Novel treatment (new drug/intervention; established drug/procedure in new situation)

Open partial splenectomy for trauma using GIA-Stapler and FloSeal matrix haemostatic agent

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Summary

A ruptured spleen caused by blunt abdominal injury is often treated by splenectomy. In view of the gravity of the 'postsplenectomy syndrome,' a conservative approach has been increasingly used. We present the case of a 29-year-old man with a Grade III splenic lesion for a blunt abdominal trauma after a car accident. We performed a partial splenectomy of the upper pole using GIA-Stapler. A supplemental haemostasis of the stapled line was successfully achieved by the application of FloSeal matrix haemostatic agent. The splenic remnant was fixed into the left-upper quadrant using human fibrin glue.

BACKGROUND

The spleen is one of the intraabdominal organs most frequently damaged in cases of blunt abdominal trauma. The severity of signs and symptoms or the lack of experience of the surgeon often leads to total splenectomy.¹ The spleen has important roles in organ defence, due to its filtering mechanism, phagocytosis and synthesis of complements factors and immunoglobulins.² Recognition of a life-long risk of serious infections after splenectomy, known as overwhelming postsplenectomy infections, led to radical changes in the management of splenic trauma, encouraging

splenic salvage techniques, including applications of haemostatic agents, splenorrhaphy and partial splenic resection.²⁻³ According to the literature, when at least 25% of healthy spleen parenchyma is preserved, all haematological immunological functions of this organ are kept.⁴⁻⁵

Splenic trauma is graded according to the standards of the Organ Injury Scaling (OIS) Committee published in 1989⁶: Grade 0 (subcapsular hematoma), Grade I (capsular tear), Grade II (superficial ruptures of the parenchyma without involvement of the hilus), Grade III (deep ruptures of the parenchyma, partly involving the hilus and segmental

Figure 1 Preoperative CT scan showing large hemoperitoneum associated with a traumatic rupture of the spleen.

Figure 2 (A-F) Postoperative CT scan showing staple line on the spleen.

arteries; massive fragmentation of one pole) and Grade IV (massive fragmentation of the whole organ and/or total hilar tear).

The splenic vasculature is segmental and highly variable. The splenic artery supplies the spleen and substantial portions of the stomach and pancreas. The splenic artery courses superior and anterior to the splenic vein, along the superior edge of the pancreas. Near the splenic hilum, the artery usually divides into superior and inferior terminal branches, and each branch further divides into four to six segmental intrasplenic branches. The superior terminal branches are usually longer than the inferior terminal branches and provide the major splenic arterial supply. A superior polar artery usually arises from the distal splenic artery near the hilum, but it may originate from the superior terminal artery. The inferior polar artery usually gives rise to the left gastroepiploic artery.⁷ The surgical anatomy of splenic vascularisation must be considered, as it can facilitate surgeons to perform partial resections.

In this report we describe the case of a young man presenting with splenic rupture for blunt abdominal trauma who underwent partial splenectomy.

CASE PRESENTATION

A 29-year-old man arrived at the emergency department following blunt abdominal trauma in a car accident. He presented with acute abdomen. A CT scan demonstrated a large hemoperitoneum associated with a traumatic rupture of the spleen with lesions in the superior polar segmental vessel (figure 1). The lesion was classified as Grade III, according to the standards of the OIS Committee. The patient underwent an urgent laparotomy. At laparotomy after aspiration of 2 L of blood, the spleen was mobilised with ligation of the gastrosplenic vessels and liberation of the spleno-pancreatic axis. The rupture of the upper pole was found, and the superior polar vessels were ligated, preserving the inferior polar branches. The splenic tissue was compressed digitally across normal parenchyma adjacent to

the injury. Only the capsule and vascular cords of connective tissue remained between the surgeon's fingers. Here we applied the GIA-75 stapler and removed the traumatised upper pole. On the staple line we applied the FloSeal matrix haemostatic agent (Baxter Healthcare, Fremont, California, USA) with complete haemostasis. In order to avoid torsion of the splenic remnant, it was positioned and fixed into the left-upper quadrant using human fibrin glue (Tissucol; Baxter Healthcare, Deerfield, Illinois, USA). His postoperative course was uneventful, and the patient was discharged on the 10th postoperative day. An abdomen CT scan was repeated 30 days later (figure 2A-F).

DISCUSSION

In the past years, a ruptured spleen caused by blunt abdominal injury was usually treated by splenectomy. Splenectomised patients have an acquired immunodeficiency state and are at increased life-long risk of serious infections. Because these patients are usually otherwise healthy and often relatively young, alternatives for total splenectomy have been sought.³ In the 1980s, partial stapled resection gained prominence and was a commonly performed procedure for elective and trauma surgery.⁴ Resection with stapler makes organ conservation possible in many cases, which would previously have required total splenectomy.⁶ Supplemental haemostasis of the parenchyma can be successfully performed by the application of fibrin glue or collagen fleece. FloSeal matrix haemostatic agent (Baxter Healthcare) consists of a gelatin matrix and a thrombin component, which are mixed together before use. Cross-linked gelatin granules in the matrix swell approximately 20% on contact with blood or bodily fluids, slowing blood flow. The coagulation cascade is activated by the thrombin component to form a firm haemostatic plug. These two processes combine to effect haemostasis by tamponade.⁵ We found it a quick and effective adjunct to the prevention of further bleeding from the cut surface of spleen. Furthermore, we recommend to fix the splenic remnant into the left-upper quadrant to avoid torsion of splenic tissue.⁴ In particular, we employed human fibrin glue.

Learning points

- ▶ Splenic trauma is graded according to the standards of the OIS Committee published in 1989 (Grade 0 to IV).
- ▶ In the past years, a ruptured spleen caused by blunt abdominal injury was often treated by splenectomy.
- ▶ The risk of postsplenectomy sepsis has encouraged the preservation of splenic tissue and functions whenever possible.
- ▶ When at least 25% of healthy spleen parenchyma is preserved, all haematological immunological functions of this organ are retained.
- ▶ Resection with stapler makes organ conservation possible in many cases that would previously have required total splenectomy. We performed a supplemental haemostasis of the parenchyma on the stapled line by the application of FloSeal matrix haemostatic agent.

In conclusion the decision about which procedure to use following splenic trauma depends on the severity of the lesion and on the condition of the patient. In trauma, both splenectomy and organ-preserving procedures remain in the domain of open surgery, particularly when the patient is not hemodynamically stable. In this case, we opted for the open approach. The laparoscopic treatment of splenic disorders has become easier and safer, thanks to technological advances and the increasing experience of surgeons. In the literature it has been recommended even for traumatic lesions to the organ, including techniques of splenic haemostasis, and total and partial splenectomy.^{9–14} The improvement of technical instrumentation, in addition to extensive experience with elective splenic surgery, will be essential factors to ensure that laparoscopy can become an effective procedure even in splenic surgery for trauma.

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Competing interests None.

Patient consent Obtained.

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