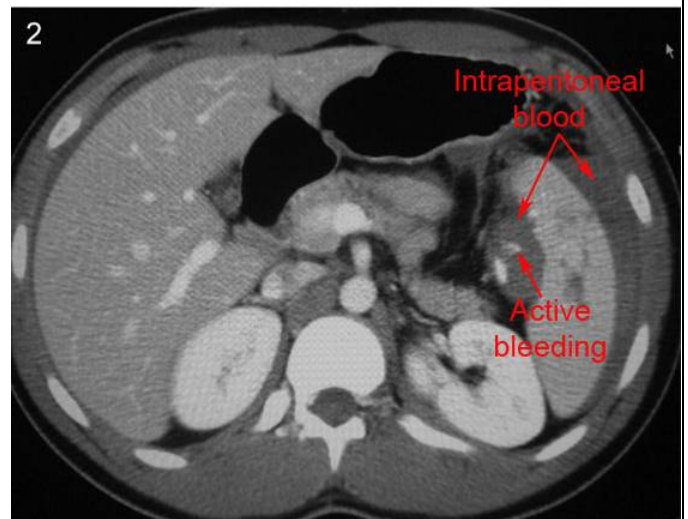
When an IV line was started in the ED, the patient's BP temporarily decreased to a systolic of about 90 mm Hg. At the time, this change was thought to be due to a vasovagal episode because his blood pressure soon returned to normal.



### 2. Investigations

However, suspicion of a splenic injury prompted (2a) a **Portable Ultrasound** (Image 1), which demonstrated a small amount of free fluid in the splenorenal space.

A subsequent (2b) **CT scan** confirmed splenic injury with a grade 2-3 splenic laceration (Images 2). Intraperitoneal blood was present, with a vascular contrast blush medial to the spleen consistent with active intraperitoneal bleeding.



In blunt trauma, the abdominal organ most commonly injured is the spleen, closely followed by the liver. Mechanisms of injury include motor vehicle crashes, assault, sports injuries, and bicycle injuries. Even minor trauma can cause splenic rupture in patients with previous splenomegaly due to mononucleosis, malaria, leukemia, or other conditions. The spleen is a highly vascular organ with the potential to contribute to severe blood loss in the setting of trauma. Patients with splenic injuries may present with isolated left upper quadrant pain or diffuse abdominal tenderness. Referred pain to the left shoulder, as observed in this patient, is due to diaphragmatic irritation from subphrenic blood; this is known as the Kehr sign. Severe haemorrhage may cause abdominal distension and frank shock. A presentation delayed by more than 48 hours after trauma may cause additional findings, such as jaundice or left pleural effusion.

Patients in haemodynamically unstable condition with signs of intraperitoneal bleeding should receive aggressive fluid resuscitation and/or blood products. These patients should be sent

directly to the operating room, and focused abdominal sonography in trauma (FAST) bedside ultrasonography may be useful to determine the presence of intra-abdominal blood.

Most patients with splenic injuries have stable vital signs and may undergo an imaging study for diagnosing and defining the injury. CT of the abdomen is typically the modality of choice.

Traumatic splenic injuries are graded I-V according to their severity, as evaluated on CT imaging. A grade I injury is a subcapsular hematoma of less than 10% of the surface area or a laceration that is less than 1 cm deep. If both of these findings are present, the injury is grade II. A grade II injury is also a subcapsular hematoma of 10-50% of the surface area, an intraparenchymal hematoma of 5-cm diameter, or a laceration 1-3 cm deep. If 2 grade II injuries are present, the severity is grade III. A grade III injury is also defined as a subcapsular hematoma of greater than 50% of the surface area, a parenchymal hematoma that is larger than 5 cm in diameter, or a laceration that is deeper than 3 cm or that involves the trabecular vessels. A grade IV injury is a laceration that involves segmental or hilar vessels that produces >25% organ devascularization. A grade V injury is a completely shattered or completely devascularized spleen.

Surgical management by means of laparotomy is indicated if hemodynamic instability is observed or if the patient requires massive transfusion (transfusion of packed red blood cells of >40 mL/kg in a child or of >2 units in an adult). In the haemodynamically stable patient, the higher the grade of injury, the more likely the need for surgery. Most grade IV or V injuries require surgical care, as do some low-grade injuries depending on a variety of circumstances, including comorbidity, concomitant injury, hospital resources (eg, angiographic and surgical capabilities), and acceptability of blood transfusion to the patient.

Nonsurgical observation is a safe practice that improves outcomes in for haemodynamically stable patients with blunt solid-organ injuries. In addition, preservation of the spleen avoids the subsequent risk of infections with encapsulated organisms, such as *Streptococcus*, *Neisseria*, and *Haemophilus* species. Overall, less than 10% of children with splenic injuries ultimately require surgery.

Some grade III injuries and all grade IV or V injuries should be initially managed in an ICU setting because sudden decompensation is an ever-present possibility. Most grade I or II injuries can be observed in a step-down unit or a regular surgical unit. Angiographic embolization may increase the likelihood for success with nonoperative treatment, especially when a vascular blush is seen on CT scans, as this procedure may help to stop bleeding and avoid surgery. Resources must be available to take the patient to the operating room if unexpected or sudden decompensation occurs.