Endovascular repair of bilateral common iliac artery aneurysms following open abdominal aortic aneurysm repair with preservation of both hypogastric arteries using commercially available stent grafts

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Endovascular treatment of aneurysmal disease has become the predominant form of repair for all aneurysms. Some areas continue to pose specific challenges to stay within the general tenets of successful repair, mainly achieving adequate seal without sacrificing other arterial pathways. Following aortic aneurysm repair, the common iliac arteries can continue to have aneurysmal degeneration. We present a case of bilateral common iliac artery aneurysms that presented 9 years after open repair of an infrarenal abdominal aortic aneurysm in conjunction with an extensive aortic dissection. These were repaired using endovascular techniques with preservation of both hypogastric arteries. (J Vasc Surg 2014;59:516-9.)

Common iliac artery aneurysms (CIAAs) occur simultaneously in approximately 25% to 40% of patients with abdominal aortic aneurysms (AAAs).[1] Not all iliac artery aneurysms are present at the time of initial diagnosis of an AAA. Endovascular repair has proven to have a lower morbidity and mortality rate.[1,2] There are, however, no commercially available devices to preserve the internal iliac arteries. We present an interesting case of bilateral CIAAs that presented 9 years after open repair of an infrarenal AAA. These were repaired using endovascular techniques with preservation of both hypogastric arteries.

CASE REPORT

A 54-year-old Caucasian male presented with enlarging, asymptomatic bilateral CIAAs. He had a history of an extensive aortic dissection treated with open aortic arch repair in 2002; 2 weeks later, he had an open infrarenal AAA repair. On surveillance imaging, he was found to have a 3.7-cm right CIAA, which extended to the iliac bifurcation. The hypogastric and external iliac arteries were patent bilaterally. The left CIAA measured 4.5 cm and extended to the iliac bifurcation with patent internal and external iliac arteries (Fig 1). His past medical history was significant for tachyarrythmias and severe pulmonary disease with desaturation at 300-foot ambulation. Given his comorbidities, age, and extensive surgical history, as well as the desire to minimize his risk for colon ischemia, spinal cord ischemia, buttock claudication, and impotence, we proceeded with an attempt at endovascular aneurysm repair with bilateral hypogastric "snorkel stents."

A 28-mm x 16-mm x 135-mm bifurcated Powerlink graft (Endologix, Irvine, Calif) was selected to preserve the native aortic bifurcation and avoid accessing the brachial artery for the hypogastric stents. After placement of the bifurcated graft component, a 16-mm x 55-mm iliac limb extension was placed on the right. Then, an 8F sheath was advanced over the bifurcation and into the right hypogastric artery with the support of an Amplatz wire. An 8-mm x 10-cm Viabahn (W. L. Gore & Associates, Flagstaff, Ariz) stent in the hypogastric artery was simultaneously deployed with a 13-mm x 88-mm iliac limb into the external iliac artery. These were ballooned with an 8-mm balloon and Coda balloon, respectively. Angiogram demonstrated a type Ib endoleak at the distal hypogastric stent. Therefore, the 8F sheath was exchanged for a 12F sheath, and a 10-mm x 5-cm Viabahn stent was placed distally and ballooned with a 10-mm balloon. Repeat angiogram showed no endoleak and intact flow into the internal and external iliac arteries (Fig 2, *A*).

The process was repeated on the left side. First, the main body was extended using a 20-mm x 88-mm limb extension. A 12F sheath was advanced over the bifurcation and guided into the left hypogastric artery over a Lunderquist wire. A 10-mm x 10-cm Viabahn stent graft and 16-mm x 88-mm iliac limb extension was simultaneously deployed in the internal and external iliac arteries, respectively. The hypogastric stent was ballooned with a 10-mm balloon, and the external iliac limb was ballooned with a Coda balloon (Fig 2, *B*). Completion angiogram demonstrated no endoleak and preserved flow into the internal and external iliac arteries (Fig 2, *C*). A total of 90 mL of contrast was used, and fluoroscopy time was 54 minutes. Total procedure time was 254 minutes. Follow-up at 30 days demonstrated maintained patency of all stents with pelvic flow (Fig 3). The patient remains free of buttock claudication and sexual dysfunction.

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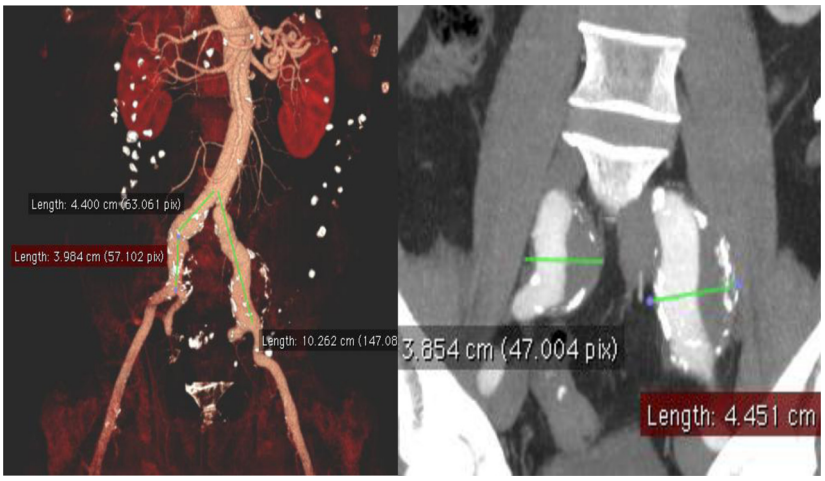

Fig 1. Preoperative computed tomography angiography with reconstructions that demonstrate bilateral common iliac artery aneurysms (CIAAs) and their extent to the bifurcation.

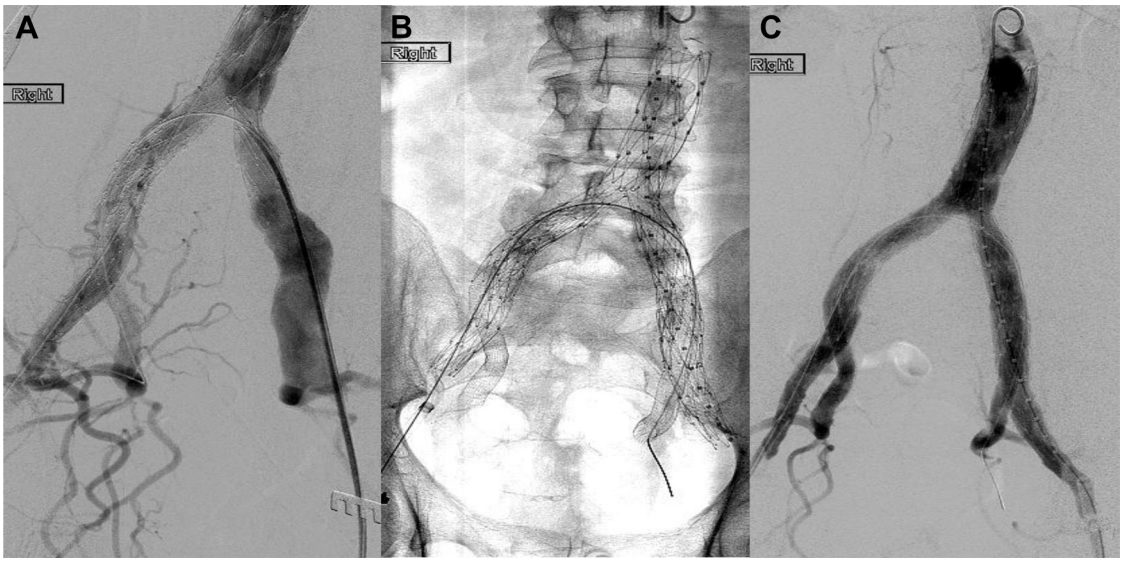

Fig 2. A, Intraoperative angiogram following successful stent placement in the right hypogastric and external iliac arteries. **B,** Noncontrasted image following placement of bilateral internal and external iliac stent grafts. **C,** Completion angiogram demonstrating intact pelvic flow with patent stents and no endoleak.

DISCUSSION

Endovascular aortic aneurysm repair for AAAs is the most common type of repair in the United States. The anatomic limitations remain the proximal and distal seal zones. Development of fenestrated and branched grafts has been an area of intense research and effort to expand the treatment of proximal aneurysms as well as the distal landing zones and iliac aneurysms. The availability of these grafts are limited with only one Food and Drug Administration-approved, commercially available graft, which is for proximal aneurysms, in the United States.

Traditional endovascular management of CIAAs has involved coil embolization of one or both hypogastric arteries with extension of the main body graft into the external iliac arteries. Although this is successful in excluding the aneurysm, it often leaves patients with significant life-limiting issues postoperatively. This may include buttock claudication, impotence, and colon or spinal cord ischemia. Buttock claudication has been reported in up to 31% of patients undergoing unilateral hypogastric embolization and 35% in those undergoing bilateral embolization.[2,3] New onset of erectile dysfunction has been

Fig 3. Reconstructed image at 1-month follow-up, once again demonstrating all stents patent with no endoleak and pelvic flow.

reported in 17% of patients undergoing unilateral hypogastric embolization and 24% of patients undergoing bilateral embolization.[2,3] Colon ischemia has also been a documented complication of hypogastric artery embolization. Symptomatic colon ischemia has been reported in 1% to 2% of endovascular aneurysm repair, which is similar to the incidence of colon ischemia in open repair. The incidence of spinal cord ischemia is thought to be relatively low but increased with bilateral hypogastric artery embolization.[2] Occlusion of the internal iliac artery serves as a risk factor for all of these postoperative morbidities.

Due to these complications, there has been an increased interest in preserving pelvic circulation during endovascular repair. Use of "bell-bottom" techniques and surgeon-modified grafts has been used in some centers to preserve hypogastric flow. In the "bell-bottom" technique, the landing zone is usually in a diseased segment of common iliac artery, which can lead to future growth and development of a type Ib endoleak with a 4% reintervention rate.[4] Surgeon-modified grafts require increased operating room time, fluoroscopy time, and contrast, as well as expertise in modifying the graft.[5,6] Dedicated iliac branch grafts are in development and testing but are not currently available for use.[4,7] Reports of unilateral hypogastric stenting using a "snorkel" technique have shown it to be a feasible alternative to embolization.

Major technical considerations are primarily related to the Endologix bifurcated device. The device structure with internal stents can pose a challenge. To address this, extreme vigilance to maintain wire access is imperative. We often snare the contralateral wire at the bifurcation and pull the wire through the ipsilateral sheath to facilitate pulling the sheath over the bifurcation. Once wire access to the hypogastric artery is obtained, then a stiff wire (Rosen or Lunderquist) is advanced into the hypogastric artery to help tracking of the sheath and stent into the hypogastric artery. We also prefer to use self-expanding covered stents due to the tortuosity of most aneurysmal iliac arteries. Another consideration is sizing of the common iliac extension limbs. These limbs are chosen based on internal and external iliac artery measurments, adding the diameters of the stents required and accommodating for oversizing.

CONCLUSIONS

We present a successful case of bilateral hypogastric preservation using commercially available stent grafts without the need for off-label modification or additional access sites using the Endologix Powerlink graft and Gore Viabahn stents. The patient continues to be free of hip and buttock claudication and erectile dysfunction at 11 months following repair and did not have any clinical evidence of colon or spinal cord ischemia. This is a technically feasible approach for endovascular treatment of aneurysms of the common iliac arteries extending to the bifurcation. The patient presented was particularly unique given his extensive surgical history, which is why bilateral hypogastric artery preservation was recommended. Bilateral preservation is not always necessary, but when technically possible, with acceptable contrast and fluoroscopy amounts, is a viable option. Further follow-up will provide more information regarding patency and durability.

REFERENCES

1. Chaer RA, Barbato JE, Lin SC, Zenati M, Kent KC, McKinney JF. Isolated iliac artery aneurysms: a contemporary comparison of endovascular and open repair. J Vasc Surg 2008;47:708-13.
2. Karthikesalingam A, Hinchcliffe RJ, Holt PJ, Boyle JR, Loftus IM, Thompson MM. Endovascular aneurysm repair with preservation of internal iliac artery using the iliac branch graft device. Eur J Vasc Endovasc Surg 2010;39:285-94.
3. Rayt HS, Bown MJ, Lambert KV, Fishwick NG, McCarthy MJ, London NJ, et al. Buttock claudication and erectile dysfunction after internal iliac artery embolization in patients prior to endovasular aortic aneurysm repair. Cardiovasc Intervent Radiol 2008;31:728-34.

4. Naughton PA, Park MS, Kheirelseid EA, O'Neill SM, Rodriguez HE, Morasch MD, et al. A comparative study of the bell-bottom technique vs hypogastric exclusion for the treatment of aneurysmal extension to the iliac bifurcation. J Vasc Surg 2012;55:956-62.
5. Oderich GS, Ricotta JJ 2nd. Novel surgeon-modified hypogastric branch stent graft to preserve pelvic perfusion. Ann Vasc Surg 2010;24:278-86.
6. Riesenman PJ, Ricotta JJ 2nd, Veeraswamy RK. Preservation of hypogastric artery blood flow during endovascular aneurysm repair of an abdominal aortic aneurysm with bilateral common and internal iliac artery involvement: utilization of off-the-shelf stent-graft components. Ann Vasc Surg 2012;26:109.e1-5.
7. Verzini F, Parlani G, Romano L, De Rango P, Panuccio G, Cao P. Endovascular treatment of iliac aneurysm: concurrent comparison of side branch endograft versus hypogastric exclusion. J Vasc Surg 2009;49:1154-61.

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