Transcatheter embolization as primary treatment for visceral pseudoaneurysms in pancreatitis: clinical outcome and imaging follow up

Hemant Deshmukh, Krantikumar Rathod, Ashwin Garg, Rahul Sheth, Suyash Kulkarni
Department of Radiology, King Edward VII Memorial Hospital, Mumbai 400 012

Background: Pseudoaneurysm formation is an uncommon but fatal complication of pancreatitis. The morbidity and mortality associated with surgical management is high. Transcatheter embolization is a definitive minimally invasive form of treatment.

Aim: To review our experience with transcatheter embolization as a therapeutic modality for pseudoaneurysms complicating pancreatitis.

Methods: This retrospective analysis included data of 30 patients (mean age 37 years, range 25 to 65; 24 men) with visceral pseudoaneurysms secondary to pancreatitis, who underwent diagnostic angiography and transcatheter embolization, during the period March 1993 to February 2003. Results: In 29 patients the pseudoaneurysms were successfully isolated from the circulation, and hemostasis was achieved. Rebleeding occurred in one patient, for which re-embolization was done. Twenty-nine patients improved clinically. One patient in whom the pseudoaneurysm was successfully embolized died due to septicemic shock. Conclusion: Endovascular embolization is a safe and effective non-surgical modality of treatment for visceral pseudoaneurysms complicating pancreatitis. [Indian J Gastroenterol/2004;23:56-58]

Key words: Gastrointestinal bleeding

Spreading inflammation in severe pancreatitis may involve adjacent vessels, causing autolysis of the media leading to visceral pseudoaneurysm, which may cause life-threatening gastrointestinal (GI) bleed. Pseudoaneurysm formation is an uncommon but disastrous complication of pancreatitis, with an incidence estimated to be as high as 10%.1 Rupture of pseudoaneurysm is associated with death in over half the affected patients.2

These patients are often ill due to pancreatitis and a minimally invasive form of treatment would be of value. The reported mortality in surgical treatment of visceral pseudoaneurysms is 37%.3 Transcatheter embolization is an established alternative to treat this life-threatening complication.4 We review our experience with this technique in the management of pseudoaneurysms complicating pancreatitis.

Methods

We analyzed data of 30 patients (mean age 37 years, range 25 to 65; 24 men) who presented with symptoms of gastrointestinal bleeding along with features of pancreatitis over the period March 1993 to February 2003. These patients were evaluated with ultrasonography, color Doppler and CT scan, followed by diagnostic conventional or digital subtraction angiography (DSA) for detection and localization of pseudoaneurysms. The 30 patients included only those proved to have a visceral pseudoaneurysm. Two patients were clinically stable, 10 had unstable vital signs, and 18 were critically ill. According to the Balthazar CT criteria, 28 patients were in Grade D and 2 were in Grade E.4

All diagnostic angiograms were performed via transfemoral accesses using 5F Cobra or Simon I (Cordis) angiography catheters. The vessels that were selectively studied included splenic, common hepatic, gastroduodenal, pancreaticoduodenal and superior mesenteric arteries. Delayed images were also taken in the venous phase to study porto-mesenteric veins. The pseudoaneurysms were embozalized using steel (Cook Inc, Bloomington, USA) tungsten (Peripheral Free Spirales, Balt, France) or platinum (Target, Boston Scientific, Ireland) coils in single or multiple sittings. These embolizations were performed either through the same diagnostic catheter or with microcatheter using coaxial technique.

Post-procedure ultrasonography was done after 24 hours to look for splenic infarcts in case of splenic artery embolization. Color Doppler was performed to confirm occlusion of the pseudoaneurysm once in every 3 months. CT scan and CT angiography were done at the end of six months. Follow-up DSA was done in patients who gave valid consent.

Results

A total of 32 visceral pseudoaneurysms were detected on celiac and superior mesenteric angiography in the 30 patients. The most commonly involved arteries were the splenic artery (n=16; Fig 1) followed by the gastroduodenal artery (12), pancreaticoduodenal artery (2) and hepatic artery (2). Both splenic and gastroduodenal arteries were concomitantly involved in two patients.

Following transcatheter embolization, the associated GI bleeding subsided in all cases. In one patient, slow flow remained in the aneurysm even after placing...
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Fig. 1: (top) Celiac angiogram shows active extravasation of contrast in large pseudoaneurysm of splenic artery; (middle) Postembolization angiogram reveals complete isolation of pseudoaneurysm with coils placed proximal and distal, and distal re-formation of splenic artery via collateral circulation; (bottom) Angiogram one year later reveals persistent isolation of embolized pseudoaneurysm with retrograde and antegrade thrombosis of splenic artery.

Coils proximal and distal to the origin of the pseudoaneurysm. Repeat color Doppler examination the next day showed patent aneurysm and re-embolization was done. This time the aneurysm was completely excluded from the circulation. She underwent surgical aneurysmectomy and distal pancreatectomy. One patient expired due to septicemic shock one week after successful embolization. Partial splenic infarcts were seen in two patients without any morbidity.

One patient developed splenic artery pseudoaneurysm distal to the previously embolized pseudoaneurysm, six months after the procedure. In all other patients, follow-up imaging studies showed no recurrence of the lesion.

Discussion

Leakage of pancreatic enzymes from an inflamed pancreas results in enzymatic autodigestion of arterial walls, with pseudoaneurysm formation. The wall of a pseudocyst can incorporate a visceral artery, converting it into a pseudoaneurysm. Spontaneous thrombosis of these aneurysms is rarely reported. Hemorrhage from these pseudoaneurysms is associated with high mortality rate.

Imaging modalities have an important role in the management of pseudoaneurysms of the peripancreatic arteries. On ultrasonography, a pseudoaneurysm appears as an anechoic mass within the pseudocyst, with or without pulsations. Color and pulse Doppler sonography demonstrate turbulent arterial flow within the anechoic mass. The CT finding of contrast enhancement within or adjacent to a suspected pseudocyst or contiguous with a vascular structure is highly suspicious of pseudoaneurysm formation. The finding of a focal collection of fluid with increased attenuation (more than 30 HU), or an interim increase in the attenuation values of the fluid within a previously demonstrated pseudocyst, is diagnostic of acute bleeding into the pseudocyst. A dynamic, contrast-enhanced spiral CT scan can diagnose pseudoaneurysms by demonstrating contrast pooling in the collection. However, CT scan has its limitations for the evaluation of small pseudoaneurysms and in unstable patients with massive GI bleed; these patients should undergo urgent angiography, which remains the gold standard for the diagnosis of vascular lesions in pancreatitis.

The splenic artery is the most commonly involved vessel (45%) in pancreatitis due to its contiguity with the pancreas, followed by the gastroduodenal (17%) and pancreaticoduodenal (11%) arteries. In our series as well, the pattern of involvement was similar.
The traditional surgical treatment for pseudoaneurysms is celiotomy, ligation of the celiac trunk or partial pancreatectomy. The mortality associated with surgical management in such cases is up to 37%. Transcatheter embolization provides a minimally invasive, effective alternative. We used fibered coils made up of steel, platinum or tungsten. Reabsorbable embolic material like gelatin sponge has been used by some authors; however, this may get rapidly resorbed by proteolytic enzymes in pancreatitis. It may also migrate and occlude small arteries within the organ, thus causing complications such as pain, infection and infarction.

Direct percutaneous embolization of pseudoaneurysms with thrombin is also mentioned in case of technical difficulty with the endovascular route. However, in our study endovascular transcatheter access could be successfully achieved in all cases. Proximal and distal occlusion of the artery bearing the pseudoaneurysm causing exclusion of the pseudoaneurysm from the circulation, is desirable. In case of splenic artery pseudoaneurysm it is important to put the distal coil close to the pseudoaneurysm and avoid coil reaching the splenic hilum. This allows formation of collateral vessels across the embolized segment, so as to maintain arterial supply to the spleen.

Rebleeding occurred in 2 of 30 cases (6.1%) in our series; these were re-embolized and the bleeding stopped completely. Mandel et al treated 13 patients with pseudoaneurysms in pancreatitis and reported a success rate of 79% with no mortality. Mauro and Jacques reported a series of 20 pseudoaneurysms in 17 patients treated by transcatheter embolization, with high clinical and technical success rates and no mortality. Three patients had procedural complications without significant clinical sequelae. In a multicenter retrospective study of 104 cases with arterial lesions associated with pancreatitis, Budgenhe et al reported a success rate of 78%; rebleeding occurred in 37%. There was no mortality related to the procedure. Complications due to embolization are rare. Mauro et al and Budgenhe et al have reported splenic and intestinal necroses. Rupture of aneurysms during embolization has also been reported; it is probably due to the pressure exerted by injection of the embolic material and its carrier fluid. We did not observe any major complication in our series. The only complication was partial splenic infarct associated with splenic artery embolization in two patients, which was managed conservatively. Similar complications after splenic embolization and their conservative management are well recognized in literature.

In conclusion transcatheter embolization, as a minimally invasive procedure with high success rates and low morbidity and mortality rate, is the preferred method for nonsurgical management of pseudoaneurysms complicating pancreatitis, even in hemodynamically unstable patients.

References

Correspondence to: Dr Rathod, Fax: (22) 2418 5678. E-mail: krantikumar@yahoo.com
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