

# An Case of Delayed Presentation Following a Mechanical Slip and Fall Associated with Splenic Injury

Danielle Lourdes D Souza

Emergency Medicine, University Hospital North Midlands

**Abstract:** *The spleen is a highly specialized intraabdominal organ with major functions in hematological and immunological systems. Splenic rupture which can occur as a direct result of abdominal trauma or underlying pathology is a critical condition. Although a vast majority of cases have tell - tale signs or symptoms of splenic rupture, lack of them does not exclude splenic rupture as an underlying problem. This is especially true in the elderly who may additionally have altered cognitive states which could complicate the path to reaching this diagnosis further. Splenic injury/rupture could also occur in states of splenomegaly without any history of trauma. In the context of trauma, recent research proves that the use of rib fractures from middle plus lower segments as an indication for abdominal screening can significantly improve sensitivity for identification of solid organ injury, including splenic injury [1]. This case report re - iterates this, as demonstrated in a case of a 60 - year - old female presenting to the emergency department 3 weeks following a minor fall who got diagnosed with poly - trauma including multiple lower rib fractures, a hydropneumothorax as well as grade 3 splenic injury.*

**Keywords:** splenic injury; traumatic spleen rupture; splenic laceration; poly trauma; rib fracture

## 1. Introduction

The spleen is situated in the left upper quadrant of the abdomen behind the stomach and the 9th – 11th ribs. It serves critical functions in regards to red blood cells (RBC's) and the immune system. Its role in the immune system occurs by 2 main mechanisms: Firstly, it has a phagocytic role in removing blood - borne pathogens and abnormal cells in the bloodstream. Secondly, it is involved in the production of opsonizing [2] antibodies through Antigen Presenting Cells (APC's) and activation of T - cells and B - cells [3]. Opsonization is essential to clear microorganisms like encapsulated bacteria and intra - erythrocytic parasites, so the spleen plays an important role in fighting off sepsis caused by these organisms. Through phagocytosis, it helps sequester bacteria that are not as well opsonized and thus, is of critical importance in the non immune host. In the hematopoietic system, the spleen plays a key role in removal of senescent and malfunctioning RBC's. These are broken down by splenic macrophages to remove and recycle iron in the body, thus helping re - generate RBC's. In addition, the spleen acts as a reservoir to store blood which is useful in cases of hemorrhagic shock, with as much as about 25% to 30% of RBC's stored in the spleen. Having such vital functions as mentioned above, splenic injury or rupture often necessitates immediate assessment and surgical review.

### Pathogenesis

The common mechanisms for developing splenic injury occurs via traumatic, non - traumatic and iatrogenic causes. Blunt abdominal trauma (such as falls in the elderly or direct blow to the abdomen in contact sports) or penetrating injuries (often after a road traffic accident) have been reported as the most common causes of splenic injury and rupture [4]. Atraumatic causes of splenic injury may occur in pathologically enlarged spleens which could spontaneously rupture, although uncommon. This may be associated with

underlying disease processes such as inflammation, infection, metabolic abnormalities, hyperlipidemias and benign or malignant growths, etc. Iatrogenic causes of injury could ensure post procedures such as colonoscopy or other upper gastro - intestinal procedures. Following trauma, tear in the capsule of the spleen causes hematoma formation and can result in rupture due to pressure on the contents, which can be potentially life - threatening due to massive hemorrhage.

## 2. Evaluation

Symptoms of splenic injury often include pain in the upper left stomach, pain radiating to the left shoulder (Kehr's sign) [5], confusion, lightheadedness, or dizziness as well as signs of hemodynamic instability such as hypotension, tachycardia, tachypnoea and in severe cases, reduced GCS. Other signs to look out for include presence of findings such as abrasions, lacerations, contusions, and seatbelt sign on the abdomen/flanks [6]. In most cases of trauma, Focused Assessment with Sonography for Trauma (FAST) is used as a quick and efficient tool to detect the presence of free fluid in the upper abdomen indicating possible injury to the spleen. The absence of free fluid does not however rule out splenic injury. Other modalities of imaging often used are CT and MRI scans with or without contrast. The AAST (American Association for the Surgery of Trauma) classifies spleen injuries from grades 1 to 5, in increasing order of severity by taking into consideration extent and depth of hematoma and/ or laceration.

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## Grades of Splenic injury (AAST) [8]

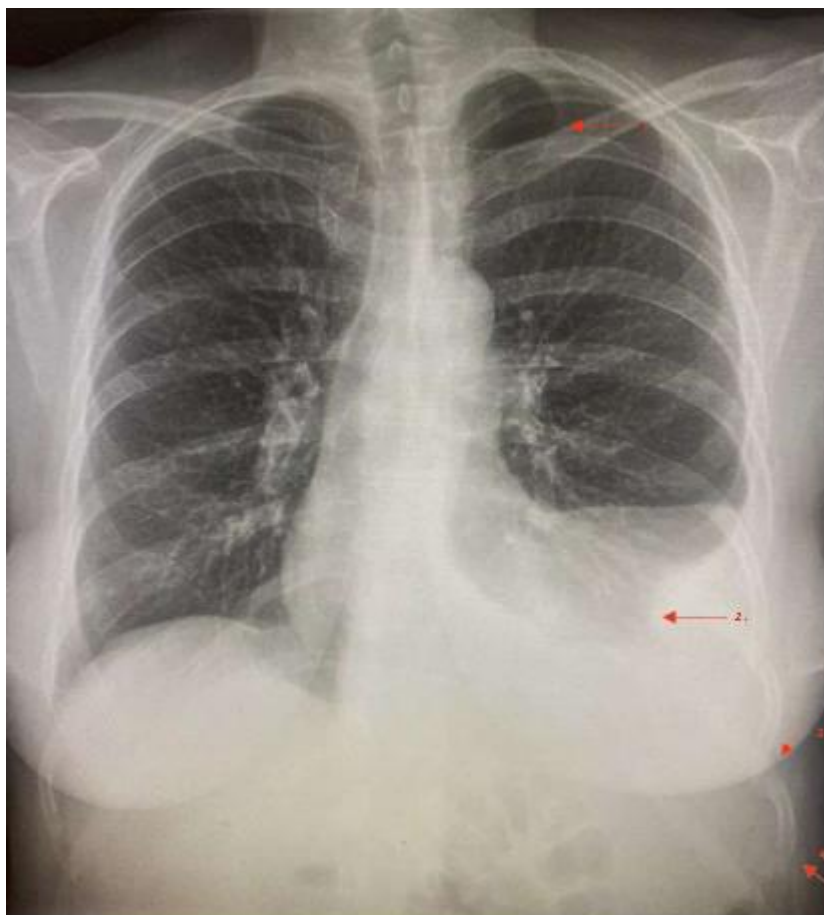
Grade	Injury
1	Subcapsular hematoma < 10% of surface area Laceration < 1 cm deep
2	Subcapsular hematoma 10–50% of surface area, intraparenchymal hematoma < 5 cm Laceration 1–3cm deep and not involving a trabecular vessel
3	Subcapsular hematoma > 50% of surface area, intraparenchymal hematoma $\geq$ 5cm, any expanding or ruptured hematoma Laceration > 3 cm deep or involving a trabecular vessel
4	Laceration involving segmental or hilar vessels and that de-vascularizes > 25% of spleen
5	Completely shattered spleen Hilar vascular injury that de-vascularizes spleen

### 3. Case Description

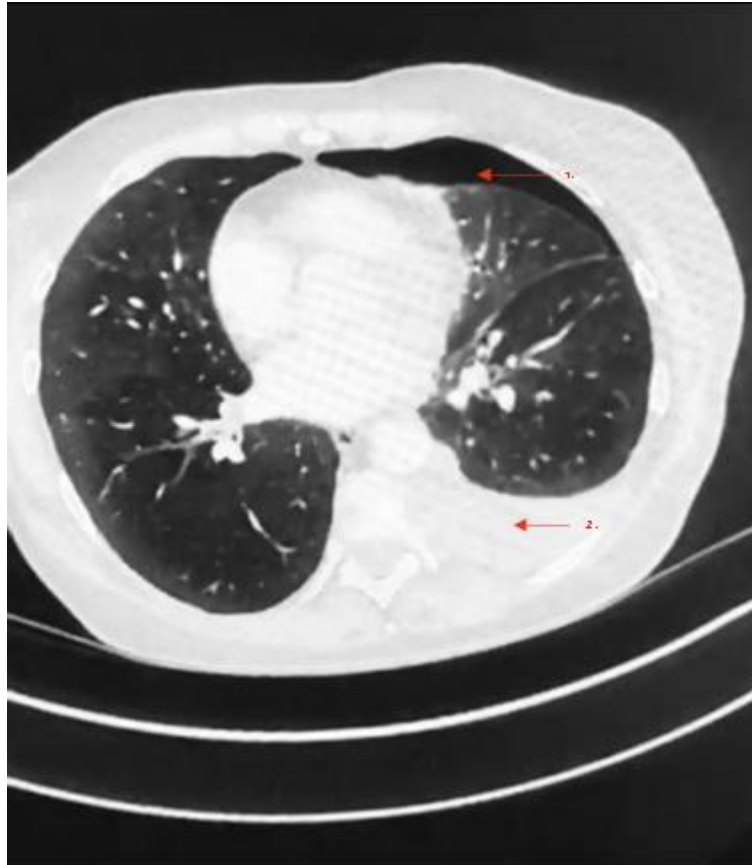
A 60 - year - old female presented to the emergency department 3 weeks following a mechanical fall on level ground with persistent left upper back pain which worsened on breathing in. Her vital signs were hemodynamically stable and she maintained normal oxygen saturation on room air. She had been using over - the - counter analgesia including regular paracetamol and codeine but was concerned as the pain had not fully gone away and hence presented for a follow - up review. Her past medical history included being a chronic smoker and ex - alcoholic with no other co - morbidities. There were no signs of chest or abdominal wall trauma on physical exam and the abdomen was soft and non - tender to palpation with normal bowel sounds. The patient was able to independently mobilize and

indicated a low pain score of 5/10. Routine bloods and an EKG were within normal limits, although a venous blood gas analysis showed respiratory alkalosis, indicating she may have been hyperventilating due to pain. Respiratory examination revealed reduced breath sounds over the left base of the lung. A Chest X ray was performed which suggested multiple lower rib fractures and a left hemopneumothorax. Following this, a CT thorax was organized which reported a moderate sized left pneumothorax with fluid collection over the left base, likely a hydropneumothorax, along with fractures of 9<sup>th</sup>– 12th ribs in multiple segments with no flail segment. CT also incidentally detected a grade 3 splenic laceration (AAST) warranting urgent surgical review. Eventually, a CT and renal Angiogram with contrast was performed which confirmed a large intracapsular hematoma suggesting an acute bleed as well as a small volume pelvic hematoma. There were no features to suggest active bleeding or pseudo - aneurysm formation. As there was a stable hemoglobin trend in the bloods and the patient remained hemodynamically stable, she was admitted under the Gastro - intestinal surgical unit for close in - patient observation. The splenic laceration was managed conservatively and further regular analgesia was administered. On obtaining appropriate consent, a chest drain was inserted. The patient was eventually discharged after removal of the chest drain and followed up in the pleural clinic for subsequent check for resolution of the pneumothorax.

### Figures



**Figure 1:** Chest X ray showing left apical pneumothorax (1), fluid collection left base (2), left lower rib fractures (3&4).



**Figure 2:** CT Thorax suggestive of pneumothorax (1) and hydrothorax (2).



**Figure 3:** CT Angiogram Abdomen and Renal showing large subcapsular hematoma (redarrow)

#### 4. Discussion

Splenic injury is an important diagnosis to consider in patients presenting with blunt abdominal trauma, especially in elderly patients and those with co-morbidities which can be linked with development of an enlarged spleen. In such cases, minimal trauma such as a simple mechanical fall can potentially cause splenic injury and even rupture which could have devastating outcomes, if missed. A lack of physical findings on examination does not always exclude the possibility of splenic rupture. In the context of falls, the presence of clinical features such as upper abdominal pain, left shoulder pain, hemodynamic instability, and concurrent features of trauma such as multiple rib fractures and/or pneumothorax can warrant the need for more definitive investigations such as CT scanning to rule this out. However, if in doubt, bed side ultrasound including the FAST scan can be particularly useful in aiding the diagnosis of significant splenic injury [9]. Once splenic injury is confirmed on CT, it can be classified according to the AAST. Low grade splenic injuries (1, 2 and 3) may be suitable for non-operative management. While earlier on, higher grade splenic injuries were often managed surgically with splenectomy to control the bleeding, recent evidence suggests that these cases may also be managed more conservatively with the adjunct of angioembolization [7]. This reformed management has many health benefits including preserved immunity function which can directly affect morbidity and mortality outcomes in elderly and pediatric patients. Severe grades of injury and presence of hemodynamic instability can sometimes still be indications for a splenectomy as a life-saving procedure.

#### 5. Summary

- Splenic injury/rupture is an emergency condition needing immediate assessment and investigation as well as surgical review.
- Blunt abdominal trauma/penetrating injuries are the cause in majority of intra-abdominal traumas as a direct cause of splenic rupture. Underlying pathologies however may also be implicated which could result in an enlarged spleen.
- The absence of signs/symptoms of chest or abdominal wall trauma cannot rule out the possibility of splenic injury amongst other intra-abdominal trauma.
- Elderly patients with multiple co-morbidities who present following a minimal trauma should have a low threshold for consideration of splenic injury as a potential cause.
- FAST scanning may be particularly important in aiding diagnosis in unclear cases, however, lack of findings on FAST scanning does not rule out the possibility of splenic injury.
- Middle and lower rib fractures may be an indication for abdominal screening which improves the sensitivity for identification of splenic injury amongst other solid organ injuries.

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