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ANATOMIC VARIATIONS

Aberrant splenic artery rising from the superior mesenteric artery: a rare but important anatomical variation

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Abstract
Aberrant splenic artery originating from the superior mesenteric artery (SMA) is extremely rare and recognition of this anomaly is important in the pre-operative planning of complex surgery such as pancreatic surgery, liver transplantation and vascular surgery. We present the case of an 80-year-old female diagnosed as septic shock due to mesenteric ischemia and obstructive pyelonephritis. Her splenic artery was originating from the SMA and the anomaly was readily appreciated on the pre-operative CT images. An explorative laparotomy associating extensive small bowel resection with endarterectomy of the proximal part of the SMA was performed. During intra-operative SMA control, we confirmed the aberrant splenic artery arising from SMA, and successfully avoid any arterial injury on the splenic artery with isolation and separated proximal and distal clamping. The anatomical vascular variation should be recognized in the pre-operative work-up of a determined surgical procedure to avoid potential intra-operative arterial injuries.

Keywords Splenic artery · Superior mesenteric artery · Anatomic variations · Mesenteric ischemia

Introduction

The splenic artery is the largest and most tortuous branch of the celiac trunk, which courses laterally to the left, posterior to the stomach, and along the superior border of the pancreas [4]. An aberrant splenic artery originating from the superior mesenteric artery is very uncommon anatomical variant, with a reported prevalence between 0.03% and 1% [1–3, 5]. For determined surgical procedures, it is imperative to know the anatomic location of the splenic artery.

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Case report

We present the case of an 80-year-old female referred to the emergency department due to lower limbs swelling and general poor condition. In her past medical history there was a type II diabetes, arterial hypertension and cardiac disease. During physical examination the patient was hypothermic with arterial hypotension and tachycardia. Bilateral lower limb edema and diffuse abdominal pain with guarding were present. The patient had received a placement of double J stent due to acute pyelonephritis 2 years before the admission, and an abdominal ultrasound showed a dilated right renal pelvis with obstructed double J stent. An arterial blood gas tests showed a severe metabolic acidosis. A CT scan showed a necrotic small bowel due to an occlusion of the proximal part of the superior mesenteric artery. A vascular anatomical variant—a splenic artery originating from the SMA—was readily appreciated on the coronal and 3D reconstruction of CT images (Fig. 1a–c). CT images were acquired with a 320-row scanner (Aquilion ONE Vision Edition, Toshiba Medical Systems, Otawara, Japan), using the following parameters: tube voltage 120 kV, gantry rotation time of 0.275 s, pitch of 0.813, automated tube current modulation with mA maxed at 400. CT acquisition was obtained within a single breath hold before and after a bolus injection of 100 mL of Ioméprol 400 mg/mL (Iomeron

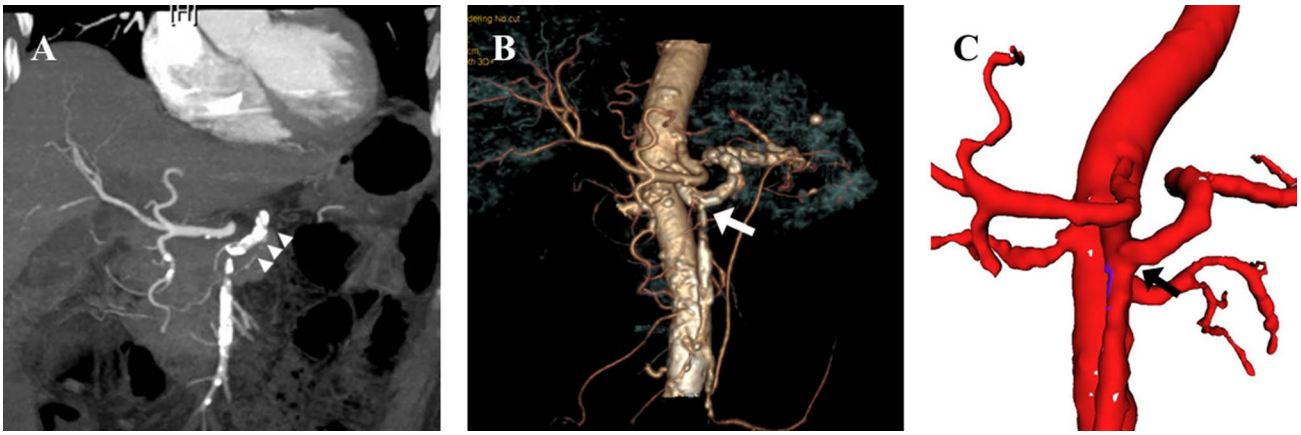

Fig. 1 Pre-operative computed tomography images. A coronal view shows the splenic artery (arrow head) origins from superior mesenteric artery (SMA) (**a**). A volume rendering image (**b**) and 3D surgical planning with VP planning™ (**c**) of celiac arteries shows the splenic artery originating from the confluence with SMA (arrow) in right anterior oblique view

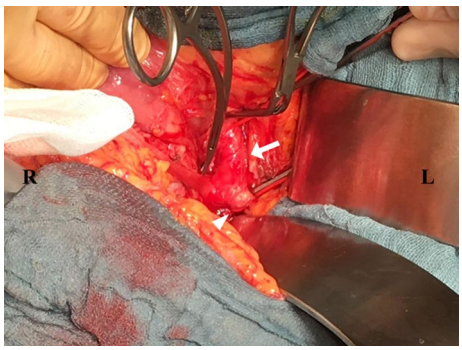

Fig. 2 Intra-operative image. The confluence of splenic artery (arrow) and superior mesenteric artery (arrow head) was shown

400, Bracco, Milan, Italy). Images were reconstructed in millimetric axial slices using iterative reconstruction (AIDR 3D, set in standard mode). The patient pre-operative diagnosis was septic shock due to mesenteric ischemia and obstructive pyelonephritis. Consequently, an explorative laparotomy associating extensive small bowel resection with endarterectomy of the proximal part of the SMA and replacement of ureteric stents were performed. Four and 30 cm of small bowel were resected, SMA patency was restored with an endarterectomy and a pericardial patch angioplasty, sutured with a 6/0 polypropylene running suture; the occluded double J stent was replaced with a single J stent. During intra-operative SMA control, we confirmed the aberrant splenic artery arising from SMA, and successfully avoid any arterial injury on the splenic artery with isolation and separated proximal and distal clamping (Fig. 2a–c). A laparostomy was then performed without intestinal anastomosis. A systematic second look was performed after 48 h and restoration of bowel continuity with a jejunoileal anastomosis was performed. Forty-five centimeters of viable small bowel were present. The entire colon was normal. The patient was discharged in good conditions on the post-operative day 9.

Discussion

This aberrant splenic artery arises embryologically from alterations in the four splanchnic roots: the left gastric artery, the splenic artery, the common hepatic artery, and the SMA [2]. Normally there is closure of the third and fourth splanchnic root with a consequent classic origin of the splenic artery from the coeliac trunk; when alterations of this process are seen, aberrancy of the splenic artery can be present [6]. In a study concerning the splenic artery position in relation to the pancreas, a suprapancreatic course of the artery was commonly observed (74.1%) followed by anteropancreatic (18.5%), intrapancreatic (4.6%), and retropancreatic (2.8%) courses [4]. In the presented case, the artery was entirely retropancreatic due to the variant. To our knowledge, in the present literature, only another case of retropancreatic aberrant splenic artery originating from SMA was described [1]. In different surgical procedures, such as distal pancreatectomy or pancreaticoduodenectomy, liver transplantation and vascular surgery, it is important to know the anatomic location of the splenic artery because unforeseen variants could possibly lead to inadvertent iatrogenic vascular injuries. This can potentially increase the procedure complexity with possible additional morbidity and mortality.

Conclusions

Anatomical vascular variations should be recognized in the pre-operative work-up of a determined surgical procedure to avoid potential intra-operative arterial injuries. Aberrant splenic artery originating from the superior mesenteric

artery is extremely rare and recognition of this anomaly is important in the pre-operative planning of complex surgical procedures.

Author contributions EF and PP contributed to the project design. EF, TW, PM, ZC, and VF collected the imaging data. EF and TW analyzed the imaging data. EF and TW wrote the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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