

Case Series

Delayed splenic rupture and conservative management: case series

Marta A. Silva^{1*}, Nídia Moreira², José Baião³, Carlos E. Costa Almeida⁴

¹Department of General Surgery, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

²Department of General Surgery, Centro Hospitalar do Baixo Vouga, Aveiro, Portugal

³Department of General Surgery, Instituto Português de Oncologia Francisco-Gentil, Coimbra, Portugal

⁴Department of General Surgery, CUF Coimbra, Coimbra, Portugal; Department of General Surgery, Hospital da Luz Aveiro, Aveiro, Portugal

Received: 11 August 2021

Revised: 04 October 2021

Accepted: 11 October 2021

*Correspondence:

Dr. Marta A Silva,

E-mail: mafr.silva@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Splenic injury is frequent in patients with abdominal trauma and delayed splenic rupture yields a poorer prognosis. Patients with hemodynamic stability, despite the grade of splenic anatomical injury, can be safely treated by conservative management (observation or angiography/angioembolization), if no other intra-abdominal injuries are found and a multidisciplinary team (surgeons, interventional radiologists) is available. The conservative approach is an alternative to surgery and its possible complications. In this case series, the authors present three trauma cases very commonly seen in emergency rooms, in whom delayed splenic rupture was diagnosed. All three patients were submitted to conservative management, with no need for surgery or complications. This case series presents some common clinical signs and diagnostic steps, also showing the safety and efficacy of clinical observation in this setting.

Keywords: Delayed splenic rupture, Conservative management, Blunt abdominal trauma

INTRODUCTION

The spleen is the most frequently injured organ after blunt abdominal trauma.¹ Delayed splenic rupture (defined as occurring 48 hours after the initial trauma²) yields a much higher mortality rate (5-15%) than acute splenic injury (1%); this is due to its “latent period” - the quiescent asymptomatic period after splenic trauma described by Baudet in 1907.²⁻⁸

In the last decades, the management of splenic trauma in hemodynamically stable patients has shifted from surgery towards conservative management, supported by growing evidence of its efficacy and safety.⁶

The authors present a case series of three non-consecutive patients with delayed splenic rupture, admitted to one single tertiary hospital between December 2017 and February 2020, who were submitted to conservative treatment.

CASE SERIES

Case 1

A 60-year-old male was admitted to the emergency room with acute diffuse abdominal pain with back irradiation. He recalled a history of a fall from his height two weeks before. His past medical history was unremarkable. He was sudoretic and tachycardic but with normal blood pressure (125/68 mmHg). On physical examination, he

presented epigastric and flank ecchymosis (Figure 1), and a tender abdomen on palpation, without guarding.

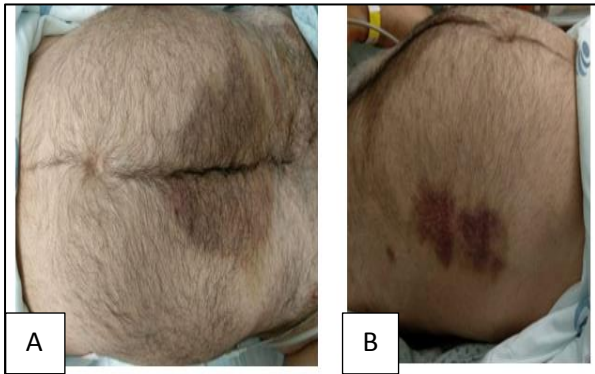


Figure 1: Physical findings in case 1. (A) periumbilical ecchymosis; (B) flank ecchymosis.

After adequate initial fluid resuscitation with crystalloid, the patient became hemodynamically stable and an abdominal CT scan with intravenous contrast was performed; a posteroinferior splenic rupture was found, associated with perisplenic and pelvic fluid, diagnosing a splenic injury grade IV according to the AAST spleen injury scale (American Association for the Surgery of Trauma). No contrast flush was seen. The blood tests revealed low haemoglobin (10.4 g/dL) but normal platelet count and no coagulopathy.

Case 2

A 38-year-old male presented to the emergency room after a motorcycle crash with cranial, thoracic, pelvic, and right foot trauma.

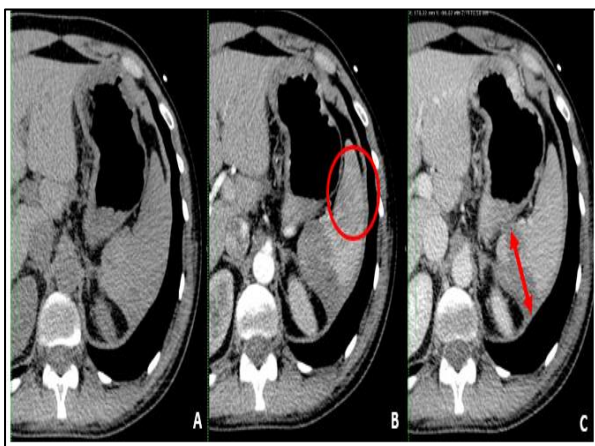


Figure 2: CT scan (axial plane) of case 2. A) without intravenous contrast. B) arterial phase, showing the parenchymal laceration (circle). C) portal venous phase showing the subcapsular haematoma (line with arrows).

His past medical history was unremarkable. Only abnormal physical findings were tachycardia (pulse 112

bpm), but normal blood pressure, and pain on right foot palpation. His abdomen examination revealed no tenderness and the pelvis was stable. The abdominal ultrasound (US) found neither organ injuries nor free fluid; given patient hemodynamic stability after fluid challenge (with normocardic normotension) and the negative findings on both physical examination and the abdominal US, an abdominal CT scan was not performed then.

The cranial CT scan showed no injuries. The only identified sustained injury was a right foot fracture and the patient was discharged with a foot cast.

Five days later he returned to the hospital with severe headache and vomiting. On physical examination, a left flank haematoma was now evident, but the patient was hemodynamically stable and with no abdominal pain. A cranial CT scan and an additional abdominal US were both normal and the patient was discharged home once again.

After five more days (ten days after the motorcycle crash), the patient returned to the emergency room, complaining of severe abdominal pain on the left flank. He was hemodynamically stable (blood pressure 110/76 mmHg, pulse 75 bpm).

The blood tests revealed anaemia (Hb 9.7 g/dL) (with normal platelet count and coagulation) and a third abdominal US was performed showing newly findings, namely a small quantity of peritoneal fluid in the left subdiaphragmatic and paracolic gutter spaces, and a heterogenic area in the upper pole of the spleen. An abdominal CT scan with intravenous contrast revealed a subcapsular haematoma with 6,7cm and a parenchymal laceration two centimetres deep, diagnosing a splenic injury grade III (AAST spleen injury scale). No contrast flush was seen (Figure 2).

Case 3

An 81-year-old male was assisted in the emergency room for abdominal pain, left chest pain and dizziness after a fall from stairs four days before. His past medical history included atrial fibrillation, asthma, arterial hypertension, and left hip surgery. He was on warfarin and had a cardiac pacemaker. He was hemodynamic stable (blood pressure 112/65 mmHg, pulse 96 bpm), with a left inferior chest ecchymosis, decreased respiratory sounds on the lower left chest, and with tenderness on the left upper abdominal quadrant, without guarding.

The blood tests revealed an elevated prothrombin time/INR (36,8 sec; 3.08), anaemia (Hb 11.8 g/dL) and a normal platelet count. Chest film was normal, and abdominal US showed a moderate quantity of peritoneal fluid around the spleen, around the liver, and in the pelvic space. The abdominal CT scan with intravenous contrast revealed a ruptured subcapsular haematoma, without

active bleeding, in the inferior splenic pole, diagnosing a splenic injury grade III (AAST spleen injury scale) (Figure 3).

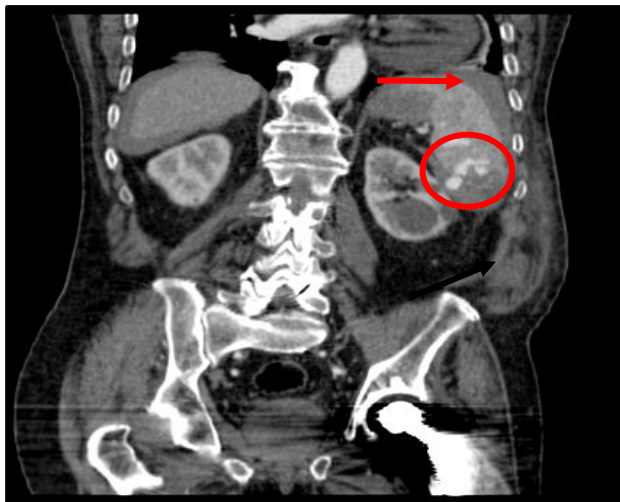


Figure 3: CT scan (coronal plane) of case 3. Arterial phase showing an intra-splenic haematoma (circle) and fluid in the perisplenic space and left paracolic gutter (arrows).

The surgical team decided for conservative management (clinical observation) in all three cases considering patients' hemodynamic stability. Patients were admitted to a high-dependency unit and maintained on bed rest, with daily blood tests.

Patients were allowed to sit and stand up progressively, since their hemodynamic parameters and haemoglobin were stable, and abdominal complaints were improving.

Patient of case three received 500 U of Octaplex® (prothrombin complex concentrate) and vitamin K to revert warfarin's related coagulopathy.

No complications occurred during the hospital stay in all cases. In-hospital length of stay varied between eight and 11 days.

All patients repeated an abdominal CT scan (during the hospital stay or after discharge –within one month after trauma) and, in all of them, a reduction of free fluid and absence of complications (such as a pseudoaneurysm) were seen. The follow-up of all patients (between two months and one year) was uneventful.

DISCUSSION

Delayed splenic rupture was first described in 1866 by Evans, and later arbitrarily defined as occurring 48 hours after the initial trauma.^{2,7,8} In 1907, Baudet described the "latent period" referring to the quiescent asymptomatic period after splenic trauma.^{4,5} Due to this initial silent period, the search for medical assistance may be

postponed, turning delayed splenic rupture severity and mortality much higher (5-15%) than acute splenic injury (1%).^{2,3}

The main complaint in patients with delayed splenic rupture is abdominal pain, present even in the "latent period".⁹ Kehr's sign (referred pain in the left shoulder due to phrenic nerve stimulation) is a typical (but infrequent) sign described in the literature.⁹ An occult splenic injury must be suspected in patients with left lower rib fractures, signs of intra-abdominal haemorrhage (abdominal dullness and tenderness) and hemodynamic collapse (tachycardia and anaemia), and objective signs of blunt abdominal trauma - such as ecchymoses, haematomas, seat belt impressions or abrasions.^{5,10,11}

Nowadays authors consider that most cases of delayed splenic rupture represent a delay in the diagnosis of the initial haemorrhage, but "true" cases of this entity have been described with a reported incidence of 0,6-14%.^{2-5,7,9,12,13} The majority of cases occur within 21 days after the initial trauma but delayed splenic rupture has been reported up to two years after injury.^{14,15}

CT scan is the most reliable imaging diagnostic tool for abdominal trauma, providing detail of the amount of hemoperitoneum and the extent of splenic laceration/haematoma.⁵ The recent World Society of Emergency Surgery (WSES) guidelines categorise splenic injuries into minor, moderate, and severe, according to the degree of the anatomic lesion (based on AAST classification) and the patients' hemodynamic status. A severe splenic injury is defined by hemodynamic instability (despite anatomic injury's degree).⁶

The WSES guidelines highlight the relevance of patients' hemodynamic status on the management of splenic injuries, translating the trend towards more conservative management in stable patients seen since the 1970s.^{6,11,16} The selective conservative approach (which includes observation and/or angiography/angioembolization) emerged as an alternative to splenectomy and its possible complications, such as the rare but highly fatal overwhelming post-splenectomy sepsis in adult patients.^{11,16-19} Previous publications have shown a high success rate (90%) of conservative management, pointing the presence of contrast flush on CT scan as a predictor of failure and indication for angiography/angioembolization.^{6,20,21}

In this case series, the authors report three non-consecutive cases of delayed splenic rupture managed conservatively. Trauma's mechanisms seen in these cases (falls and road traffic accidents) are well described in the literature and are a frequent reason for admission in our emergency room.^{5,6}

These patients had only splenic trauma, but on blunt abdominal trauma scenarios the liver is the most

frequently injured organ; isolated involvement of the spleen occurs in 46% of cases.^{22,23}

Two patients (cases one and three) only searched for medical assistance more than 48h after trauma (14 and 4 days later, respectively); in case two, patient's initial assessment didn't reveal any lesions. It was only ten days following the trauma event that a third consecutive abdominal US showed free peritoneal fluid. On physical examination, two patients presented with left flank ecchymoses/haematoma, which should have raised the suspicion of splenic injury; the other patient had a left lower chest trauma, which can also be associated with splenic injury.^{5,10,11} No patient presented with hemodynamic instability (in cases one and three tachycardia reverted after initial resuscitation).

Case two of this series represents the limitation of abdominal US in detecting splenic trauma in some patients; despite its wide availability and non-invasiveness, US may provide false-negative results in small splenic injuries, especially in absence of free abdominal fluid (in this setting US sensibility is <50%, even with a highly experienced operator).²⁴ On his second visit to the emergency room, the patient's main complaint was headache and vomiting, raising concern about possible complications of the initial head trauma; so, a cranial CT scan was requested. Due to flank haematoma, a second abdominal US was performed, but the splenic injury was missed. If an abdominal enhanced CT scan had been performed at first evaluation, the splenic injury might have been detected earlier. Nowadays, the authors perform an abdominal CT scan during the initial evaluation of all patients suffering from a high kinetic trauma. Performing a CT scan at the very first evaluation will promote an early diagnosis of a clinically silent splenic injury and will help us decide on the best management.

To overcome this limitation of the conventional abdominal US, some authors advocate for contrast-enhanced ultrasonography (CEUS) in stable patients – when giving IV contrast agents such as Sonovue®, abdominal US accuracy for detecting organ lesions is similar to CT scan.²⁵ However, this US modality is not available in our institution.

An abdominal CT scan with intravenous contrast eventually was performed in all patients and the images were reviewed with radiologists. Moderate splenic injuries were diagnosed in all cases. The surgical team decided for conservative management (clinical observation) in all cases given patients' hemodynamic stability, absence of other intra-abdominal injuries or active bleeding, and permanent availability of angiography/surgical teams in our hospital (in case patients' status deteriorated), as mentioned on WSES guidelines.⁶

Patients were admitted to a high dependency unit, allowing for frequent clinical assessments and daily haemoglobin/ platelets/ coagulation factors measurements. During clinical surveillance, patients maintained clinical and laboratory stability, excluding the need for more invasive procedures (such as angiography/ angioembolization or surgery).

Besides the immediate availability of a surgical team and an operation room, our institution has a 24-hour interventional radiologist; this grants that, if the clinical or hemodynamic patients' status changed (worsening of abdominal pain/ guarding and/or sustained hypotension/ tachycardia), an immediate abdominal CT scan with intravenous contrast and angioembolization could be performed.

The value of sequential CT scans in these patients is controversial. While some authors advocate that imaging studies can detect early vascular complications and allow for early intervention, others have found that repeated CT scans don't change patients' management in most cases, adding the risks of radiation exposure.^{26,27} In this case series, the length of observation was determined by clinical and laboratory findings. The authors decided to repeat a CT scan in all cases to exclude complications but without delaying hospital discharge.

CONCLUSION

This case series illustrates the safety of conservative management (clinical observation) in hemodynamically stable patients with delayed splenic rupture. The management of spleen trauma must be multidisciplinary and patients' clinical status and laboratory data should be frequently assessed to promptly identify possible complications. Additionally, this approach should only be attempted in centers capable of intensive management, if needed. Emergency care providers must have a low threshold of suspicion and must be aware that splenic injury can be clinically evident beyond the three weeks commonly cited in the literature.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Stivelman RL, Glaubitz JP, Crampton RS. Laceration of the spleen due to nonpenetrating trauma. *Am J Surg.* 1963;106(6):888-91.
2. Benjamin CI, Engrav LH, Perry JF. Delayed rupture or delayed diagnosis of rupture of the spleen. *Surg Gynecol Obstet.* 1976;142(2):171-2.
3. Foster RP. Delayed haemorrhage from the ruptured spleen. *BJS.* 1970;57(3):182-92.
4. Olsen WR, Polley TZ. A Second Look at Delayed Splenic Rupture. *Arch Surg.* 1977;112(4):422-5.

5. Dang C, Schlater T, Bui H, Oshita T. Delayed rupture of the spleen. *Annals of Emergency Medicine.* 1990.
6. Coccolini F, Montori G, Catena F, Kluger Y, Biffi W, Moore EE, et al. Splenic trauma: WSES classification and guidelines for adult and pediatric patients. *World J Emerg Surg.* 2017;12(1):1-26.
7. Evans C. Ductless glands: Rupture of the spleen from external violence. *Trans Pathol Soc London.* 1866;(17):299-301.
8. Berlatzky Y, Shiloni E, Anner H, Weiss Y. "Delayed rupture of the spleen" or delayed diagnosis of the splenic injury? *Isr J Med Sci.* 1980;16(9-10):659-64.
9. Zabinski, Edward J, Harkins HN. Delayed splenic rupture: a clinical syndrome following trauma. *Arch Surg.* 1943;46(2):186.
10. Gamblin TC, Wall CE, Royer GM, Dalton ML, Ashley DW. Delayed splenic rupture: Case reports and review of the literature. *J Trauma - Inj Infect Crit Care.* 2005;59(5):1231-4.
11. Freiwald S. Late-Presenting Complications After Splenic Trauma. *Perm J.* 2010;14(2):41-4.
12. Resteghini N, Nielsen J, Hoimes ML, Karam AR. Delayed splenic rupture presenting 70 days following blunt abdominal trauma. *Clin Imaging.* 2014;38(1):73-4.
13. Olsen WR. Delayed rupture of the spleen as an index of diagnostic accuracy. *Surg Gynecol Obstet.* 1974;138(1):82.
14. Sizer JS, Wayne ER, Frederick PL. Delayed Rupture of the Spleen. *Arch Surg.* 1966;92(3):362.
15. Müller JX. Die traumatische Spätblutung der Milz. *Beitr z kiln Chir.* 1940;376-411.
16. Pachter HL, Guth AA, Hofstetter SR, Spencer FC. Changing patterns in the management of splenic trauma: The impact of nonoperative management. *Ann Surg.* 1998;227(5):708-19.
17. Di Cataldo A, Puleo S, Li Destri G, Racalbuto A, Trombatore G, Latteri F, et al. Splenic trauma and overwhelming postsplenectomy infection. *British Journal of Surgery.* 1987.
18. Lynch AM, Kapila R. Overwhelming postsplenectomy infection. *Infect Dis Clin North Am.* 1996;10(4):693-707.
19. Cullingford GL, Watkins DN, Watts ADJ, Mallon DF. Severe late postsplenectomy infection. Vol. 78, *British Journal of Surgery.* 1991;716-21.
20. Smith J, Armen S, Cook CH, Martin LC. Blunt Splenic Injuries: Have We Watched Long Enough? *J Trauma Inj Infect Crit Care.* 2008;64(3):656-65.
21. Schurr MJ, Fabian TC, Gavant M, Croce MA, Kudsk KA, Minard G, et al. Management of Blunt Splenic Trauma. *J Trauma Inj Infect Crit Care.* 1995;507-13.
22. Williamson J. Splenic injury: diagnosis and management. *Br J Hosp Med [Internet].* 2015;76(4):204-29.
23. Poletti P-A, Wintermark M, Schnyder P, Becker CD. Traumatic injuries: role of imaging in the management of the polytrauma victim (conservative expectation). *Eur Radiol.* 2000;12(5):969-78.
24. Chiu WC, Cushing BM, Rodriguez A, Ho SM, Mirvis SE, Shanmuganathan K, et al. Abdominal Injuries without Hemoperitoneum. *J Trauma Inj Infect Crit Care.* 1997;42(4):617-25.
25. Piccolo CL, Trinci M, Pinto A, Brunese L, Miele V. Role of contrast-enhanced ultrasound (CEUS) in the diagnosis and management of traumatic splenic injuries. *J Ultrasound.* 2018;21(4):315-27.
26. Furlan A, Tublin ME, Rees MA, Nicholas DH, Sperry JL, Alarcon LH. Delayed splenic vascular injury after nonoperative management of blunt splenic trauma. *J Surg Res.* 2017;211:87-94.
27. McCray VW, Davis JW, Lemaster D, Parks SN. Observation for nonoperative management of the spleen: How long is long enough? *J Trauma - Inj Infect Crit Care.* 2008;65(6):1354-8.

Cite this article as: Silva MA, Moreira N, Baião J, Almeida CEC. Delayed splenic rupture and conservative management: case series. *Int Surg J* 2021;8:3407-11.