Ultrasound-guided percutaneous thrombin for the management of superior mesenteric artery pseudoaneurysm

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Visceral aneurysms are a well-recognized and potentially fatal occurrence in the event of rupture. Endovascular occlusion using stent grafting or embolization is often favorable over high-risk open surgical repair. However, interventional mesenteric angiography may not always be feasible or successful. We present an emergency case of successful occlusion of a large peripancreatic pseudoaneurysm using a single percutaneous injection of thrombin under ultrasound guidance alone after both laparotomy and mesenteric angiography had failed to identify and control bleeding. In this case and review of the current evidence, we propose an effective alternative first-line treatment strategy in these complex patients. (J Vasc Surg Cases 2015;1:211-3.)

Visceral aneurysms are a well-recognized and potentially fatal occurrence, with rupture rates as high as 50%. Intraperitoneal rupture may have a mortality rate approaching 100%.[1] Often asymptomatic, they usually originate from splenic, hepatic, gastroduodenal, or pancreatic arteries, although rarely they can arise from the superior mesenteric artery or one of its branches, accounting for <3.5% of all visceral aneurysms.[2] Any traumatic, iatrogenic, or inflammatory process can predispose to pseudoaneurysm development, but previous pancreaticoduodenectomy and chronic or acute pancreatitis are common causes as proteolytic pancreatic enzymes cause artery intimal wall autodigestion. Endovascular occlusion using stent grafting or embolization is favorable over high-risk open surgical repair. However, interventional mesenteric angiography may not always be feasible or successful. In selected cases, percutaneous thrombin injection using computed tomography (CT) or ultrasound guidance alone offers a minimally invasive alternative to treating these complex patients. In this report, we present an emergency case of successful occlusion of a large peripancreatic pseudoaneurysm using a single percutaneous injection of thrombin under ultrasound guidance after laparotomy and mesenteric angiography had failed to identify and control bleeding. The patient gave full informed consent to the publication of this case.

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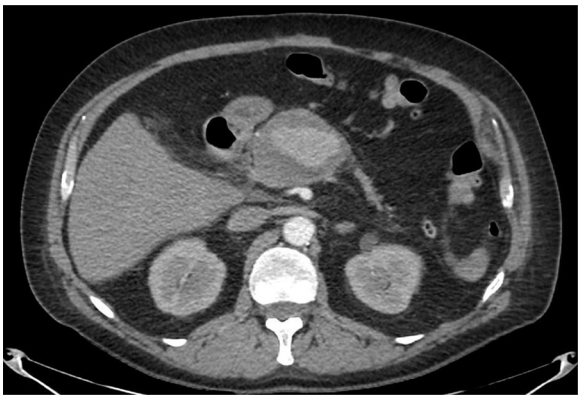

Fig 1. Arterial-phase axial computed tomography (CT) scan demonstrating 5.6-cm aneurysm arising from a branch of the superior mesenteric artery.

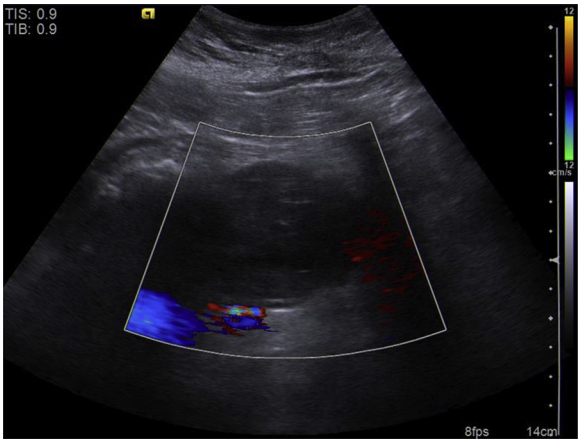

Fig 2. Ultrasound image showing absence of Doppler flow in the thrombosed aneurysm sac 3 days after thrombin injection.

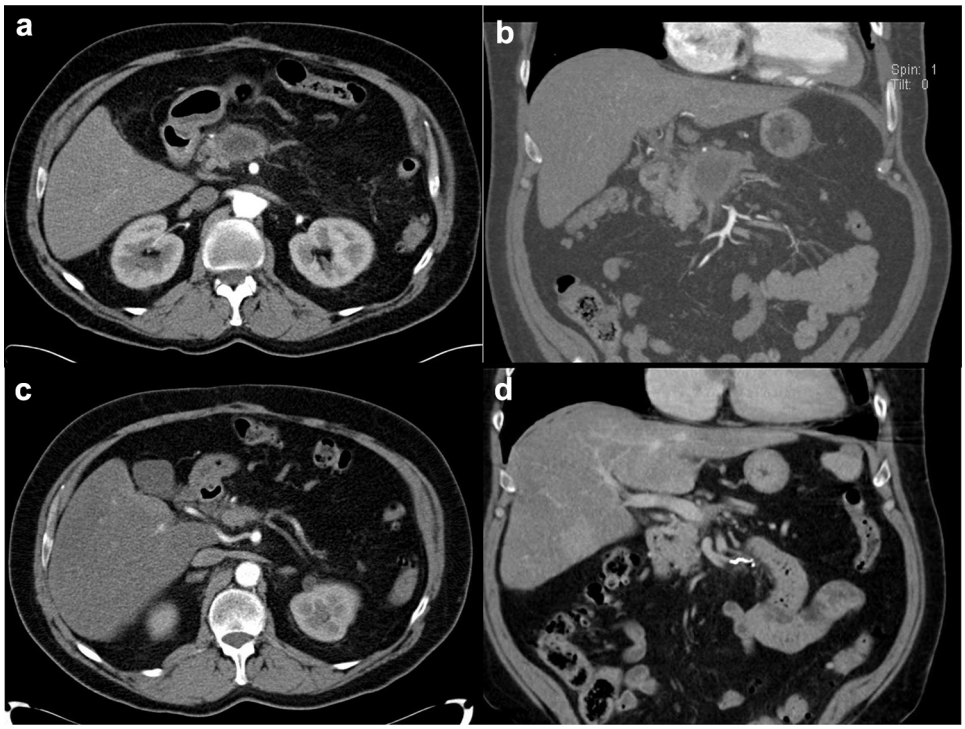

Fig 3. Coronal **(a)** and axial **(b)** arterial-phase computed tomography (CT) images 1 month after thrombin injection. The aneurysm sac has reduced in size to 4.4 cm and remains occluded. The 8-month follow-up CT scan shows virtually complete resolution of the aneurysm sac on coronal **(c)** and axial **(d)** views.

CASE REPORT

A 67-year-old man with a history of alcohol excess and recurrent pancreatitis presented with acute epigastric pain and hemodynamic instability to a peripheral district general hospital. He was receiving warfarin for atrial fibrillation, and his international normalized ratio was 4.1. There was a surgical history of distal pancreatectomy 20 years previously for benign disease. An arterial-phase CT scan showed a large amount of free intraperitoneal fluid plus a small pseudoaneurysm adjacent to the uncinate process of the pancreas arising from an unnamed branch of the superior mesenteric artery. He remained unstable, necessitating laparotomy, which revealed 3 liters of intraperitoneal blood with a hematoma in the root of the small bowel mesentery, but no active hemorrhage was detected. The next day, selective mesenteric angiography failed to identify the pseudoaneurysm but confirmed cessation of hemorrhage. The patient recovered and was medically fit for discharge on day 9. Twelve months later, he presented again with hemodynamic instability and melena. Hemoglobin level was 5.7 g/dL; serum amylase level was 123 IU/L. Urgent endoscopy was unremarkable. Repeated arterial-phase CT scan showed significant enlargement of the previously noted peripancreatic pseudoaneurysm, now measuring 5.6 cm (Fig 1). He was transferred acutely to a tertiary hepatobiliary unit. Percutaneous thrombin injection was proposed, given the previously nondiagnostic angiography, the potential difficulty anticipated with catheterization of the unnamed branch of the superior mesenteric artery, and the current CT appearances showing a readily accessible aneurysm sac through the percutaneous route. Therefore, under ultrasound guidance and local anesthetic, a 5F amniocentesis needle was inserted percutaneously into the aneurysm sac. A single 5-mL aliquot of thrombin (1000 U/mL bovine thrombin) was injected as a bolus with immediate aneurysm thrombosis. The patient's condition, pain, and hemoglobin level stabilized, and check ultrasound scan on day 3 confirmed occlusion with no signs of periprocedural complications (Fig 2). The patient was discharged 6 days later. Four-week follow-up CT scan showed sustained thrombosis with a reduced sac size to 4.4 cm, and on 8-month CT scan, the aneurysm sac was barely visible (Fig 3).

DISCUSSION

Peripancreatic pseudoaneurysms are often asymptomatic and found incidentally. They can be manifested as pain from pressure effect on surrounding structures or acute hemorrhage, the latter of which may be catastrophic, with mortality reported from 15% to 50%.[3] Rupture into the gastrointestinal tract (and presumably the pancreatic duct in this case) is unusual but may cause diagnostic confusion as to the underlying source of hemorrhage. The role of arterial-phase cross-sectional imaging in these cases is crucial, especially considering that mesenteric angiography fails to identify the source of bleeding in 14% to 60% of cases.[4,5]

Since Cope and Zeit[6] first described the use of thrombin for percutaneous occlusion of pseudoaneurysms in 1986, its noninvasive therapeutic benefits have expanded dramatically, and it has proven efficacy in treating iatrogenic femoral and radial pseudoaneurysms.[7] The mounting

evidence of successful cases in visceral pseudoaneurysm occlusion raises the possibility of its use as first-line therapy.[2,8-10] To date, there have been eight reported cases in the literature of successful embolization using the ultrasound-guided technique. Although it is less invasive and less expensive than interventional angiography, its success depends heavily on percutaneous accessibility and user experience. It is also noteworthy that failed cases are probably under-reported in the literature, leaving the true efficacy and risk of this technique unclear. Indeed, Puri et al[11] are the only authors to describe a case of recanalization detected on follow-up CT scan of a pancreatic pseudoaneurysm 4 weeks later, although reinjection of thrombin successfully occluded the sac. One major concern with ultrasound-guided injection is traversing bowel with the needle. Radiologic experience is therefore crucial, with careful review of the cross-sectional imaging. In this case, the pseudoaneurysm was deemed safely accessible under ultrasound guidance alone, precluding the need for further CT.

CONCLUSIONS

Percutaneous thrombin under ultrasound guidance offers a safe and effective strategy for managing peripancreatic pseudoaneurysms, especially in the emergency setting or when mesenteric angiography is unsuccessful. User experience and percutaneous accessibility to the aneurysm sac are also important factors, which means that this technique should be considered on a case-by-case basis and is unlikely to completely replace percutaneous catheterization as a standard of care.

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