

Pioneer re-entry into covered stent graft to recanalize occluded, jailed external iliac artery

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ABSTRACT

Aortoiliac occlusive disease in patients who are poor surgical candidates requires innovative strategies in endovascular surgery. We present a case of a 59-year-old gentleman with significant medical comorbidities and chronic limb-threatening ischemia secondary to a chronically occluded left-to-right cross-femoral bypass, as well as an occluded right iliac system owing to a jailed right external iliac artery from a prior common-to-internal iliac covered stent, originally done for buttock claudication. He was treated successfully from an endovascular approach with kissing stents in the right internal and external iliac arteries after gaining access to the old right common iliac stent via an ipsilateral access and use of a Pioneer intravascular ultrasound-guided re-entry catheter. Use of this strategy to treat complex aortoiliac occlusions in patients that are not suitable surgical candidates can be achieved effectively, even in the setting of existing prior ipsilateral stent grafts. (*J Vasc Surg Cases Innov Tech* 2023;9:101189.)

Keywords: Aortoiliac occlusive disease; Pioneer re-entry; Iliac stenting; Endovascular salvage

Aortoiliac occlusive disease (AIOD) is a significant subset of peripheral arterial disease that leads to debilitating proximal claudication and chronic limb-threatening ischemia. In 2007, the most recent Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC)-II classification guidelines were published for patients with AIOD, and for TASC C and D lesions, including aortoiliac occlusion, unilateral iliac occlusion, or diffuse stenosis throughout the aortoiliac system, open surgery is recommended as the treatment of choice. With advancements in endovascular technologies, the rate of endovascular interventions in these patients has drastically increased, particularly since 2009.^{1,2} The TASC-II guidelines cited endovascular intervention as the treatment of choice only for TASC A and B lesions in AIOD; however, several studies have been published demonstrating high technical success and comparable long-term patency of endovascular intervention with open repair for high TASC (C and D) lesions.³⁻⁶ We present a case of a poor surgical candidate with significant AIOD and prior failed open and endovascular interventions who underwent endovascular recanalization of an occluded, jailed external iliac artery using

the Pioneer re-entry catheter. Appropriate informed consent was obtained from the patient before publication.

CASE REPORT

A 59-year-old African American man presented with subacute on chronic critical limb ischemia with nocturnal rest pain and a right toe pressure of 0 mm Hg. He had a known history of chronic right external iliac artery occlusion with remote left-to-right femoral-femoral bypass that now seemed to be occluded. He also had a history of right common to internal iliac stent for buttock claudication 3 years prior. Based on a computed tomography angiogram, it seemed that the previously placed common iliac artery stent was occluded, in addition to the cross-femoral artery bypass. Before any intervention for his current presentation, the patient complained of chest pain and dyspnea, and required further evaluation with cardiology that included a stress test and echocardiogram. As a result, he was deemed to be of elevated risk for an open surgical operation. Of note, the patient also had a history of chronic pancreatitis status-post total pancreatectomy 4 years prior. An endovascular approach was deemed appropriate given the patient's functional and cardiac status, as well as prior surgical history, with a plan to perform redo femoral-femoral bypass if recanalization was unsuccessful. Redo cross-femoral bypass was considered but patency rates for such a bypass are lower compared with iliac stenting,^{1,3,7-9} and the patient had complained of chronic pain at the site of his prior bypass and had a planned future bladder cancer treatment at the tunnel location.

The procedure was initiated by performing exposure of the distal right external iliac artery through the femoral bifurcation and resecting the hood of the occluded cross femoral artery bypass. After extended endarterectomy and removal of chronic, organized thrombus (Fig 1), a bovine pericardial patch was anastomosed and then accessed with a ministick kit in a retrograde fashion. A wire and catheter were able to be advanced readily to the proximal external iliac artery, but attempts at further advancement continued to enter a subintimal plane at the level

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Fig 1. Computed tomography (CT) image demonstrating occlusion of the right iliac system and cross femoral bypass (top left), angiogram demonstrating total occlusion of the common iliac (bottom left), representation of the Pioneer re-entry catheter gaining access to the existing iliac stent after traversing the chronically occluding external iliac (top right), and image showing the chronic, organized thrombus removed via endarterectomy (bottom right).

of the common iliac artery. Ultrasound guidance was used to access the contralateral femoral artery in a retrograde fashion, and a sheath was advanced up and over to the right common iliac artery. Multiple obliques were used, as well as multiple catheter combinations, but the external iliac artery did indeed seem to be jailed. Given the relative lack of subcutaneous tissue in which to tunnel a redo bypass, as well as the patient already experiencing chronic pain at the prior bypass site, and planned future bladder cancer therapy in this region, we felt it would be worthwhile to attempt use of a re-entry catheter to traverse from the subintimal plane into the previously placed covered stent, thus avoiding a redo tunnel attempt in a patient requiring cancer therapy in the region and possible exacerbation of chronic pain.

Using a Pioneer intravascular ultrasound guided re-entry catheter in a retrograde fashion (Phillips, Amsterdam, the Netherlands) to direct the re-entry attempt, we were able to direct a wire intraluminally at the level of the common iliac artery. The Pioneer re-entry catheter was subintimal along the prior common iliac stent, and re-entry was achieved through both this subintimal plane, and the existing stent. After entry through the wall of the prior stent, the tract was dilated with a 4 × 40 Sterling balloon (Boston Scientific, Marlborough, MA), as well as a Crosstella balloon (Terumo, Tokyo, Japan). An 8F sheath was then advanced through this fenestration. This was

confirmed both angiographically and with intravascular ultrasound. In order to preserve the internal iliac artery, we then proceeded to perform kissing stenting by delivering an 8 × 59 VBX (W. L. Gore & Associates, Flagstaff, AZ) stent to the hypogastric artery via the contralateral femoral access while delivering an 8 × 79 VBX to the external iliac artery stent via the open femoral exposure simultaneously. The procedure was done by expanding the VBX stents to nominal pressure without the need for any high-pressure balloons. The external iliac was then extended with a 10 × 10 Viabahn stent (W. L. Gore & Associates). There was brisk filling of the extremity with preservation of the internal iliac artery (Fig 2).

The patient's postoperative course was uneventful, and he was discharged with resolution of his rest pain as well as persistent freedom from buttock claudication. He was maintained on dual antiplatelet therapy of clopidogrel 75 mg and aspirin 81 mg daily and continues to do well with resolution of his symptoms at current follow-up out to 1 year.

DISCUSSION

Complex AIOD often requires innovative approaches to treatment, and in patients who have significant comorbidities or poor functional status prohibitive of open repair, this often means it is appropriate to use an

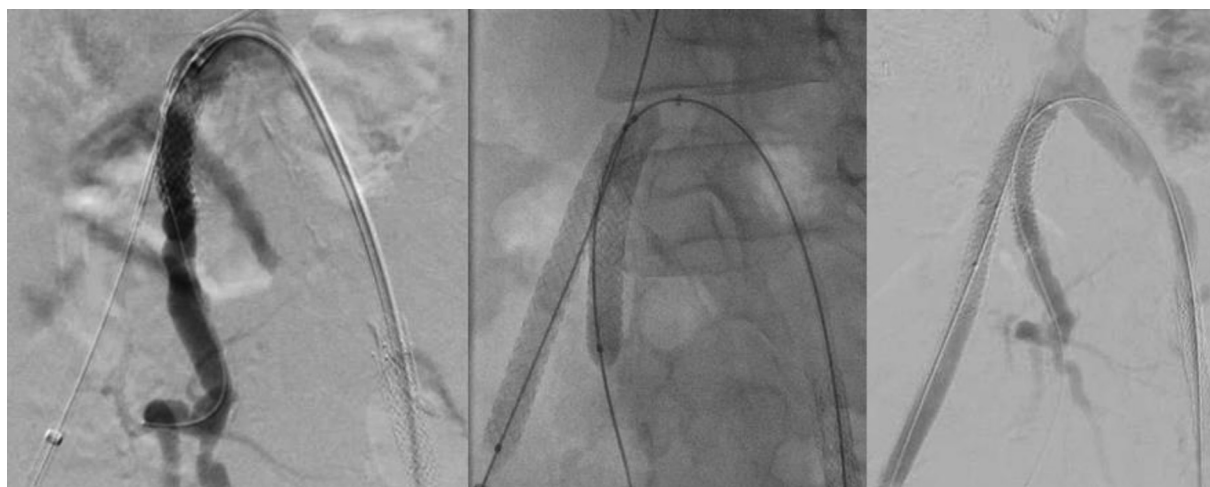


Fig 2. Angiographic images demonstrating access via the ipsilateral endarterectomy site, as well as up-and-over access from the contralateral side gaining access into the internal iliac system (left), stent deployment in a kissing fashion (middle), and completion angiography demonstrating patency of both the internal and external iliac systems (right).

endovascular-first approach. The patient presented here was a poor open surgical candidate given cardiac stress testing consistent with a significantly elevated risk with surgery, as well as a history of chronic pain at prior open surgical sites, bladder cancer with planned future treatment, and prior open abdominal operations. The complex anatomical considerations in this case, including a jailed external iliac artery with occluded prior femoral-femoral bypass, required that we plan an endovascular intervention from an ipsilateral retrograde approach via a subintimal and substent plane.

The data available for TASC C and D lesions demonstrates that the patency and limb salvage of this patient's repair should be similar to open repair, although these data are retrospective in nature and lack a true prospective randomized control trial between open and endovascular intervention.³⁻⁶ One single-center retrospective comparison between open and endovascular intervention in patients with TASC C/D AIOD also demonstrated a similar rate of freedom from related reinterventions between groups.³ The type of endovascular intervention that patients receive in the reported literature is often heterogenous. One systematic review of endovascular interventions involving the iliac segments in high TASC lesions stated the use of both covered and noncovered stents were routinely used, as well as balloon-expandable and self-expanding stents.⁵ The Covered vs Balloon Expandable Stent Trial (COBEST) trial sought to provide some more clarity in this respect, comparing balloon-expandable covered with uncovered stenting of AIOD. The trial effectively stratified patient analysis based on TASC classification, and clearly demonstrated a benefit in freedom from restenosis for covered stenting compared with uncovered stenting out to 18 months in patients with TASC C and D lesions. In TASC A and B

lesions, these differences were not seen.¹⁰ Therefore, relevant to our patient, covered stenting was appropriate.

The Pioneer re-entry catheter has been demonstrated effective in treating iliac occlusions, with improved technical success in iliac revascularization, but has not been demonstrated in the literature in the manner of re-entering an existing covered stent, and in conjunction with hypogastric preservation.^{11,12} Hypogastric preservation is important, because 25% of patients with unilateral internal iliac artery sacrifice will have buttock claudication and 50% of these patients will have persistent symptoms that significantly decreases their quality of life. Other severe complications can occur with internal iliac artery sacrifice, including spinal cord ischemia and ischemic colitis.^{13,14} Overall, endovascular intervention in complex aortoiliac occlusions in patients who are unsuitable for open revascularization can be achieved effectively with consideration of the Pioneer re-entry catheter, even in the setting of existing prior ipsilateral stent grafts.

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