Endovascular treatment of an arterioportal fistula following pancreaticoduodenectomy

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ABSTRACT

We present a rare case of an arterioportal fistula that formed between the superior mesenteric artery and portal vein 30 days following a pancreaticoduodenectomy, which was successfully managed with endovascular procedures.

KEYWORDS

Arterioportal fistula – Whipple – Pancreaticoduodenectomy – Pseudoaneurysm – Arteriovenous fistula

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Case report

The patient was a 77-year-old male with a past medical history significant for hypertension, hyperlipidaemia and gout, who underwent a pancreaticoduodenectomy for a 3.5cm pancreatic ductal adenocarcinoma. He had received neoadjuvant chemotherapy and stereotactic beam radiation therapy prior to the procedure. Intraoperatively, the tumour was found to be densely adherent to a small area of the portal vein and a 1-cm segment of the superior mesenteric artery (SMA). The SMA was skeletonised and the specimen was successfully removed with negative margins. The patient had an uneventful postoperative course and was discharged home six days later.

The patient was readmitted approximately three weeks later with fevers, hypotension and tachycardia. Workup included computed tomography (CT) of the abdomen and pelvis, which demonstrated multiple abdominal fluid collections. He was started on broad spectrum intravenous antibiotic therapy and underwent image guided drain placement of the fluid collections.

On hospital day eight, thirty days following the original procedure, the patient had bright red bleeding per rectum in addition to acute drop in haemoglobin and hypotension. CT angiogram was performed and revealed a fistulous connection between the SMA and portal vein, as well as a gastroduodenal artery (GDA) pseudoaneurysm (Fig 1). These findings were subsequently confirmed by arteriogram (Fig 2). The GDA pseudoaneurysm was embolised and the arterioportal fistula partially embolised, in addition to a bleeding jejunal branch of the SMA (Fig 3). The patient, however continued to require transfusions and had more episodes of melaena. He

underwent repeat arteriogram and the pancreatic artery was found and coiled, as well as the inferior pancreatic artery arising from the middle colic artery. He subsequently underwent an SMA stent placement at the site of the fistula and was initially stable (Fig 4) but then developed an acute drop in his haemoglobin, which prompted another arteriogram. The arteriogram suggested further extravasation near the dorsal pancreatic artery, which it was not possible to access due to tortuosity. As such, the proximal–mid splenic artery was

Figure 1 Axial computed tomography in the liver window showing contrast enhancement in the region of the gastroduodenal artery suspicious for a pseudoaneurysm

Figure 2 Arteriogram of the superior mesenteric artery (SMA) revealing fistula between the proximal SMA and portal vein, with reduced flow in the distal branches of the SMA

Figure 3 Arteriogram of the superior mesenteric artery demonstrating reduced flow in the arterioportal fistula following coil embolisation

embolised (Fig 5). The patient's haemoglobin stabilised and he was discharged to a skilled nursing facility.

Discussion

Classification

Arterioportal fistulas were first described by Weigert in 1886 and are defined as vascular communications between systemic arteries and the portal circulation. Guzman and colleagues classified arterioportal fistulas into three subtypes, with type one representing small peripheral asymptomatic fistulas with minimal physiological insult, type two indicating larger fistulas that result in physiological effects and type three characterising congenital fistulas.¹ Using the

classification system, the fistula described in this case report would be a type two fistula. The inflow artery in an arterioportal fistula is most commonly the hepatic artery (65%), followed by the splenic artery (11%) and the superior mesenteric artery (10%).²

Aetiology

Acquired arterioportal fistulas can result from direct hepatic trauma,³ interventional procedures,⁴ splanchnic artery aneurysms,⁵ as a result of surgery,⁶ or they can occur

Figure 4 Stenting of the superior mesenteric artery with (a) the guide wire in place prior to (b) stent deployment. No evidence of continued flow (c) into the portal vein following the procedure

Figure 5 Arteriogram of the coeliac axis with demonstration of (a) extravasation from the dorsal pancreatic artery, which is halted by (b) coil embolisation of the proximal-mid splenic artery

spontaneously due to cirrhosis⁷ or tumours.⁸ Iatrogenic arterioportal fistulas are often caused by suture or biopsy needle injury to an artery and the portal vein or mass ligation of mesenteric vessels.² They have also arisen as a complication of radiofrequency ablation of liver malignancies.⁹ It is likely that contributing factors in this case included the formation of intra-abdominal collection and skeletonisation of the SMA, both of which have been linked to increased rates of haemorrhage following pancreaticoduodenectomy.^{10,11}

Presentation

The majority of patients with arterioportal fistulas are asymptomatic, although symptoms can manifest due to alterations in portal pressure. Typical manifestations include gastrointestinal bleeding, ascites, congestive heart failure and diarrhoea.² Portal hypertension is more likely to develop if a larger inflow artery is involved, such as was the situation with this case. Liver function tests are usually preserved and liver architecture is normal on biopsy. The delay between

fistula formation and its presentation can range from hours to years and in this case there was a lag of 30 days from the day of surgery until the patient became symptomatic.

Imaging and management

Arterioportal fistulas can be investigated using a variety of imaging modalities, including ultrasound, CT, magnetic resonance imaging (MRI) and arteriography. Arteriography following CT or MRI is arguably the standard approach, as it enables confirmation of the diagnosis and definitive treatment in the form of embolisation or stenting.² Small fistulas can often be controlled and completely occluded with one intervention, however larger, high-flow fistulas may require repeated attempts,¹² as in this case. Surgical management is an alternative option, including ligation or hepatic resection, but these interventions are often associated with significant morbidity.²

Conclusion

Although rare, arterioportal fistula can occur following a pancreaticoduodenectomy and may present with gastrointestinal bleeding. As with other forms of gastrointestinal bleeding following pancreaticoduodenectomy, a high index of suspicion is necessary for timely diagnosis and intervention. Persistence with interventional radiological techniques can produce effective outcomes, even with the presence of large, high-flow arterioportal fistulas.

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