Successful Angiographic Stent-graft Treatment for Spontaneously Dissecting Broad-base Pseudoaneurysm of the Superior Mesenteric Artery

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Visceral arterial aneurysm is an uncommon form of vascular disease that has a significant potential for rupture or erosion into an adjacent viscera, resulting in life-threatening hemorrhage. Superior mesenteric artery (SMA) aneurysms are especially rare, comprising only 5–8% of all visceral arterial aneurysms. Traditionally, the most common treatment for SMA aneurysms has been simple surgical ligation of the proximal and distal vessel. Herein, we report the case of a 53-year-old man with a dissecting pseudoaneurysm of the SMA, demonstrated by multi-slice computed tomography and angiography. The patient was successfully treated with percutaneous transluminal angioplasty and stenting. [*J Chin Med Assoc* 2005;68(8):397–400]

Key Words: computed tomography, interventional radiography, pseudoaneurysm, stent, superior mesenteric artery

Introduction

An aneurysm is defined as pathologic dilatation of a segment of a blood vessel. Visceral arterial aneurysm is an uncommon form of vascular disease that has a significant potential for rupture or erosion into adjacent viscera, resulting in life-threatening hemorrhage.[1] About 22% of reported visceral arterial aneurysms rupture, resulting in a mortality rate of 8.5%.[1] Superior mesenteric artery (SMA) aneurysms may be saccular or fusiform and are almost always located within 5 cm of the SMA orifice.[1] Although rupture still remains a major cause of sudden death, most SMA aneurysms have warning symptoms of mild upper abdominal discomfort or intestinal angina. Typically, patients will have moderate to severe abdominal pain that is usually progressive in its course. In ruptured SMA aneurysm, it can be difficult to determine clinically whether the pain is secondary to aneurysm expansion or to relative mesenteric ischemia. Patients may also experience nausea, vomiting, gastrointestinal hemorrhage, hemobilia, or jaundice.[1]

Arteriography is the main diagnostic tool, but computed tomography (CT) and ultrasound may also be used diagnostically, either incidentally during fever work-up or when looking for an occlusive lesion.[2] SMA aneurysms are very susceptible to rupture, irrespective of size, and may be difficult to manage even in the case of elective surgery.[3] An aggressive approach to the diagnosis and management of these aneurysms is warranted.[1]

Herein, we report the case of a 53-year-old man with a dissecting pseudoaneurysm of the SMA, which was demonstrated by multi-slice CT and angiography. The patient was successfully treated by stent-graft deployment, and remained asymptomatic with full employment for 23 months after the procedures.

Case Report

A 53-year-old male was sent to our emergency department (ED) suffering from a sudden onset of

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sharp abdominal pain for 1 hour. He denied having diabetes mellitus, hypertension, or other systemic diseases. He had a 1 pack/day cigarette habit and had consumed alcohol socially for decades. On arrival at the ED, he remained in clear consciousness, and his vital signs were as follows: body temperature, 36.1°C; blood pressure, 153/94 mmHg; pulse rate, 72 beats/min; respiration rate, 18 breaths/min.

A physical examination revealed a muscular, well-nourished man. His conjunctivae were not pale, and his sclerae were not icteric. The breathing sound was clear, with bilateral symmetric chest expansion. A regular heart beat without cardiac murmur was found. Abdominal examination disclosed diffuse tenderness, especially over the periumbilical area, without radiation to the back; there was no pulsation, rebound pain, or muscle guarding. Mild cold sweating was evident, and hypoactive bowel sounds were heard under stethoscope. Laboratory data were as follows: white blood cell count, 6,110/mm^3; hemoglobin, 14.4 g/dL; platelet count, 196 × 10^3/mm^3. Serum blood urea nitrogen was 13 mg/dL, and creatinine was 0.9 mg/dL. Serum total bilirubin, sodium, potassium, amylase, aspartate aminotransferase, alanine aminotransferase, and glucose were all within normal reference ranges, as was urine routine. Chest X-ray at the ED did not show any lung lesions or cardiomegaly, except for a mildly distended stomach at the left upper quadrant. A kidney-urinary-bladder X-ray examination revealed small-bowel dilatation with suspected thumb-printing appearance; an early intestinal ischemic change was considered. Therefore, an abdominal CT scan was requested and disclosed mild dilatation of the SMA, with segmental low density 3.1 cm away from the SMA orifice. Acute intra-arterial thrombosis, acute SMA dissection, and pseudoaneurysm formation were considered as the differential diagnoses (Figure 1).

Selective angiography revealed a spontaneous dissection with broad-base pseudoaneurysm formation (2.1 × 0.6 cm) in the proximal SMA, with segmental severe stenosis compressed by the dissecting pseudoaneurysm (Figure 2). The patient was treated with stent-graft deployment (Figure 3), via percutaneous transluminal angioplasty involving puncture of the right femoral artery. A 9 Fr introducer (Flexor®; Cook Inc, Bloomington, IN, USA) was inserted into the proximal SMA; a stent graft (JOSTENT® GraftMaster; Jomed, Rangendingen, Germany; 5 mm, 1.8 cm) was deployed to cover the pseudoaneurysm, but unfortunately, the stent slipped into the sac of the pseudoaneurysm because it was too small. Therefore, another longer stent graft (JOSTENT® Peripheral; Jomed; 4–9 mm, 3.8 cm) mounted on a 6 mm balloon catheter was deployed in turn. The follow-up angiogram showed complete obliteration of the pseudoaneurysm with some thrombus formation in the SMA branches; infusion of urokinase (780,000 U) followed. The follow-up angiogram also showed nearly full re-canalization of the thrombosed segment, with good collateral formation over the marginal artery (Figure 3). Changes in cell counts, electrolytes, and amylase levels after the procedures were within normal reference ranges. The patient's abdominal pain subsided after the above procedures and analgesics were given.

One month after discharge, a 16-slice abdominal CT scan with multi-planar reconstruction coupled with CT-angiography was performed, and showed the stent graft to be in the proper position and without significant stenosis or obstruction. Follow-up imaging studies 22 months after the procedures showed the stent graft with minimal shortening, good conformability and flexibility, without any change in its location and without significant lumen stenosis or obstruction (Figure 4).

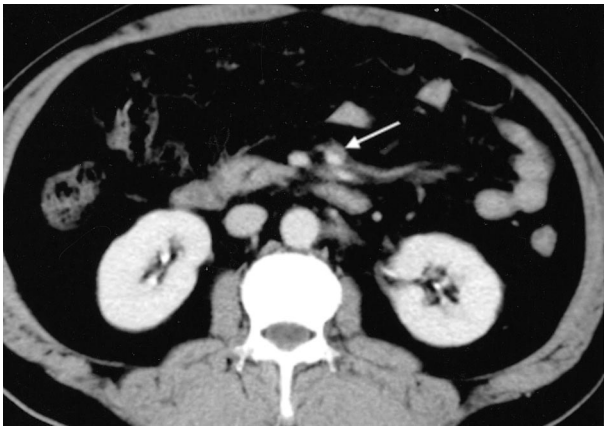

Figure 1. Spiral computed tomography image showing segmental low density in the superior mesenteric artery.

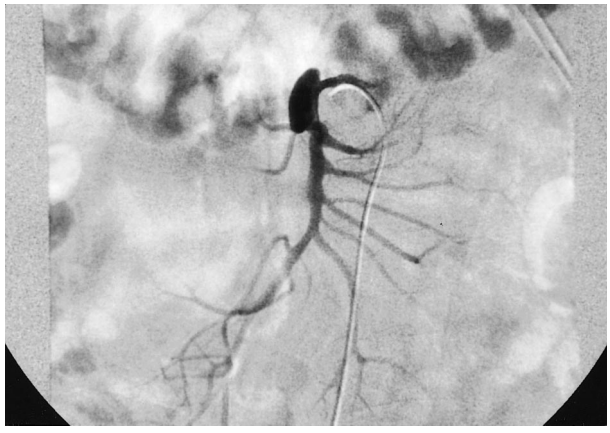

Figure 2. Superior mesenteric artery aneurysm pre-stent-grafting, demonstrated by angiography.

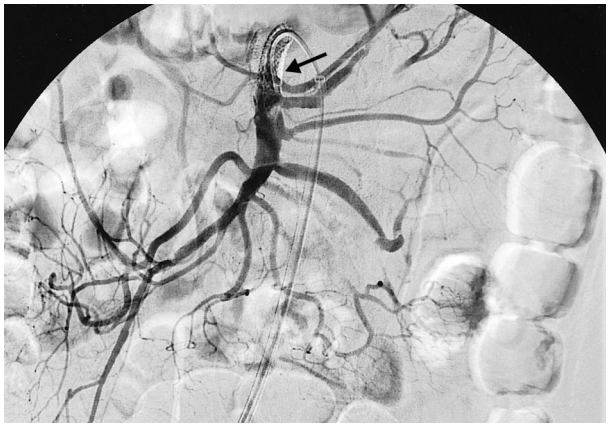

Figure 3. The superior mesenteric artery post-stent-grafting, demonstrated by angiography; note that the aneurysm has disappeared.

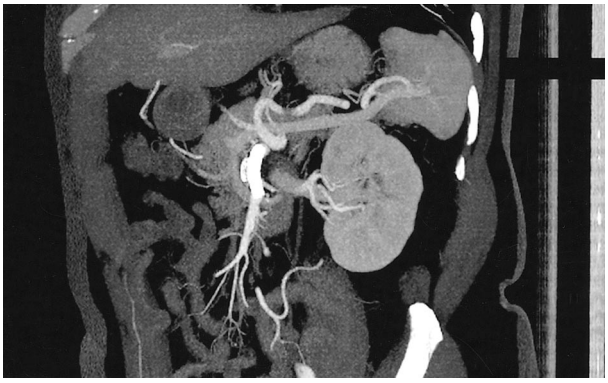

Figure 4. Follow-up multi-slice computed tomography images, with multi-planar reconstruction 22 months after the procedures, showing the vascular stent graft in the proper position, with obliteration of the aneurysm and minimal shortening, without significant lumen stenosis or obtruction.

Discussion

The main causes of visceral artery aneurysms are arteriosclerosis (20–30%), trauma (25%), inflammation (11%) and infection, especially that secondary to subacute bacterial endocarditis.[1,3,4]

SMA aneurysms may thrombose, causing mesenteric ischemia or rupture, resulting in exsanguinating hemorrhage, and the mortality rate after rupture of an SMA aneurysm remains quite high. SMA aneurysms pose unique challenges for surgical repair. Traditionally, the most common surgical approach was simple ligation of the proximal and distal vessel. Other techniques for repair include aneurysmectomy, which has been used in 35% of reported cases, and aneurysmorrhaphy, which has been used in 21% of patients.[1] Although aneurysms of the SMA were first described by Koch in 1851, attempts at surgical repair were not undertaken until 1895 by Stevenson and 1898 by Finney. DeBakey and Cooley (1953)[5] were the first to report successful excision of an SMA aneurysm. Because of the high frequency of rupture and thrombosis (50% of cases), it seems reasonable to surgically excise SMA aneurysms electively if the operative risk is acceptable. Nevertheless, surgical treatment carries significant morbidity and mortality in high-risk patients with severe disseminated vascular disease. The reported mortality rate is 4–16%,[6–8] and the primary vascular patency rate is 78%.[8] Moreover, inflammation and infection are common features of these aneurysms, making dissection hazardous. Therefore, transarterial embolization has recently been suggested as an alternative to surgery.[2]

In 1991, Guglielmi et al[9,10] first described the clinical use of detachable platinum coils for the endovascular treatment of intracranial aneurysms. Since their approval by the Food and Drug Administration, Guglielmi detachable coils (GDCs) have become important tools in the management of intracranial aneurysms. More recently, coil compaction of SMA pseudoaneurysm was reported by Hama et al[11] in 2002.

Endovascular stenting was first introduced by Palmaz et al[12] in 1987 to treat a stenotic iliac artery. A few years later, a Palmaz stent was placed in the stenotic celiac ostium to treat mesenteric ischemia.[13] Endovascular stenting implantation could reduce recoil, the rate of restenosis, and dissection, and is less invasive than standard open surgery.[14–19] Therefore, endovascular stenting could also be an effective alternative in the treatment of SMA aneurysm.

In the current case, the segmental crescent-like low density in the SMA on abdominal CT scan could be attributed to the mixed entity of intimal flap of the pseudoaneurysm and thrombus within the sac. Intimal flap and mural thrombus are key factors for diagnosing dissection at the SMA using contrast-enhanced CT images. However, the intimal flap cannot always be detected; therefore, the mural thrombus might be the only imaging evidence. Once the clue of mural thrombus is detected, local preventive urokinase dripping or heparinization via sheath side-port might help to prevent distal clot migration before any aggressive procedure. The possible complications of endovascular stent-graft placement include intimal tear, graft thrombosis, and acute occlusion due to misplacement of the stent graft.[18] In our case, the

propagation of thrombus at marginal arteries of the SMA could be treated as a complication during the procedure, especially after the initial failed deployment of the stent graft, which slipped into the pseudoaneurysm sac. Preventive dripping of urokinase might be helpful to avoid such a complication or to limit its severity. Consequently, if the complication occurs, infusion of urokinase could assist re-canalization of the thrombosed marginal arteries, as in our case.

In this report, our patient was successfully treated with angiographic stent grafts and remained asymptomatic and in full employment for 23 months after the procedures. We conclude that dissecting pseudoaneurysm of the SMA should be considered in the differential diagnosis of acute abdominal pain, and that endovascular stenting could be an effective, less invasive alternative to simple surgical ligation for such pseudoaneurysm.

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