Case Report

Absorbable Mesh Splenorrhaphy in an Adolescent with Blunt Splenic Rupture: A Case Report and Narrative Review

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Abstract

Operative management of blunt splenic trauma is rare in the paediatric population. Splenorrhaphy, with or without absorbable mesh, is a surgical procedure rarely used, although it preserves splenic function and has good outcomes. A 12-year-old girl accidentally fell from a height onto an iron bar. She complained of abdominal pain and difficulty breathing. Physical examination showed abdominal guarding and tenderness. Abdominal ultrasound demonstrated haemoperitoneum and splenic lacerations, confirmed by a CT scan, which highlighted active splenic bleeding. As she became haemodynamically unstable despite saline administration, we performed an absorbable mesh splenorrhaphy. She also received a blood transfusion. Surgical outcomes were good. She was discharged home on postoperative day 12. At a two-year follow-up, she is doing well. Absorbable mesh splenorrhaphy is an effective surgical procedure in children with haemodynamically unstable splenic trauma. Few paediatric cases are reported in the literature despite its ease of performance, its advantage of preserving spleen function, and its good outcomes.

Keywords: Absorbable mesh splenorrhaphy, Blunt abdominal trauma, Splenic trauma, Splenectomy, Child

Introduction

Spleen injury after blunt trauma is common in children, accounting for 45% of all visceral injuries.[1] Non-operative management (NOM) is the standard treatment for isolated blunt organ injury in hemodynamically stable pediatric patients, and its successful rate is over 90%.[2] It consists of close monitoring or selective splenic embolization.[3,4] Operative management (OM) is the standard treatment in hemodynamically unstable patients. Different surgical procedures include splenorrhaphy (conventional or absorbable mesh wrap), partial splenectomy, and total splenectomy. Splenorrhaphy is the least used and reported in the literature, although its efficiency has been proven.[5] Herein, we report the case of a 12-year-old girl who fell from a height onto an iron bar and presented with blunt splenic rupture, treated with absorbable mesh splenorrhaphy.

Case Report

A 12-year-old girl accidentally fell from a height onto an iron bar. She complained of abdominal and left shoulder pains and difficulty breathing. One hour later, she briefly fainted, so her parents brought her to the emergency department. She had no past medical history. Her weight was 40 kg, and her height was 147 cm (IMC 18.5 kg/m²). On arrival, the heart rate was 132 beats /min; the respiratory rate was 30 breaths/min; the blood pressure was 109/54mmHg; the oxygen saturation was 99% in room air; and the capillary glycaemia was 3.49 g/L. The initial HemoCue was 115 g/L, and blood gases demonstrated lactic acidosis with pH at 7.25 and lactate at 5 mmol/L. On inspection, she was pale and had a bruise on the left flank. On palpation, she had diffuse abdominal guarding. She was administered saline. A repeat HemoCue was 89 g/l. The emergency physician performed a fast ultrasound, which showed a haemoperitoneum.

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An abdominal ultrasound highlighted splenic lacerations and subcapsular and intra-parenchymatous haematomas (Figure 1A), and an abdominal CT scan highlighted the presence of active bleeding near the lower splenic pole (Figures 1B and 1C). Her condition was diagnosed as a grade IV injury on the American Association for the Surgery of Trauma (AAST) splenic injury scale.

Immediately after the CT scan, she became unstable, with the heart rate reaching 200 beats/min, the blood pressure dropping several times to 70/50mmHg, and the respiratory rate reaching 40 breaths/min, despite the administration of saline. However, she remained conscious, and the HemoCue remained at 89g/l.

Hence, the patient was brought to the operating room in an emergency. We performed an exploratory laparotomy. At the opening of the peritoneum, a flow of blood and clots erupted. We aspirated them, which permitted us to locate the spleen. We placed compresses beneath it to elevate it. Then, we coagulated the short gastric vessels and the gastrosplenic ligament. The spleen was lacerated in multiple parts, but the hilum was intact. There was no active bleeding. We decided to place the spleen in an absorbable mesh, suture its edges around the splenic hilum, using a running 4-0 Vicryl suture, without compressing it, and replace it in its lodge after removing the compresses. We aspirated all the remaining haemoperitoneum and placed a 10-Frenchdrain in the left flank in front of the superior pole of the spleen. We closed the aponeurosis with two running 0 Vicryl sutures, the subcutaneous layer with inverting 3-0 Vicryl sutures, and the skin with an intradermal suturing using 4-0 Monocryl (Figures 1D-1F).

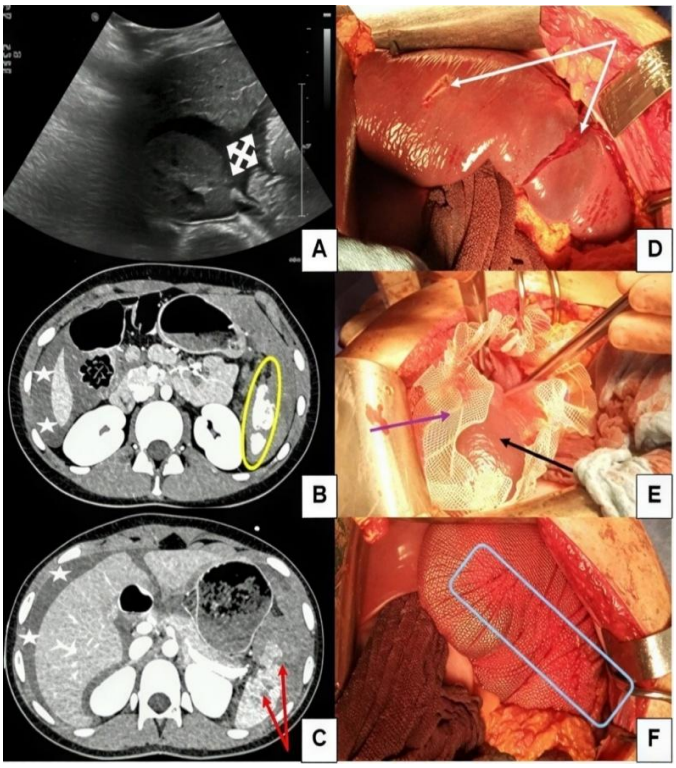
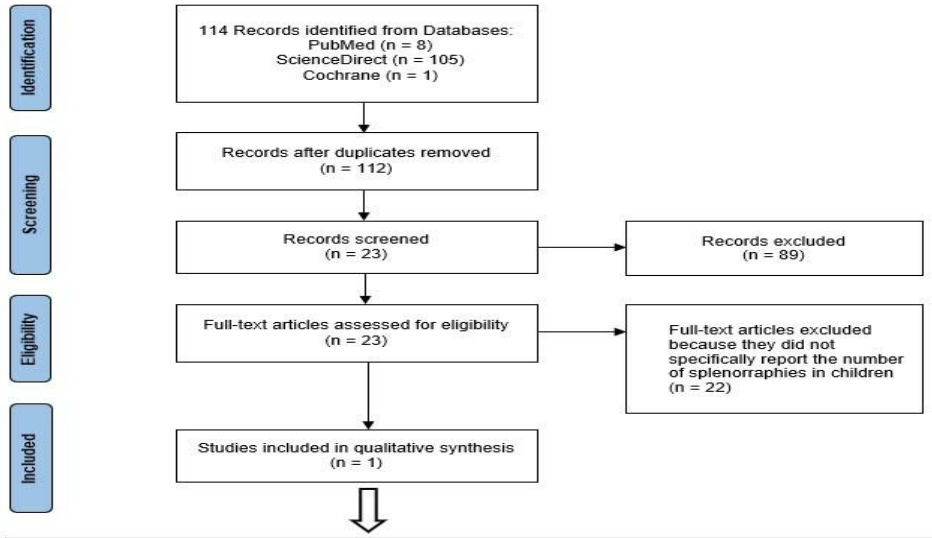


Figure 1: (A) An abdominal ultrasound exam showed a splenic rupture (white cross). (B) A contrast-enhanced abdominal CT scan in the early arterial phase highlighted diffuse haemoperitoneum (white stars) associated with acute splenic bleeding (yellow ellipse). (C) A contrast-enhanced abdominal CT scan in the late arterial phase demonstrated splenic lacerations (red arrows). (D-F) Absorbable mesh splenorrhaphy by exploratory laparotomy: using retractors, we exposed the spleen, highlighting several parenchymal lacerations (white arrows). Then, we installed the spleen (black arrow) in the absorbable mesh (purple arrow). Afterward, we sew the mesh around the injured organ, which acts as a self-healing sponge.



Author	Time length	Type of article	N[Δ]	Sex	Mean age (years)	Splenectomy	Splenorraphy	SEA
Arbuthnot	2004-2013	Retrospective Study	9567	6831 M 2736 F	10.4	201	76	43
Destinval	2022	Case Report	1	F	12.0	No	1	No

[Δ]**N:** Number of patients; **SEA:** Splenic Angio-Embolization; **M:** Male; F: **Female.**

Figure 2: Diagram flow of the literature review about splenorrhaphy in children with blunt trauma from 2004 to 2024 and article data

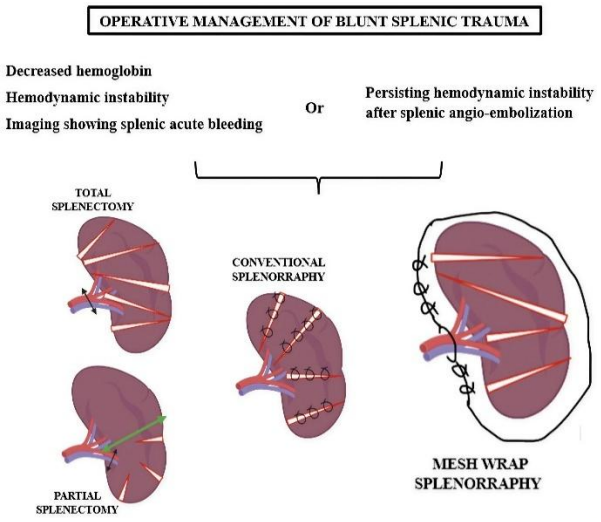


Figure 3: Operative management of blunt splenic trauma: in case of an isolated splenic lesion, an absorbable mesh splenorrhaphy is feasible with good outcomes. [5] Wrapping the mesh around the splenic parenchyma helps it self-heal. Conventional splenorrhaphy with direct sutures on the spleen may be more aggressive and can lead to persistent bleeding. Partial and total splenectomies may also be chosen, particularly in multiple life-threatening intra-abdominal organ injuries. [7]. (Figure created by Christelle Destinval using Biorender).

Peroperatively, we administered two blood transfusions, 1g of Tranexamic acid, and cefazolin antibiotic prophylaxis.

She received noradrenaline during surgery to sustain her haemodynamics. The anaesthesiologist also placed a right radial arterial catheter peroperatively. Blood loss was approximately 800 ml. She was then transferred to the intensive care unit, where she remained haemodynamically stable and never needed amines again. Analgesics were switched from fentanyl, nefopam, and paracetamol to nalbuphine and paracetamol within 24 hours. She tolerated oral intake on postoperative day one. On postoperative day two, the haemoglobin level was 95g/L while the abdominal ultrasound exam showed the regression of the splenic subcapsular haematoma and the haemoperitoneum, and no splenic artery pseudoaneurysm. She was then transferred to the paediatric surgery department. She had blood tests and abdominal ultrasound exams on postoperative days 5, 7, and 12, all of which were reassuring. She was discharged home on postoperative day 12, with a haemoglobin level of 100g/L.

The benefits of this conservative surgery compared to splenectomy are the preservation of the native spleen, which protects the patient from the risk of overwhelming-post-splenectomy infection, so it does not require any antibioprophylaxis or vaccines. A clinical, biological, and ultrasonographic monthly follow-up for three months showed the regression of the splenic laceration, and blood tests demonstrated the absence of Howell-Jolly bodies. A month later, she underwent splenic scintigraphy, which did not detect any accessory spleens. At a two-year follow-up, she is doing well.

Discussion

L. Dretzka was the first to report patients successfully treated by splenorrhaphy in 1930. Later, in 1968, P. Upadhyaya and J.S. Simpson convincingly advocated for conservative management in children, leading to the concept of Non-Operative Management (NOM),[6] which consists of strict bed rest and close monitoring of vital signs in the hospital, with or without arterial embolization.[3,4] It has considerably reduced the splenectomy rate and its complications, such as overwhelming post-splenectomy infection (OPSI), by preserving the spleen's immune function.[6]

However, operative management remains necessary in cases of haemodynamically unstable patients with blunt abdominal trauma. Splenorrhaphy with absorbable mesh is less aggressive than direct splenorrhaphy, as no direct suture is applied to the splenic parenchyma, which could favor bleeding. Nevertheless, surgeons tend to perform a partial or a total splenectomy rather than a splenorrhaphy.[7] We conducted a literature review using the terms “splenorrhaphy” OR “splenectomy” AND “Child” from 2014 to 2024 in PubMed, ScienceDirect, and Cochrane. Of the 105 findings, 23 English-language articles were fully available, and only one reported splenorrhaphy in children (Figure 2).

Arbuthnot *et al*. implied that splenorrhaphy could have been used instead of partial or total splenectomy. Nevertheless, as few pediatric surgeons will have to perform a splenorrhaphy during their career, it may explain why they choose partial or total splenectomy over absorbable mesh splenorrhaphy. Then, sponsoring this efficient surgical procedure through reporting and promoting its learning through simulation training is essential.[7] We suggest a possible algorithm for managing traumatic splenic rupture in children (Figure 3) subject to a more wider incidence reporting.

Conclusion

Operative management of traumatic splenic rupture is rare in children. Absorbable mesh splenorrhaphy is the least chosen surgical procedure, although it is easy to learn, efficient, reproducible, and protective of the spleen function. Simulation training should help surgeons to master this surgical technique.

Besides, a multicentric prospective study could be interesting for evaluating and promoting this procedure.

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Conflicts of interest

There are no conflicts of interest

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