

Splenic Injury in Polytrauma: An Overview

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Abstract

Background: Splenic trauma is the most common solid organ injury in blunt abdominal trauma and is frequently encountered in polytrauma patients following road traffic accidents.(1,2,5) Contemporary management is guided by AAST and WSES classifications, with non-operative strategies favoured in haemodynamically stable patients and splenectomy reserved for unstable, high-grade injuries or those with peritonitis.(3,4) Delayed splenic haemorrhage, historically described as the “latent period of Baudet”, remains an important but often under-recognised complication in patients initially managed non-operatively.(7,8). **Case presentation:** A 39-year-old male pedestrian presented following a road traffic accident with borderline haemodynamics, generalised abdominal tenderness, guarding and a positive Kehr’s sign. Contrast-enhanced CT demonstrated an AAST Grade IV splenic laceration with perisplenic haematoma, mild haemoperitoneum and multiple left-sided rib fractures with a small pneumothorax. Given his clinical status and imaging, he underwent emergency laparotomy, which revealed a Grade IV splenic injury with approximately two litres of haemoperitoneum, and splenectomy was performed. His postoperative course was complicated by atelectasis and pleural effusions related to chest trauma, managed conservatively with respiratory support and physiotherapy. He was discharged in a stable condition with infectious-disease-guided post-splenectomy vaccination and education regarding the risk of overwhelming post-splenectomy infection (OPSI). (3,12–16). **Results:** This case illustrates guideline-concordant operative management of high-grade splenic injury in the setting of polytrauma, emphasising that clinical findings can override apparently reassuring CT descriptors such as “mild haemoperitoneum”.(3–6) Placed in the context of Baudet’s latent period and modern literature on delayed splenic haemorrhage, it highlights the temporal spectrum of splenic rupture—from immediate presentation with peritonitis to delayed haemorrhage weeks after trauma—and the consequent need for careful selection and follow-up of patients undergoing non-operative management.(6–11) The case also underscores the importance of structured post-splenectomy care, including vaccination, patient counselling and long-term OPSI prevention strategies in trauma populations.(12–16). **Conclusion:** Splenic injury remains the most common solid organ injury in blunt abdominal trauma, and in the polytrauma setting, a thorough abdominal examination is mandatory regardless of distracting skeletal injuries, as a life-threatening intra-abdominal haemorrhage must never be overlooked.(1,2,5) The latent period of Baudet serves as a critical reminder that delayed splenic haemorrhage may occur in seemingly stable patients, with the risk window extending up to and beyond 14 days from the index injury; structured clinical review and interval imaging in selected patients during this period are essential to identify evolving haematomas or pseudoaneurysms before catastrophic rupture ensues.(7,8,10,11) Every surgeon managing trauma must keep this temporal spectrum in mind alongside other differential diagnoses, as the spleen that appears safe on day one may rupture on day ten.(7–11) Post-splenectomy vaccination, patient education and long-term surveillance for overwhelming post-splenectomy infection complete the continuum of care that every splenectomised trauma patient deserves.(12–16).

Keywords: Splenic injury, blunt abdominal trauma, latent period of Baudet, polytrauma.

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INTRODUCTION

Splenic trauma is the most common solid organ injury in blunt abdominal trauma and accounts for approximately 25–30% of all traumatic abdominal injuries.^[1–5] Road traffic accidents remain the leading cause, particularly in polytrauma patients where concurrent thoracic, cranial and musculoskeletal injuries further complicate management.^[1,3,5]

The spleen’s rich vascularity and its position in the left upper quadrant predispose it to high-energy decelerative forces, with injuries ranging from trivial subcapsular haematomas to complete hilar disruption with catastrophic haemoperitoneum.^[1,2,5] The American Association for the Surgery of Trauma (AAST) Organ Injury Scale grades

splenic injuries from I to V based on laceration depth and vascular involvement.^[3,4] The World Society of Emergency Surgery (WSES) treatment protocol integrates this grading with the patient’s clinical and haemodynamic status, and stratifies

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treatment into non-operative management (NOM), angioembolisation (AE) and operative management (OM).^[3,4] NOM is favoured in haemodynamically stable patients with low-to-moderate grade injuries, whereas high-grade injuries with haemodynamic instability or peritonitis require emergent laparotomy, often with splenectomy.^[3-5]

Delayed splenic rupture is a frequently overlooked clinical entity within splenic trauma. It was first described by the French surgeon Baudet in 1902.^[7] The “latent period of Baudet” refers to the symptom-free interval between the initial traumatic event and the clinical appearance of splenic haemorrhage, traditionally defined as more than 48 hours.^[7-10] The term “delayed splenic haemorrhage” (DSH) is used interchangeably in modern literature.^[8-11] Clinicians managing patients with both high-energy and apparently minor splenic injuries must understand this continuum, which ranges from immediate rupture at the time of trauma to delayed rupture weeks later.^[5,7-11]

We present the case of a 39-year-old male pedestrian who sustained polytrauma in a road traffic accident, was found to have an AAST Grade IV splenic laceration with haemoperitoneum, and underwent emergency laparotomy with splenectomy. This case illustrates the acute end of the continuum of splenic rupture, in contrast to the latent Baudet phenomenon, and highlights several clinically important lessons regarding imaging interpretation, decision-making in polytrauma and post-splenectomy care.

CASE PRESENTATION

A 39-year-old male with no significant past medical or surgical history was brought to the Emergency Department following a road traffic accident in which he sustained injuries as a pedestrian struck by an autorickshaw. He described a brief loss of consciousness at the scene.

On primary survey, the patient had a pulse rate of 108 beats per minute, blood pressure of 100/60 mmHg, respiratory rate of 22 breaths per minute and temperature of 98°F, and was haemodynamically borderline. The Glasgow Coma Scale score was 14/15 (E3V5M6). Abdominal examination revealed sluggish bowel sounds, diffuse tenderness with guarding, generalised distension and a positive Kehr’s sign, all strongly suggestive of diaphragmatic irritation from splenic haemorrhage. Chest auscultation demonstrated equal bilateral air entry with left-sided chest tenderness and crepitus. Local examination showed a 2 × 2 × 2 cm laceration above the left eyebrow and several abrasions over the face, right thigh and left foot.

Radiological Investigation

Contrast-enhanced computed tomography (CECT) of the abdomen showed an AAST Grade IV splenic injury, a mild perisplenic haematoma with surrounding fat stranding, posterior fractures of the left seventh and eighth ribs, mild haemoperitoneum, fatty liver and cholelithiasis with mild wall thickening at the gallbladder neck.^[3,4]

High-resolution CT (HRCT) of the chest confirmed a mild left pneumothorax, mildly displaced fractures of the anterolateral aspects of the left third to seventh ribs, and

posterior fractures of the left seventh, eighth and ninth ribs with adjacent soft-tissue oedema and bilateral basal atelectasis. Non-contrast CT of the brain revealed no acute haemorrhage, and MDCT of the cervical spine showed no fracture.



Images (A-C): showing splenic laceration with perisplenic and intrasplenic hematoma and hilar injury

Intra-Operative Findings

In view of the high-grade splenic injury, borderline haemodynamics, peritonitis and associated thoracic trauma, emergency laparotomy with splenectomy and left ICD insertion was performed after resuscitation and multidisciplinary assessment.^[3-5]

Intra-operatively, a Grade IV splenic laceration with approximately two litres of haemoperitoneum was confirmed. A bowel walkthrough showed no additional visceral injuries. The spleen was mobilised to the abdominal surface; the vascular pedicle was clamped, ligated and divided, and the spleen was removed and sent for histological examination (HPE). Concurrently, wound debridement with primary skin closure and collagen application was carried out for the facial wound.



Histopathology and postoperative course

Histopathology of the splenectomy specimen demonstrated laceration with fresh haemorrhage and early infarction-related changes, consistent with acute traumatic splenic injury.

Post-operatively, the patient initially improved, and the ICD was removed on postoperative day 2. Subsequently, he developed tachycardia, hypoxia and an inability to maintain oxygen saturation on room air. Repeat CT imaging revealed post-splenectomy status with minimal left subdiaphragmatic

fluid and bilateral mild pleural effusions with passive atelectasis of the adjacent lungs, findings consistent with the underlying chest trauma rather than an intra-abdominal complication. He was managed with broad-spectrum intravenous antibiotics, analgesics, bronchodilators, chest physiotherapy and incentive spirometry. He was discharged in a stable condition with advice regarding wound care, respiratory exercises and the need for urgent review in case of fever or unexplained illness, in view of the risk of overwhelming post-splenectomy infection (OPSI).^[12-16]

DISCUSSION

A. Epidemiology and classification of splenic trauma

The spleen is the most frequently injured solid organ in blunt abdominal trauma.^[1,2,5] In polytrauma, especially after high-energy road traffic accidents, concurrent thoracic, head and limb injuries are common and significantly influence the haemodynamic trajectory and operative decision-making.^[1,3,5]

Splenic injuries are graded from I to V on the AAST Organ Injury Scale according to the degree of parenchymal disruption, vascular involvement and depth of laceration.^[3,4] WSES combines AAST grade with haemodynamic status into a practical four-tier management classification, ranging from low-grade, stable injuries suitable for NOM to high-grade injuries with instability or peritonitis that require operative management.^[3,4] Grade IV injuries, as in this case, typically involve lacerations affecting a large portion of the parenchyma and/or hilar vascular involvement with devascularisation of more than 25% of the spleen.^[3,4]

B. Non-operative versus operative management: the decision in polytrauma

NOM—including observation and, where available, splenic angioembolisation—is now the accepted standard of care for haemodynamically stable splenic injuries across all grades, with success rates above 80–90% in carefully selected patients.^[3-5] However, haemodynamic instability, diffuse peritonitis and associated injuries requiring surgical intervention are well-established indications for operative management and splenectomy.^[3-5] Recent series have confirmed that high Injury Severity Scores (ISS), thoracic injuries and haemodynamic compromise strongly predict failure of NOM in polytrauma patients with splenic injury.^[5] In this case, NOM was unsafe and splenectomy was the most appropriate course of action due to the patient's borderline blood pressure (100/60 mmHg), tachycardia (108 bpm), diffuse peritoneal signs, positive Kehr's sign, Grade IV splenic injury with approximately two litres of haemoperitoneum, and multiple left rib fractures with pneumothorax requiring ICD insertion.^[3-5] According to the 2017 WSES guidelines, such a constellation of high-grade abdominal injury with haemodynamic derangement and peritonitis corresponds to a WSES Grade IV spleen trauma, for which operative management is recommended.^[3]

An important observation in this case was the disparity between the CT report of "mild haemoperitoneum" and the intra-operative finding of two litres of blood. This highlights a clinically relevant limitation: CT-based descriptors of

haemoperitoneum volume do not reliably predict ongoing haemorrhage, and physiological parameters must always take precedence over radiological wording when making decisions about laparotomy, particularly in polytrauma.^[3-5]

C. The latent period of Baudet and delayed rupture spleen

The present case, in which bleeding was apparent at the time of injury with clear clinical and radiological evidence, represents the acute end of the spectrum of traumatic splenic rupture. This contrasts sharply with the phenomenon of delayed splenic rupture, historically described in association with the "latent period of Baudet".^[7-10]

Baudet first reported the existence of a symptom-free interval between splenic trauma and the onset of clinically significant haemorrhage. El-Rifi's 1967 paper in the *British Journal of Surgery* formally analysed this latent period and established it as a distinct clinical entity.^[7] Conventional definitions describe delayed splenic rupture as occurring more than 48 hours after the initial trauma, and many authors now use the term delayed splenic haemorrhage (DSH).^[7-11] The Western Trauma Association multicentre study confirmed that DSH is a real and clinically important complication in patients managed non-operatively, with approximately 90% of delayed events occurring within four weeks of the index trauma.^[8]

The literature describes latent periods ranging from 48 hours to as long as 70 days following blunt trauma, emphasising the wide temporal range.^[9-11] Proposed mechanisms include tamponade of haemorrhage by an intact splenic capsule or perisplenic haematoma with later capsular failure; formation and delayed rupture of a subcapsular haematoma; and rupture of a traumatic splenic pseudoaneurysm.^[9-11] These mechanisms explain how CT imaging may initially appear normal or show only minor subcapsular change, yet patients can present later with haemodynamic collapse due to splenic haemorrhage.^[9-11]

The difference between this case and the Baudet paradigm conveys a key clinical message: the absence of peritonitis or haemodynamic instability in the immediate post-trauma period does not exclude the possibility of significant splenic haemorrhage. All patients with documented or suspected splenic injury require structured follow-up, clear safety-netting advice about symptoms of delayed rupture, and, in selected cases, interval imaging to detect evolving haematomas or pseudoaneurysms.^[3,5,7-11]

D. Post-splenectomy infections and OPSI

Although emergency splenectomy can be life-saving, it carries a lifelong risk of overwhelming post-splenectomy infection (OPSI), a fulminant sepsis syndrome most often caused by encapsulated organisms such as *Neisseria meningitidis*, *Haemophilus influenzae* type b and *Streptococcus pneumoniae*.^[12-15] The estimated lifetime risk of OPSI in asplenic or hyposplenic patients is approximately 1–5%, with reported mortality rates of 50–70% once OPSI occurs.^[13-15]

International guidelines recommend vaccination against these organisms for all splenectomised patients, ideally after postoperative day 14 to allow for immunological recovery, but before discharge if follow-up may be unreliable.^[12-16] Long-term preventive strategies also include patient education, medical alert identification and, in some settings, standby or prophylactic antibiotics.^[12-16]

In this case, post-splenectomy care was supported by

infectious-disease consultation and explicit discharge advice regarding fever and unexplained illness, which is appropriate in the context of OPSI risk. Early postoperative morbidity was dominated by respiratory issues—atelectasis and pleural effusion—related to the underlying chest trauma rather than the abdominal procedure, consistent with reports that pulmonary complications are frequent after trauma splenectomy in patients with concomitant thoracic injuries.^[5] This underlines that respiratory management, early physiotherapy and careful monitoring for pulmonary infection are as crucial as abdominal wound care in the early post-operative period in polytrauma splenectomy patients.

CONCLUSION

The most common solid organ injury in blunt abdominal trauma is still splenic injury. In the context of polytrauma, an abdominal examination should always be performed regardless of the presence of multiple skeletal injuries; a potentially life threatening intra-abdominal haemorrhage should not be overlooked due to a distracting injury.^[1,2,5] Beyond the acute presentation, the idea of the latent period of Baudet is a crucial reminder that a group of patients who seem stable following initial trauma may experience delayed splenic haemorrhage. The risk period extends up to and beyond 14 days from the primary injury, during which time interval imaging and structured clinical review are essential in identifying evolving haemorrhages, hematomas or pseudoaneurysms in specific patients before catastrophic rupture occurs.^[7-11] The spleen that seems safe on day one might rupture on day ten, therefore every surgeon handling trauma needs to keep this at the forefront of their clinical thought along with other differential diagnoses.^[7-11] The continuity of care that every post-splenectomy trauma patient deserves is completed by immunization, patient education, and long-term surveillance for overwhelming post-splenectomy infection.^[12-16]

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Conflicts of interest

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