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## Left-sided portal hypertension: Successful management by laparoscopic splenectomy following splenic artery embolization



Damiano Patrono<sup>a</sup>, Rosa Benvenega<sup>a</sup>, Francesco Moro<sup>a</sup>, Denis Rossato<sup>b</sup>, Renato Romagnoli<sup>a</sup>, Mauro Salizzoni<sup>a,\*</sup>

<sup>a</sup> General Surgery 2U and Liver Transplantation Center, University of Turin, A.O.U. Città della Salute e della Scienza di Torino, Corso Bramante 88-90, 10126 Turin, Italy

<sup>b</sup> Radiology Department, University of Turin, A.O.U. Città della Salute e della Scienza di Torino, Corso Bramante 88-90, 10126 Turin, Italy

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## ABSTRACT

**INTRODUCTION:** Left-sided portal hypertension is a rare clinical condition most often associated with a pancreatic disease. In case of hemorrhage from gastric fundus varices, splenectomy is indicated. Commonly, the operation is carried out by laparotomy, as portal hypertension is considered a relative contraindication to laparoscopic splenectomy (LS). Although some studies have reported the feasibility of the laparoscopic approach in the setting of cirrhosis-related portal hypertension, experience concerning LS in left-sided portal hypertension is lacking.

**PRESENTATION OF CASE:** A 39-year-old man was admitted to the Emergency Department for haemorrhagic shock due to acute hemorrhage from gastric fundus varices. Diagnostic work up revealed a chronic pancreatitis-related splenic vein thrombosis causing left-sided portal hypertension with gastric fundus varices and splenic cavernoma. Following splenic artery embolization (SAE), the case was successfully managed by LS.

**DISCUSSION:** The advantages of laparoscopic over open splenectomy include lower complication rate, quicker recovery and shorter hospital stay. Splenic artery embolization prior to LS has been used to reduce intraoperative blood losses and conversion rate, especially in complex cases of splenomegaly or cirrhosis-related portal hypertension. We report a case of complicated left-sided portal hypertension managed by LS following SAE. In spite of the presence of large varices at the splenic hilum, the operation was performed by laparoscopy without any major intraoperative complication, thanks to the reduced venous pressure achieved by SAE.

**CONCLUSION:** Splenic artery embolization may be a valuable adjunct in case of left-sided portal hypertension requiring splenectomy, allowing a safe dissection of the splenic vessels even by laparoscopy.

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### 1. Introduction

The advantages of laparoscopic over open splenectomy are well-known and include reduced intraoperative blood losses, faster postoperative recovery, lower complication rate and shorter hospital stay.<sup>1</sup> Since its first description in 1991,<sup>2</sup> the indications for laparoscopic splenectomy (LS) have been widening and nowadays include most benign and malignant hematologic diseases as well as cases of massive splenomegaly (i.e. diameter > 20 cm).

Left-sided portal hypertension complicated by gastrointestinal hemorrhage represents an indication for splenectomy.<sup>3,4</sup> Due to the increased risk of intraoperative hemorrhage, portal hypertension

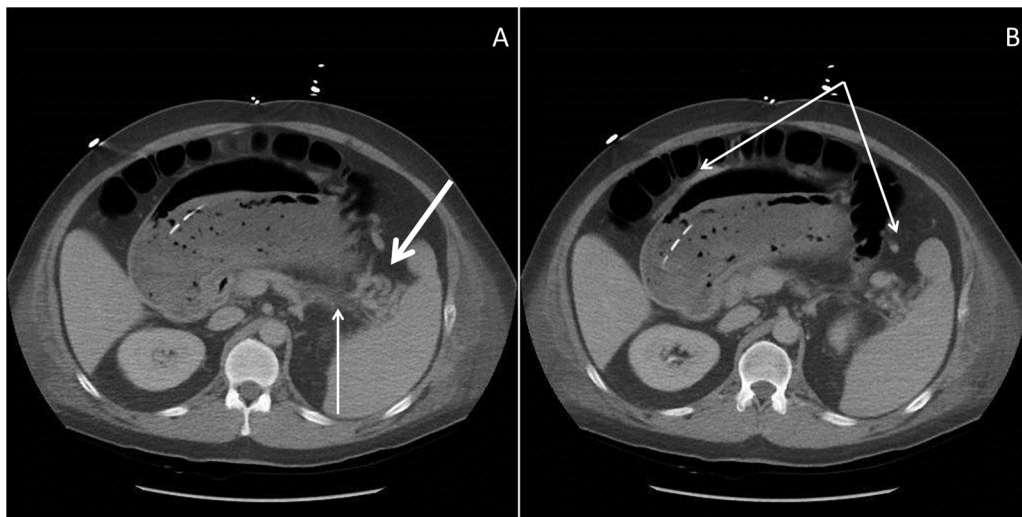
has been considered as a contraindication to LS.<sup>1</sup> Although some studies have shown the feasibility of laparoscopic splenectomy in patients suffering from cirrhosis-related portal hypertension,<sup>5–7</sup> the setting of left-sided portal hypertension presents peculiar diagnostic and management issues and possibly constitutes an even more challenging anatomic situation to the operating surgeon.

Here we report a case of left-sided portal hypertension complicated by gastric bleeding which was successfully managed by preoperative splenic artery embolization (SAE) followed by LS.

### 2. Case report

A 39-year-old man was admitted to the Emergency Department of our hospital for hematemesis and hemorrhagic shock. His previous medical history was significant for arterial hypertension, autoimmune thyroiditis and type 2 diabetes mellitus

\* Corresponding author. Tel.: +39 0116334374; fax: +39 0116336770.  
E-mail address: [mauro.salizzoni@unito.it](mailto:mauro.salizzoni@unito.it) (M. Salizzoni).



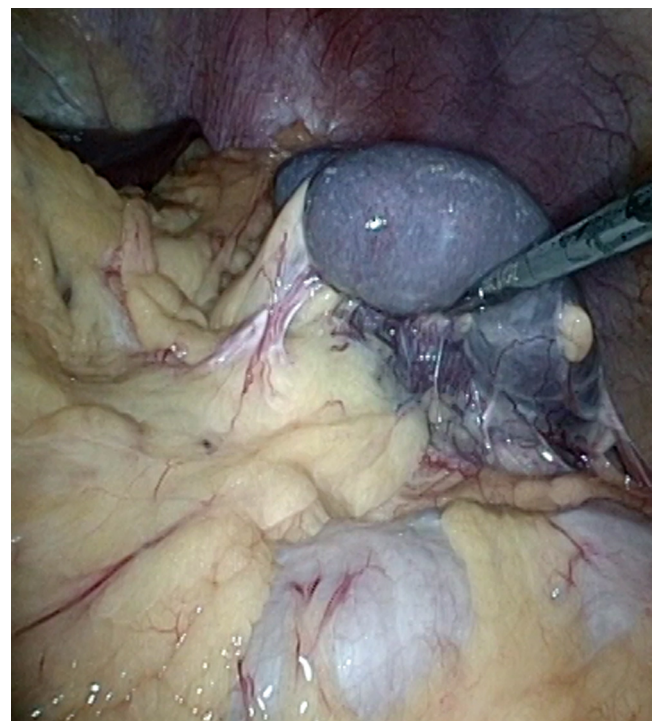
**Fig. 1.** Computed tomography showing the dilated stomach occupied by a huge blood clot, the severely atrophic pancreas and the splenomegaly. (A) Thrombosis of the splenic vein (thin arrow) and splenic cavernoma (thick arrow). (B) Dilated gastroepiploic vein functioning as a shunt from the splenic hilum to the superior mesenteric vein.

complicated by diabetic neuropathy, retinopathy and nephropathy leading to a stage 3 chronic renal failure. He reported no history of liver disease, alcohol abuse or exposure to hepatotoxic substances. Noteworthy, during the week before admittance, he had assumed large doses of non-steroidal anti-inflammatory drugs for his neuropathic lower limbs pain. After initial resuscitation, an emergency esophagogastroduodenoscopy (EGDS) showed a huge clot in the stomach with signs of active bleeding, but the source of hemorrhage could not be identified. During the procedure he presented a cardiac arrest requiring cardiopulmonary resuscitation for 10 min. Once hemodynamic stability achieved, he was transferred to the intensive care unit where the administration of high-doses of proton pump inhibitors was started. Abdominal Doppler ultrasonography showed no sign of liver disease and a normal flow into the vena porta, but the pancreas and spleen region were poorly assessed because of the important abdominal meteorism. A further EGDS again failed in identifying the source of bleeding, so a celio-mesenteric arteriography was obtained, showing no arterial blush. During the following days, the patient presented two further episodes of gastrointestinal hemorrhage and was repeatedly transfused with packed red blood cells and plasma. An abdominal contrast-enhanced computed tomography (CT) was then obtained, revealing a severe atrophy of the whole pancreas with signs of chronic pancreatitis, a thrombosis of the splenic vein, a splenomegaly and a cavernomatous transformation of the splenic hilum (Fig. 1). A third EGDS performed after the remission of bleeding showed the presence of large, isolated varices of the gastric fundus, with signs of recent bleeding. As a whole, these findings were consistent with a diagnosis of left-sided portal hypertension complicated by gastrointestinal hemorrhage from isolated gastric fundus varices. Thus, the patient was scheduled for a splenectomy that, given the limited entity of the splenomegaly (longitudinal diameter = 17 cm), was deemed feasible by the laparoscopic approach. In order to reduce the intraoperative bleeding, a splenic artery embolization was carried out 24 h prior to the operation, by means of two vascular plugs (Amplatzer® Vascular Plug, St. Jude Medical Inc., MN, USA) and a coil (Cirrus .015, Balt Extrusion, Montmorency, France), which were released proximally to the splenic hilum region. At operation, the spleen was completely ischemic and, although a reticulum of varices was observed at the splenic hilum (Fig. 2), the dissection could be achieved by laparoscopy. The splenic artery, the gastroepiploic and splenic veins and the short gastric vessels were divided by the mean of an endoscopic vascular

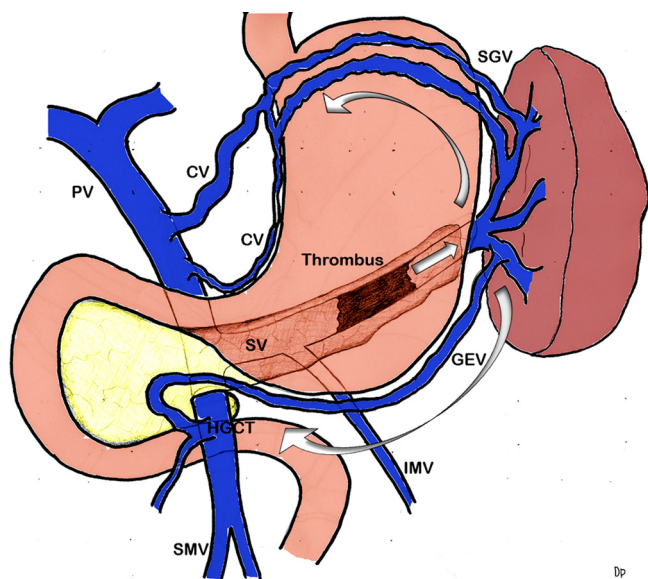
stapler. Blood losses were minimal and no intraoperative complications occurred. The spleen was extracted through one of the port sites after morcellation. The postoperative course was uneventful and he was discharged from our department on postoperative day 4; at one-year follow-up he is alive and presented no further episode of gastric bleeding from gastric varices.

### 3. Discussion

This report describes the successful management of a case of left-sided portal hypertension complicated with gastric bleeding by the association of pre-operative splenic artery embolization and laparoscopic splenectomy.



**Fig. 2.** An intraoperative snapshot showing the dense reticulum of varices at the splenic hilum and the ischemic spleen after splenic artery embolization.



**Fig. 3.** A scheme of the venous flow redistribution from the splenic hilum to the coronary veins through the short gastric and posterior veins, and to the superior mesenteric vein through the gastroepiploic vein. *Abbreviations:* PV, portal vein; CV, coronary veins; SGV, short gastric veins; SV, splenic vein; GEV, gastroepiploic vein; HGCT, Henle's gastrocolic trunk; IMV, inferior mesenteric vein; SMV, superior mesenteric vein.

Our patient presented with severe upper gastrointestinal hemorrhage which led to the diagnosis of gastric fundus varices, pancreas atrophy, splenic vein thrombosis and left-sided portal hypertension. In spite of the negative anamnesis, we can argue that both the type 2 diabetes and the splenic vein thrombosis were the issue of a clinically-silent chronic pancreatitis of unknown etiology. In patients suffering from chronic pancreatitis, indeed, the incidence of splenic vein thrombosis is estimated to be around 12%.<sup>8</sup> Splenic vein thrombosis (SVT) may be associated with a segmental, or left-sided, form of portal hypertension. In this condition the venous drainage of the spleen is redirected through the short and posterior gastric vessels to the coronary veins (draining into the vena porta) and through the gastroepiploic veins to the superior mesenteric vein, respectively. The submucosal venous reticulum of the gastric fundus represents the anatomic bridge between the short and posterior gastric veins and the coronary veins and, as a consequence of the increased pressure, may dilate into varices and originate bleeding (Fig. 3).<sup>3</sup>

If the indication for splenectomy remains controversial in patients with uncomplicated left-sided portal hypertension,<sup>3,9,10</sup> bleeding from gastric varices represents a widely recognized indication for splenectomy.<sup>4</sup> The rationale for splenectomy in this setting is to interrupt the arterial supply feeding the collateral draining veins and the gastric fundus varices, thus reducing the pressure of the system and, consequently, the risk of re-bleeding.<sup>3</sup>

Concerning the choice of the surgical approach, the advantages of laparoscopic over open splenectomy are well-known and include reduced postoperative pain, lower complication rate, quicker recovery and shorter hospital stay. Nonetheless, according to the 2008 EAES guidelines on laparoscopic splenectomy,<sup>1</sup> portal hypertension represents a contraindication to laparoscopy, given the higher risk of intra-operative hemorrhage. Since the publication of these guidelines, a few articles have shown the feasibility of the laparoscopic technique in patients with portal hypertension associated with liver cirrhosis.<sup>5–7</sup> No patient in these series, however, has been reported to have left-sided portal hypertension, which clearly represents a very different anatomic setting from cirrhosis-related portal hypertension. In left-sided portal hypertension, indeed, the

splenic hilum is the fulcrum of the hypertensive venous system, from which all the venous collaterals, i.e. the dilated short gastric, posterior gastric and gastroepiploic veins, branch off. In this setting, a safe dissection of the “splenic cavernoma” by laparoscopy may be even more hazardous than in patients with liver cirrhosis.

For this reason we considered pre-operative SAE as a mean to reduce the venous pressure at the splenic hilum and to allow a safer and easier dissection of the splenic vessels, which was successfully accomplished by laparoscopy. Splenic artery embolization is not devoid of potential complications, including splenic rupture, acute pancreatitis, gastric ulcer, pleural effusion, lung atelectasis, sepsis and the so-called “post-infarction syndrome”, represented by abdominal pain, leukocytosis and fever. However, the incidence of these complication can be reduced by proper technique, antibiotic coverage and effective analgesia.<sup>11</sup> One of the first studies about the combination of SAE with LS was that of Poulin et al.<sup>12</sup> reporting an initial decrease in the conversion rate associated with preoperative SAE, which was successively overtaken by the acquisition of a more effective surgical technique. Reso et al.<sup>13</sup> used SAE before LS in patients with splenomegaly suffering mostly from hematologic malignancies and found it associated with reduced blood losses, a shorter operative time and a reduced conversion rate. Hama et al.<sup>6</sup> used preoperative splenic artery occlusion with a balloon in patients undergoing LS for cirrhosis-related portal hypertension and splenomegaly, obtaining results comparable to those of LS in patients with normal-size spleens and no portal hypertension. Finally, Wu et al.<sup>14</sup> compared SAE plus LS versus LS alone and open splenectomy in the setting of splenomegaly. Noteworthy, the most frequent indication for splenectomy in their study was liver cirrhosis. They found that the patients treated with SAE plus LS had less intraoperative blood loss, lower complication rate and shorter hospital stay, concluding that SAE is a valuable adjunct in patients with splenomegaly. In our case, in consideration of the expected technical difficulties, SAE clearly seemed to have an advantageous risk/benefit ratio, which was confirmed during the operation: in spite of the presence of large and numerous varices, the splenic hilum could be dissected easily and the splenic vessels safely controlled.

#### 4. Conclusion

Splenic artery embolization represents a precious adjunct in the management of complex cases requiring LS, as in patients with an enlarged spleen in the setting of complicated left-sided portal hypertension.

#### Conflict of interest statement

None.

#### Funding

None.

#### Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contributions

Damiano Patrono wrote the paper, obtained the informed consent, processed the digital images and performed the literature



search; Rosa Benvenega was the resident in charge of patient care, performed the literature search and helped in writing the paper; Francesco Moro performed the laparoscopic splenectomy and critically revised the manuscript; Denis Rossato performed the splenic

artery embolization and critically revised the manuscript; Renato Romagnoli critically revised the manuscript; Mauro Salizzoni was the overall responsible for the care of the patient, supervised and critically revised the manuscript.

### Key learning point

- Splenic artery embolization allowed a safe dissection of splenic vessels during laparoscopic splenectomy for complicated left-sided portal hypertension.

### References

1. Habermalz B, Sauerland S, Decker G, Delaitre B, Gigot JF, Leandros E, et al. Laparoscopic splenectomy: the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES). *Surg Endosc* 2008;**22**:821–48.
2. Delaitre B, Maignien B. Splenectomy by the laparoscopic approach. Report of a case. *Presse Med* 1991;**20**:2263.
3. Koklu S, Coban S, Yuksel O, Arhan M. Left-sided portal hypertension. *Dig Dis Sci* 2007;**52**:1141–9.
4. Wang L, Liu GJ, Chen YX, Dong HP, Wang LX. Sinistral portal hypertension: clinical features and surgical treatment of chronic splenic vein occlusion. *Med Princ Pract* 2012;**21**:20–3.
5. Cai YQ, Zhou J, Chen XD, Wang YC, Wu Z, Peng B. Laparoscopic splenectomy is an effective and safe intervention for hypersplenism secondary to liver cirrhosis. *Surg Endosc* 2011;**25**:3791–7.
6. Hama T, Takifuji K, Uchiyama K, Tani M, Kawai M, Yamaue H. Laparoscopic splenectomy is a safe and effective procedure for patients with splenomegaly due to portal hypertension. *J Hepatobiliary Pancreat Surg* 2008;**15**:304–9.
7. Tomikawa M, Akahoshi T, Sugimachi K, Ikeda Y, Yoshida K, Tanabe Y, et al. Laparoscopic splenectomy may be a superior supportive intervention for cirrhotic patients with hypersplenism. *J Gastroenterol Hepatol* 2010;**25**:397–402.
8. Butler JR, Eckert GJ, Zyromski NJ, Leonardi MJ, Lillemoe KD, Howard TJ. Natural history of pancreatitis-induced splenic vein thrombosis: a systematic review and meta-analysis of its incidence and rate of gastrointestinal bleeding. *HPB (Oxford)* 2011;**13**:839–45.
9. Heider TR, Azeem S, Galanko JA, Behrns KE. The natural history of pancreatitis-induced splenic vein thrombosis. *Ann Surg* 2004;**239**:876–80, discussion 880–2.
10. Agarwal AK, Raj Kumar K, Agarwal S, Singh S. Significance of splenic vein thrombosis in chronic pancreatitis. *Am J Surg* 2008;**196**:149–54.
11. Madoff DC, Denys A, Wallace MJ, Murthy R, Gupta S, Pillsbury EP, et al. Splenic arterial interventions: anatomy, indications, technical considerations, and potential complications. *Radiographics* 2005;**25**(Suppl. 1): S191–211.
12. Poulin EC, Mamazza J, Schlachta CM. Splenic artery embolization before laparoscopic splenectomy. An update. *Surg Endosc* 1998;**12**:870–5.
13. Reso A, Brar MS, Church N, Mitchell P, Dixon E, Debru E. Outcome of laparoscopic splenectomy with preoperative splenic artery embolization for massive splenomegaly. *Surg Endosc* 2010;**24**:2008–12.
14. Wu Z, Zhou J, Pankaj P, Peng B. Comparative treatment and literature review for laparoscopic splenectomy alone versus preoperative splenic artery embolization splenectomy. *Surg Endosc* 2012;**26**:2758–66.

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