Challenges of Treating Heavily Calcified Aorto-Iliac Occlusive Lesions: How Can Intravascular Lithotripsy Be Helpful

Fabrizio Fanelli, MD, EBIR
Professor of Radiology
Director Vascular and Interventional Radiology Department
“Careggi” University Hospital
Florence - Italy

Background
Atherosclerosis of iliac arteries is widespread. As inflow vessels, they are of great clinical significance and increasingly being treated by endovascular means. Transcatheter aortic valve implantation (TAVI), thoracic endovascular aortic repair (TEVAR), endovascular abdominal aortic repair (EVAR) have been established as promising less invasive therapeutic options. However, the use of large-sheaths still remain an important challenge since significant coexisting arterial disease may be encountered in patients.

Access problems associated with EVAR/TEVAR are common
- Gabrielli reported 7.62% of cases had unexpected difficulties due to small arteries, stenosis, heavy calcifications and tortuosity (N = 1696)¹
- Significantly contributes to morbidity and mortality²
- Leading cause of conversion to open repair³


Iliac Vessel Preparation
- PTA
- Cutting balloon
- Scoring balloon
- Atherectomy
- “Paving and Cracking” technique
- Lithotripsy

Lithoplasty
Localized Lithotripsy to treat vascular calcium
Lesion modification using lithotripsy in a balloon
Sonic Pressure Waves are Tissue-selective:
- Hard on hard tissue, Soft on soft tissue
Waves, unfocused and spherical in shape, travel outside balloon:
- Designed to disrupt both superficial, deep-calcium

- Designed to normalize vessel wall compliance prior to controlled, low pressure dilation
- Effective lesion expansion with minimized impact to healthy tissue
- Familiar Balloon-based endovascular technique
- “Front-line” balloon strategy (.014” compatible)
Lithoplasty
Vascular applications

The Shockwave Medical Lithoplasty System is indicated for dissection-enhanced balloon dilation of lesions, including calcified lesions, iliac, femoral, popliteal, infrapopliteal, and renal arteries. It is not used in the coronary or cerebral vasculature.

Lithoplasty – Iliac arteries
Initial Personal Experience

- 5 pts (2 pre-EVAR / 1 pre-TEVAR / 2 severe stenoses)
- 1 bilateral kissing lithoplasty
- Technical success: 5/5 pts
- Correct insertion of aortic devices 3/3 pts.
- No complications
- No dissections
- No rupture

Calcium:
Grade 4a: 1
Grade 4b: 4

Calcium grading according to Fanelli et al. CVIR 2014

Lithoplasty – Iliac arteries
Initial Personal Experience

- Lithoplasty balloon Ø: 7 mm
- N° pulses: 90-210 (mean 150)
- Impact Admiral (Medtronic)
  7x60: 3 pts
  8x60: 2 pts
- Inflation time: 3 min
- Post dilatation: 1/5 pts (20%) 8 mm PTA
- Provisional stenting: 0/5
- Residual stenosis: 5 – 30 % (mean 15%)

Lithotripsy
pre-EVAR

Rt Common Iliac Artery

Lithotripsy – Iliac arteries
Initial Personal Experience

MLD pre: 3.1 – 5 mm (mean 4.3 mm)
MLD: post: 5.2 – 6.3 mm (mean 5.9 mm)
MLD gain: 1.2 – 2.1 mm (mean 1.7 mm)
Kissing Lithoplasty

Pre-Treatment  Lithoplasty  Post treatment

Kissing Lithotripsy
7 mm balloons
3 cycles

Conclusions

- Calcium limits optimal dilatation and increase the risk of rupture especially in the iliac arteries
- Challenging iliac access is associated with a higher risk of injury or rupture
- Despite advancements, large sheaths are still required during EVAR/TEVAR and TAVI procedures
- Lithotripsy is a new technique to prepare the CIA for the introduction of large sheaths but can also be used in preparation of a stent
- Allows for future treatments through same access point

fabrizio.fanelli@unifi.it