Combined transbrachial and transfemoral strategy to deploy an iliac branch endoprosthesis in the setting of a pre-existing endovascular aortic aneurysm repair

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ABSTRACT

This article describes brachial access to position a long sheath in the abdominal aorta in conjunction with a large caliber sheath via the femoral artery ipsilateral to the target site to deliver a 0.018 bodyfloss wire. This bodyfloss wire is inserted into the precannulation port of the iliac branch endoprosthesis (W. L. Gore and Associates, Flagstaff, Ariz), which is then advanced from the groin. Once the bifurcated device is deployed, hypogastric access and stenting is achieved from the upper extremity. This technique is an alternative to safely extend the distal seal while preserving the hypogastric artery and has the advantage of limited iliac bifurcation manipulation. (J Vasc Surg Cases and Innovative Techniques 2019;5:305-9.)

Keywords: Iliac branch endoprosthesis; Iliac aneurysm; Endovascular aortic aneurysm repair (EVAR); Reintervention; Transbrachial

Reintervention rates after endovascular aortic aneurysm repair (EVAR) can approach 20% within the first 5 postoperative years.[1,2] Although it is unclear what fraction of these reinterventions are from distal degeneration, a recent synthesis of the available EVAR literature suggests approximately 10% are due to a type I endoleak.[3] If the integrity of the distal seal is compromised by progressive iliac artery aneurysmal degeneration, hypogastric embolization and extension into the external iliac artery (EIA) is the traditional endovascular strategy to extend the distal seal to avoid the development of a type IB endoleak. Unfortunately, loss of one, or both, hypogastric arteries result in a 20% to 40% risk of buttock claudication and adversely affects quality of life.[4-6]

The Food and Drug Administration-approved Gore iliac branch endoprosthesis (IBE; W. L. Gore and Associates, Flagstaff, Ariz) can be deployed to preserve hypogastric flow while allowing extension of the distal attachment site. This platform requires bilateral femoral artery access to maintain a bodyfloss wire up and over the aortic bifurcation. This procedure is a challenge in patients with a prior EVAR or aortoiliac reconstruction secondary to risk of graft dislodgement and/or acute angulation of the common iliac arteries (CIA). We describe an alternative technique to deploy an IBE using brachial and femoral artery access without compromising the architecture of previously implanted aortoiliac endografts. Written informed consent was obtained before to the submission of this article.

TECHNIQUE

A 66-year-old man with a 55-mm infrarenal abdominal aortic aneurysm (AAA) underwent elective EVAR in 2016 with an Excluder device. Two years postoperatively, routine surveillance demonstrated an increase in the right CIA diameter to 31 mm on a computed tomography angiogram. The right CIA limb had retracted toward the aorta with the continued arterial remodeling, but there was no evidence of type IB endoleak on arterial or delayed phases (Fig 1). The residual aortic aneurysm sac remained stable in size. Given the growing size of the CIA, as well as retraction of the iliac limb with a poor remnant distal seal zone, we were concerned about the stability of our aneurysm repair. After considerable discussion with the patient, we opted to reoperate to better seal the distal site.

The reintervention was performed in a hybrid room with a fixed imaging unit (Artis Zeego, Siemens Medical Solutions USA, Malvern, Pa). The proximal left brachial artery was exposed via a standard cutdown approach. The patient was systemically heparinized and arterial access obtained by micropuncture and upsized to a 9F- × 90-cm sheath positioned in the abdominal aorta in the usual over-the-wire technique. Perclose-assisted (Abbott Vascular, Santa Clara, Calif) percutaneous access of the right common femoral artery was obtained and upsized to a 16F sheath positioned within the previously placed aortic stent.

An 0.018 wire was advanced from the brachial position and snared, establishing a left brachial to right femoral bodyfloss (Fig 2). The IBE (23 × 100 × 12 mm) was

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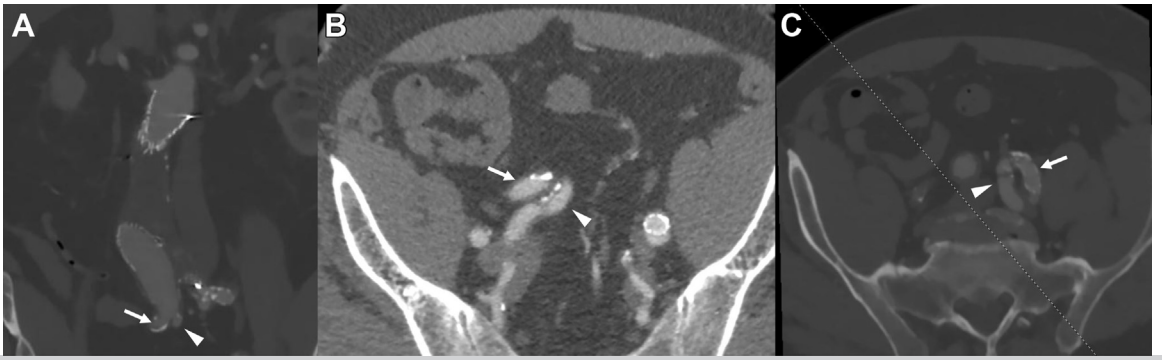

Fig 1. Representative preoperative images demonstrating an ectatic right common iliac artery (CIA) **(A)** at the level of the external iliac artery (EIA) (*arrow*) and hypogastric artery (*arrowhead*) takeoff. Distally, the caliber of both vessels returns to normal **(B)**. On the opposite side **(C)**, the hypogastric artery (*arrowhead*) fills from pelvic collaterals and the CIA and EIA remains within normal diameter limits.

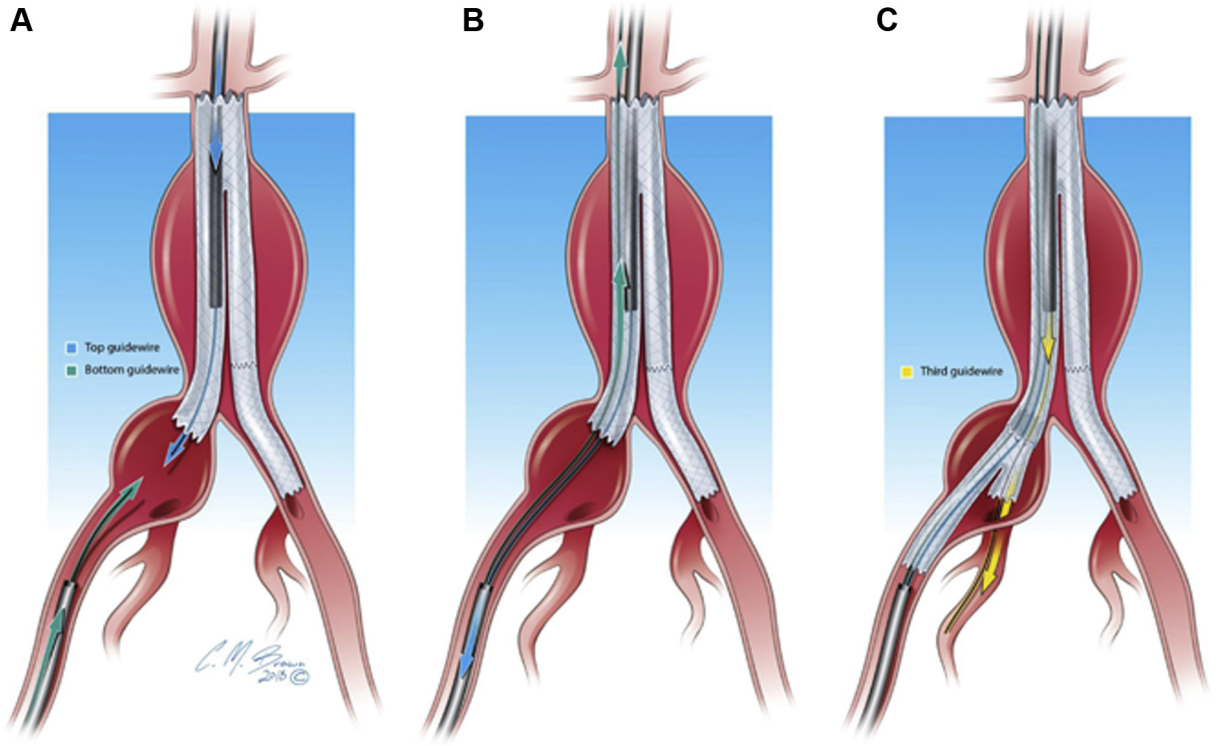

Fig 2. Steps in the procedure demonstrating simultaneous positioning of the brachial and femoral sheaths on either side of the target iliac aneurysm **(A)**. After snaring the 0.018 bodyfloss wire, a stiff wire is positioned into the thoracic aorta to allow for the delivery of the iliac branch endoprosthesis (IBE) **(B)**. After the IBE is positioned, the hypogastric artery is cannulated and a covered stent is deployed **(C)**.

introduced from the right groin over an Amplatz (Boston Scientific, Marlborough, Mass) stiff wire with the established bodyfloss inserted in the precannulation port to maintain access to the hypogastric limb of the IBE. The IBE was deployed within the previously placed iliac limb and the brachial 9F sheath advanced just proximal to the IBE flow divider. An 0.035 hydrophilic buddy wire was advanced from the brachial sheath through the hypogastric limb of the IBE device cannulating the native hypogastric and positioned distally while maintaining the 0.018 brachial-femoral bodyfloss to stabilize the sheath position. After exchanging our hydrophilic wire for a stiff alternative, an 8 × 79 mm VBX stent-graft (W. L. Gore & Associates) was advanced through the 9F sheath and deployed in the hypogastric artery (Fig 3). Postdeployment dilation of the VBX was performed to 14 mm using a compliant balloon advanced from the transbrachial sheath.

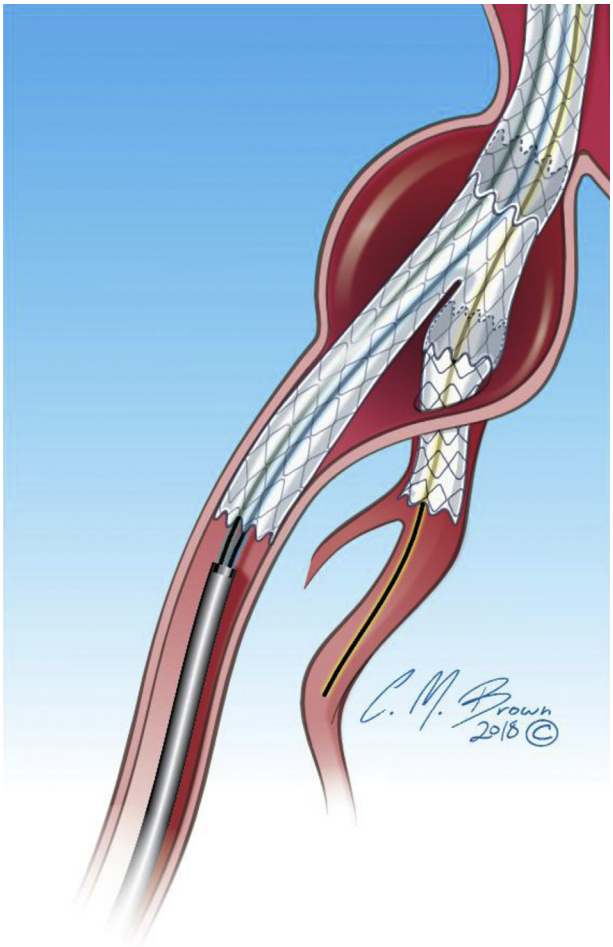

Fig 3. The iliac branch endoprosthesis endovascular aortic aneurysm repair (IBE-EVAR) structure at the completion of stent deployment demonstrating complete exclusion of the iliac artery aneurysm with preservation of the hypogastric artery.

With hypogastric flow secured, an additional 26- × 33-mm aortic cuff was placed between the IBE and existing iliac limb and molded with a conformable balloon to ensure adequate overlap and prevent junctional separation. The distal EIA seal zone was extended with an 11 × 50 mm Viabahn (W.L. Gore & Associates). Completion angiogram demonstrated no evidence of endoleak and the preservation of flow into the remaining hypogastric artery (Fig 4). The patient was discharged the following day and seen in clinic 1 month later, where it was noted that his access sites were well healed. At 6-month follow up, a computed tomography angiogram demonstrated no endoleak and preserved flow into the hypogastric and EIAs.

DISCUSSION

From 2003 to 2013, the number of AAAs repaired via an open surgical approach in the United States decreased by 76% secondary to the progressive adoption of EVAR.[7] This shift in the treatment of AAAs in the last 15 years has greatly impacted the way we intervene on aneurysmal iliac arteries as well. With the influence of advancing endovascular procedures, open repair of iliac artery aneurysms has largely been abandoned in favor of stent exclusion with extension into the EIA and embolization of the hypogastric artery, if needed. The Gore IBE, using a branched design, is the only Food and Drug Administration-approved platform to cover the iliac arterial system and allow for the preservation of the hypogastric artery. Maintenance of flow to at least one of the hypogastric arteries is important to decrease the risk of buttock or thigh claudication, impotence, colonic ischemia, and spinal cord ischemia.[8]

Our report is the first to describe deployment of the Gore IBE using a brachial-femoral bodyfloss wire in lieu of the traditional femoral-femoral wire to maintain and stabilize a sheath to allow for easy cannulation and tracking of the stent graft into the hypogastric artery.[9] Previously, Bisdas et al[10] reported excellent results associated with a similar technique in a series of 18 consecutive EVAR patients who received a Cook (Bloomington, Ind) iliac branch device after distal aneurysmal degeneration. Technical success, their primary end point, was 100%. Primary patency was 100% over their median follow-up of 15 months. There were no new type IB or III endoleaks and only two patients required reintervention (thrombectomy of an EIA occlusion, stenting of a CIA stenosis).

The deployment of an IBE in the presence of a preexisting EVAR can be technically challenging given the need to track the device across the reconstructed aortic "bifurcation," exposing the stent graft to damage or migration. Although our technique requires open dissection in the upper arm to introduce a 9F sheath, we prefer it to bilateral groin access and tenuously tracking a stent system across the flow divider of an aortic stent graft. We favor left brachial access to minimize the risk of cerebral embolization. The stroke risk associated with iliac revascularization via a left brachial access is unclear, but likely ranges between 0.5% and 1.5%.[11-13] Alternate techniques include using a steerable sheath or an up-and-over technique that has been previously described by Dawson et al.[7] Unfortunately, both of these methods require crossing the flow divider of the stent graft system at an acute angle and limits device options to the more flexible stents.

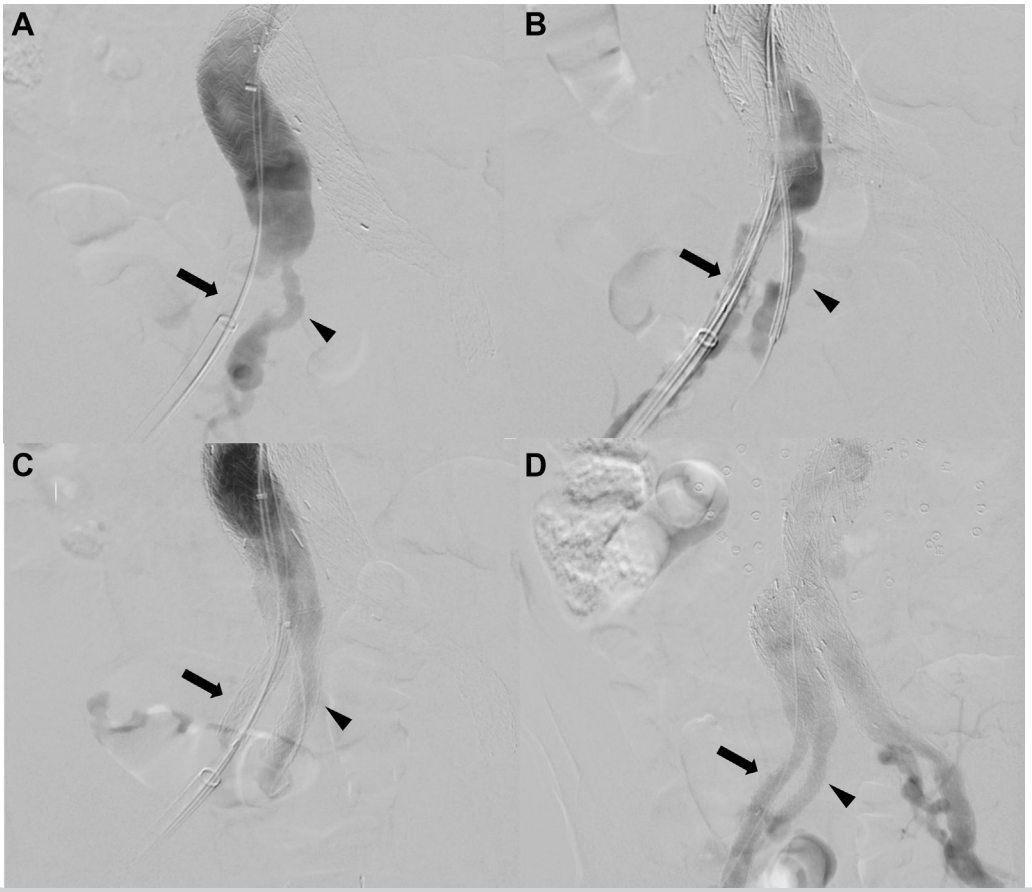

Fig 4. Intraoperative angiogram **(A)** before stent deployment demonstrating the iliac aneurysm along with the external iliac artery (EIA; *arrow*) and hypogastric (*arrowhead*). **B,** Positioning of the iliac branch endoprosthesis (IBE) before deployment in the common iliac artery (CIA). Both the IBE and VBX stents are deployed **(C)** to exclude the iliac artery aneurysm while maintaining hypogastric artery flow. Completion angiogram **(D)** demonstrating the IBE-endovascular aortic aneurysm repair (EVAR) structure.

CONCLUSIONS

The technique described in this report using combined transbrachial and transfemoral access can be successfully employed to avoid traversing the flow divider created by a pre-existing EVAR, allowing for easy trackability and effective cannulation of the target hypogastric artery to deliver an IBE.

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