Make Way for a Better Stent – Managing a Calcified Iliac Artery

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Abstract

A 70-year-old woman presented with progressive claudication of bilateral lower limbs over six months. Angiography found bilateral iliac artery chronic total occlusions. The left iliac artery was treated first with balloon angioplasty and stenting. The right iliac artery was heavily calcified, and devices failed to pass after successful bidirectional wiring. Rotational atherectomy was thus applied throughout the iliac artery, which was finally stented with a covered stent and a balloon-expandable stent, post-dilated with high pressure. The patient's symptoms resolved completely after the procedures. In heavily calcified chronic occlusions in the peripheral arteries, debulking and plaque modification via atherectomy reduces risk of rupture, and improves balloon and stent expansion and enhances lumen gain.

Keywords: lower extremity arterial disease, peripheral arterial occlusive disease, rotational atherectomy

Case report

A 70-year-old woman with a medical history significant for type 2 diabetes and hypertension presented with progressive claudication of the bilateral lower limbs over six months. Vascular duplex demonstrated very poor monophasic waveform from the bilateral common femoral arteries to the tibial arteries (Figure 1A). Computed tomography showed heavily calcified vessels, with bilateral iliac artery total occlusion. Diagnostic angiography showed bilateral external iliac artery chronic total occlusions (CTO) with recanalization in the common femoral arteries, which were relatively spared (Figure 1B, C).

The left iliac artery was treated first. The left iliac artery CTO segment was successfully crossed with bidirectional wiring. The antegrade system was established via the right brachial artery with a 6 Fr sheath and with a JR4 diagnostic catheter over a Gladius 0.018" wire. The retrograde system was set up via the left proximal superficial femoral artery (punctured under ultrasound guidance), with a 6 Fr MP guiding catheter, a CXI 2.3 Fr microcatheter with an Astato XS 20 0.014" wire. The retrograde wire was guided into

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the descending aorta (Figure 2A), followed by sequential balloon angioplasty and then stenting with an EverFlex 7.0*80 stent (Figure 2B) and high-pressure post-dilatation (Figure 2C). Final angiography showed good flow (Figure 2D).

The right iliac artery was treated 3 months later. Diagnostic angiography showed right external iliac artery CTO with recanalization in the superficial femoral artery (Figure 3). A bidirectional approach was planned with the antegrade system from the left radial artery using a 6 Fr sheath and the retrograde system from the right superficial femoral artery using an 8 Fr sheath. All access sites were punctured under ultrasound guidance. Retrograde wiring was first attempted with an Astato XS 20 0.014" wire with a CXI 2.3 Fr microcatheter and 6 Fr MP guiding catheter, but failed to penetrate the most calcified CTO segment (Figure 4A). Antegrade wiring was then attempted with an Astato 30 0.018" wire, also with a CXI 2.6 Fr microcatheter and 6 Fr MP guiding catheter. The antegrade wire easily passed through the proximal external iliac occluded segment but deviated to the subintimal space in the distal calcified segment (Figure 4B).

Retrograde attack was attempted again, and the CTO segment was finally successfully penetrated with an Astato XS 20 0.014" wire via an intraplaque route (as evident on the fluoroscopy, Figure 4C). The retrograde wire was advanced into the descending aorta by the reverse CART technique (Figure 4C) and then externalized into the antegrade MP guiding catheter with a handmade snare. Intravascular ultrasound (IVUS) was tried but neither a small balloon nor IVUS could pass through the CTO segment. Rotational atherectomy was thus considered since these devices had failed to pass. Although passage of other balloons (for example, over-the-wire devices) may be possible (especially after externalization of the wire that enables devices to be pulled through), there is a higher risk of vessel rupture, limited lumen gain, and elastic recoil without plaque modification (Figures 5A, B).

The Astato wire was switched to an Extra Support Rotawire with a Finecross microcatheter. Rotational atherectomy with a 2.5 mm burr up to 180000 rpm was completed throughout the right iliac artery (Figure 6A). Angiography after rotational atherectomy confirmed the absence of dissections or extravasation. Sequential balloon angioplasty was performed (Figure 6B), and the entire CTO segment was stented (a 7*100 Viabahn followed by 7*37 Express LD, Figure 6C) and then post-dilated with high pressure balloons (Figure 6D). Stent expansion was acceptable after high pressure post-dilatation. Final angiography showed good flow and the procedure was thus closed (Figure 7).

Conclusions

In heavily calcified CTO or severely stenotic lesions, the presence of calcium restricts the effects of balloon angioplasty. Initial lumen gain may be limited due to inadequate balloon inflation or high proportion of recoil after balloon deflation. In addition, the presence of calcium may necessitate very high pressures during balloon angioplasty, increasing the risk of vessel rupture. Debulking and plaque modification via rotational atherectomy may be considered to improve the safety and efficacy of the procedure in selected cases.

(A)

(B)

(C)

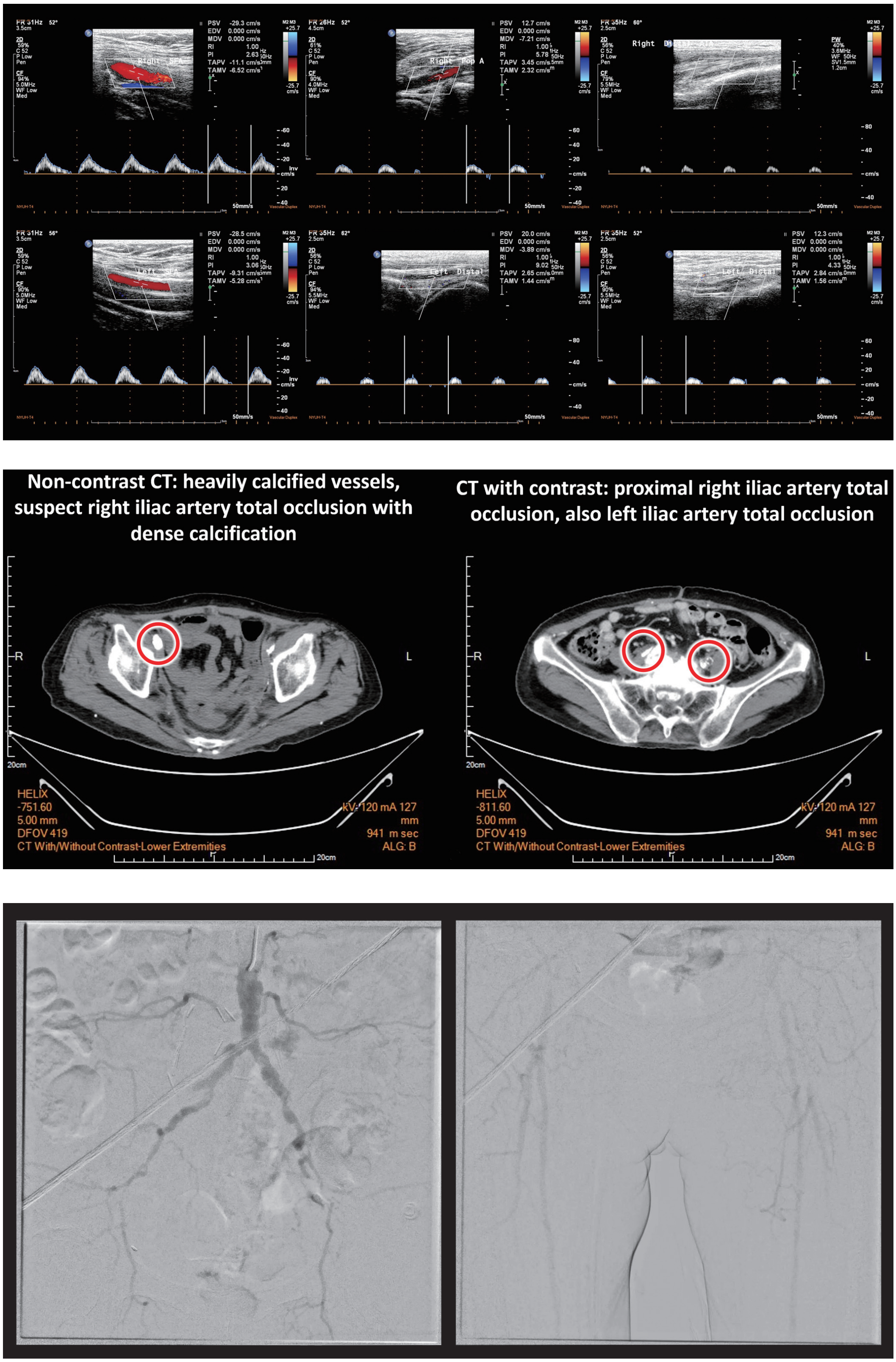


Figure 1. (A) Pre-procedural lower limb vascular duplex, (B) computed tomography, and (C) diagnostic angiography.

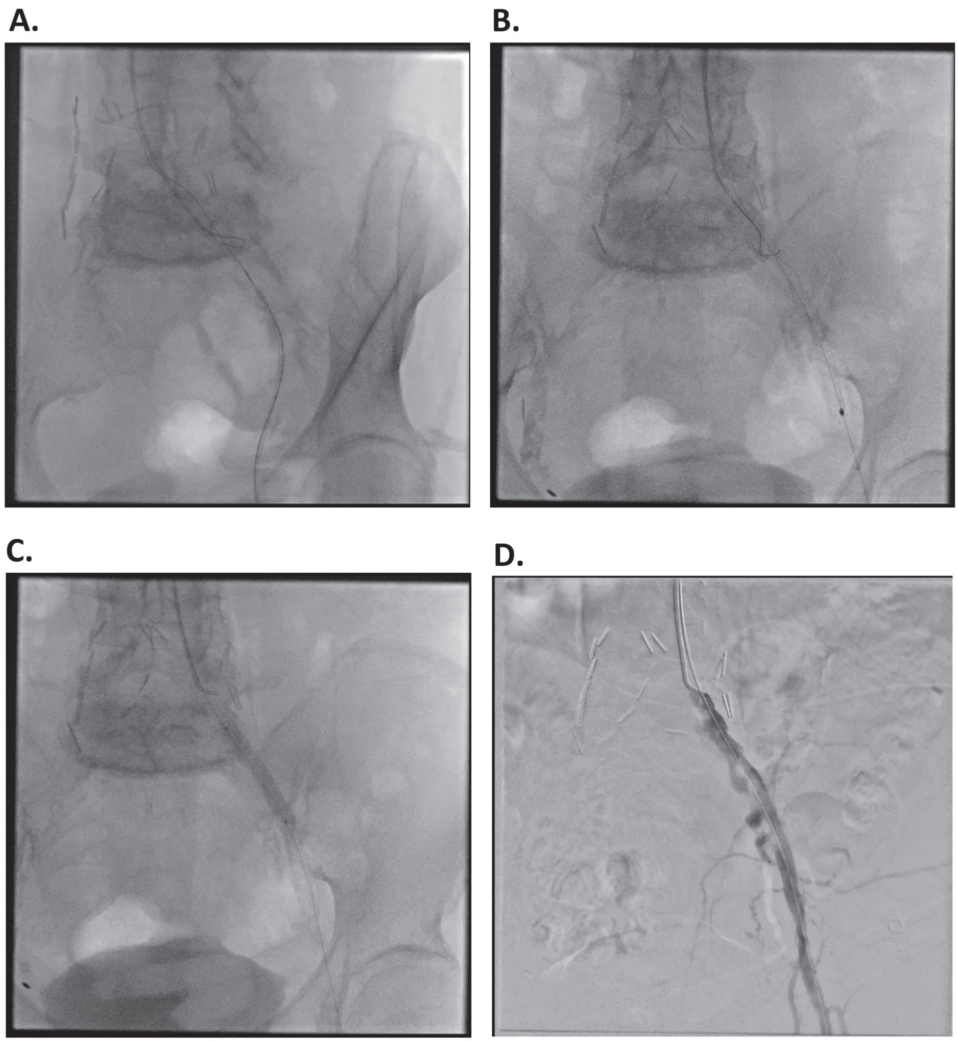


Figure 2. Endovascular therapy of the left iliac artery, with (A) retrograde wiring, (B) stent deployment, (C) post-dilatation, and (D) final angiography.

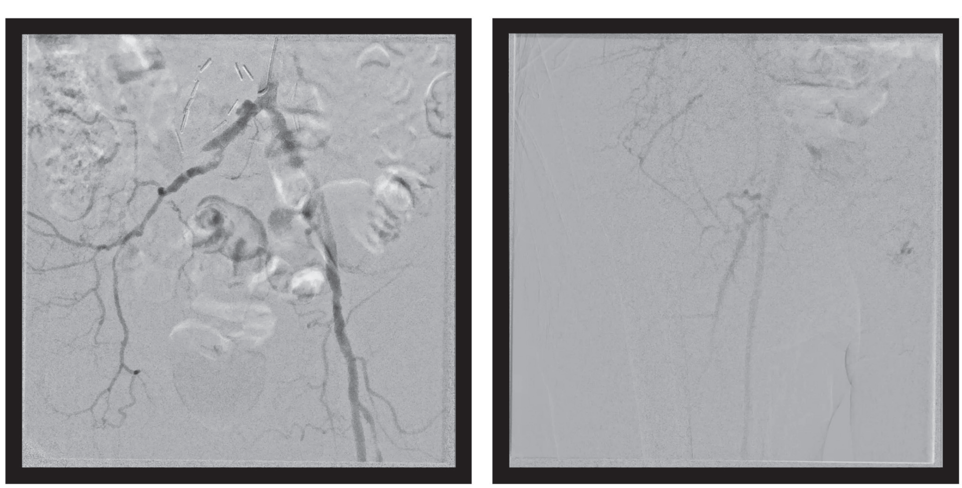


Figure 3. Diagnostic angiography before intervention to the right iliac artery.

(A)

(B)

(C)

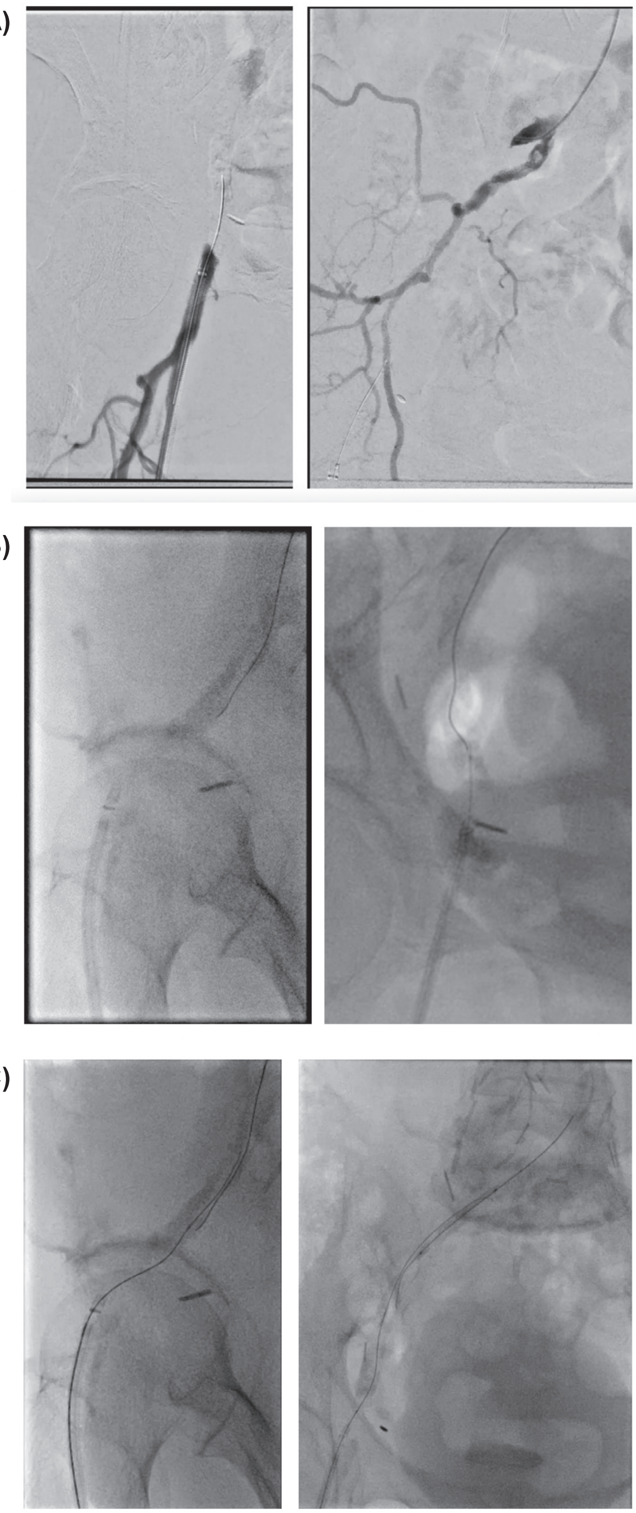
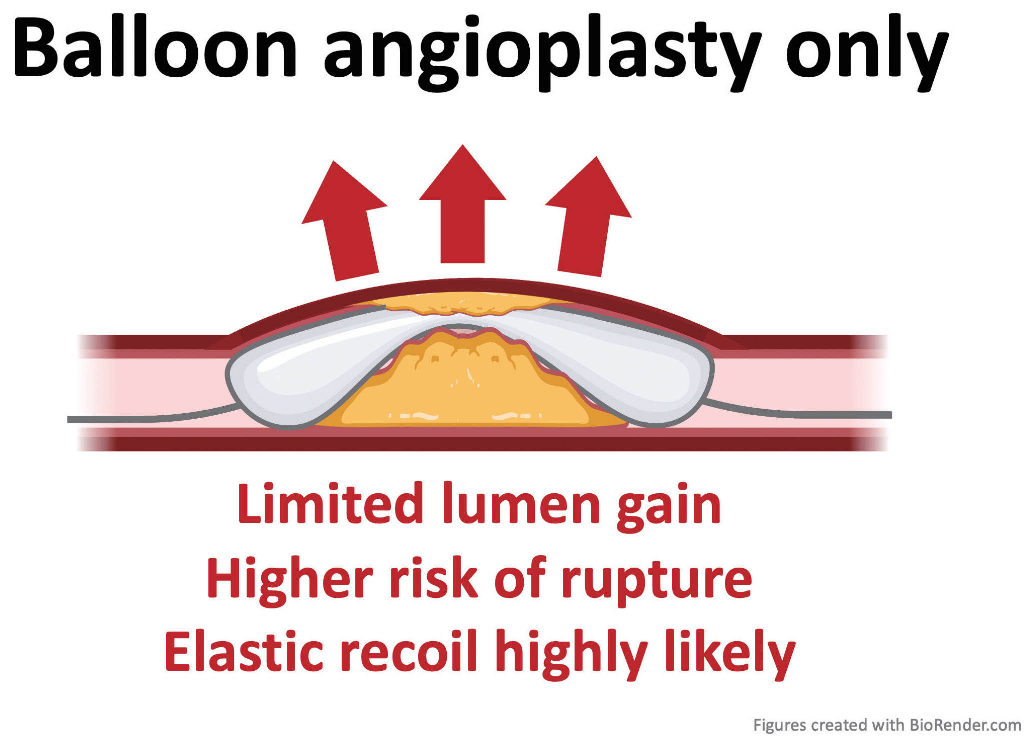
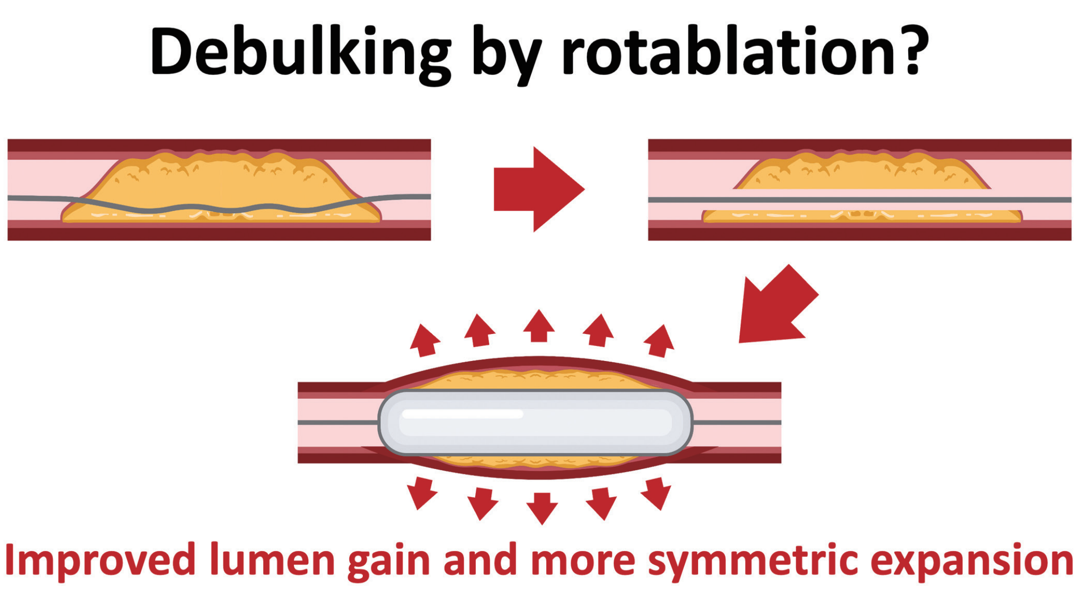


Figure 4. Wiring process for the right iliac artery occlusion, with (A) initial difficulties deploying the retrograde wire in the most calcified segment, (B) eccentric deviation of the antegrade wire, and finally (C) crossing via the intraplaque route, retrogradely and into the aorta with reverse CART.
Reverse CART, reverse controlled antegrade and retrograde tracking.



(A)



(B)

Figure 5. Schema of balloon angioplasty (A) without and (B) with atherectomy.

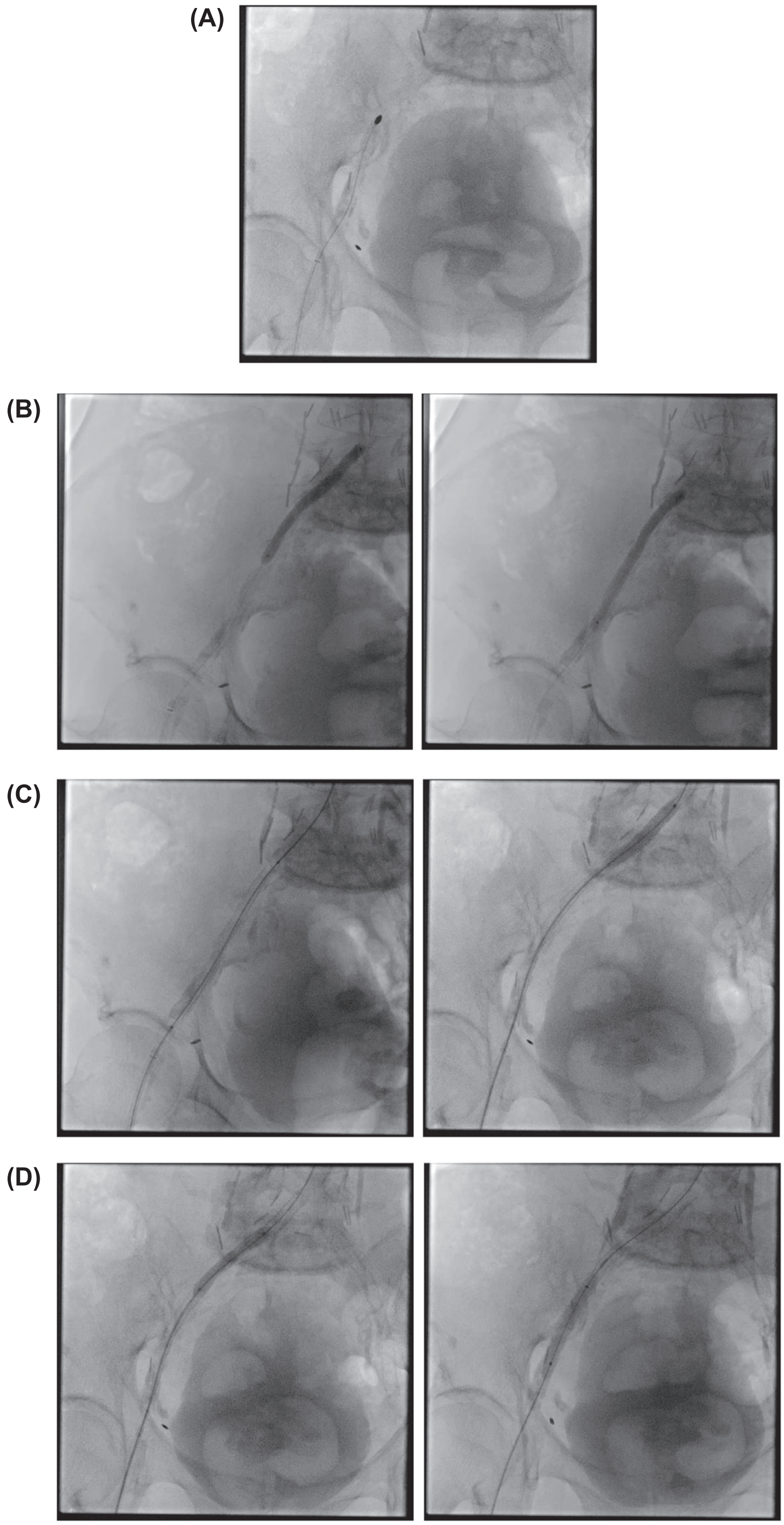


Figure 6. Vessel preparation and stenting of the right iliac artery, with (A) rotational atherectomy, (B) balloon angioplasty, (C) stenting and (D) post-dilatation.

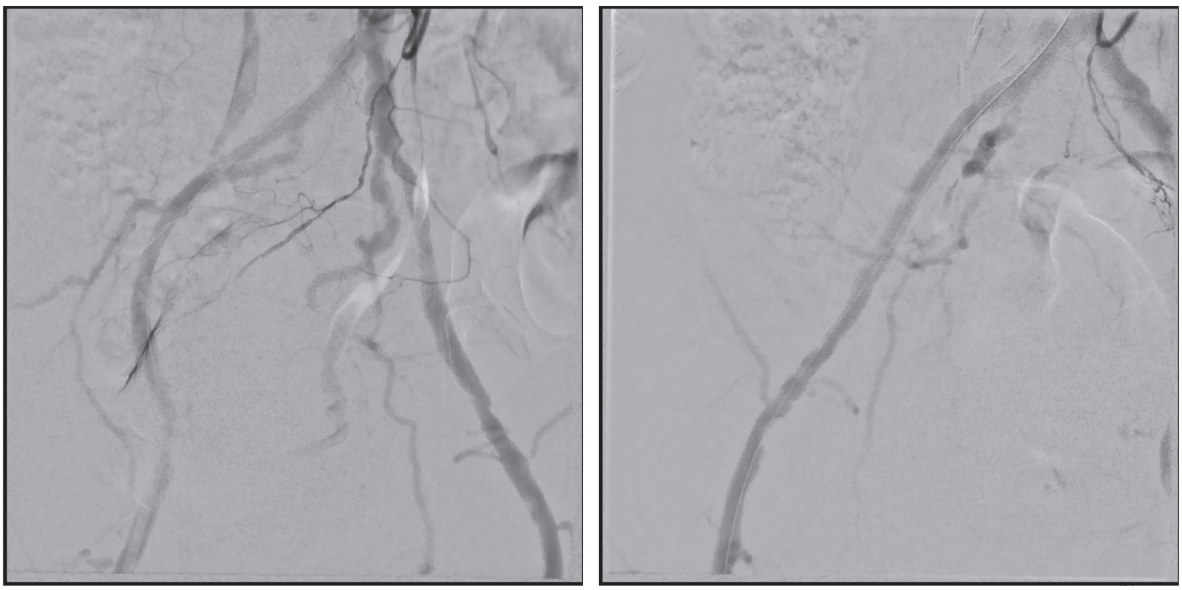


Figure 7. Final angiography after intervention to the right iliac artery.