

Use of a Stent Graft for Bleeding Hepatic Artery Pseudoaneurysm Following Pancreaticoduodenectomy

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Although uncommon, bleeding following pancreaticoduodenectomy is associated with high mortality. Management generally includes surgical reexploration or, alternatively, transarterial embolization. We report the case of a 62-year-old man who presented with massive upper gastrointestinal bleeding 3 weeks after pancreaticoduodenectomy. Selective coeliac angiography revealed a large pseudoaneurysm involving the proper hepatic artery. This was treated successfully with a stent graft. There was no recurrence of bleeding at the 6-month follow-up. To our knowledge, this is the first report of stent graft repair of bleeding hepatic artery pseudoaneurysm following pancreaticoduodenectomy. [*Asian J Surg* 2006;29(4):283–6]

Key Words: pancreaticoduodenectomy, pseudoaneurysm, stent graft

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Introduction

Although mortality following pancreaticoduodenectomy has markedly improved over the last two decades, the incidence of postoperative complications remains high.^{1,2} Bleeding is the most serious complication and is associated with high fatality. Conventional management of postoperative bleeding is surgical reexploration. Alternatively, arteriography with transarterial embolization (TAE) has been advocated as a minimally invasive technique to manage this complication, particularly when associated with pseudoaneurysms.^{3,4} In patients with more proximal lesions, however, the risk of substantial hepatic infarction

after embolization may be high, as the collateral circulation (via the gastroduodenal artery and the pancreaticoduodenal arcade) is inevitably reduced from the surgery. This case describes a novel endovascular approach to bleeding hepatic artery pseudoaneurysm with the use of a stent graft.

Case report

A 62-year-old man was admitted for obstructive jaundice secondary to adenocarcinoma of the distal common bile duct. Percutaneous transhepatic biliary drainage was performed preoperatively, after which he underwent standard

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Figure 1. Selective coeliac arteriogram demonstrates a large pseudoaneurysm (arrow) involving the proper hepatic artery.



Figure 2. Small endoleak (arrow) is noted after deployment of a covered stent across the pseudoaneurysm.

pancreaticoduodenectomy. His immediate postoperative course was unremarkable, and the patient was discharged on the 9th postoperative day. Two days after discharge, he was readmitted for fever and upper abdominal pain. Computed tomography of the abdomen revealed fluid collections within the porta hepatis and pancreatic bed suggestive of beginning abscess formation. This was treated conservatively with intravenous antibiotics, and the patient was discharged after 3 days on oral levofloxacin and metronidazole.

Three weeks after pancreaticoduodenectomy, the patient presented at the Urgent Care Center with complaints of melaena and lightheadedness. His haemoglobin and haematocrit were 8.6 g/dL and 26.5%, respectively. Upper gastrointestinal endoscopy did not reveal blood in the stomach or small intestine. Continued drop in haematocrit despite blood transfusion prompted angiography. Selective coeliac and superior mesenteric arteriographies were performed. The coeliac angiogram revealed a large pseudoaneurysm involving the main hepatic artery (Figure 1). Using road mapping, a hydrophilic guidewire (Glidewire®; Terumo Medical Corp., Somerset, NJ, USA) was carefully advanced through the pseudoaneurysm into the distal right hepatic artery. This was exchanged with a stiff wire (Amplatz™; Boston Scientific Corp., Natick, MA, USA) through which an 8 Fr guiding catheter (Vista Brite Tip®; Cordis Corp., Piscataway, NJ, USA) was advanced into the right hepatic artery. A 6 mm × 5 cm covered stent (Viabahn®; WL Gore & Associates Inc., Flagstaff, AZ, USA) was introduced through the sheath and deployed across the aneurysm. Postdeployment arteriogram demonstrated



Figure 3. Completion angiogram shows complete exclusion of the pseudoaneurysm with patent flow into the distal right hepatic artery.

a small endoleak at the distal fixation site (Figure 2). A second endograft (5 mm × 2.5 cm) was then deployed and extended distally, occluding the take-off of the left hepatic artery. Final arteriogram revealed complete exclusion of the pseudoaneurysm with patent flow into the distal right hepatic artery (Figure 3).

The procedure was complicated by liver abscess formation involving the left and caudate lobes 5 weeks after discharge (Figure 4). These were successfully treated with percutaneous catheter drainage. He had no further episodes of gastrointestinal bleeding at 8 months of follow-up.

Discussion

Major haemorrhage following pancreaticoduodenectomy occurs in approximately 3–7.6% of cases.^{2,5–7} Clinically,

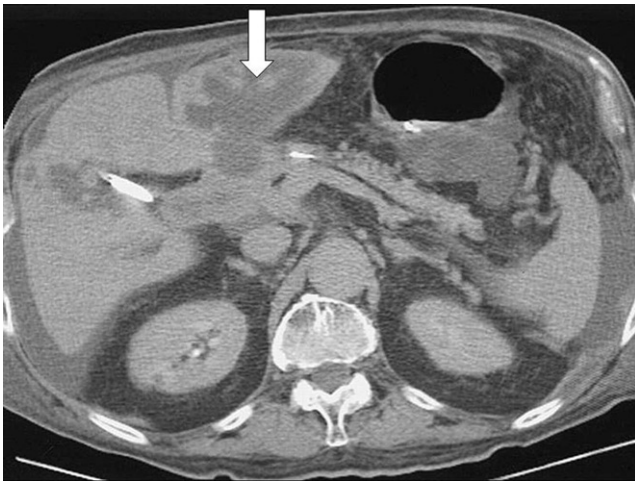


Figure 4. Abdominal computed tomography reveals abscess formation involving the left (arrow) and caudate lobe of the liver.

the bleeding episode can present early or late. Early-onset bleeding (<5 days) is generally due to inadequate haemostasis at the anastomotic site or nonsecure ligation of blood vessels. Such bleeding is best treated with immediate reoperation and surgical control of the bleeding site. On the other hand, late-onset bleeding often results from marginal ulcers or from rupture of a pseudoaneurysm. The exact mechanism of pseudoaneurysm formation is unknown although predisposing factors include leakage of pancreatic juice, bile, or localized infection and abscess formation, with consequent erosion of the arterial wall. Indeed, numerous reports have observed anastomotic leakage and intra-abdominal abscess to precede delayed haemorrhage development.⁵⁻⁸ In their report of 14 ruptured pseudoaneurysms, Okuno et al noted that anastomotic leakage and intra-abdominal abscess formation presaged rupture in 43% and 29% of cases, respectively.⁸ Other predisposing factors include injury to the vessel wall during radical dissection and lymphadenectomy, preoperative radiation therapy and pressure necrosis by silicone drains.

Hepatic artery pseudoaneurysms can rupture into the peritoneal cavity, retroperitoneally, or into the common bile duct, gallbladder, portal vein and adjacent bowel. Depending on where the rupture occurs, these may present clinically as haemoperitoneum, haemobilia or gastrointestinal bleeding. Intraluminal bleeding results predominantly from the pseudoaneurysm eroding at the anastomosis or into the adjacent duodenum or hepaticojejunostomy.

The traditional approach to haemorrhage from pseudoaneurysms has been direct surgical intervention. Surgical exploration, however, may be hazardous due to tissue

friability, and identification of the bleeding site may be difficult because of postoperative adhesions. Angiography with TAE has thus been advocated as the first-line treatment modality for late-onset bleeding.^{4,6,9} The reported success rate is 83–100%, with a mortality of 0–20%.^{4,6-8} Morbidity associated with TAE arises from occlusion of the end-organ vasculature, with subsequent infarction, abscess formation or, more commonly, transient signs of ischaemia such as increase in transaminases in the case of hepatic artery embolization. Recurrence of the pseudoaneurysm after successful embolization has also been reported.¹⁰

Recently, endovascular treatment of hepatic artery pseudoaneurysms with stent grafts has been described.^{11,12} This technique has the advantage of providing continued perfusion to the end-organ and, therefore, obviates the risk of occlusion and ischaemia often seen with TAE. On the other hand, potential complications do occur and include stent occlusion, stent deformation or kinking, and exclusion of branch vessels. In this patient, exclusion of the left hepatic artery rendered the left lobe ischaemic, leading to abscess formation. Furthermore, the lack of long-term results and experience in its use in areas exposed to pancreatic juice or infection may be a cause for concern. Nonetheless, our experience and that of others show that the use of a stent graft for treatment of bleeding visceral artery pseudoaneurysms is technically feasible, effective and safe. We believe that this technique should be considered a strong option in patients with prohibitively high risk for surgery, those who fail embolization, and those who are at risk for significant hepatic infarction with embolization.

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