

◆ CASE REPORT ◆

Alternative Hybrid Reconstruction for Bilateral Common and Internal Iliac Artery Aneurysms Associated With External Iliac Artery Occlusion

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Purpose: To describe an alternative reconstruction for bilateral common (CIA) and internal (IIA) iliac artery aneurysms associated with external iliac artery (EIA) occlusion in a patient unfit for open surgery.

Case Report: A high-risk 81-year-old man presented with contained rupture of a left CIA aneurysm in the presence of bilateral CIA and IIA aneurysms associated with complete occlusion of the left EIA and normal patency of both common femoral arteries. In an emergent procedure, the left EIA was recanalized subintimally, and the right IIA was embolized with a 14-mm Amplatzer Plug. The main body of a standard Excluder endograft was deployed just distal to the origin of the left renal artery, and the ipsilateral leg was extended into the proximal right EIA. On the contralateral side, a short 10-mm-diameter limb was inserted through a 12-F sheath and deployed in the CIA, proximal to the iliac bifurcation. Via a percutaneous left brachial artery access, 3 covered stents (9×59 mm, 10×59 mm, 10×59 mm) were deployed from the distal IIA to the endograft contralateral limb. A right-to-left femorofemoral crossover bypass graft concluded the operation. The patient was discharged on the 5th postoperative day without complications; follow-up imaging at 6 months showed patency of the stent-graft and crossover bypass, with complete exclusion of the aneurysms and no evidence of endoleak.

Conclusion: This case demonstrates an effective solution for complex aortoiliac lesions using commercially available devices, underlining how an accurate knowledge of alternative endovascular techniques and materials is crucial in the management of complex cases.

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Key words: common iliac artery, aneurysm, external iliac artery, occlusion, stent-graft, covered stent

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Isolated iliac artery aneurysms are rare, representing only 0.5% to 2% of all aneurysms.^{1–2} Open surgical repair has been the standard treatment; however, it is associated with an incidence of perioperative complications ranging from 3% to 22%.³ Endovascular treatment in patients at high risk for open repair is feasible, with promising early and

long-term results.^{4,5} Nevertheless, while unilateral common iliac artery (CIA) aneurysms are typically treated by extending a stent-graft across the origin of the internal iliac artery (IIA),⁶ standard endovascular exclusion of bilateral CIA aneurysms is limited by the need for bilateral IIA occlusion, which is associated with a risk of pelvic and bowel

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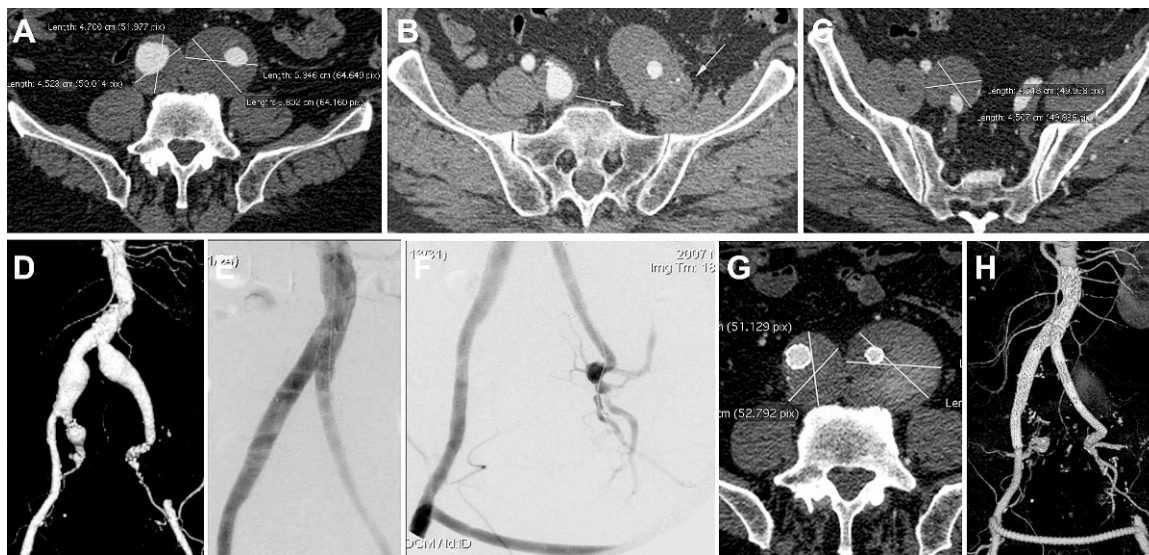


Figure ♦ Preoperative CTA scans (A–D) showing large bilateral CIA and IIA aneurysms associated with left EIA occlusion. Completion angiography (E,F) showing normal patency of the endograft, the left IIA, and the femorofemoral crossover bypass with no endoleak. Six-month (G) axial and (H) reconstructed CTA scans showing aneurysm exclusion, with normal patency of the left IIA and crossover bypass.

ischemia.^{7,8} In such difficult cases, a co-existing external iliac artery (EIA) occlusion significantly increases the complexity of the treatment by further limiting the feasibility of endovascular techniques.

We present an alternative hybrid reconstruction aimed at maintaining direct pelvic perfusion, carried out emergently in a symptomatic patient with bilateral CIA and IIA aneurysms associated with total occlusion of the left EIA.

CASE REPORT

An 81-year-old man was referred to the emergency room of our hospital for acute back pain. Duplex ultrasound examination with thoracic and abdominal computed tomographic angiography (CTA) revealed a contained rupture of a left CIA aneurysm in the presence of bilateral CIA aneurysms (maximum diameter 4.7 cm right and 5.8 cm left) and IIA aneurysms (maximum diameter 4.5 cm right and 3.8 cm left) associated with complete occlusion of the left EIA and normal patency of both common femoral arteries (CFA; Figure, A–D). The patient had a medical

history of prior right nephrectomy, hypertension, dyslipidemia, coronary artery disease (previous myocardial infarction treated with percutaneous coronary intervention), left lower limb lifestyle-limiting claudication, obesity (body mass index 38.1 kg/m²), and severe pulmonary disease requiring home oxygen therapy. The patient was felt to be unfit for open repair and was therefore considered for endovascular treatment.

The procedure was carried out in the operating room under local anesthesia and mild sedation. After surgical exposure of both CFAs, direct puncture of the distal left CFA was made for insertion of a short 4-F sheath. Retrograde subintimal recanalization of the left EIA was performed with a 0.035-inch J stiff Glidewire (Terumo Medical Corp., Tokyo, Japan) supported by a 4-F vertebral Glidewire catheter (Terumo Medical Corp.). Once the guidewire re-entered the true lumen at the level of the left CIA, a crossover with selective cannulation of the right IIA was performed. At this time, a 7-F Super Arrow sheath (Arrow International, Inc., Reading, PA, USA) was advanced into the right IIA, which was embolized with a 14-mm Amplatzer Plug

(AGA Medical Corp., Golden Valley, MN, USA). An 18-F sheath was positioned in the right CFA, and the main body of a standard Excluder endograft (PXT 261216; W.L. Gore & Associates, Flagstaff, AZ, USA) was deployed just distal to the origin of the left renal artery. The ipsilateral leg was then extended with a standard iliac extension (PXC161200) into the proximal right EIA. On the contralateral side, after gate cannulation, a short limb with a 10-mm distal diameter (PXL161007) was inserted through a 12-F sheath and deployed in the CIA, proximal to the iliac bifurcation.

Using a percutaneous left brachial artery access, a 0.035-inch J stiff guidewire supported by a 5-F, 125-cm Berestein catheter was advanced into the endograft, exiting the contralateral limb to selectively cannulate the left IIA. A 7-F Shuttle sheath (Cook, Inc., Bloomington, IN, USA) was advanced into the left IIA, and 3 Advanta V12 covered stents (9×59 mm; 10×59 mm; 10×59 mm; Atrium Medical Corp., Hudson, NH, USA) were deployed from the distal IIA to the endograft contralateral limb. Completion angiography showed normal patency of the endograft, right EIA, and left IIA, with delayed opacification of the right IIA via the contralateral side without endoleak (Figure, E,F). A right-to-left femorofemoral crossover bypass with a 6-mm polytetrafluoroethylene graft concluded the operation.

The patient was discharged on the 5th postoperative day without complications and with a normal duplex scan. One- and 6-month follow-up CTA scans (Figure, G,H) showed normal patency of the stent-graft and crossover bypass, with complete exclusion of the aneurysms and no evidence of endoleak.

DISCUSSION

Bilateral CIA aneurysms significantly reduce the feasibility of endovascular treatment, especially when the hypogastric arteries are involved. Whereas unilateral IIA exclusion is a safe procedure,⁶ intentional occlusion of the IIAs bilaterally is rarely asymptomatic⁷ and can result in devastating sequelae, with severe morbidity and mortality.⁸ To increase the applicability of endovascular treatment in the presence of complex iliac aneurysms,

different solutions aimed at preserving pelvic circulation have been proposed: surgical revascularization of the hypogastric artery prior to endovascular exclusion⁹, EIA-to-IIA retrograde endograft placement with contralateral aortomonoiliac stent-graft,¹⁰ branched stent-grafts,¹¹⁻¹² and antegrade stent-grafting of a bifurcated endograft into the IIA.^{13,14} However, all these techniques have limited applicability, and the concomitant occlusion of one EIA further limits their use.

We describe an alternative reconstruction for complex bilateral CIA and IIA aneurysms associated with left EIA occlusion. In order to find a viable solution in an emergent case involving a symptomatic high-risk patient, we were forced to use only standard materials available in our department. Our strategy consisted of a hybrid approach using a variety of endovascular techniques and materials in addition to surgical bypass. Insofar as we know, no one has used bilateral CIA aneurysm exclusion with a commercially available stent-graft in the setting of EIA occlusion. Serracino-Inglott et al.¹⁵ reported a similar case, but they used a custom-made Zenith bifurcated stent-graft, consisting of a main body with a contralateral 10-mm-diameter limb instead of the standard 12-mm limb to allow direct exclusion of the IIA aneurysm with 3 10-×59-mm covered stents.

In our opinion, our approach offers the major advantage of maintaining direct perfusion of the IIA without requiring custom endovascular or complex surgical revascularizations. Moreover, the feasibility of this procedure with standard devices permits its application in urgent cases as well. A possible limitation of this technique is the need to recanalize an occluded artery to extend a bifurcated graft with a 10-mm-diameter iliac limb. However, this was the only way to perform an antegrade stent-graft deployment in the IIA from a transbrachial access. In fact, 12-mm covered stents, such as the Viabahn, Fluency Plus, Wallgraft, and Jostent, require 11-F or 12-F sheaths, which can be difficult to advance via the brachial artery.

We recognize that the use of a branched stent-graft would have been the ideal solution for this challenging case. From a technical point of view, after successful recanalization

of the EIA, a branched graft could be deployed with extensions into both the IIA and the entire EIA. Nevertheless, we had to consider that extending the endograft across the inguinal ligament might adversely affect long-term patency of the graft limb. Furthermore, in this specific urgent case, we could not use a branched device since, as in most hospitals, they are not held in stock.

Conclusion

Our experience demonstrated that successful endovascular exclusion of complex aortoiliac lesions is feasible without custom-made devices. However, it requires the combination of different endovascular techniques in addition to the availability and accurate knowledge of endovascular devices. In the era of fenestrated and branched stent-graft options, these techniques must be part of the armamentarium of the modern vascular surgeon.

REFERENCES

1. Richardson JW, Greenfield LJ. Natural history and management of iliac aneurysms. *J Vasc Surg.* 1988;8:165–171.
2. Dorigo W, Pulli R, Troisi N, et al. The treatment of isolated iliac artery aneurysm in patients with non-aneurysmal aorta. *Eur J Vasc Endovasc Surg.* 2008;35:585–589.
3. Sandhu RS, Pipinos II. Isolated iliac artery aneurysms. *Semin Vasc Surg.* 2005;18:209–215.
4. Caronno R, Piffaretti G, Tozzi M, et al. Endovascular treatment of isolated iliac artery aneurysms. *Ann Vasc Surg.* 2006;20:496–501.
5. Pitoulias GA, Donas KP, Schulte S, et al. Isolated iliac artery aneurysms: endovascular versus open elective repair. *J Vasc Surg.* 2007;46:648–654.
6. Razavi MK, DeGroot M, Olcott C, et al. Internal iliac artery embolization in the stent-graft treatment of aortoiliac aneurysms: analysis of outcomes and complications. *J Vasc Interv Radiol.* 2000;11:561–566.
7. Farahmand P, Becquemin JP, Desgranges P, et al. Is hypogastric artery embolization during endovascular aortoiliac aneurysm repair (EVAR) innocuous and useful. *Eur J Vasc Endovasc Surg.* 2008;35:429–435.
8. Bratby MJ, Munneke GM, Belli AM, et al. How safe is bilateral internal iliac artery embolization prior to EVAR? *Cardiovasc Intervent Radiol.* 2008;31:246–253.
9. Unno N, Inuzuka K, Yamamoto N, et al. Preservation of pelvic circulation with hypogastric artery bypass in endovascular repair of abdominal aortic aneurysm with bilateral iliac artery aneurysms. *J Vasc Surg.* 2006;44:1170–1175.
10. Bergamini TM, Rachel ES, Kinney EV, et al. External iliac artery-to-internal iliac artery endograft: a novel approach to preserve pelvic inflow in aortoiliac stent grafting. *J Vasc Surg.* 2002;35:120–124.
11. Haulon S, Greenberg RK, Pfaff K, et al. Branched grafting for aortoiliac aneurysms. *Eur J Vasc Endovasc Surg.* 2007;33:567–574.
12. Ziegler P, Avgerinos ED, Umscheid T, et al. Branched iliac bifurcation: 6 years experience with endovascular preservation of internal iliac artery flow. *J Vasc Surg.* 2007;46:204–210.
13. Delle M, Lonn L, Wingren U, et al. Preserved pelvic circulation after stent-graft treatment of complex aortoiliac artery aneurysms: a new approach. *J Endovasc Ther.* 2005;12:189–195.
14. Leon LR, Mills JL, Psalms SB, et al. A novel hybrid approach to the treatment of common iliac aneurysms: antegrade endovascular hypogastric stent grafting and femorofemoral bypass grafting. *J Vasc Surg.* 2007;45:1244–1248.
15. Serracino-Inglott F, Myers P. An alternative to aorto-uni-iliac EVAR and femoro-femoral crossover in a patient having an aorto-iliac aneurysm with an occluded external iliac artery. *Eur J Vasc Endovasc Surg.* 2007;33:575–577.