The "buddy balloon technique" facilitates retrograde ipsilateral access to postdilate an iliac side branch after endovascular aneurysm repair

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If unilateral common iliac aneurysms occur simultaneously with abdominal aortic aneurysm, endovascular treatment consists of implantation of a bifurcated stent graft with extension into the external iliac artery while the ipsilateral internal iliac artery is often occluded. The internal iliac artery may be preserved by an iliac branch device (IBD). In this technical note, we describe a technique to probe the side branch of an IBD for postdilation through an ipsilateral retrograde access using one balloon to block the way upstream while directing a second percutaneous transluminal angioplasty balloon into the side branch despite the hostile angle of side branch and IBD. (J Vasc Surg Cases 2015;1:57-60.)

Unilateral common iliac aneurysms occur in up to 43% of patients with an abdominal aortic aneurysm.[1] In such circumstances, a bifurcated stent graft needs extension into the external iliac artery while the ipsilateral internal iliac artery (IIA) is often occluded. Alternatively, the IIA may be preserved to avoid ischemic complications either by surgical treatment, which includes relocation of the IIA origin or IIA bypass, or by an endovascular approach using an iliac branch device (IBD).[2] In this technical note, we describe a technique to probe the side branch of an IBD for postdilation through an ipsilateral retrograde access using one balloon to block the way upstream while directing a second percutaneous transluminal angioplasty (PTA) balloon into the side branch despite the hostile angle of side branch and IBD.

The patient consented to publication of this case report.

CASE REPORT

An 82-year-old man was scheduled for endovascular repair of simultaneous infrarenal aortic and left common iliac artery aneurysms (Fig 1, *A*). The aneurysms were treated under general anesthesia and by use of a bifurcated prosthesis (E-vita; Jotec, Hechingen, Germany) with extension into the left external iliac artery using an IBD (E-iliac, Jotec). A 10 × 57-mm stent graft (E-ventus, Jotec) was used as a side branch. At completion angiography, a discrete residual perfusion in the common iliac artery aneurysm (Fig 1, *B*) was noted. Selective angiography (Fig 2, *A*) of the IBD showed an inadequate sealing zone of the distal end of the side branch within the IIA that had not been detected during implantation. The treatment of choice was thought to be postdilation of the implanted stent graft to seal the leak from the side branch. However, as the bifurcated prosthesis was already in place, a contralateral transfemoral access was out of the question. Before an additional transbrachial puncture as the access of choice to probe the side branch from above, we tried to access the side branch through the sheath in the left common femoral artery. The side branch was catheterized selectively by a 5F catheter (Imager II; Boston Scientific, Natick, Mass), followed by placement of a hydrophilic 0.035-inch guidewire (Radifocus; Terumo, Tokyo, Japan) into the left superior gluteal artery. After removal of the catheter, we tried to introduce a 12- × 40-mm balloon catheter (Armada; Abbot Vascular, Beringen, Switzerland) into the iliac side branch. Even after the guidewire was exchanged for a stiffer one (Radifocus stiff, Terumo), it was not possible to steer the PTA catheter into the side branch, first and foremost owing to the hostile angle of the side branch and the IBD (Fig 2, *B*). Therefore, a second 0.035-inch guidewire (Radifocus) was inserted parallel to the first one through the left femoral route, and a 14 × 40-mm PTA catheter (Armada)—the "buddy balloon"—was placed in the proximal segment of the IBD, just above the ostium of the IBD, where it was then inflated (Fig 3, *A*). Through the indwelling guidewire in the side branch and the superior gluteal artery, the 12 × 40-mm PTA catheter (Armada) was inserted again and could then be advanced into the side branch, as the way upstream was blocked and the route of the PTA catheter was stabilized and directed by the buddy balloon in the IBD. After passage of the 12 × 40-mm PTA catheter into the side branch, the buddy balloon was deflated to avoid stasis in the IBD while the side branch could then be flared (Fig 3, *B*) up to 12 mm in diameter. Completion angiography showed

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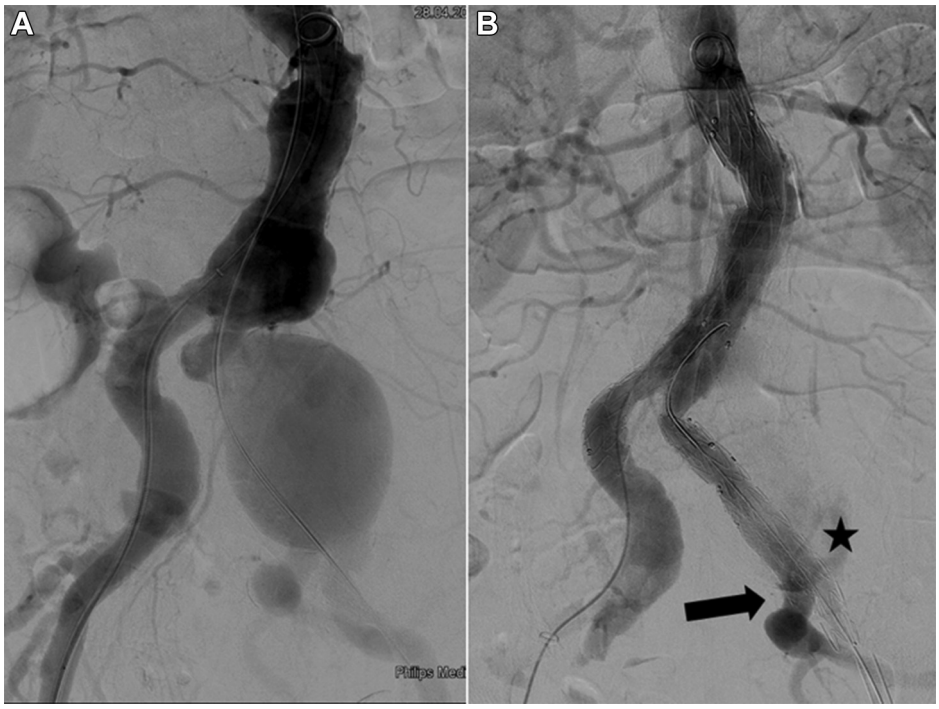

Fig 1. A, Digital subtraction angiography depicts an infrarenal abdominal aortic aneurysm and a common iliac artery aneurysm on the left side. **B,** After implantation of a bifurcated prosthesis with an iliac branch device (IBD), an insufficient sealing zone of the distal part of the side branch in the internal iliac artery (IIA) is present (*arrow*), and the common iliac artery aneurysm is still perfused (*asterisk*).

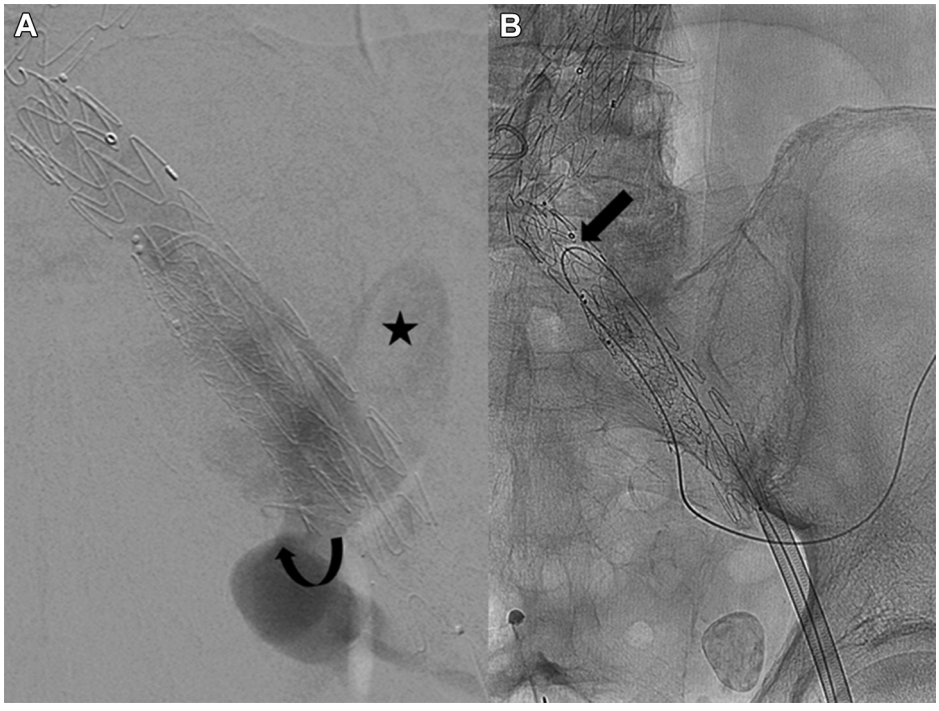

Fig 2. A, Selective digital subtraction angiography of the iliac branch device (IBD) and side branch depicts leakage (*curved arrow*) from the distal sealing zone of the stent graft in the left internal iliac artery (IIA) with perfusion of the common iliac artery aneurysm (*asterisk*). **B,** Ipsilateral retrograde insertion of a guidewire into the side branch demonstrates a hostile angle of almost 180 degrees.

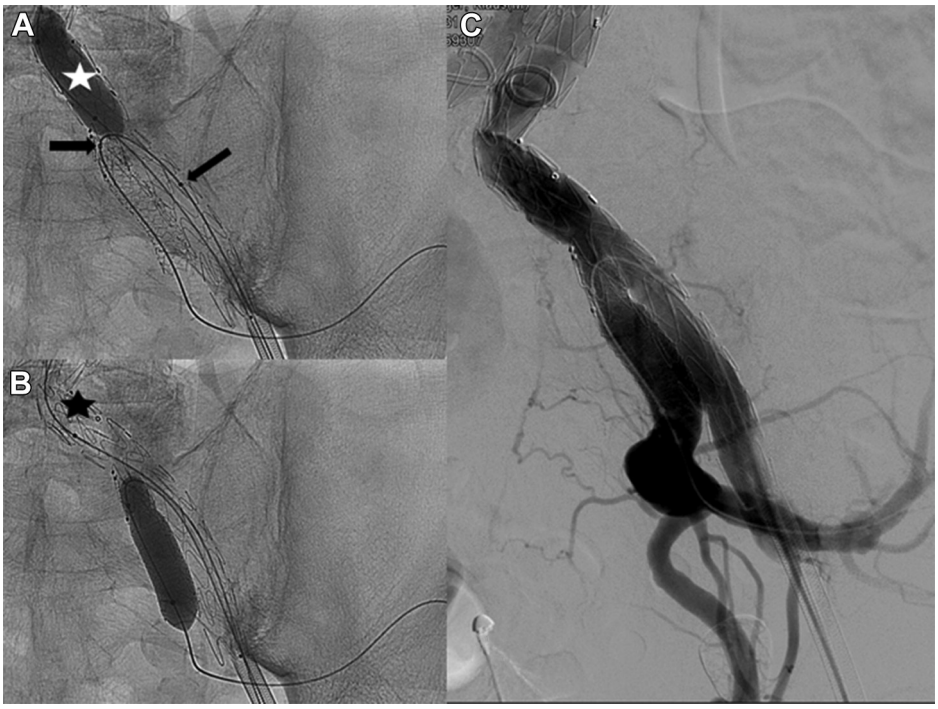

Fig 3. Buddy balloon maneuver. **A,** After catheterization of the superior gluteal artery with a 0.035-inch guidewire, a second one was inserted into the iliac branch device (IBD), and a percutaneous transluminal angioplasty (PTA) balloon (*asterisk*, buddy balloon) was inflated just above the ostium of the IBD. A second PTA catheter was inserted and could be maneuvered into the side branch (*arrows* point to proximal and distal markers of uninflated balloon). **B,** After successfully entering the side branch, the buddy balloon (*asterisk*) was deflated and the second balloon inflated, thereby flaring the side branch graft. **C,** Digital subtraction angiography after postdilation of the side branch shows sufficient sealing without residual perfusion of the iliac artery aneurysm.

sufficient sealing of the side branch without residual perfusion of the iliac aneurysm (Fig 3, *C*).

DISCUSSION

Endovascular aneurysm repair (EVAR) has become an alternative treatment option for abdominal aortic aneurysm and iliac artery aneurysms.[3] IBDs have been developed to allow extension of bifurcated stent grafts beyond the IIA while blood flow into its vessel territory can be preserved.[2] Occlusion of the IIA has been associated with complications mainly consisting of buttock claudication and erectile dysfunction.[4,5] Data regarding the severity and duration of these ischemic complications are inconsistent, with studies reporting a low incidence of those complications that resolved after a few months,[6] but there are also studies that report a new onset of erectile dysfunction in 17% of patients and buttock claudication in 31%, which did not resolve.[7] Especially young or active patients as well as those with a low cardiac output have been proposed to be at risk for these ischemic complications.[2] One may argue that occlusion of the ipsilateral hypogastric artery would have been a more straightforward procedure compared with IBD implantation, especially to treat a large common iliac artery aneurysm as in the case presented here. However, we aim to preserve the hypogastric artery as often as possible but in any case in a patient who is young or suffering from low cardiac output, the latter of which was the case in our patient. Implantation of the IBD described in this report starts with IBD fixation, followed by contralateral insertion of the side branch, which is implanted into the IIA. After this first step of implantation, we did not detect a problem at the distal sealing zone of the stent graft and so we went on with the procedure, namely, implantation of the main body and limbs followed by modulation of proximal and distal landing zones as well as overlapping areas of main body and limbs, respectively, of the IBD. As we detected an insufficient sealing at the distal end of the side branch during final angiography, postdilation and thereby flaring of the stent graft was thought to be the adequate step to take. The reason that the insufficient sealing was not detected initially can only be speculated on; one reason could have been movement of one of the components of the IBD or bifurcated stent graft following control angiography after the side branch had been implanted. Another problem could have been that the selected side branch was too short. With respect to the device used in this patient, the manufacturer recommends moderate oversizing of 10% regarding the diameter of the side branch and a minimum of 10 mm as a landing zone within the hypogastric artery. On the other hand,

postdilation did solve the problem so that the length of the selected stent graft seemed to be appropriate. A crossover maneuver for probing the side branch was not taken into consideration as the bifurcated graft was already in place. One way of probing the side branch would have been through a left transbrachial route. This would have been associated with additional access in the arm, possibly increasing procedure time, costs, and risk of complications, although current literature has reported low complication rates after a transbrachial access, at least for complex EVAR cases, mainly consisting of hematoma with and without neurologic symptoms.[8] Although we routinely use this vascular access route for most fenestrated EVAR cases, probing the side branch in a retrograde fashion appeared to be the quickest and cheapest way with the lowest risk of complication in this special case. Owing to the hostile angle of 180 degrees between the IBD and the side branch, it may be technically demanding to navigate a PTA catheter or a sheath around such a curve into the side branch for postdilation or even stent graft extension into the IIA. The buddy balloon technique (1) blocks the given direction of retrogradely parallel inserted devices and (2) steers those into the iliac side branch, therefore supporting ipsilateral retrograde access into the branch despite the hostile angle. One could even have tried to insert a flexible sheath or an additional stent graft into the side branch by this technique, eg, allowing extension of the side branch deeper into the IIA in case the initially implanted side branch had been too short. When the side branch is entered with any material whatever, attention should be paid to avoiding dislocation of the already implanted stent graft or IBD by pushing too hard around the curve.

In addition, one may discuss that this technique might be of help in dealing with complex vascular anatomy with a hostile angle (eg, complex crossover maneuver) or endovascular procedures (eg, probing an ostium of a fenestrated prosthesis from a transfemoral route) apart from implantation of an IBD. With regard to IBD procedures, the buddy balloon might have facilitated insertion of a flexible sheath to deliver a second stent graft to extend the side branch into the hypogastric artery.

CONCLUSIONS

The buddy balloon technique may facilitate ipsilateral retrograde access into the side branch after finalization of endovascular repair of an aortoiliac aneurysm by bifurcated stent grafting and IBD implantation. An additional transbrachial approach to flare or to extend the side branch may thereby be avoided.

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