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# Dual alternate access sites for the treatment of an ostial left common iliac artery chronic total occlusion

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**Abstract**

Growing endovascular strategies with TASC D lesions in aortoiliac disease reflect increasing technical success with evidenced safety and efficacy. In cases of failed transfemoral access, revascularization of iliac chronic total occlusions has prompted the utilization of other alternate access sites (e.g. transradial and transbrachial approaches) as important options in aortoiliac TASC D lesions. We describe a case of successful revascularization of an occluded ostial left common iliac artery in an 81-year-old man using a dual ulnar and tibioperoneal approach (absent radial artery). A Controlled Antegrade and Retrograde Tracking technique was performed where a balloon was advanced from the peroneal artery into the distal cap of the chronic total occlusion in the proximal common femoral artery. Balloon inflation was performed and a glidewire from transulnar access was advanced and re-entered into the true lumen in the common femoral artery. The wire was then snared and externalized out the transpedal access site creating a continuous true lumen from the ulnar artery to the peroneal artery. To reconstruct the aortic bifurcation, kissing balloon inflations were performed from the peroneal as well as the ulnar artery approaches. A 10 mm × 59 mm balloon expandable stent was placed in the ostial left common iliac artery and a 8 mm × 60 mm self-expanding stent was placed in the left external iliac artery successfully.

**Keywords**

Cardiovascular, surgery, peripheral artery disease, alternate access site, transpedal intervention, transradial intervention, chronic total occlusion, iliac artery stenosis

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## Introduction

Despite initial recommendations by the Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II) for open surgical revascularization for TASC D lesions in aortoiliac disease, a growing endovascular-first strategy reflects increasing technical success in those who may be poor surgical candidates with potential for both safety and efficacy.[1–3] Specifically, revascularization of iliac chronic total occlusions (CTOs) has been achieved with transfemoral, transradial, and transbrachial arterial approaches.[4,5] However, anatomical variations and radial artery spasm can complicate transradial access. Similarly, transbrachial access has its own risk profile along with hand ischemia and difficulty in achieving post-procedural hemostasis.[6] Transulnar access with coronary intervention showed no significant difference in complications compared to transradial access.[7] However, radial and ulnar approaches in peripheral artery disease (PAD) have been infrequently used. We describe a case of successful revascularization of a CTO of the common iliac artery (CIA) using a combined transulnar and tibioperoneal approach.

## Case report

An 81-year-old man presented with a chronic non-healing ulcer of the left first toe and rest pain consistent with critical limb ischemia. His past medical history included diabetes mellitus, long-time smoker, and severe PAD with a prior

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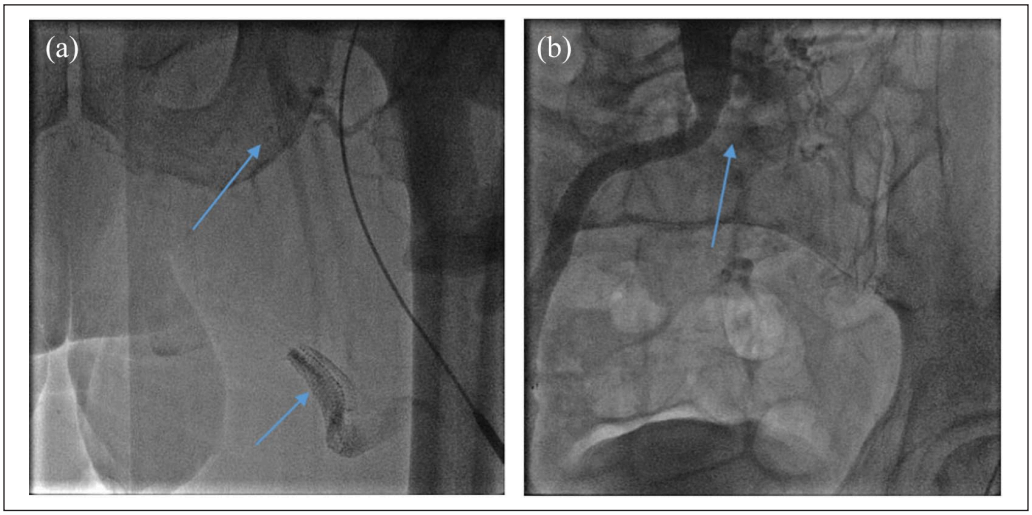


**Figure 1.** Diagnostic angiography demonstrating (a) reconstitution of left common femoral artery stent (top arrow) with stent in failed femoral-femoral bypass (bottom arrow) and (b) flush occlusion of left common iliac artery (arrow).

history of femoral-femoral bypass grafting as well as multiple endovascular interventions. Subsequently, initial workup showed an ankle-brachial index (ABI) of 1.1 (right) and 0.6 (left). Additionally, computed tomography angiography (CTA) revealed a patent stent in right CIA, occluded left common and external iliac arteries (EIAs), and an occluded femoral-femoral bypass graft. Upon catheterization, angiography confirmed an occluded left CIA with reconstitution at the common femoral artery (CFA) (Figure 1(a)). Given the ostial flush occlusion of the left CIA (Figure 1(b)) in the setting of an identified absence of the radial artery, a decision was made to pursue ulnar artery access along with tibioperoneal access to perform endovascular revascularization. The operators did not believe enough support would be available through a contralateral femoral access in addition to significant bilateral atherosclerotic disease noted of the bilateral CFAs and superficial femoral arteries (SFAs) via arterial duplex.

With administration of an antispasmodic cocktail of 100 µg of nitroglycerin, 2.5 mg of verapamil, and unfractionated heparin (5000 U, intra-arterial), left ulnar artery access was obtained and a 6F 119 cm R2P Slender Glide sheath (Terumo, Somerset, NJ) was advanced to the distal aorta (Figure 2(a)). Barbeau test was performed prior to ulnar access which showed adequate hand perfusion. Upon ultrasound examination, the left distal anterior tibial (AT) artery and left posterior tibial (PT) artery were occluded so peroneal artery access was obtained (Figure 2(b)) and a 4F sheath (Terumo, Somerset, NJ) was placed. Initial tibial angiogram confirmed occlusion of the PT artery and the distal AT artery with faint collaterals filling the dorsalis pedis artery. From the antegrade approach, a 0.035″ Straight Stiff glidewire (Terumo, Somerset, NJ) was advanced in the subintimal plane around the occlusion and into the CFA (Figure 2(c)). Via the peroneal access, a 0.018″ V18 wire (Boston Scientific) was used to subintimally dissect around the distal cap of the occlusion and into the CFA (Figure 2(a) and (c)).

A CART (Controlled Antegrade and Retrograde Tracking) technique was performed where a 6.0 mm × 80 mm Sterling OTW balloon (Boston Scientific, Somerset, NJ) was advanced into the retrograde dissection plane (Figure 3(a)). Retrograde balloon inflation was performed and the stiff Glidewire was now able to re-enter into the true lumen from above. The wire was then snared and externalized out the foot creating a continuous true lumen from the ulnar to the peroneal (Figure 3(b)). To reconstruct the aortic bifurcation, kissing balloon inflations (6.0 mm × 80 mm Sterling OTW (Boston Scientific) and 6.0 mm × 200 mm Metacross (Terumo, Somerset, NJ)) were performed (Figure 3(c)) from the antegrade and retrograde approaches. Intravascular ultrasound was performed to confirm the size and apposition of the stents. An Omnilink 10 mm × 59 mm balloon expandable stent (Abbott Vascular, Santa Clara, CA) was deployed in the ostial left CIA followed by an Absolute Pro SE 8 mm × 60 mm self-expanding stent (Abbott Vascular, Santa Clara, CA) in the left EIA (Figure 3(d)). The final angiographic result (Figure 4(a)) showed excellent flow with no complications during the procedure.

Postoperatively, the patient regained ambulation shortly after with no claudication or rest pain. The wound healed and left dorsalis pedis pulse was palpable. Repeat ABI on the left improved to 0.9 and both the iliac stents and peroneal artery access sites remained patent greater than 1-year post procedure.

## Discussion

Our case demonstrates that successful revascularization of a CTO of the CIA is safe and feasible using a combined

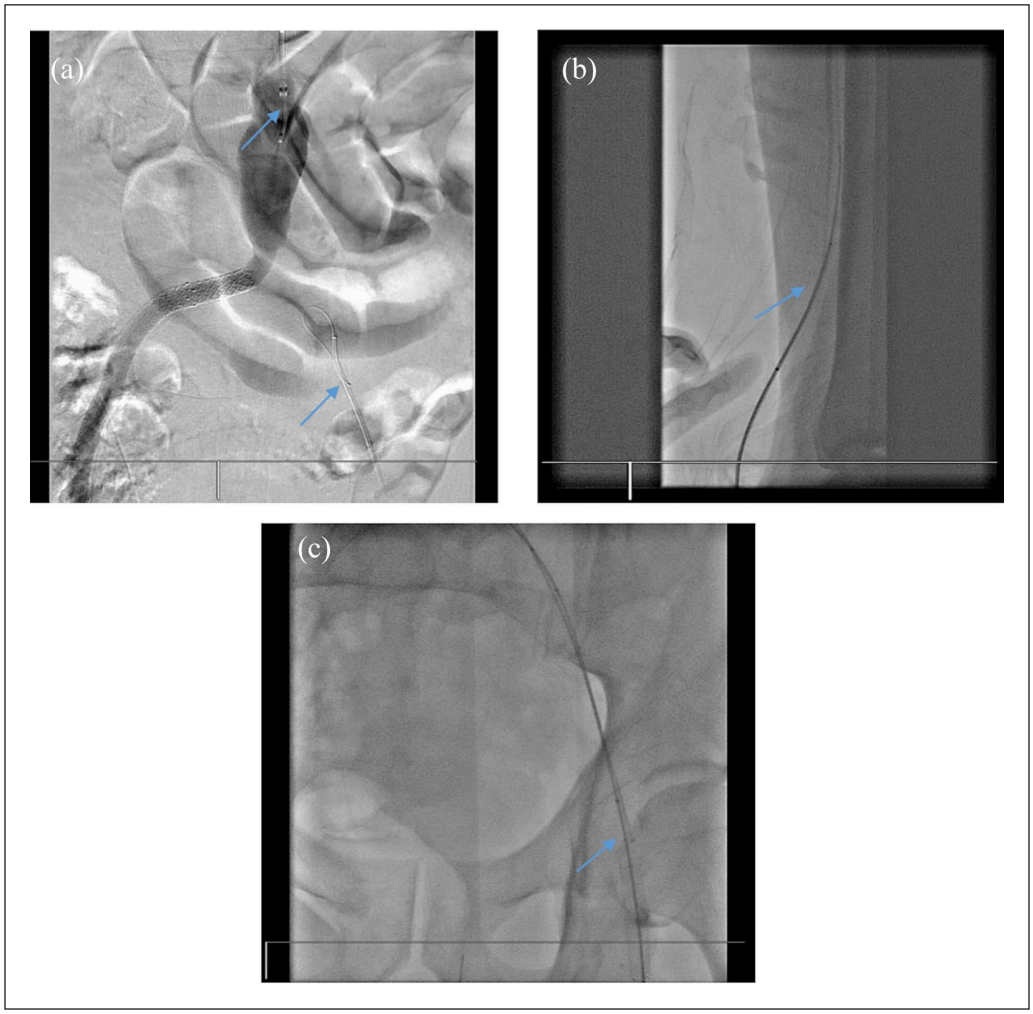


**Figure 2.** Access approaches with (a) sheath advanced from ulnar artery to distal aorta (top arrow) with retrograde dissection of proximal cap of occlusion (bottom arrow), (b) left peroneal artery access, and (c) subintimal advancement into the common femoral artery (arrow).

transulnar (if radial artery access is poor) and tibioperoneal approach in the setting of an occluded femoral-femoral bypass graft. Noting the adoption of transradial approaches over transfemoral in coronary interventions due to reduced risk of access-related complications and mortality, the transradial approach with lower limb intervention has recently been found to have comparable technical success and lower overall complication rates relative to the conventional contralateral transfemoral approach.[4,8] For TASC C-D iliac disease (particularly flush occlusions), transbrachial access has been advocated since it can provide a direct line for recanalization and avoid retrograde aortic dissection; however, this approach may often require a cutdown adding complexity and risk to the procedure.[9] Nevertheless, comparative evidence between transradial (or transulnar) and transbrachial approaches with TASC C-D aortoiliac disease is lacking.

In our case described here, surgical revascularization with a femoral-femoral bypass had become occluded and reoperation carried significant risks so an endovascular approach was chosen as the best treatment strategy. Given the ostial flush occlusion, a contralateral femoral approach would have difficult due to angulation and lack of support. Furthermore, a combined antegrade and retrograde approach was planned given the length and complexity of the CTO. While an absent radial artery pulse obviated its use, a transulnar approach was preferred over a transbrachial approach due to a lower risk with access site complications. The most frequent major complication noted with a transbrachial approach (2%) has been thrombotic occlusion of the brachial artery requiring surgical treatment.[6] Furthermore, in prior evidence with coronary revascularization, transulnar approach was comparably safe to a transradial approach in terms of major cardiovascular events (MACE) and neurovascular events (at access), including lower

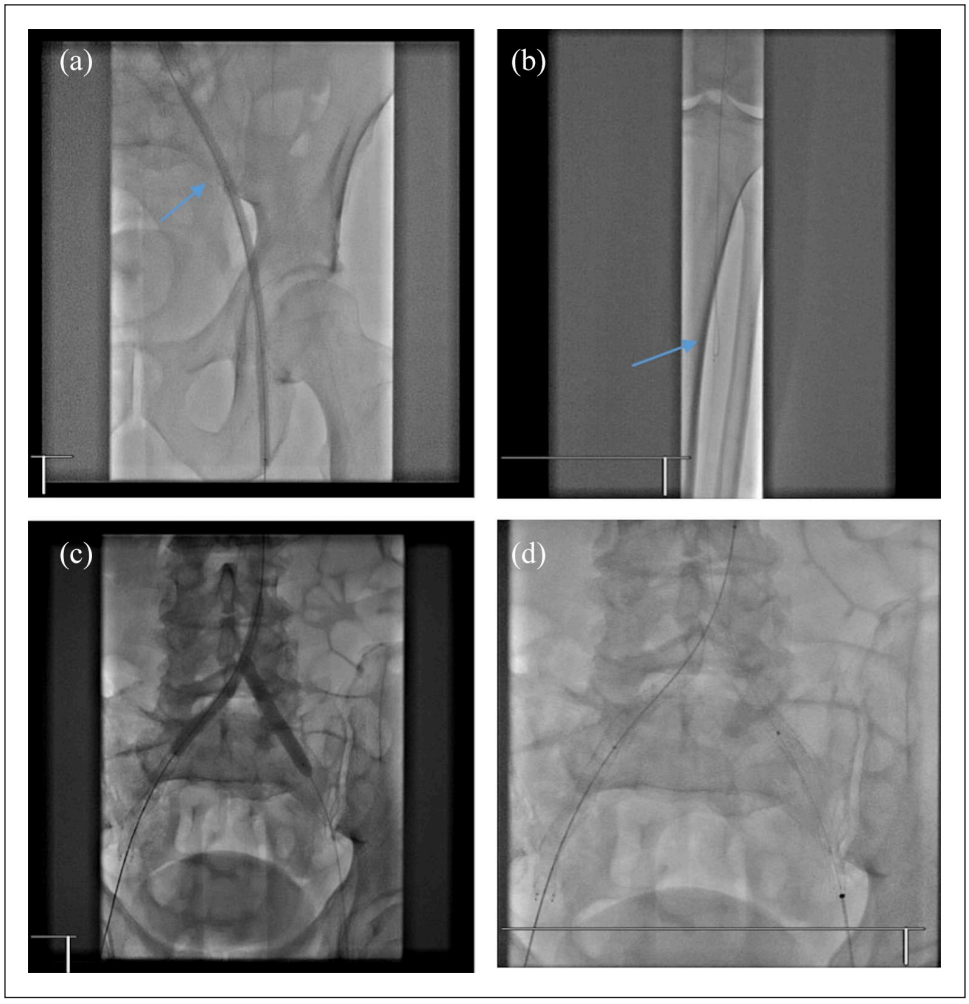


**Figure 3.** Controlled antegrade and retrograde tracking and dissection by (a) retrograde balloon inflation (from peroneal artery access) with (b) snare and externalization of advanced guidewire by antegrade wiring (from ulnar artery access). (c) Subsequent aortic bifurcation reconstruction by kissing balloon inflations and (d) absolute Pro SE stent in left external iliac artery.

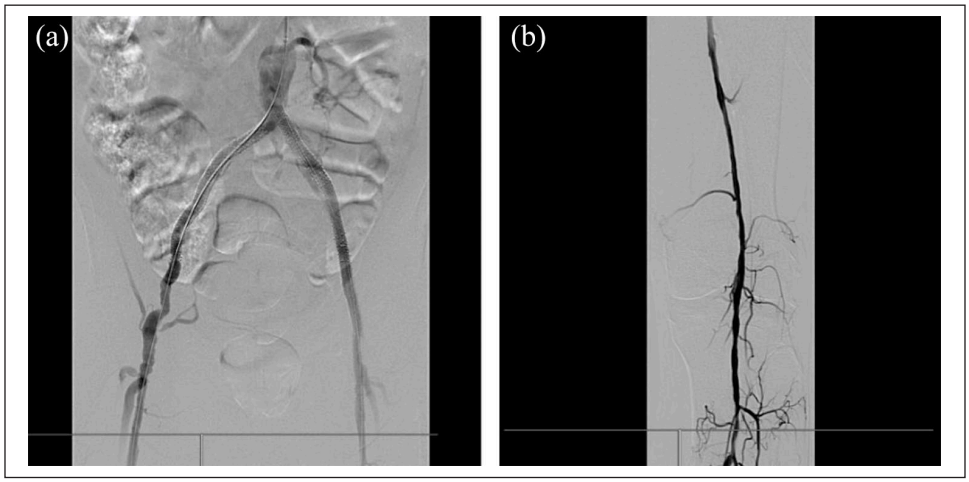


**Figure 4.** (a) Final angiographic result demonstrating revascularization of left common iliac artery and external iliac artery with (b) patent popliteal artery with no downstream embolization visualized.

rates of arterial spasm and occlusion.[7] In a small case series by Ruzsa et al.,[10] the transulnar approach for iliac artery revascularization was studied in the context of a failed transradial approach (n=7 patients). Ruzsa et al. found similar technical success and safety profile to both transradial and transfemoral approaches with the transulnar approach, and only reported one ulnar artery occlusion.

The use of a tibioperoneal retrograde approach has also been previously described with infrageniculate arterial occlusive disease in the setting of failed conventional antegrade recanalization.[11] However, given the length and location of the CTO, single retrograde access would not be advisable and therefore antegrade access is necessary to define the proximal cap. Still to our knowledge, this is the first case to describe successful retrograde tibioperoneal access utilizing the CART technique to treat severe aortoiliac occlusive disease. Given one-vessel runoff, there is a theoretical risk of damage to the vessel but the ability to stay 4F may mitigate this risk. Although traditional access sites were limited in this complex patient, we still recommend the input of experienced operators and close monitoring until further data is available.

## Conclusion

In summary, our case demonstrated the feasibility of the use of dual transulnar and tibioperoneal access in the treatment of a complex iliac artery CTO. While further prospective evaluation is needed, these alternative access sites can be considered when traditional treatments and access sites are unavailable.

### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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### Informed consent

This patient has provided written informed consent for the publication and dissemination of the pictures and information in this case report.

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