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Original Article

Bilateral isolated internal iliac artery aneurysms treated by bifurcated stent-graft combined with the coil embolization: a case report

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Abstract: We report the case of an 80-year-old patient with bilateral isolated internal iliac artery aneurysms (IIIAAs), which were diagnosed by computer tomography angiography (CTA). Aneurysms with short proximal necks and large diameters were treated with coils, followed by placement of a bifurcated stent-graft within the aortic and external iliac arteries. When ectopic embolism and a type III endoleak were present, they were overcome by removing the coil from the common femoral artery and placing another stent-graft. The patient tolerated the procedure well, and at 7 days and 6 months after the surgery, no endoleak was present, and bilateral IIIAAs were found to be totally thrombosed on follow-up CTA. The patient has remained well so far. Therefore, bifurcated stent-graft combined with the coil embolization may be an effective alternative treatment option for bilateral IIIAAs, especially for patients with high risks and special anatomical structure.

Keywords: Isolated internal iliac artery aneurysms, endovascular repair, stent graft, ectopic embolism, endoleak

Introduction

Internal iliac artery aneurysms (IIAAs) constitute an important subset of aortoiliac aneurysms, but isolated internal iliac artery aneurysm (IIIAA) is rare [1] and bilateral IIIAAs are especially rare, with only 6 of 55 IIIAAs having been reported by Antoniou et al. [2]. They are clinically significant because of their anatomical position deep within the pelvis, elusive clinical presentation and diagnosis, and the risk of rupture [3]. When left untreated, their natural history is probably one of continued expansion and rupture with a high mortality rate. However, with correct and timely treatment, survival can be improved [4]. Open repair of IIIAAs can be particularly challenging because of the aneurysm's location, difficulty in exposing the distal branches, and closely associated venous structures et al. [5]. In the past decade, endovascular repair of abdominal and thoracic aneurysms has become widespread. Endovascular treatment of IIIAAs also has been reported with success. Endovascular modalities include stent-grafting, various embolization techniques, or a combination of both methods [2]. Occasionally, we treated an aged patient with bilateral IIIAAs with bifurcated stent-graft combined with coil embolization.

Case report

An 80-year-old man was seen at an outlying hospital with a 12 hours history of gradually increasing lower abdominal pain. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Nanchang University. Written informed consent was obtained from all participants. The patient had hypertension, which had been treated with medication for 10 years, and severe constipation for several years. Abdominal ultrasonography showed possible aneurysms, and hence the patient was admitted to our hospital. At our facility, the patient's vital signs were normal; there was mild abdominal tenderness, and abdominal-pelvic pulsatile mass was palpable. An emergency computed tomography angiography (CTA) was performed. The CTA results showed bilateral IIIAAs; the left IIAA measured

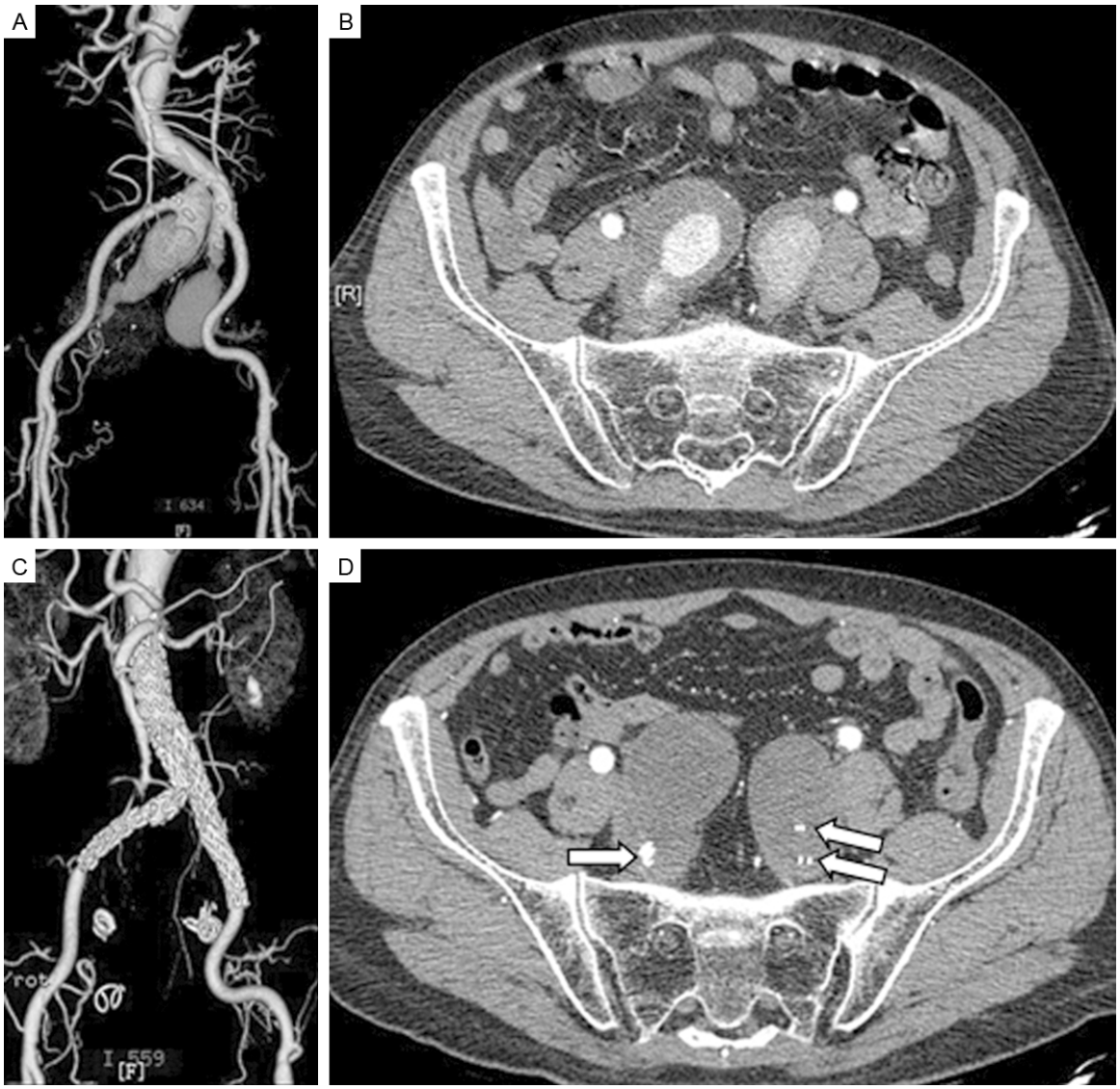

Figure 1. A computer tomography angiography (CTA). (A, B) Computer tomography angiography show bilateral isolated internal iliac artery aneurysms before the operation; (C, D) Computer tomography angiography show that the bilateral isolated internal iliac artery aneurysms disappeared and the aneurysms sacs were completely thrombosis at 6 months after the operation. Arrows indicate the coils in (D).

6.3 cm × 5.2 cm, and the orifice diameter was 1.5 cm; the right IIAA measured 6.8 cm × 5.7 cm, and the orifice diameter was 2.7 cm, and both common iliac arteries were short (**Figure 1**). The physical examination and routine laboratory tests, including complete blood count, blood chemistry, liver function tests, serum electrolytes, and bleeding times, were all normal. Therefore, we decided to attempt endovascular repair using bifurcated stent-grafts and coil embolization. This was followed by an emergency surgery performed in the interventional operation room. Bilateral femoral arterial access was obtained directly under general anesthesia, and were blocked. Heparin (4,000 units) was administered intravenously prior to the procedure. The patient underwent pre-procedural digital subtraction angiography to evaluate the anatomic configuration of the aorto-iliac system, which showed bilateral IIIAAs just as the CTA had, but without contrast outside of the vessel (**Figure 2**). Embolization of both IIAA's was performed using coils (Right: MWCE15-8, 3 pairs; Left: MWCE15-8, 2 pairs and MWCE10-8, 1 pair) to induce thrombosis of these arteries from the left femoral artery.

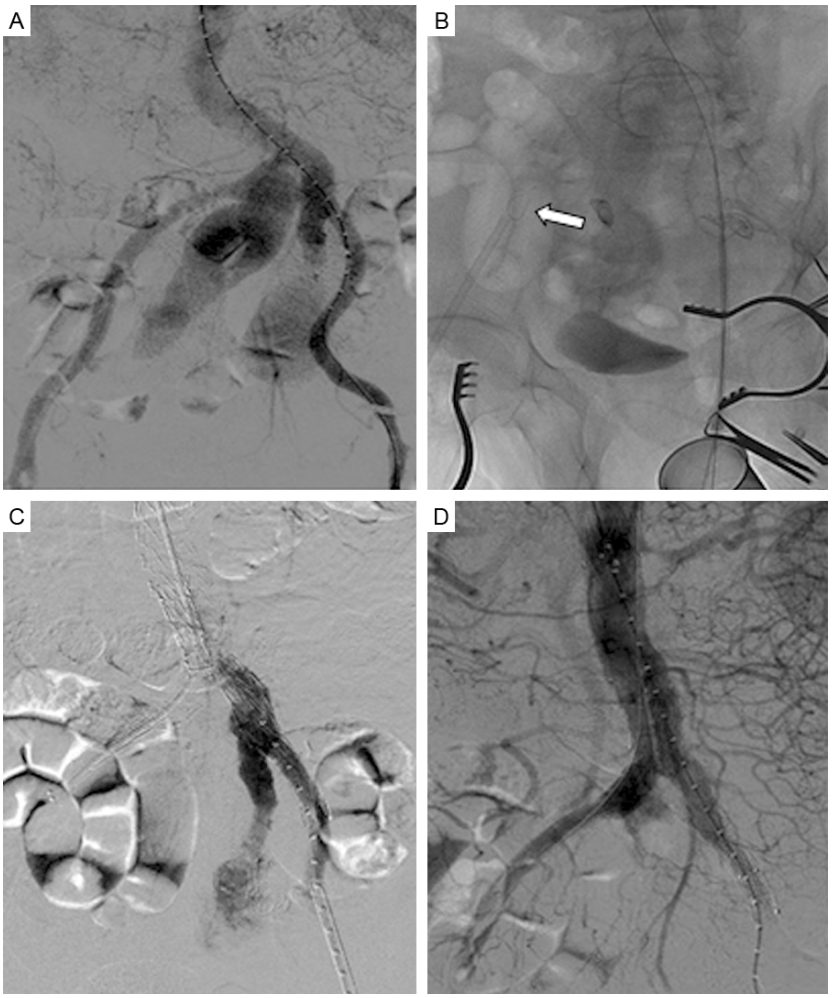

Figure 2. The patient underwent pre-procedural digital subtraction angiography. A. Intra-arterial DSA image shows bilateral isolated internal iliac artery aneurysms; B. Image shows ectopic embolism happened in right external iliac artery (Arrow indicated); C. Intra-arterial DSA image shows an type III endoleak presented at the ostia of left internal artery; D. Intra-arterial DSA image shows result after the operation.

Bifurcated stent-grafts (Medtronic, ENDURANT, ENBF2313C175EE, and ENLW1613C95EE) were inserted into the abdominal aortic artery below the renal artery and both external iliac arteries, covering the ostia of the internal iliac arteries (**Figure 2**). Ectopic embolism occurred in the right external iliac artery, the coil was removed from the common femoral artery (**Figure 2**). A type III endoleak was present at the ostia of left internal iliac artery (**Figure 2**). Hence, another stent-graft (Medtronic, ENLW-1613C95EE) was inserted in left common iliac artery and external iliac artery. The final angiogram showed complete exclusion of aneurysms with no signs of endoleak, and accurate positioning of the stent-grafts (**Figure 2**). The patient did well after the procedure, was discharged 7 days later, and has had gradual resolution of the initial symptoms. A follow-up CT scan 1 week and 6 months after the repair showed no evidence of an endoleak, the aneurysmal sacs were completely thrombosed (**Figure 1**), and the patient has remained well without claudication until now.

Discussion

An IIIAA can be defined as a two-fold increase in the size of the artery without a coexisting aneurysm in another location [6]. IIIAAs are an unusual entity, with a reported prevalence of less than 0.03% [7]. Bilateral IIIAAs were reported in only 6 out of 55 patients with IIAAs by Antoniou et al. [2]. They constitute chronic degenerative conditions, most frequently of atherosclerotic etiology, which usually occur in an elderly population with a male predominance [8].

IIIAAs are difficult to diagnose, and often present late, as a result of complications due to a large diameter. Patients develop symptoms due to owing to compression of adjacent structures, aneurysmal expansion, or rupture. The most common presentations are lower abdominal pain, low back pain, or buttock pain [4]. In this case, the patient was an old man with lower abdominal pain and severe constipation. IIIAAs can be diagnosed by trans-abdominal ultrasonography, but it is inaccurate because of their location deep within the pelvis [9]. It can however be confirmed by CT angiography [10]. CTA will provide accurate localization of the internal iliac artery (**Figure 1**), exclude the presence of other intra-abdominal aneurysms, and provide

information on wall integrity, which is helpful in deciding the treatment.

The natural history of IIIAAs, high risk of associated rupture, and associated mortality provides evidence for an aggressive approach to the management of IIIAAs. This rationale is reinforced by the operative mortality rates. Elective open surgery mortality rates of up to 11% have been reported. In emergency cases, the mortality figures may be as high as 50% [4]. Therefore, early elective intervention is required to improve the survival rate. The challenges faced by conventional open surgical repair, have precipitated application of innovative therapeutic strategies to confront the significant mortality associated with the disease. Antoniou et al. reported better results with the endovascular treatment of 56 patients with IIAAs [2]. The endovascular procedure consisted of coil embolization of the aneurysm outflow, aneurysm sac itself and/or the aneurysm neck, with or without stents. Technical success was achieved in 71% of cases. The most common reason for technical failure (11/16, 69%) was incomplete exclusion of the internal iliac artery with residual filling of the aneurysm sac, and one was due to coil displacement. The early postoperative morbidity rate was 20% (11 patients), which was associated with insufficiency of the pelvic circulation resulting in buttock/thigh claudication in nine patients. Two of the patients who developed claudication symptoms had been treated for bilateral internal iliac artery aneurysms. Igari et al. recently reported a case of bilateral IIIAAs treated successfully by endovascular surgery [11]. Exclusion of the orifice of the internal iliac artery can be achieved by deploying a stent graft along the common and external iliac arteries, if the aneurysm neck anatomy is suitable. However, in this case, the promixal necks were too short, and the ostia of the IIAs were too large. Initially, there was a concern about complications such as severe buttock claudication, rest pain, or even gluteal/peroneal necrosis et al. if simultaneous embolization of both internal arteries was performed.

On checking the pre-operative CTA, we found that if both the hypogastric arteries did not have good main outlets, most part of the mural thrombus existed in the distal end of aneurysms, and pelvic organs could get some blood from the lateral arteries arising from external iliac or femoral arteries. Meanwhile, the patient had undergone 12 hours of gradually increasing lower abdominal pain that was not well localized. This was an indication that the aneurysm could rupture anytime. Thus, in order to avoid the type I and II endoleak and to prevent the aneurysm from rupturing, we chose the bifurcated stent-graft combined with the coil embolization in the aneurysm sacs. In this particular case, the type III endoleak occurred first, and was recovered by inserting another stent-graft. The displacement of coil, which is the most hazardous complication, also occurred in this case. This was possibly due to the diameter of internal artery orifice and the large size of aneurysm and the coil dancing, which appeared after the coil was inserted into the aneurysm sac. It could also be a reason for the guiding catheter of coil being near to the orifice. Therefore, first placing the stent-graft and inserting the catheter a bit distally in the sac may prevent the coils from steak out. It was luck The displaced coil was removed from the common femoral artery directly before the femoral arteries could be blocked. Too much coil was not needed since it was required only to induce thrombosis of the aneurysm sac. This was confirmed by CTA, which showed that the IIAAs were completely thrombosed at 7 days post-procedure. The patient had gradual resolution of the initial symptoms. A follow-up CTA scan one week and 6 months after the repair showed no evidence of an endoleak, and the patient has remained well until now.

Following our positive experience in this patient, bifurcated stent-graft combined with the coil embolization of both IIAAs is an effective alternative treatment option for bilateral IIIAAs, and only a few coils are needed so as to not embolize the whole sac, especially for patients with high risk and special anatomical structure.

Disclosure of conflict of interest

None.

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