



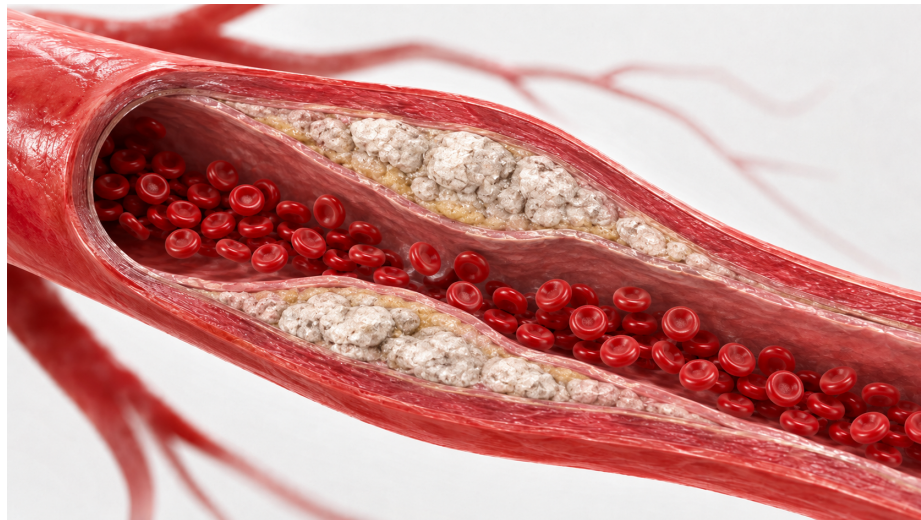
TIPS & TRICKS FOR INTRACORONARY LITHOTRIPSY

Mazzone Placido Maria



Introduction

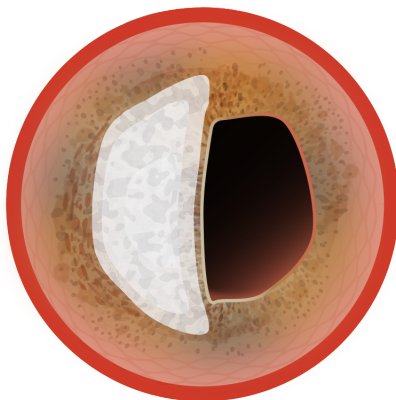
- The amount of coronary artery calcification increases with age and the presence of cardiovascular risk factors and comorbidities.
- Up to 20% of PCI procedures are challenged by severe calcifications.
- Coronary calcifications have been shown to be an independent predictor of PCI failure and future adverse cardiac events.



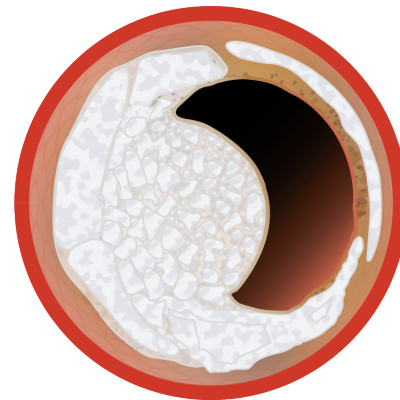
Phenotypes of calcific lesion



CONCENTRIC



ECCENTRIC



NODULAR



Techniques for calcified lesions

- High-pressure and super-high pressure non-compliant balloons
 - Cutting/scoring balloons
 - Atherectomy devices, both rotational and orbital
 - Excimer lasers
-
- ❖ Tissue compression and or tissue debulking
 - ❖ Higher rates of procedural complications, such as dissections, perforations and distal embolization.
 - ❖ Success rate reduced with deep, thick or eccentric calcifications
 - ❖ Induced tissue injury might accelerate uncontrolled neointimal growth and restenosis



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Lesion effect	Balloon-based therapies	Atherectomy	IVL
Not dependent on hydrostatic force	—	++	++
Selectively targets calcium	—	++	++
Able to modify deep calcium	+	—	++
Independent of wire bias	++	—	++
Independent of lumen size	++	—	++



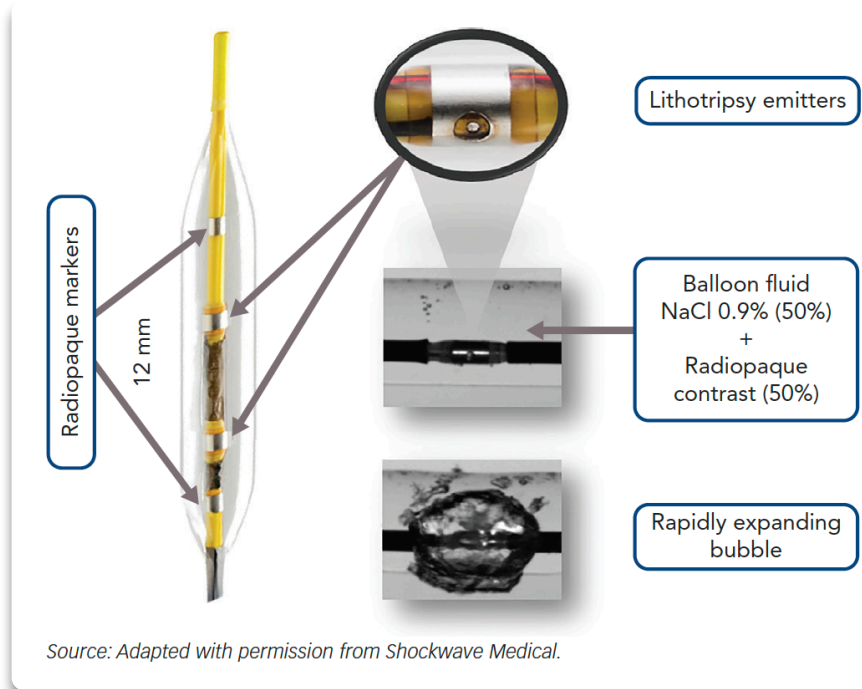
Intravascular lithotripsy (IVL)

- Intravascular lithotripsy (IVL) (*Litho-stone; tripsy-break*)
- Has emerged as a therapy for the treatment of vascular calcification.
- IVL is based on the established therapeutic strategy of using acoustic pressure waves to treat renal calculi.



Mechanism

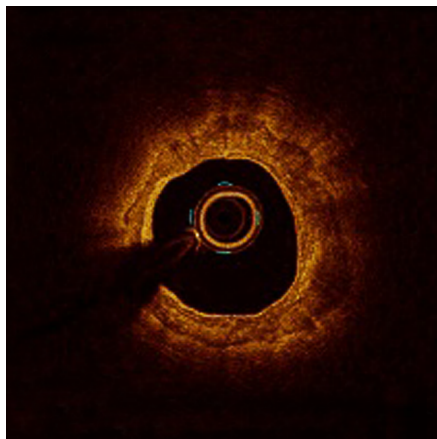
- IVL emitters produce electric sparks that create vapor bubbles in the surrounding fluid medium within the integrated balloon.
- IVL produces low levels of electric energy, which leads to the formation and rapid expansion of vapor bubbles, which result in acoustic pressure waves that radiate circumferentially and transmurally in an unfocused manner.
- The leading edge of the shockwave imparts compressive stress once calcium is encountered and is the primary mechanism of calcium fracture with IVL.
- Deliver tissue-safe positive (50atm) and minimal peak negative(-3atm) pressure pulses-less tissue injury.



IVL's Effectiveness in Concentric Calcium Well Established

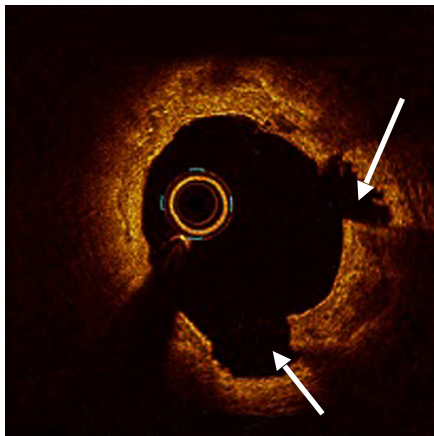
Large Multi-plane & Longitudinal Calcium Fractures

A) Severe calcific stenosis



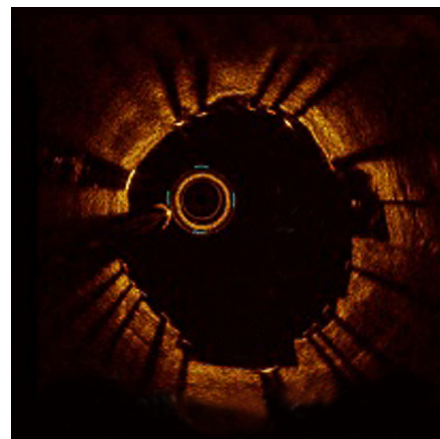
OCT demonstrating severe calcific stenosis

B) Post-IVL



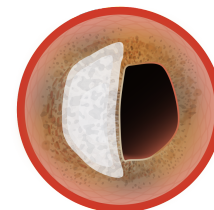
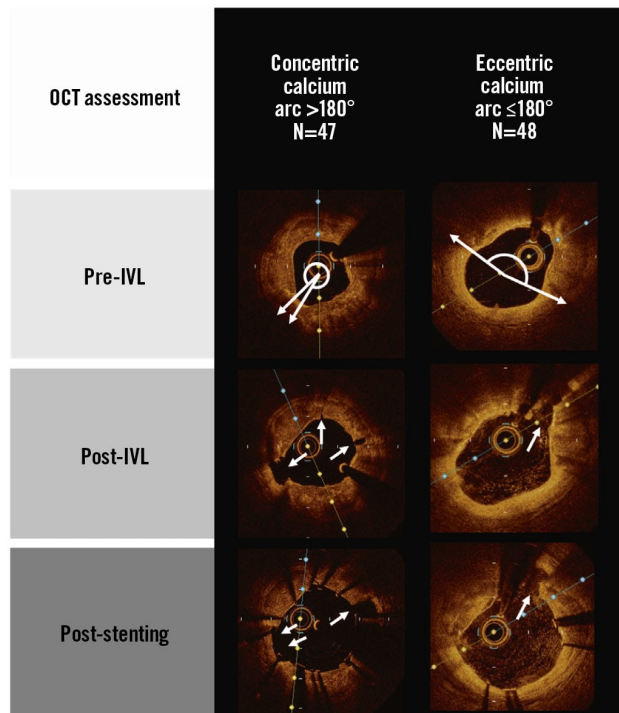
Following IVL, two fractures (white arrows) are seen with associated luminal gain

C) Following stent deployment

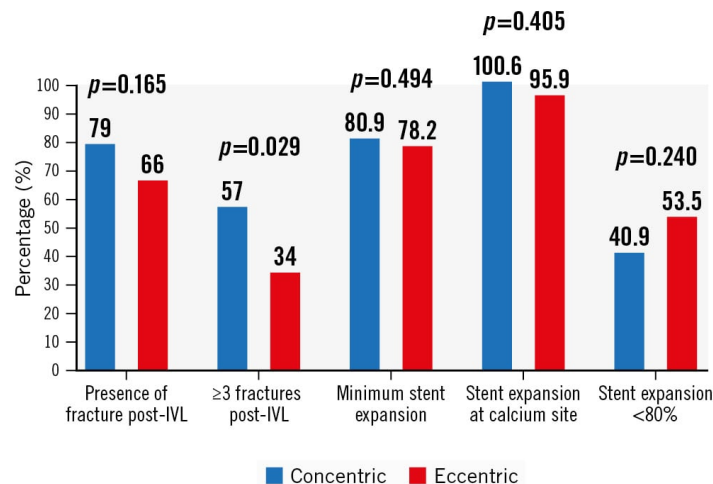


Fracture widening (markers) following stent deployment facilitates further luminal gains





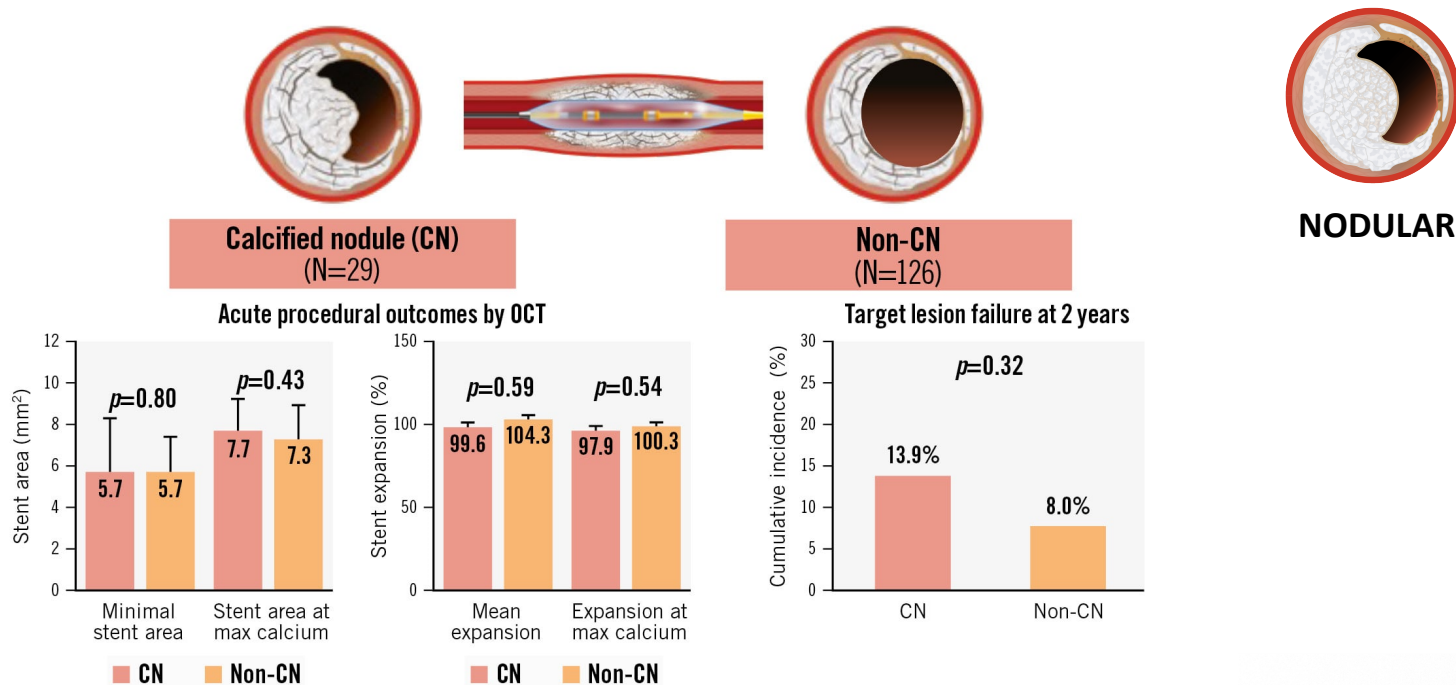
ECCENTRIC



McInerney A, et al. Impact of coronary calcium morphology on intravascular lithotripsy. EuroIntervention. 2024 May



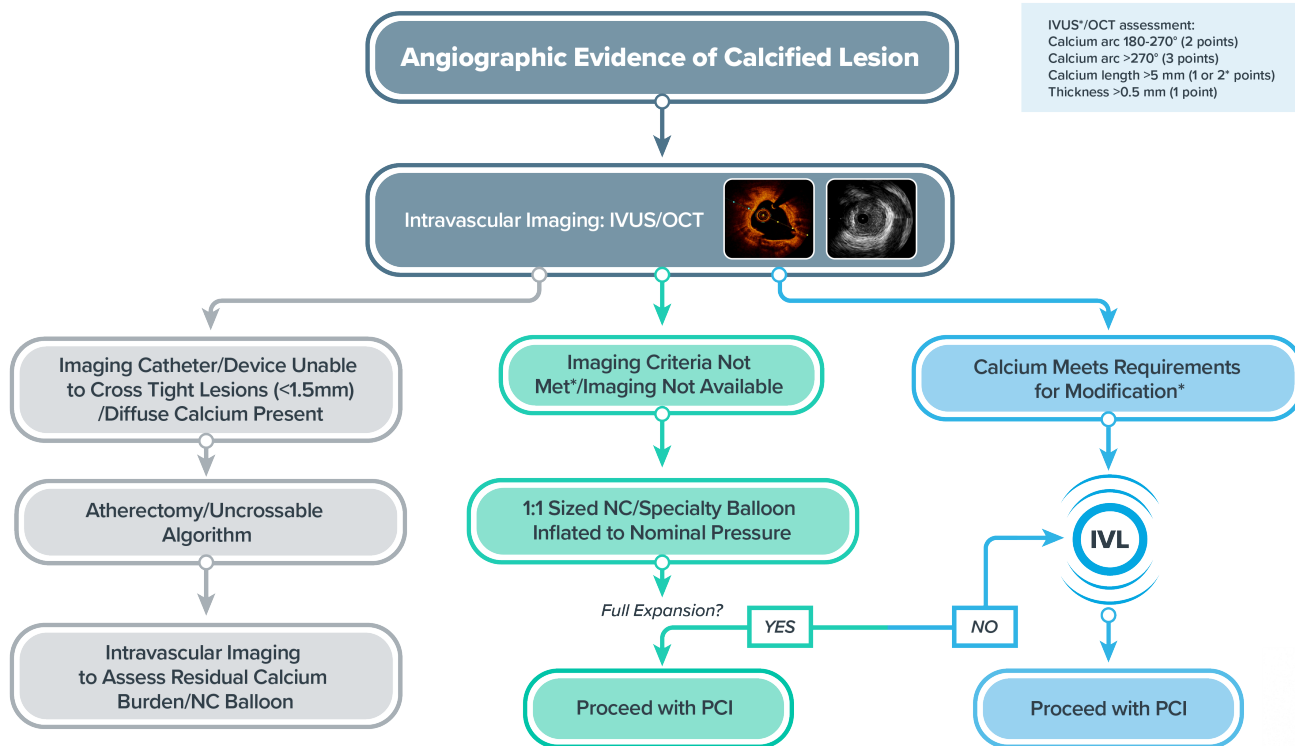
IVL Offers Mechanistic Benefits in Nodular & Eccentric Calcium



Ali ZA, et al. Outcomes of coronary intravascular lithotripsy for the treatment of calcified nodules: a pooled analysis of the Disrupt CAD studies. EuroIntervention. 2024 Dec.



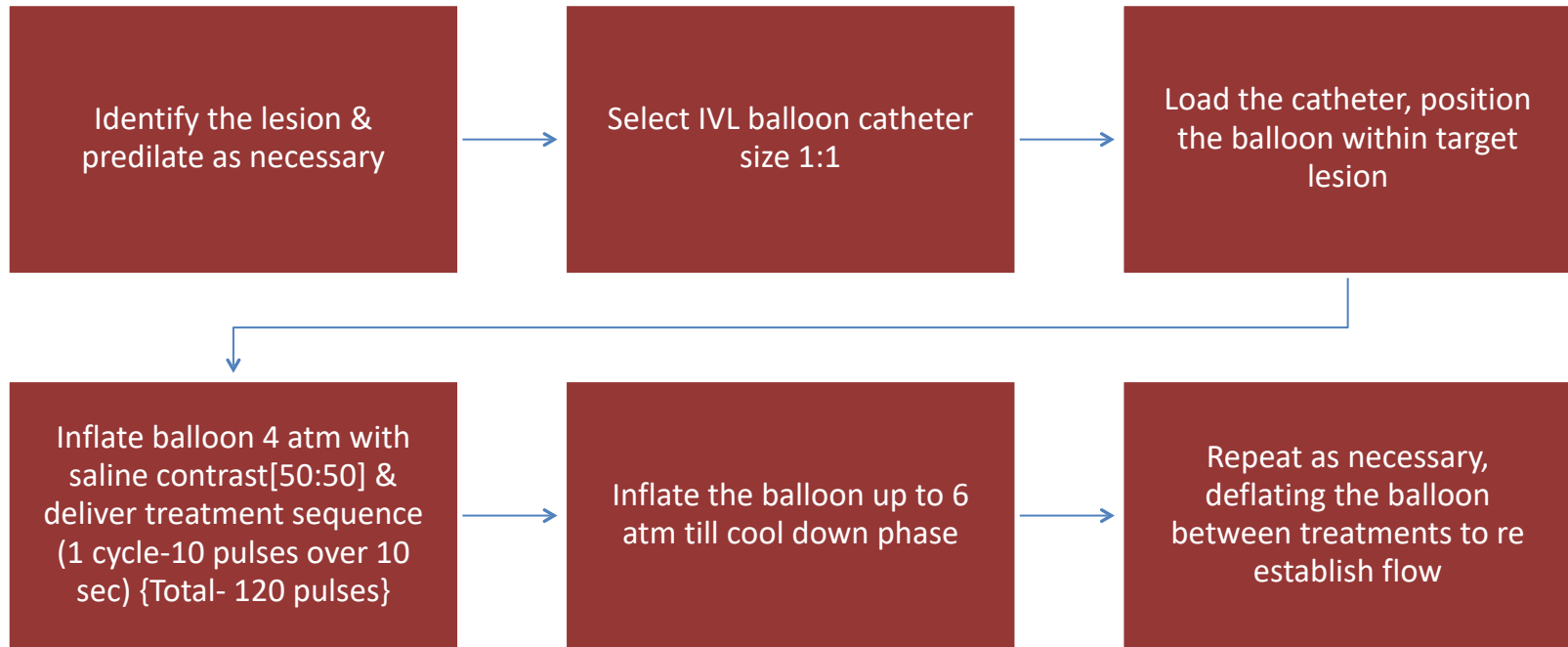
Using Algorithm(s) to Guide Your Use of IVL



Riley RF, Patel MP, Abbott JD, et al. SCAI Expert Consensus Statement on the Management of Calcified Coronary Lesions. J Soc Cardiovasc Angiogr Interv. 2024.



Step of use



Inflation pressure

- Lithotripsy delivery pressure – 2 to 4 ATM
- Do not exceed 8 ATM

Sizing

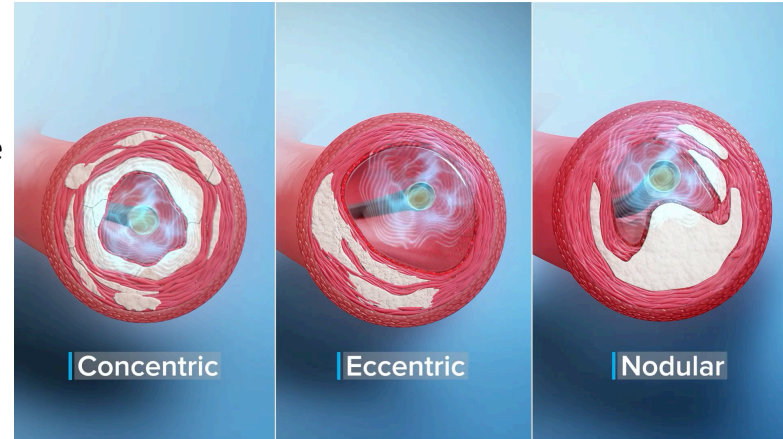
- Size balloon 1:1 to distal reference vessel diameter
- Utilize an NC post-IVL proximally if catheter is undersized due to diffuse lesion

Shockwave IVL Technique

- In case of diffuse disease, proceed distal to proximal
- Overlapping by 2 mm to 10 mm between pulse cycles may optimize energy profile and minimize geographical miss

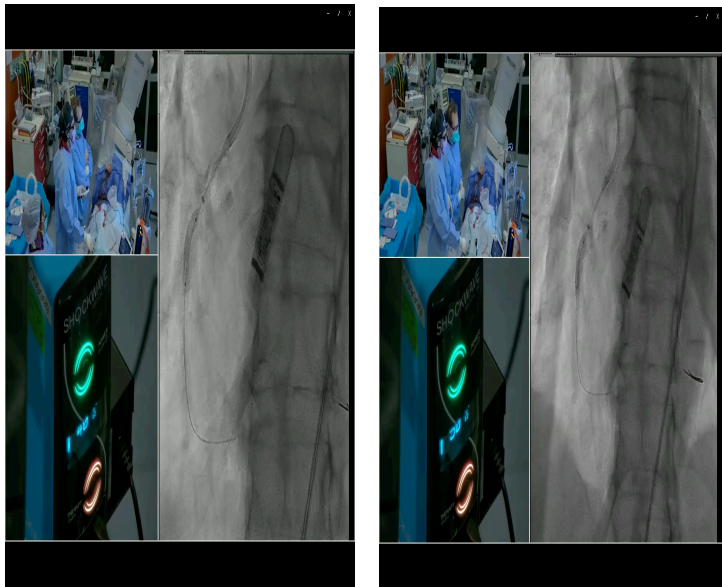
Eccentric & Nodular Calcium specifics

- Position catheter emitters near area of greatest calcium may optimize energy profile
- More pulses may be needed to improve vessel compliance compared to concentric calcium



Maximizing Sonic Output By Reducing Air in the Balloon

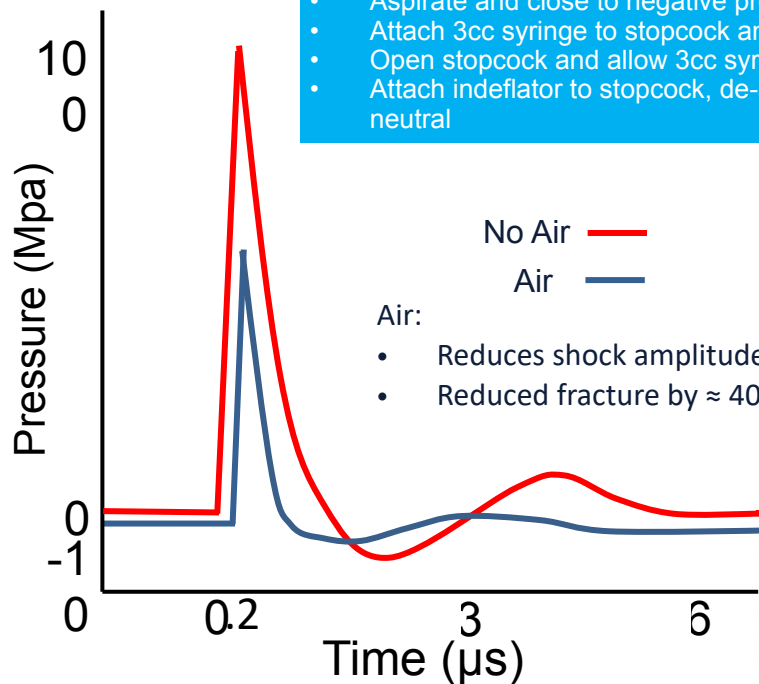
Proper Balloon Prep is Critical to Ensure Maximum Sonic Pressure Reaches the Calcium



No Air

Air

Pishchalnikov Y et al. J Urol. 2006; 176: 2706–2710



- Connect stopcock and 20cc syringe to balloon port
- Aspirate and close to negative pressure x2
- Attach 3cc syringe to stopcock and purge
- Open stopcock and allow 3cc syringe to fill balloon
- Attach deflator to stopcock, de-air, purge and leave on neutral

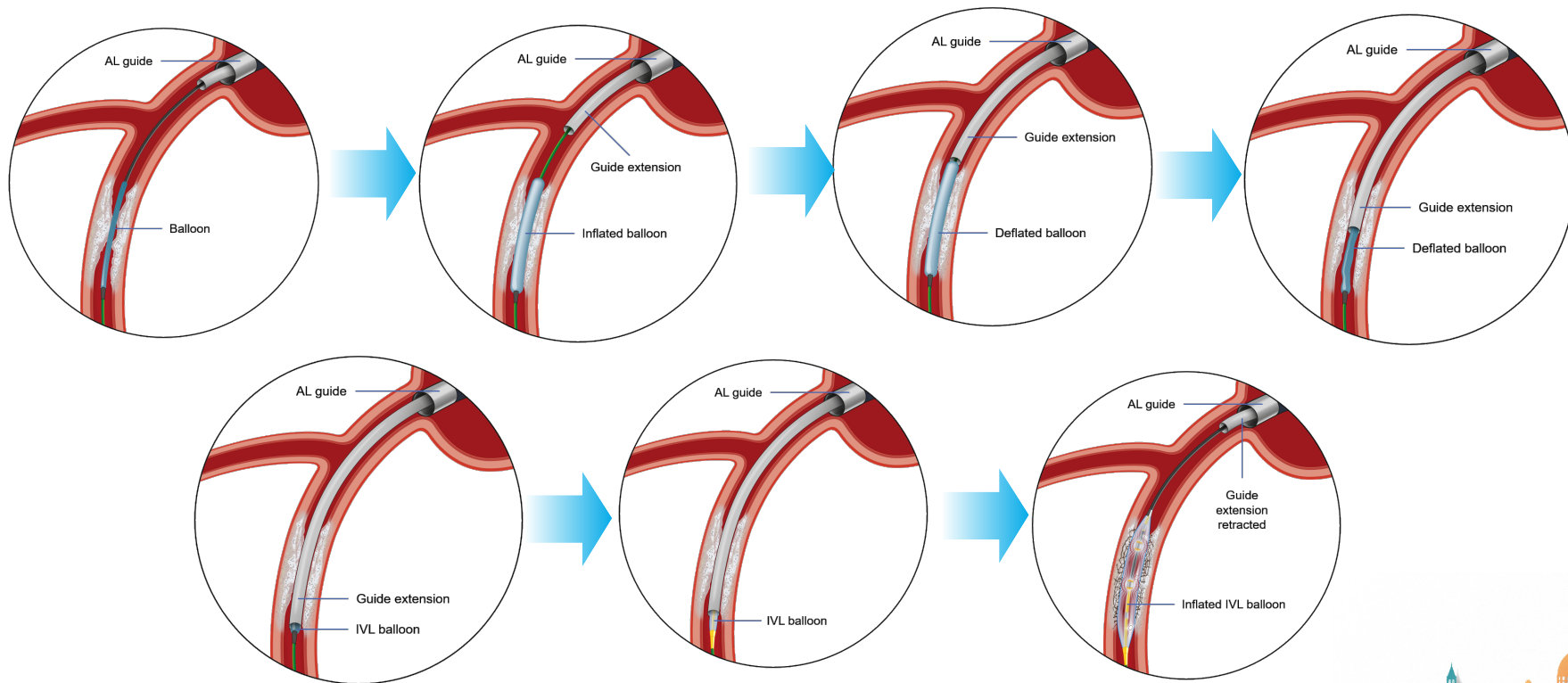
No Air —
Air —

Air:

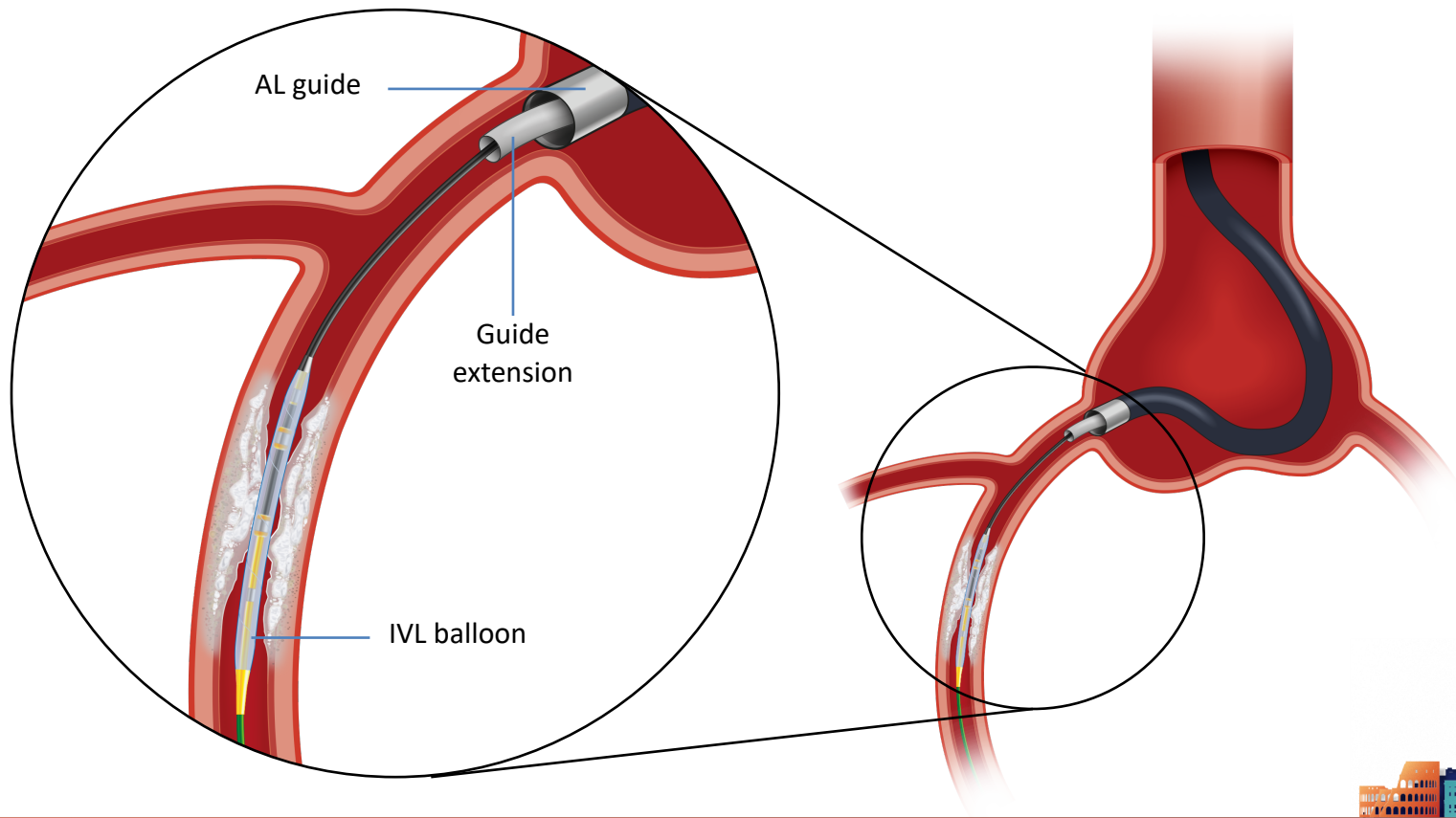
- Reduces shock amplitude by $\approx 20\%$
- Reduced fracture by $\approx 40\%$



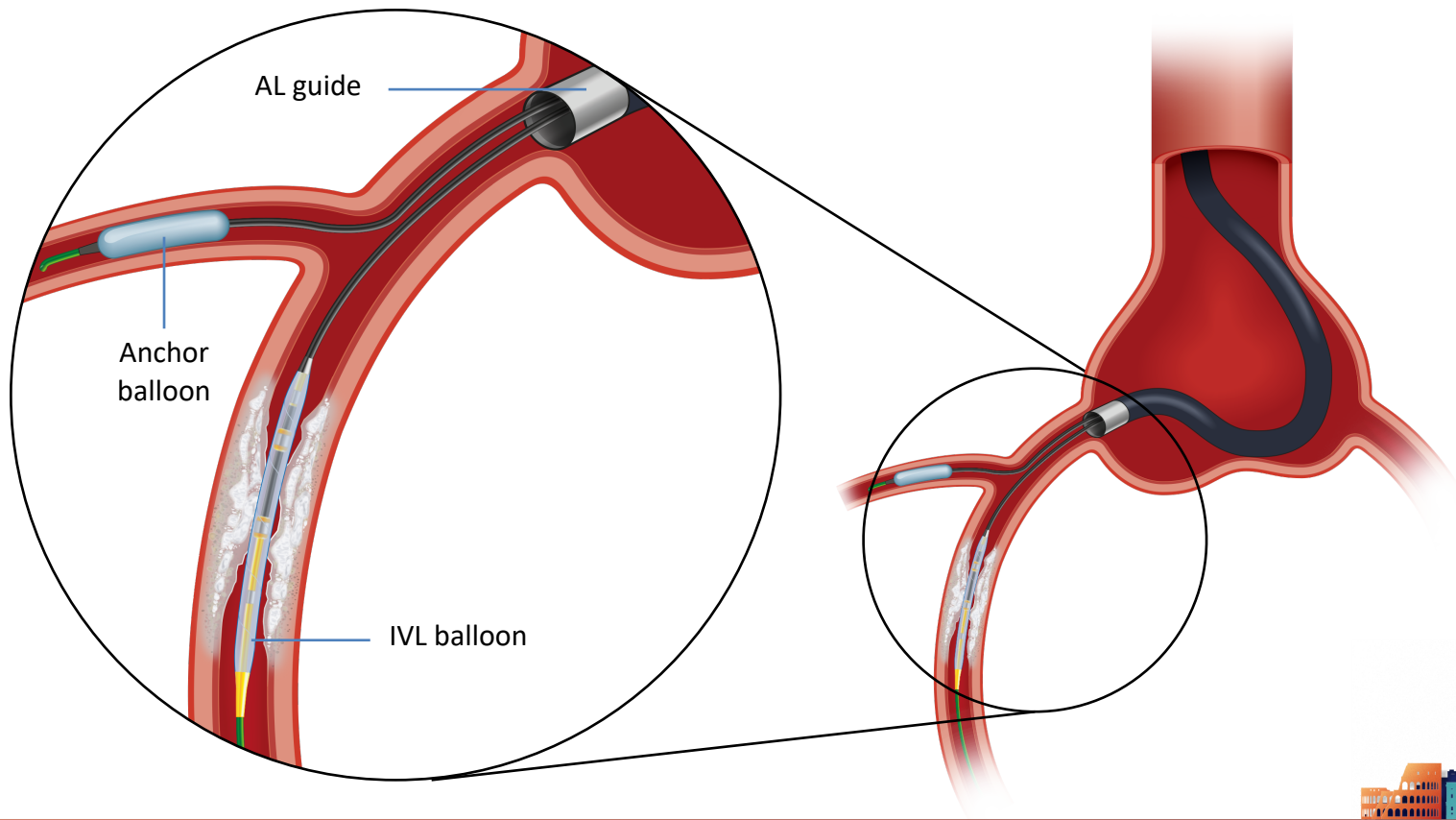
Unsheathing the IVL Catheter Via a Guide Extension



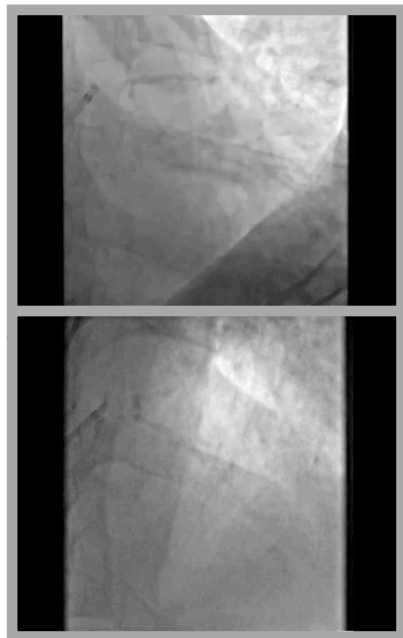
Providing Additional Support Via a Guide Extension



Providing Additional Support Via a Anchor Balloon



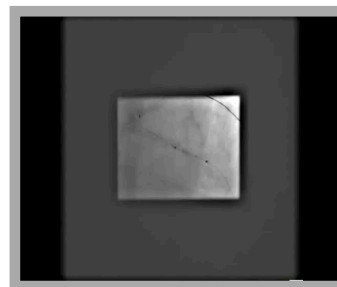
Eccentric & Nodular Calcium



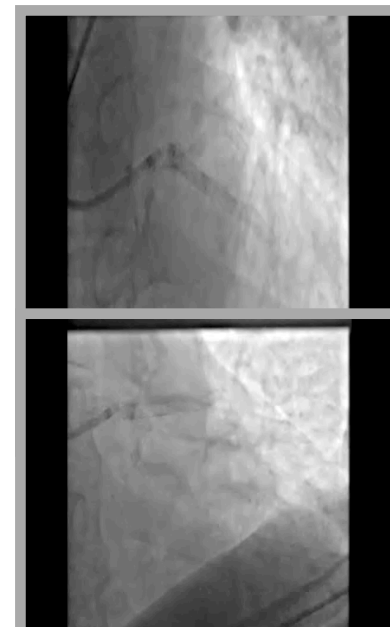
Baseline



Concentric, Eccentric and Nodular Calcium Present along treatment lesion

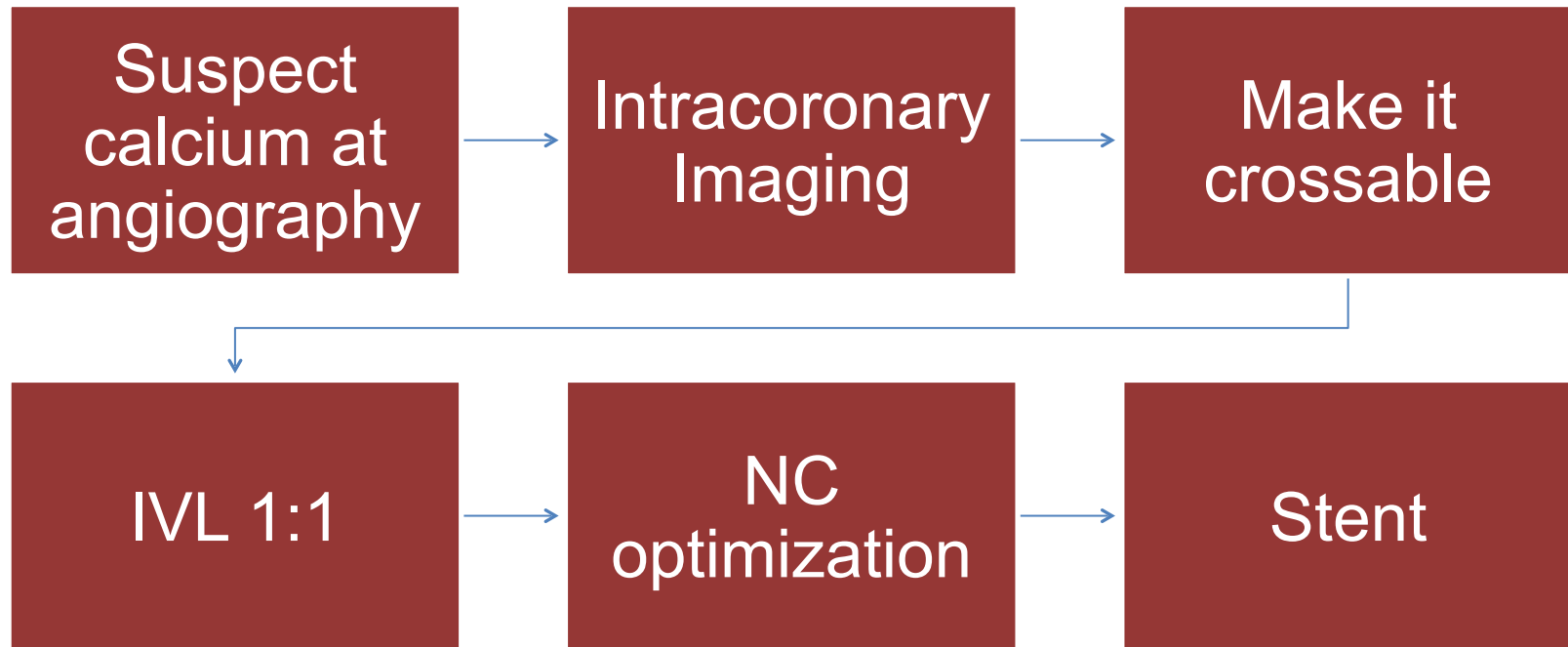


120 Pulses Delivered with Shockwave C²⁺ Catheter to Calcified areas



*Final Result after placement of:
3.0x32, 2.5x28 and 3.0x20 stents*







Thank you for your attention

