J HK Coll Radiol. 2009;12:27-30

CASE REPORT

Concomitant Late Type II Endoleak with Recanalised Internal Iliac Artery and Type III Endoleak after Endovascular Aneurysm Repair of Aortoiliac Aneurysm

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ABSTRACT

An 86-year-old patient with infrarenal abdominal aortic aneurysm and right common iliac artery aneurysm was treated with endovascular aneurysm repair with an endograft after internal iliac artery embolisation with coils, followed by cross-femoral bypass surgery. Three years later, a type II endoleak, due to recanalisation of the internal iliac artery, leading to an enlarging common iliac artery aneurysm and a concomitant type III endoleak in the aortic aneurysm sac were identified. This report describes the management of the condition.

Key Words: *Aorta; Aortic aneurysm; Graft occlusion, vascular; Implants and prostheses; Stents*

INTRODUCTION

Up to 40% of abdominal aortic aneurysms have coexisting unilateral or bilateral iliac artery aneurysm or ectasia.[1,2] Aortoiliac aneurysm is a challenge for endovascular repair due to complex anatomy, difficult vascular access, and possible insufficient landing for an endovascular endograft. Endovascular aneurysm repair (EVAR) of an aortoiliac aneurysm with endograft is believed to have a high risk for type I endoleak and delayed rupture. To manage aortoiliac aneurysm with insufficient landing zone in the common iliac artery (CIA), preliminary internal iliac artery (IIA) embolisation before EVAR has been a widely accepted management to prevent potential type II endoleak. IIA embolisation has a high success rate and late recanalisation is uncommon.[2-5] However, this report describes a patient who had late recanalisation of the IIA leading to an enlarging CIA aneurysm. In addition, he had a concomitant late type III endoleak of the infrarenal abdominal aortic aneurysm, probably due to fabric tear of the endograft.

CASE REPORT

An 86-year-old man was referred to the Department of Radiology, Tuen Mun Hospital, Hong Kong, in 2004 after surgery for an incidental finding of pulsatile abdominal mass. He had a history of sigmoid colon cancer, for which sigmoidectomy was performed, and bladder cancer without metastasis. He was able to walk unaided and lived independently.

Computed tomography (CT) aortogram and digital subtraction angiography showed an infrarenal aortic aneurysm measuring 5.2 cm in maximal diameter and 5.0 cm in length, and a right distal CIA saccular aneurysm of 6.0 cm in maximal diameter and 6.0 cm in length. The right external iliac artery (EIA) was tortuous and stenotic, and was insufficient for the safe placement of an endograft. A hybrid surgical and endovascular procedure was performed.

Right IIA embolisation was performed with 9 coils, including 3 coils with diameters of 4 to 8 mm and length of 30 to 50 mm (MReye Flipper Detachable Embolization Coil Delivery System; Cook, Bloomington, USA) and 6 coils with diameters of 5 to 6 mm and length of 50 to 60 mm (Fibered Platinum Coils; Boston Scientific, Natick, USA). Post-procedure angiograms confirmed complete occlusion of the IIA.

A hybrid open/endovascular procedure was performed 10 days after IIA embolisation. An aortouniiliac endograft (AUI 32 mm, Talent Stent Graft System; Medtronic, Santa Rosa, USA) and a left iliac extender cuff (18 mm) were deployed via the left common femoral approach. After

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Submitted: 15 May 2009; Accepted: 1 June 2009.

EVAR, a cross-femoral bypass graft was fashioned to redirect blood to the right lower limb. The patient had no immediate complications and remained stable during the postoperative period.

He continued regular clinical follow-up in the surgical outpatient clinic, and there was no evidence of lack of perfusion to the legs 12 months after the procedure. However, he defaulted follow-up for further CT aortogram. Three years after operation, he was admitted to the Tuen Mun Hospital because of an incidental finding of an enlarging mass in the right lower abdomen. The mass was not pulsatile on clinical examination and was non-tender. The patient was clinically stable. Due to the previous history of aneurysm repair, CT angiogram aortogram (16-multidetector CT, Brilliance; Philips Medical Systems, Cleveland, UK) was arranged and showed 2 problems. First, the right IIA was recanalised with retrograde blood flow to the CIA aneurysm. The CIA had been largely thrombosed but there was a small area of contrast opacification at its distal part (Figure 1). Second, there was abnormal contrast opacification around the aortic endograft, suggesting the presence of endoleak into the aortic aneurysm sac (Figure 2). The type of endoleak was not determined by reviewing the CT findings alone and no retrograde flow of blood from the adjacent arteries to the aortic aneurysm sac could be identified. Digital subtraction angiogram (DSA) showed contrast extravasation at the proximal part of the endograft compatible with type III endoleak (Figure 3a).

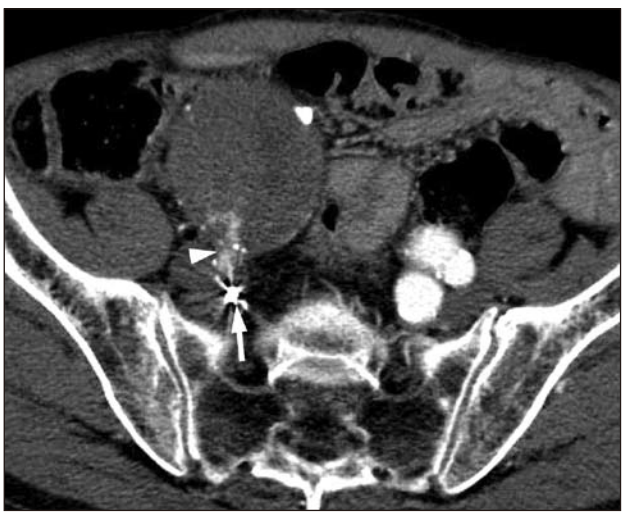

Figure 1. Computed tomography angiogram aortogram showing a small amount of contrast opacification (arrowhead) in the distal part of the right common iliac artery aneurysm due to a recanalised internal iliac artery with retrograde blood flow towards the common iliac artery aneurysm. The common iliac artery aneurysm is mostly thrombosed. Coils (arrow) indicate the site of previous internal iliac artery embolisation.

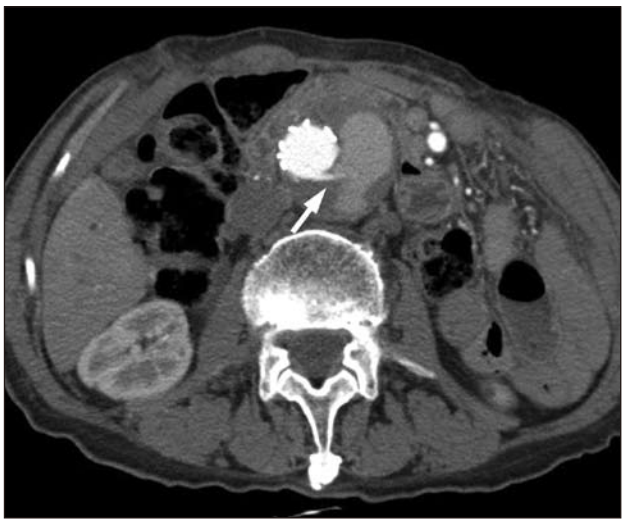

Figure 2. Computed tomography angiogram aortogram showing an endoleak with blood entering the aneurysm sac and the site of the leakage (arrow).

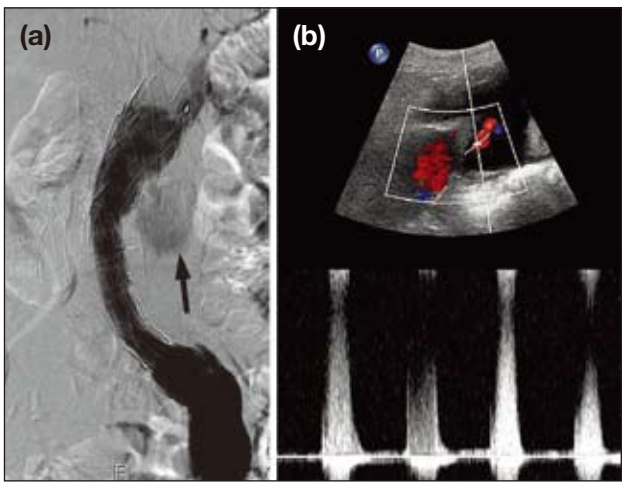

Figure 3. (a) Digital subtraction angiogram showing the site of fabric tear and type III endoleak (arrow); and (b) colour-flow Duplex sonogram showing arterial waveform at the site of the leakage.

Colour-flow Duplex sonogram demonstrated a focal area of disintegrity with arterial blood entering the aneurysm sac (Figure 3b). CT aortogram performed 1 week later showed an enlarging right CIA aneurysm with a maximal diameter of 7 cm. There was persistent retrograde blood flow from the recanalised right IIA. Two-stage management was selected.

DSA was performed to delineate the site of disintegrity. A second endograft (AUI 32 mm, Talent Stent Graft System; Medtronic) was deployed within the lumen of the previous endograft. Post-procedure DSA showed no further leakage of contrast into the aneurysm sac. The patient remained stable and proceeded to the second-stage of management 2 weeks later.

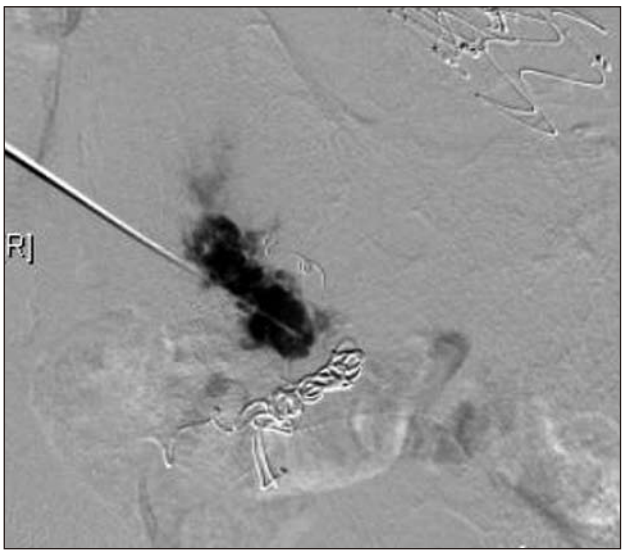

Figure 4. Fluoroscopy showing N-butyl-cyanoacrylate glue injection to the site of the leakage.

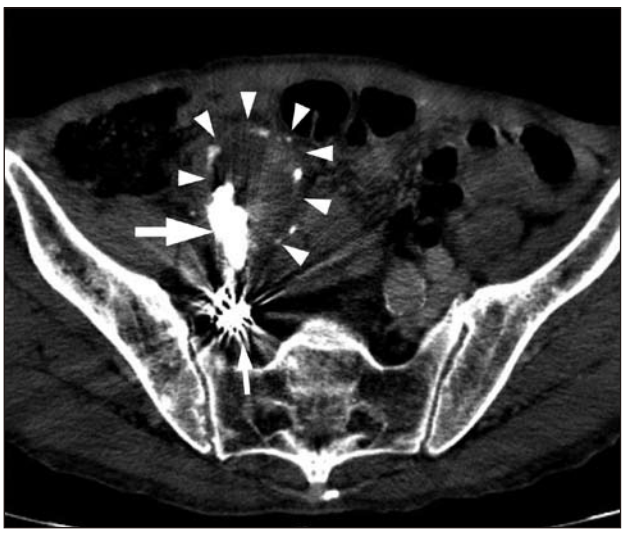

Figure 5. Computed tomography angiogram showing glue cast (big arrow) occluding the site of the leakage at the inferior part of the right common iliac artery aneurysm. The right common iliac artery aneurysm is largely thrombosed (arrowheads). Coils (small arrow) indicate the site of the previous internal iliac artery embolisation.

With the patient supine, the recanalised right IIA was localised by Duplex-Doppler sonography. Under sonographic guidance, a 20-G needle was percutaneously directed to the site of the retrograde blood flow of the right IIA. N-butyl-cyanoacrylate glue (NBCA; Cordis Neurovascular, Miami, USA) was mixed with ethiodized oil at a 1:2 ratio, and was hand injected under fluoroscopic monitoring (Figure 4). Intermittent sonographic imaging detected any residual blood flow and guided fine adjustment of the needle position until no more residual flow was detected. Post-procedure sonogram showed an absence of retrograde blood flow of the right IIA. The patient remained clinically stable and was discharged 4 days after the procedure.

CT angiograms 8 days and 1 month after the procedure showed complete occlusion of the right IIA with glue cast (Figure 5). The size of the right CIA aneurysm showed no further increase and there was no endoleak of the aortic aneurysm endograft. However, the patient died of pneumonia 3 months after the procedure.

DISCUSSION

Placement of the endograft in the EIA during endovascular management of aortoiliac aneurysm is a widely accepted and common management for aortoiliac aneurysm. In patients with ectatic iliac arteries, various methods have been described to manage the distal placement of the endograft and prevent type II endoleak. Among the methods, preliminary coil embolisation of 1 or both IIAs, followed by extension of the limb of the endograft into the EIA, is usually performed.[2-5] Apart from coils, vascular occlusion plugs were used recently to occlude the vessel.[6] Both methods can achieve high technical success rates and late recanalisation is uncommon.[4-6] However, in this patient, it was believed that the enlarging common iliac aneurysm was due to the recanalised IIA based on the CT and sonographic findings. Moreover, the size of the common iliac aneurysm was controlled after re-embolisation of the IIA.

Recanalisation of the IIA is not commonly reported and several reasons may account for the condition in this patient. First, the right IIA had a diameter of 10 mm with several calcified atherosclerotic plaques on its wall. There was no noteworthy stenosis and the artery was not particularly tortuous, but difficulties were encountered in deploying the coils during the procedure, therefore 9 coils were used to ensure complete occlusion of the vessel. Second, loosening of the coils over time was possible and the loss of elasticity of the arterial wall in the atherosclerotic vessels may have allowed blood flow to pass through the once occluded segment.

To embolise the recanalised IIA, it was decided to perform percutaneous NBCA glue injection for several reasons. The endovascular access to the site of retrograde flow of the IIA was not feasible due to the placement of the AUI endograft and ligation of the EIA for the construction of the cross-femoral bypass during previous surgery. NBCA was the choice of embolic agent because it can produce long-term occlusion. NBCA is easier to control during injection then a liquid

agent such as thrombin. Moreover, after mixing NBCA with lipiodol, it could be visualized under fluoroscopy and the procedure could be performed under real-time fluoroscopic guidance.

The Talent endograft has a woven polyester coating supported by nitinol connector bars and endograft rings. Type III endoleak is very rare after Talent endograft.[7] A case of fabric hole has been reported and the development of chronic friction between the endograft and the polyester coat due to partial twisting of the graft before deployment was postulated to be the cause.[7] Other causes of type III endoleak include separation of modular components, fabric tear, and the hypothesised mechanism of suture breakage due to material fatigue. Type III endoleak has to be managed promptly and the usual management practice for type III endoleak of a second endograft to conceal the site of leakage was followed.[8]

In this patient, type III endoleak of the aortic aneurysm endograft was supported by the angiographic and sonographic findings of contrast leakage at the site of the aortic endograft, and the concealment of leakage after second endograft placement. Without surgical exploration, the exact cause of endoleak could not be confirmed. It was hypothesized that both fabric tear or suture breakage leading to microleak could be the underlying mechanisms. Although there was no surgically proven confirmation, the relative movement of the endograft within the aneurysm sac could induce friction between the polyester fabric and the wall of the aneurysm sac, particularly in the presence of calcified atherosclerotic plaques. Moreover, the effect of arterial tortuosity and atherosclerosis on the integrity of endograft has to be further evaluated.

This patient demonstrated the late complications after traditional hybrid open/endovascular procedure for managing aortoiliac aneurysm following IIA embolisation. With the advances in endovascular techniques and devices, the role of IIA embolisation in EVAR has been questioned. It has been found that the incidence of type II endoleak in patients without prior IIA embolisation was not significantly higher than those with IIA embolization.[7,8] Given the potential risks of pelvic ischaemia related to both unilateral and bilateral IIA embolisation,[9-11] a newer endograft iliac extension limb such as the iliac branch device has been developed to allow perfusion of the IIA via its short side branch.[12,13] Further long-term studies on the efficacy and safety of this new device are needed.

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