CardioVascular and Interventional Radiology

Published Online: 2 November 2006

Cardiovasc Intervent Radiol (2007) 30:121–123
DOI: 10.1007/s00270-005-0392-6

Bare Stent Implantation in Iatrogenic Dissecting Pseudoaneurysm of the Superior Mesenteric Artery

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Abstract

Iatrogenic arterial dissection leading to the development of dissecting pseudoaneurysms of the superior mesenteric artery (SMA) is a rare complication of angiography. Surgical and endovascular treatment options exist for this important condition. We report a case of bare stent implantation in dissecting pseudoaneurysm of the SMA that developed after angiography in a patient with acute mesenteric ischemia. Although it is rarely published, iatrogenic arterial dissection causing pseudoaneurysm can occur after diagnostic and interventional angiography. Bare stent implantation in dissecting pseudoaneurysm of the SMA could be an advantageous endovascular treatment option in selected cases due its to potential preservation of important side branches of the SMA.

Key words: Acute mesenteric ischemia—Dissecting pseudoaneurysm—Superior mesenteric artery—Stent implantation

Iatrogenic arterial dissections are among the rare and less frequently published complications of angiography, and they are usually caused by technical mistakes or rough handling of catheters [1]. Also, the dissecting type of visceral arterial aneurysm involving the superior mesenteric artery (SMA) trunk is reported to be rare [2]. In this report, we present a case of dissecting pseudoaneurysm of the SMA that developed after angiography for acute mesenteric ischemia and was treated by bare stent implantation.

Case Report

A 74-year-old man with symptoms suggesting acute mesenteric ischemia was referred to our department for mesenteric angiography. Angiography demonstrated acute occlusion of the SMA after giving off first jejunal branches and also prominent pancreaticoduodenal arteries communicating with the gastroduodenal artery (Fig. 1A). The occlusion was passed with a hydrophilic guidewire and the thrombus was negotiated with the guidewire (Fig. 1B). The thrombus was partially recanalized and distal flow re-established (Fig. 1C). Although intra-arterial thrombolysis could have been employed in our case, due to concerns about the time needed for lysis and better assessment of bowel viability with laparotomy and possible revascularization with embolectomy or resection of infarcted bowel, thrombolysis was not performed due to the preference of the surgeon. The patient was operated on after angiography with an intention to perform embolectomy. Since at operation there were no signs of ischemia in the bowel segments and pulsations in the SMA were noted, nothing was done. He was discharged after 3 days of clinical observation.

One month later, the patient returned with abdominal pain. Control angiography showed no thrombus in the SMA but there was a 10 mm × 20 mm aneurysm at the proximal part of the SMA about 1.5 cm distal to the aortic origin (Fig. 2A, B). The aneurysm was accepted as a dissecting pseudoaneurysm that had developed after the first diagnostic angiography. A 6 × 40 mm self-expanding stent (OptiMed Sinus-Repo Stent, Germany) was implanted from the femoral approach. Since the dissection was not completely covered a second stent (6 mm × 80 mm, OptiMed Sinus-Repo Stent, Germany) was placed in the SMA in an overlapping fashion. Control angiography at the end of the procedure demonstrated exclusion of the pseudoaneurysm and patency of the SMA and its branches (Fig. 3A, B). After stent implantation, heparinization (1,000 units/hr) was continued for 48 hr and acetylsalicylic acid (250 mg/day) was initiated. The patient was discharged after 3 days in hospital without any symptoms. He is being followed up by monthly Doppler examination, which has demonstrated patency of the stent and non-filling of the aneurysmal sac. One year follow-up control angiography (Fig. 4) demonstrated a patent SMA stent, total exclusion of the pseudoaneurysm and preservation of side branches.

Discussion

Acute mesenteric ischemia due to both arterial and venous causes has a poor prognosis, with reported survival rates ranging from 0 to 60.3% [4]. Early diagnosis and appropriate treatment, either surgical or endovascular, of this potentially catastrophic condition is important [3]. With arteriography it is possible to identify the cause and in selected cases to employ endovascular treatment options (e.g., intra-arterial infusions of vasodilators, thrombolysis, percutaneous transluminal angioplasty) [3, 4].

SMA aneurysms (aneurysms and pseudoaneurysms) are the third most common visceral artery aneurysms after splenic and celiac artery aneurysms, with a reported incidence in the literature of between 5.5% and 8%. They are almost always located in the first 5 cm of the SMA due to various causes [5–7]. Autodigestion of the arterial walls caused by release of pancreatic enzymes in pancreatitis, erosion of nearby pseudocysts into adjacent vessels, associated visceral stenoses, trauma, arteriosclerosis, surgery, infection, medial necrosis, collagen vascular disease, and arteritis are among the reported causes of mesenteric pseudoaneurysms [6, 8]. Dissections might lead to the development of SMA aneurysms [9] and, in particular, the dissecting type of SMA aneurysm without aortic involvement is rare [7]. There are reports of spontaneous dissections of the SMA in the literature [10]. Although arteriosclerosis is the most commonly reported cause of arterial dissections, iatrogenic causes, which are rarely reported, could also lead

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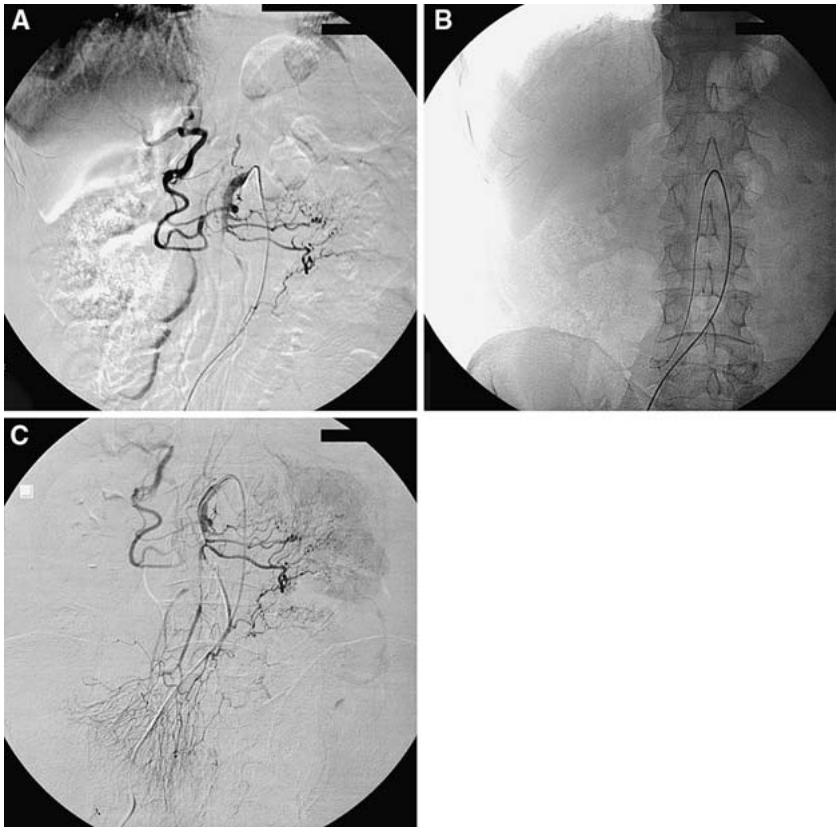

Fig. 1. **A** Selective arteriogram of the superior mesenteric artery shows acute occlusion of the SMA after giving off first jejunal branches and prominent pancreaticoduodenal arteries. **B** A hydrophilic guidewire was passed and the thrombus negotiated. **C** Arteriogram at the end of the angiography demonstrates partial recanalization of the thrombus and establishment of distal flow.

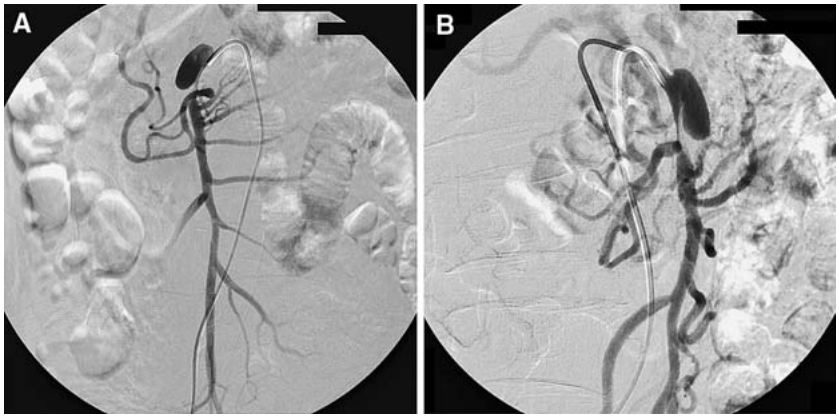

Fig. 2. Control selective injections show **A** patency of the SMA but **B** a 10 mm $\times$ 20 mm dissecting pseudoaneurysm at the proximal part of the SMA about 1.5 cm distal to the aortic origin.

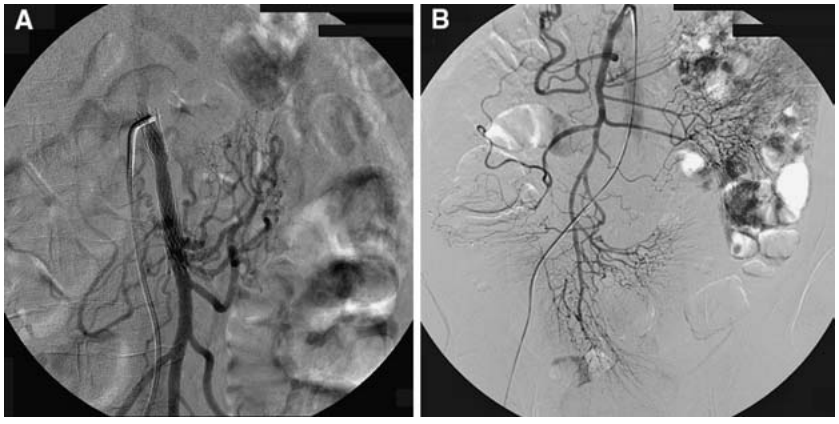

Fig. 3. Control angiograms after stent implantation show **A** complete exclusion of the pseudoaneurysm and **B** patency of the SMA and its branches.

Fig. 4. Follow-up selective angiography of the SMA after 1 year demonstrates patency of the stents, total exclusion of the pseudoaneurysm, and preservation of side branches.

to the development of SMA dissection [1]. Progressive involvement of the vessel and rupture back into the lumen, progression for a variable distance followed by cessation, and rupture through the adventitia are reported to be the possible courses of SMA dissection [2]. In our case, we believe that the most probable cause of arterial dissection was guidewire manipulation and catheter advancement. Although a hydrophilic guidewire had been used, its excessive manipulation in order to pass the occlusion and advancement of the catheter to aspirate thrombus might have caused a small intimal tear that allowed blood to enter the outer media, an increase in size of the tear leading to the longitudinal dissection and development of the pseudoaneurysm over the period of a month [1, 11]. Dissection may also be the result of surgery, but no surgical intervention involving the SMA was done in our case. Therefore we do not think that the dissection in our case was caused by the operation. Most SMA aneurysms are symptomatic and typically present with moderate to severe progressive abdominal pain, nausea, hemorrhage, hemobilia, or jaundice [5–7]. Our patient was also readmitted with abdominal pain 1 month after his discharge, which could have been the result of compression of the true lumen by the expanding false lumen [7]. These aneurysms could have ruptured and caused the death of the patient [5, 8].

In the literature it has been reported that the treatment of both symptomatic and asymptomatic patients with SMA aneurysms, either by surgical or percutaneous measures, is mandatory due to the high risk of aneurysm rupture [6, 12]. For aneurysms exceeding 2 cm in diameter and all pseudoaneurysms, surgery has been reported as the standard approach [5, 13]. Since our case showed limited progression, had not ruptured through the adventitia and did not show progressive involvement of the SMA [2], endovascular treatment with stent implantation, which is less invasive than surgical treatment [7], was chosen after obtaining the patient's consent. Stent-graft implantation could be a better option for aneurysm cases due to the total exclusion of the pseudoaneurysm [5, 7, 12]. However, stent-grafts could occlude the SMA branches [7]. Also, embolizations with coils, gelatin or *N*-butylcyanoacrylate has been used successfully for both ruptured and unruptured visceral artery aneurysms regardless of their clinical presentation, etiology or location, morbidity and recanalization rates ranging from 75% to 100%, 14% to 25%, and 18% to 37%, respectively [6, 13]. In our case, we preferred a rather small bare stent with an intention to seal off the dissection to exclude the pseudoaneurysm by preserving the prominent side branches. However, the first stent did not completely seal off the dissection, and therefore a longer bare stent was implanted in order not to obliterate the SMA branches. Control angiographies in our case showed that placement of the bare stents resulted in total exclusion of the pseudoaneurysm, sealing off the dissection and preserving the SMA branches.

Diagnostic and interventional angiographies must be performed with due regard to standard techniques, and with careful attention to detail during the procedure. Although it is rare, iatrogenic SMA dissection leading to pseudoaneurysm development can be encountered during angiography, especially in elderly patients. Bare stents could be an option for the endovascular treatment of dissecting pseudoaneurysms of the SMA due to their potential preservation of side branches.

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