

Percutaneous Ultrasound-Guided Thrombin Injection as First-Line Treatment of Pancreatic Pseudoaneurysm

Aoife McErlean, Seamus Looby, Michael J. Lee

Department of Radiology, Beaumont Hospital, Dublin 9, Ireland

Abstract

Pancreatic pseudoaneurysms are a rare but potentially fatal complication of pancreatitis. Surgical intervention and transcatheter embolization are not always feasible therapeutic options. In this report we present a case of a pseudoaneurysm secondary to pancreatitis which, despite being angiographically invisible, was successfully embolized with a single ultrasound-guided percutaneous injection of thrombin.

Key words: Pancreatitis—Percutaneous—Pseudoaneurysm—Thrombin injection

Pancreatic pseudoaneurysms are an uncommon but potentially lethal complication of acute or chronic pancreatitis. The formation of pseudoaneurysms has been reported in up to 10% of cases of pancreatitis [1]. The pervasive autodigestive properties of pancreatic enzymes in addition to severe local inflammation and pseudocyst formation can result in a necrotizing arteritis of nearby vessels with subsequent destruction of the arterial wall leading to pseudoaneurysm formation or hemorrhage. Pancreatic pseudoaneurysms secondary to pancreatitis can develop with or without pseudocyst formation. The splenic, gastroduodenal, inferior, and superior pancreaticoduodenal arteries are most commonly involved [2, 3].

The initial diagnosis of a pancreatic pseudoaneurysm is often made with CT imaging, which also allows an assessment of the severity of pancreatic inflammation and necrosis as well as identification of other secondary complications such as the development of an abscess, pseudocyst, splenic vein thrombosis or varices. Mesenteric angiography is used to precisely localize the vascular anatomy of the pseudoaneurysm with a view to embolization either as a definitive treatment or as a temporary measure to stabilize a patient preoperatively.

The high mortality rate associated with rupture and bleeding of pancreatic pseudoaneurysms necessitates their active management. There is, however, much controversy in the literature regarding the optimal therapeutic modality. Surgery in the setting of such intense inflammation and marked tissue and vessel friability is extremely challenging and has a high associated morbidity and mortality rate. In the era of improved radiological intervention, surgery is currently considered only in those patients who are hemodynamically

unstable or who require surgical treatment of other secondary complications (for example debridement of infected tissue, extrinsic compression or pseudocyst drainage), or after failed attempts at transcatheter embolization [2, 3].

Radiological intervention, either transcatheter embolization or image-guided percutaneous thrombin injection, is proving a less invasive and safer alternative to surgery in the management of pseudoaneurysms [3, 4].

We report the successful occlusion of a pancreatic pseudoaneurysm with percutaneously injected thrombin.

Case Report

A 46-year-old man with a heavy chronic alcohol intake presented to the Emergency Department with a 24 hr history of severe abdominal pain and an 18 hr history of vomiting. On clinical examination he had a tender epigastrium with no signs of peritonism. He was hemodynamically stable and afebrile. Initial laboratory investigations revealed hemoglobin 11.8 g/dl, an elevated white cell count ($14 \times 10^9/l$) and serum amylase (783 IU/l), and mildly abnormal liver biochemistry (serum bilirubin 20 $\mu\text{mol/l}$, serum alanine aminotransferase 30 IU/l, serum alkaline phosphatase 123 IU/l, serum gamma-glutamyl transferase 326 IU/l). He was treated for acute pancreatitis secondary to alcohol.

An abdominal ultrasound examination demonstrated a 7 cm round complex mass of mixed echotexture to the left of the midline within the distal body of the pancreas. The patient settled clinically and the serum amylase decreased over a number of days. A contrast-enhanced CT scan of the pancreas was performed on a 16-slice multi-detector Siemens scanner. A 7.5 cm \times 7 cm \times 6.5 cm lesion of mixed attenuation was identified within the body of the pancreas. This lesion had a 2 cm \times 2.5 cm enhancing nodule consistent with a pseudoaneurysm (Fig. 1). The feeding vessel could not be seen definitively on CT imaging. The patient proceeded to formal mesenteric digital subtraction angiography with a view to embolization of the pseudoaneurysm. Despite selective and superselective catheterization of the celiac artery, superior mesenteric artery, gastroduodenal artery, and splenic artery, the pseudoaneurysm was not identified (Fig. 2). A Doppler ultrasound examination, however, demonstrated classic “ying-yang” flow within the pseudoaneurysm (Fig. 3). Under ultrasound guidance thrombin (Tisseel kit, Baxter, Vienna, Austria) was injected percutaneously into the pseudoaneurysm sac with immediate cessation of flow and occlusion of the sac (Fig. 4). The patient remained clinically stable. Doppler ultrasound performed the following day showed the pseudoaneurysm had remained completely thrombosed. A dynamic CT scan performed 6 days after the thrombin injection confirmed complete occlusion of the pseudoaneurysm (Fig. 5). The patient was discharged home and remained asymptomatic. Three months later the patient returned for routine follow-up imaging and a dynamic CT scan demonstrated that the thrombosed pseudoaneurysm remained occluded and had decreased in size (Fig. 6).



Fig. 1. Dynamic CT scan demonstrating the pseudoaneurysm (arrowhead) within a larger collection. Note the high-density blood (arrow) in the collection.



Fig. 2. Digital subtraction angiogram of the celiac axis. The pseudoaneurysm was not demonstrated on this study. Further superselective studies also failed to demonstrate the pseudoaneurysm.

Discussion

Percutaneous thrombin injection under ultrasound guidance has been successfully used as first-line treatment in the management of iatrogenic femoral artery pseudoaneurysms as well as in traumatic pseudoaneurysms of other peripheral arteries. It provides a safe, comfortable, and fast alternative to open surgical repair or ultrasound-guided compression [5]. Successful fluoroscopy-guided percutaneous thrombin injection has also been reported in the setting of ruptured visceral artery aneurysms [6].

In our case the pancreatic pseudoaneurysm was clearly identified on CT and ultrasound; however, its exact vascular anatomy was difficult to clarify. Even with multiple selective and superselective mesenteric angiograms by an experienced interventional radiologist, the pseudoaneurysm could not be detected. Despite this

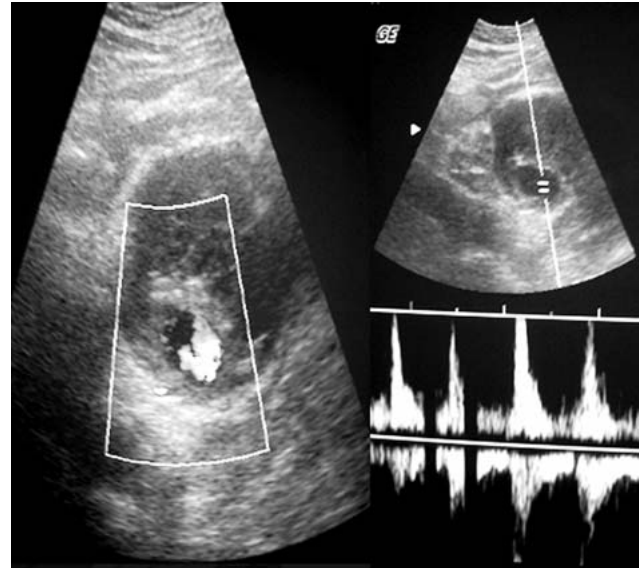


Fig. 3. Arterial flow within the pseudoaneurysm is shown with both color and pulse-wave Doppler ultrasound. Note the “ying-yang” effect.

inability to visualize the pseudoaneurysm angiographically, a single injection of human thrombin under ultrasound guidance resulted in satisfactory thrombosis with no recurrence after 3 months of follow-up.

The importance of follow-up to ensure persistent thrombosis and to detect any recanalization has been highlighted in two case reports [7, 8]. Puri et al. described a successful initial result following CT-guided percutaneous thrombin injection into a pancreatic pseudoaneurysm secondary to chronic pancreatitis but on follow-up CT imaging at 4 weeks the pseudoaneurysm had partially recanalized. Repeat thrombin injection resulted in satisfactory occlusion [7].

Our patient was hemodynamically stable but the rapid and immediately demonstrable effect of thrombin injection may be an added benefit in the unstable patient.

The potential complications of intravascular thrombin injection include distal embolization, native artery thrombosis, and anaphylaxis. Kang et al. reported a patient suffering hand ischemia due to a technical error (where there was inadvertent injection of thrombin directly into the artery) during attempted injection into a persistent neck of a brachial artery pseudoaneurysm [5]. As a result of this complication they recommend injecting a volume of thrombin less than the volume of the pseudoaneurysm cavity to avoid forcing any of the thrombin into the native artery. Concerns regarding the immunological side-effects of bovine thrombin, including anaphylaxis, have been virtually eliminated with the advent of human thrombin, which is in widespread use [9].

In conclusion, this case consolidates the evolving role of percutaneous thrombin injection as a safe, fast, and simple alternative to transcatheter embolization as first-line management of pancreatic pseudoaneurysms. We have also demonstrated that even in the absence of angiographic visualization successful thrombosis of the pseudoaneurysm is possible.

References

1. White AF, Baum S, Barabasiri S (1976) Aneurysms secondary to pancreatitis. *AJR AM J Roentgenol* 127:393–396

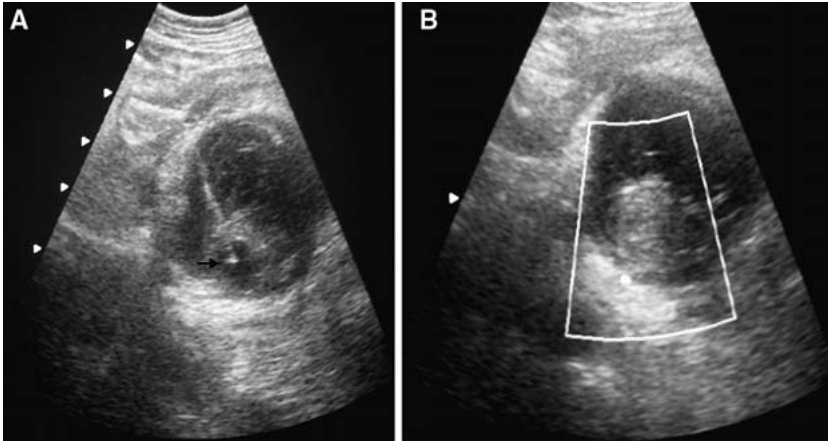


Fig. 4. **A** A 22 gauge needle (arrow) inserted into the pseudoaneurysm. **B** Immediate cessation of flow within the pseudoaneurysm following injection of thrombin.



Fig. 5. Follow-up dynamic CT scan on day 6 after thrombin injection shows persistent thrombosis of the pseudoaneurysm.



Fig. 6. Three months after thrombin injection the thrombosed pseudoaneurysm has regressed and there is no recurrence of flow within it.

2. Carr JA, Cho J, Shepard AD, Nypaver TJ, et al. (2000) Visceral pseudoaneurysms due to pancreatic pseudocysts: rare but lethal complications of pancreatitis. *J Vasc Surg* 32:722–730
3. Bergert H, Hinterscher I, Kersting S, et al. (2005) Management and outcome of hemorrhage due to arterial pseudoaneurysms in pancreatitis. *Surgery* 137:323–328
4. Sparrow P, Asquith J, Chalmers N (2003) Ultrasonic-guided percutaneous injection of pancreatic pseudoaneurysm with thrombin. *Cardiovasc Intervent Radiol* 26:312–315
5. Kang SS, Labropoulos N, Mansour MA, et al. (2000) Expanded indications for ultrasound-guided thrombin injection of pseudoaneurysms. *J Vasc Surg* 31:289–298
6. Kemmeter P, Bonnell B, Vander Kolk W, et al. (2000) Percutaneous thrombin injections of splanchnic artery aneurysms: Two case reports. *J Vasc Interv Radiol* 11:469–472
7. Puri S, Nicholson AA, Breen DJ (2003) Percutaneous thrombin injection for the treatment of a post-pancreatitis pseudo-aneurysm. *Eur Radiol* 13:L79–L82
8. Armstrong EM, Edwards A, Kingsnorth AN, et al. (2003) Ultrasound-guided thrombin injection to treat a pseudoaneurysm secondary to chronic pancreatitis. *Eur J Vasc Endovasc Surg* 26:448–449
9. Elford J, Burrell C, Freeman S, et al. (2002) Human thrombin injection for iatrogenic pseudoaneurysms. *Cardiovasc Intervent Radiol* 25:115–118