Use of Intravascular Lithotripsy for Severe Calcification in Endovascular Aortoiliac Reconstruction

Rohan Virdee[1], BMBS; Michael Leshen[2], MD; Sankrit Kapoor[3]; Devang Butani[2], MD; Sanjiv Virdee[2], MD

(1) University Hospital Coventry and Warwickshire; (2) University Of Rochester Department of Vascular and Interventional Radiology; (3) University of Rochester

Purpose

Arterial calcification is common in Peripheral Arterial Disease, often resulting in suboptimal clinical outcomes following angioplasty and stent placement. The use of intravascular lithotripsy (IVL) to create micro-fractures within the calcification may increase luminal patency and prevent stent under expansion. We detail usage of IVL in the distal abdominal aorta (AA) during an endovascular aortoiliac (AI) reconstruction of TASC D lesions

Material and Methods

A 62-year-old female with rest pain and left lower extremity claudication presented for percutaneous transluminal angioplasty of the iliac artery. The first attempt was prematurely terminated 1 month prior due to severe back and knee pain, requiring general anesthesia for the second attempt. Right brachial retrograde access (RA) was performed followed by placement of a sheath in the infrarenal abdominal aorta. An aortogram revealed a 3-4 cm occlusion of the distal AA, extending into bilateral CIAs and the left EIA. Collateral circulation was provided by hypertrophied iliolumbar and inferior mesenteric vessels. Calcified plaque was seen in the right common femoral artery (CFA) resulting in 85 % stenosis. Chronic occlusion of the right superficial femoral artery (SFA) was present, and the right CIA was conventionally cannulated.

Results

Significantly decreased flow through collaterals and excellent luminal patency were seen angiographically and on IVUS. Pulses were palpable and the patient reported immediate relief in symptoms.

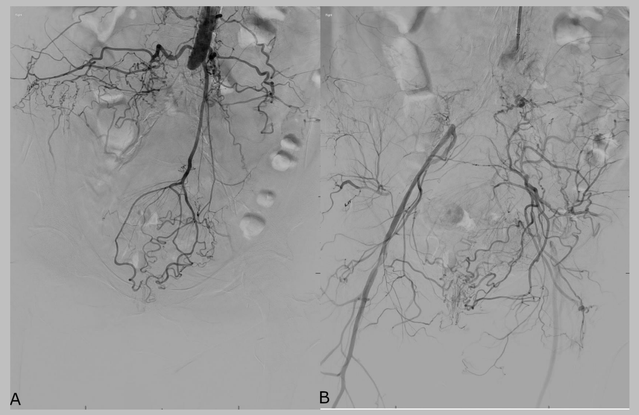

Figure 1: Intraoperative Aortogram

Early (A) and late (B) DSA Aortogram depicting occlusion of the distal abdominal aorta and bilateral common iliac artery occlusion. Collaterals from the iliolumbar and inferior mesenteric arteries are also present.

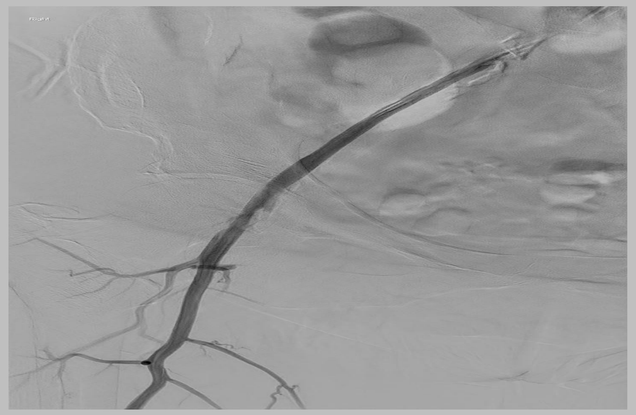

Figure 3: Right Common Femoral Artery Following Intervention

DSA of the right common femoral artery after intravascular lithotripsy in order to obtain non-flow limiting retrograde access.

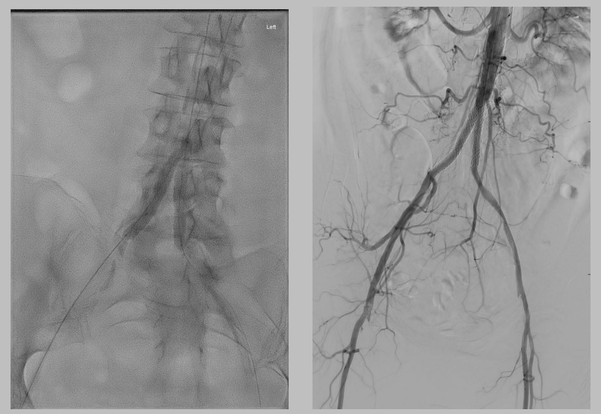

Figure 4: Kissing Shock Wave Balloons and Completion

Left: DSA depicting placement of bilateral kissing shockwave balloons in the common iliac arteries.

Right: Final DSA following the insertion of kissing covered stents at the aorto-iliac bifurcation post angioplasty.

Figure 2: Right Common Femoral Artery Prior to Intervention

DSA of the right common femoral artery prior to intravascular lithotripsy. Arrow indicates dense calcifications targeted by shockwave therapy.

A shockwave IVL device was initially used in the right CFA to allow safe non-flow limiting RA via the proximal right SFA. A loop-snare was then used to pass a wire from the right SFA access point into the abdominal aorta across the right CIA occlusion. Subintimal cannulation of the long segment left distal AA/CIA/EIA occlusion via the brachial sheath was successful. Intravascular ultrasound (IVUS) ensured re-entry into the EIA true lumen above the inguinal ligament crossover. Kissing Shockwave Balloon (SB) angioplasty was used in the distal AA and CIAs. SBs were also used in the left EIA. Significant luminal gain was noted post-SB angioplasty; however, kissing-covered stents at the Aortoiliac bifurcation and left EIA were needed based on angiography and IVUS.

Conclusions

IVL can serve as a useful tool in modifying, normally resistant calcified plaque morphology to improve angiographic results and ultimately clinical outcomes. Modification in calcified plaque mortality may ultimately lead to improved stent patency. This has been documented in other lower extremity vessels but less so in AI occlusive disease.

References

1) Rocha-Singh KJ, Zeller T, Jaff MR. Peripheral arterial calcification: Prevalence, mechanism, detection, and clinical implications. Catheterization and Cardiovascular Interventions. 2014;83(6). doi:10.1002/ccd.25387
2) Hardman R, Jazaeri O, Yi J, Smith M, Gupta R. Overview of classification systems in peripheral artery disease. Seminars in Interventional Radiology. 2014;31(04):378-388. doi:10.1055/s-0034-1393976

Contact

Address correspondence to: Dr; Rohan Virdee, BMBS
University Hospital Coventry and Warwickshire
rsv11@georgetown.edu