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Spontaneous thrombosis of a saccular iliac artery aneurysm induced by overlapping self-expandable bare metallic stents

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ABSTRACT
Isolated iliac artery aneurysms are rare lesions. Prompt diagnosis and timely intervention are essential in their management. In elderly patients with coexisting medical problems, endovascular procedures are preferred to avoid the risks of morbidity and mortality associated with general anesthesia and surgery. We report a case of a true saccular external iliac artery aneurysm that underwent spontaneous thrombosis after treatment with placement of two overlapping bare self-expandable metallic stents only.

Key words: • *iliac artery* • *aneurysm* • *stents* • *thrombosis*

Endovascular techniques are well-known and accepted methods for the treatment of peripheral artery stenoses and aneurysms. Stent-grafting or coiling with or without stent-supported procedures may be performed in the treatment of aneurysms (1–5). Spontaneous thrombosis of the aneurysms after stent placement only, i.e., without additional coil packing, is rarely seen. There have been isolated case reports using this approach, particularly following neurointerventional procedures for small caliber vessels and aneurysms (6–8).

In this article, a case of spontaneous thrombosis of a saccular iliac artery aneurysm (IAA) following deployment of two overlapping bare stents without further embolization is presented.

Case report

An 80-year-old man was admitted to our institution with a complaint of transient ischemic attacks. Color Doppler imaging of carotid arteries revealed 80% stenosis of the proximal left internal carotid artery. After evaluation for the stenting of the lesion, a decision to use endovascular treatment was made. Because of the absence of right femoral pulse, arterial access was gained via percutaneous left femoral approach. Angiograms showed occlusion of the right common iliac artery (CIA) and external iliac artery (EIA), as well as 80–90% stenosis in the left distal CIA, in addition to carotid disease. There was also a 10 mm saccular aneurysm in the left proximal EIA, distal to the stenosis (Fig. 1). Rich collaterals were seen on the right side bypassing the occlusion.

The left carotid lesion was treated first. Stenting of the left CIA stenosis and coiling of the EIA aneurysm with the support of the stent was also planned because of the degree of stenosis. Two overlapping 10 x 40 mm self-expandable bare metallic stents (Protege, ev3, Plymouth, Minnesota, USA) were deployed, covering the stenosis and the base of the aneurysm. Overlapping segments of the stents were aligned to the base of the aneurysm (Fig. 2). After deployment of the stents, dilation of the stenosis with a 10 x 40 mm balloon angioplasty catheter (Opti-Plast, Bard, UK) was performed. Control angiography immediately after this intervention displayed full patency of the vessel. Additionally, slow filling of the contrast medium into the aneurysmal lumen was observed, indicating slower flow within the sac. Hence, it was thought that bare stenting could induce spontaneous aneurysmal thrombosis. Because of this possibility, further filling of the aneurysm with coils was abandoned, and the procedure was stopped. Acetylsalicylic acid (100 mg) and clopidogrel (with a loading dose of 300 mg followed by 75 mg daily for 3 months) were initiated.

Multidetector computed tomography (CT) angiography scan at 3 months confirmed complete thrombosis of the saccular EIA aneurysm and full patency of the arteries (Fig. 3). Color Doppler ultrasound examination at 6 months revealed no recurrence of the aneurysm.

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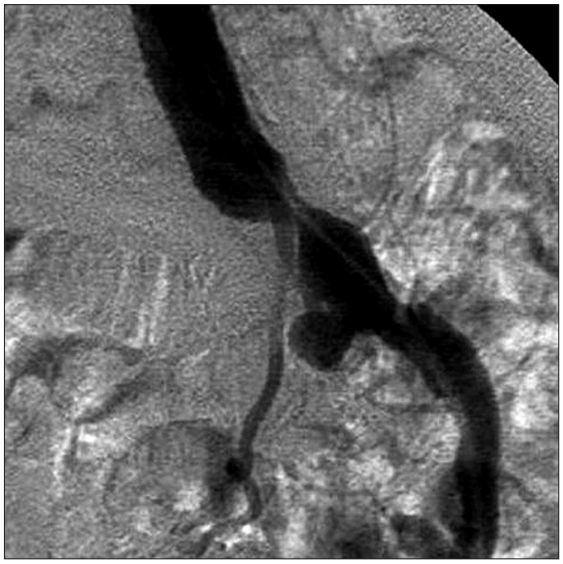


Figure 1. Non-selective angiographic image reveals a saccular left external iliac artery aneurysm and a proximal stenosis.

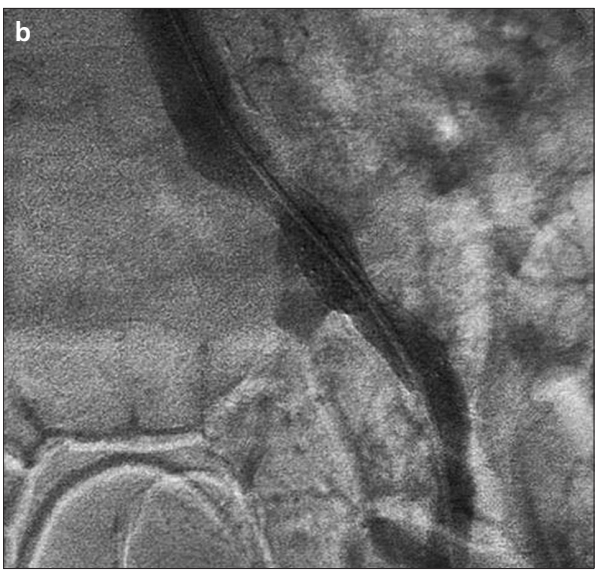
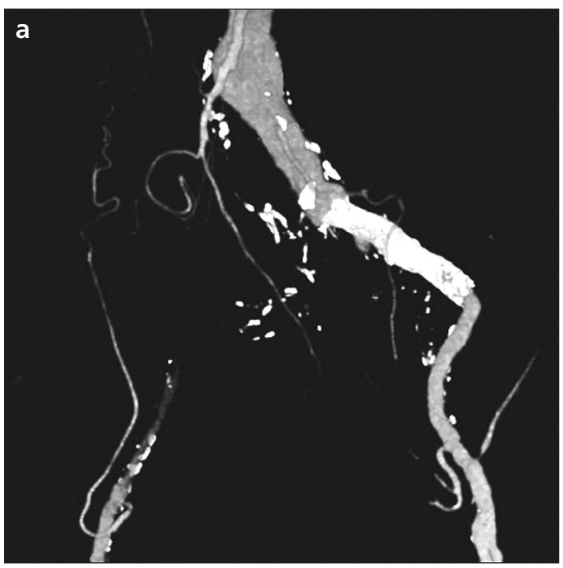


Figure 2. a, b. Midarterial **(a)** and late phase **(b)** angiographic images obtained after placement of two overlapping bare self-expandable metallic stents display slow flow into the aneurysmal lumen.



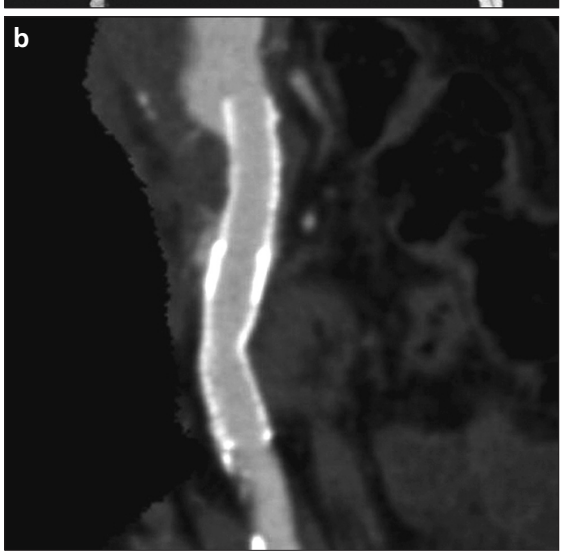


Figure 3. a, b. Multidetector CT (16-row) angiography obtained 3 months after intervention, with volume rendering 3D image **(a)** and coronal-oblique curved reformatted image **(b)**, shows that the left common iliac artery and external iliac artery are fully patent and the aneurysm is totally thrombosed.

Discussion

Involvement of the iliac arteries is seen in 10–20% of patients with abdominal aortic aneurysms (AAAs) (9). Isolated IAAs, however, are relatively rare, with an estimated prevalence of 0.008–0.03%, based on large autopsy series (10). It is well known that fusiform aneurysms are more frequent than saccular aneurysms in this anatomic region, although we could not find any data in the literature about the ratio. Brin and Busuttil (11) reported a 67% incidence of rupture, with 90% mortality in untreated patients. Early diagnosis and exclusion of the aneurysm are imperative to avoid this outcome (12).

IAAs with compressive symptoms (e.g., neurologic or urologic symptoms) should be treated with open surgery because endovascular treatment cannot rapidly reduce aneurysm size. IAAs without compressive symptoms can be treated by endovascular procedures. Endovascular treatment options for peripheral arterial aneurysms are stent-graft placement, coil embolization, and stent-assisted coil embolization. Endovascular repair of IAAs is a minimally invasive technique and is associated with low mortality and morbidity. Choosing an appropriate option is essential for achieving excellent long-term results and reducing potential complications (1–5).

Many interventionists prefer placement of a short stent-graft as the definitive approach to treatment in IAAs. In our case, this approach would cure both stenosis and aneurysm. However, higher restenosis and occlusion rates of stent-grafts in atherosclerotic stenosis compared to bare stents are reported (13). Our primary aim was to restore and keep the patency of the remained iliac route to the aortic and supraaortic area. Therefore, bare stenting of the iliac artery stenosis with angioplasty was performed first. Because we observed sluggish flow, further coiling of the aneurysm was abandoned.

Stent-assisted coiling is another treatment option for peripheral artery aneurysms. Achari and Krajcer (14) reported a case of an AAA treated successfully by a bare metal stent implantation following coil embolization. Furthermore, disappearance of aneurysm after treatment with bare metallic stent only can be observed in selected patients. Villareal et al. (15) described a case of inflammatory AAA that regressed after bare metallic stent implantation.

Spontaneous thrombosis of aneurysms without any treatment or after stent placement only is more frequently reported in the neurovascular system (6, 7, 16). This can be explained by the relatively smaller size of neurovascular lesions, resulting in more rapid thrombosis after change in flow induced by stenting. Another reason for more frequent reports in neuroradiology may be the high incidence of saccular aneurysms in neurovascular system, allowing greater frequency of case collections.

Various factors influence the spontaneous thrombosis of an aneurysm. The most important factor appears the relationship between volume and neck size. Black and German (17) demonstrated that the volume to orifice ratio of the aneurysm appears to be the major contributing factor to the balance between thrombogenesis and thrombolysis: the larger the volume with respect to the neck, the more sluggish the flow inside the aneurysm. In our patient, control angiograms after stenting showed the aneurysm filled and emptied very slowly, indicating very sluggish intraaneurysmal flow.

Strut numbers and volume of the metallic material of the stents are also factors related to spontaneous thrombosis of the aneurysm treated with stenting and without coiling. Benndorf et al. (18) used two overlapping stents and suggested that the reduced stent porosity caused by the overlapping stents, which result in significant hemodynamic changes inside the aneurysmal sac, may accelerate intraaneurysmal thrombosis. In our case, increased numbers and area of the metallic struts covering the neck of the aneurysm by overlapping stents might have contributed to the stagnation of the blood and to the thrombosis.

Aneurysm location and relationship to parent artery may also be important in spontaneous thrombosis. It can be supposed that sidewall saccular aneurysms as in our case can undergo spontaneous thrombosis more easily and frequently than the bifurcation aneurysms because of more forceful flow in the bifurcation.

Another factor likely related to spontaneous aneurysm thrombosis is the contrast medium used for angiography. Warschewske et al. (19) reported the complete thrombosis of a giant anterior communicating artery aneurysm four weeks after diagnostic angiography. Although the underlying mechanisms are not completely understood, nonionic contrast media may interact with clotting (endothelium, platelets, and red blood cells), causing activation of coagulation or thrombosis (20). However, the effect of the contrast medium provoking the thrombosis seen in our case is obscure.

The possibility of spontaneous thrombosis should be considered when slow flow and/or stagnation are present after stent placement, especially for sidewall saccular peripheral artery aneurysms. If thrombosis is not present after adequate waiting time, additional coiling is always an alternative choice. Stenting decreases the possibility of rupture during that waiting time, because the blood flow into the aneurysmal lumen is decreased. If spontaneous thrombosis occurs, treatment with bare stenting only is easier than other treatment options.

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