



Indocyanine Green (ICG) for the assessment of splenic perfusion during laparoscopic splenic artery aneurysmectomy.

A case report



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Indocyanine Green (ICG) for the assessment of splenic perfusion during laparoscopic splenic artery aneurysmectomy. A case report.

CASE REPORT: We describe the case of a 54-year-old man with a 20mm splenic aneurysm, who underwent laparoscopic aneurysmectomy, without splenic removal. The residual splenic blood supply was assessed by using indocyanine green *i.v.* administration.

CLINICAL FINDINGS: The patient presented at ED with abdominal pain, syncopal episode, and tachycardia. A CT scan with contrast showed hemoperitoneum with a 20mm splenic aneurysm, which was located at the bifurcation of the splenic and left gastroepiploic artery.

Treatment and Outcome Laparoscopic surgery was then warranted. Abdominal exploration revealed a serohemorrhagic collection without active source of bleeding. After opening the gastro-colic ligament and obtaining vascular control of the splenic artery, the aneurysm was clipped and resected. No macroscopic modifications occurred to the spleen. This finding was confirmed by intravenous administration of indocyanine green. The operating time was 265 minutes. During the postoperative course, a grade A pancreatic fistula occurred. The patient was discharged on postoperative day seventh.

CLINICAL RELEVANCE: The management of true splenic artery aneurysms should be patient-tailored, considering the location of the aneurysm, operative risks and the patient's age, life expectancy and clinical status. The use of ICG in splenic surgery helps delineate the splenic parenchyma and evaluate residual splenic vascularization.

KEY WORDS: Indocyanine Green, Laparoscopy, Mini-invasive Surgery, Splenic Artery Aneurysm

Introduction

Splenic artery aneurysm (SAA) is the third most common abdominal aneurysm following aortic and iliac aneurysms. However, although these aneurysms represent the majority among splanchnic aneurysms, they are uncommon in the adult population¹. Management of true SAAs is challenging, since most recommendations come from small cohort studies. Moreover, the diagno-

sis is often incidental due to their asymptomatic but potentially life-threatening nature. The etiology of splenic artery aneurysms remains unclear although SAAs seem to be associated with some conditions like collagen vascular disease, α -1-antitrypsin deficiency, hemodynamic and endocrine changes during/linked with pregnancy, and portal hypertension¹.

SAAs should be treated when symptomatic or when bigger than 2 cm even if asymptomatic, moreover it is highly recommended to treat SAAs during pregnancy or in women of childbearing-age.

The current management strategies include conservative observation with radiographic surveillance; endovascular treatment such as transcatheter embolization or stenting; open or laparoscopic surgery consisting of aneurysm ligation or resection followed by eventual arterial reconstruction or splenectomy if necessary when the residual

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vascularization is insufficient². This latter aspect still remains a challenge. Spleen preservation requires a sufficient residual blood supply to the spleen. Currently, there is no consensus about the quickest and safest method of blood supply evaluation.

Some authors propose the macroscopic evaluation of the organ after the aneurysmectomy, whereas others refer to intraoperative techniques like color Doppler ultrasonography or intraoperative fluorescence imaging. The appropriate indication for intervention and the operative technique for splenic artery aneurysms treatment remain controversial.

Case Description

A 54-year-old man was admitted to our Emergency Department for abdominal pain and syncopal episode. He had no episode of abdominal trauma, pancreatitis or portal hypertension. In his medical history, he had undergone right hemicolectomy for high grade dysplasia polyposis and subsequently, a robotic retromuscular hernia repair with bilateral transversus release (TARR) and polypropylene mesh for incisional hernia. At admission, tachycardia and pain on palpation at the periumbilical region without signs of peritonism were present. The patient underwent abdominal computed tomography that detected hemoperitoneum without a detectable active source, and a dimensional growth of a known splenic aneurysm (Fig. 1), which was better defined through vascular reconstruction (Fig. 2).

Due to the size (> 2 cm) and perihilar location (bifurcation in true splenic and left gastroepiploic artery) of the aneurysm, the presence of a hemoperitoneum, and a tendency to present hemodynamic instability, surgery was warranted. A laparoscopic approach was adopted (see video attached). The optic camera was introduced through the trocar inserted at the umbilicus; we used a 10mm, 30° laparoscope. Two trocars were introduced at

the right mid clavicular line and one at the left mid-clavicular line, for a total of three operative trocars. Abdominal exploration revealed a serohemorrhagic collection without active source of bleeding.

The exposure of the upper board of the pancreas was reached by opening the gastro-colic ligament. Vascular control was guaranteed by isolating and looping the proximal splenic artery. The aneurysm was clipped and resected with sharp dissection. The aspect of the spleen remained roughly unchanged after the aneurysmectomy. Furthermore, we administered intravenous indocyanine green that confirmed the validity of the residual perfusion of the spleen with the exception of a centimetric area at the lower pole (Fig. 3).

The operating time was 265 minutes. Histological examination showed loss of the muscular layer, arterial intimal hyperplasia with a small atherosclerotic plaque, and Monckeberg's calcific sclerosis of the tunica media. During the postoperative course, a grade A pancreatic fistula occurred. The patient was discharged seven days after surgery.

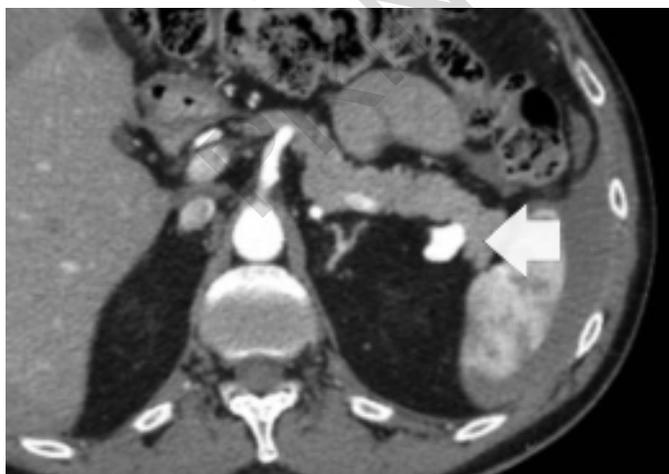


Fig. 1

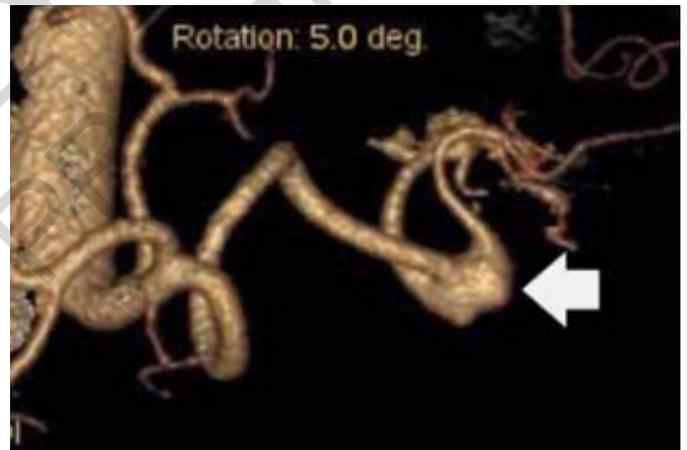


Fig. 2

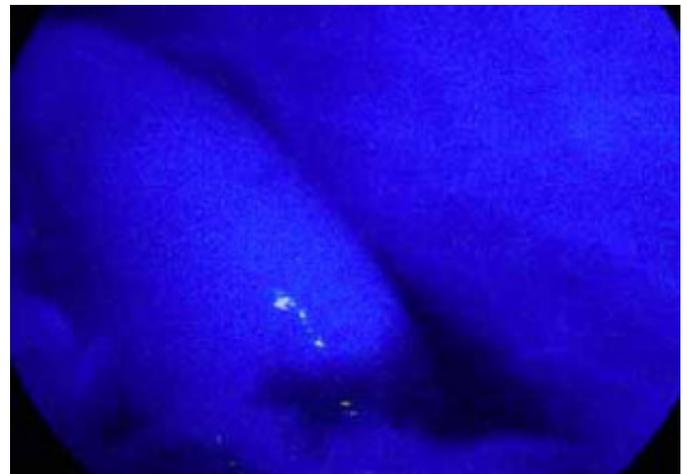


Fig. 3

Discussion

The management of true splenic artery aneurysms is challenging and must take into account patient's comorbidities and general performance status. Management strategies consist of a conservative approach, endovascular repair or surgical management. The clinical decision should be tailored on the basis of the location of the aneurysm, operative risks and the patient's age, life expectancy and clinical status. Endovascular treatment has better short-term results and lower post-procedure mortality, whereas surgery is associated with lower incidence of relapse and reintervention during follow-up³. The laparoscopic procedure can be led using either a lateral or an anterior approach^{4,5}. In the present case, we adopted an anterior approach in order to maintain good control over the whole abdomen. CT scan and vascular tridimensional reconstructions allowed us to plan the access to the aneurysm preoperatively. Splenic artery aneurysm can be treated with proximal and distal ligation but if the anatomic relationship with the pancreas makes it feasible, the aneurysm itself can be excised. We gained early control over the artery and this allowed us to dissect its entire course and finally proceed with the excision of the aneurysmal tract. While splenectomy may be required if the aneurysm is located at the hilus of the spleen⁶, spleen preservation remains the goal in order to prevent future complications associated with splenectomy. Aiming to avoid splenectomy, some authors proposed an empirical criterion for evaluating the adequacy of splenic blood supply based on the color of the spleen after the aneurysmectomy⁷. Other authors proposed an intraoperative color Doppler ultrasonography to check arterial flow signal inside the spleen before and after exclusion of the artery as essential to decide the appropriate procedure⁸. More recently, intraoperative fluorescence imaging has been used to evaluate the residual splenic blood supply. In the present case, intravenous administration of indocyanine green was fundamental in order to check the splenic vascular supply after aneurysmatic resection. Indocyanine green (ICG) is usually used in the evaluation of residual vascularization during colorectal surgery, and flap perfusion during reconstructive surgery⁹. The use of ICG in splenic surgery was recently described during a case of laparoscopic pseudocystectomy. This allowed a complete delineation of vital splenic parenchyma, allowing its preservation¹⁰. In the present case, the use of indocyanine green allowed us to safely avoid splenectomy. In conclusion, elective surgical treatment is indicated for the aneurysms exceeding 2 cm. Perihilar position and patient age reinforce the indication for surgical management. Spleen preservation remains the challenge and several existing techniques may help evaluating residual splenic blood supply after aneurysmectomy. None of these methods is definitely superior to the others, due to the rarity of the disease and the lack of large stud-

ies. The use of ICG in splenic surgery helps delineate the splenic parenchyma and evaluate residual splenic vascularization.

Riassunto

Un'adeguata gestione degli aneurismi dell'arteria splenica richiede una attenta valutazione della posizione dell'aneurisma, dei rischi operatori, dell'età e dello stato clinico del paziente. L'uso del verde di indocianina nella chirurgia splenica aiuta a valutare il parenchima splenico e la vascularizzazione residua. Riportiamo il caso di un uomo di 54 anni giunto in pronto soccorso con dolore addominale, episodio sincopale e tachicardia. La TAC con mezzo di contrasto evidenziava emoperitoneo con un aneurisma splenico di 20 mm, localizzato in sede perilare. Vista la stabilità emodinamica, il paziente veniva sottoposto ad esplorazione laparoscopica, in cui si evidenziava una raccolta sieremorragica senza segni di sanguinamento attivo. Dopo aver aperto il legamento gastro-colico e ottenuto il controllo vascolare dell'arteria splenica, l'aneurisma è stato resecato. Non sono state identificate modifiche macroscopiche alla milza. Tale reperto è stato confermato anche dalla somministrazione endovenosa di verde indocianina. Durante il decorso postoperatorio, è comparsa una fistola pancreatica di grado A, risoltasi con la sola terapia medica. Il paziente è stato quindi dimesso in settima giornata postoperatoria.

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