Supplementary Material (Source: all original)

Calcium Modification Techniques. "Atherectomy techniques: Rotablation, Orbital and Laser".

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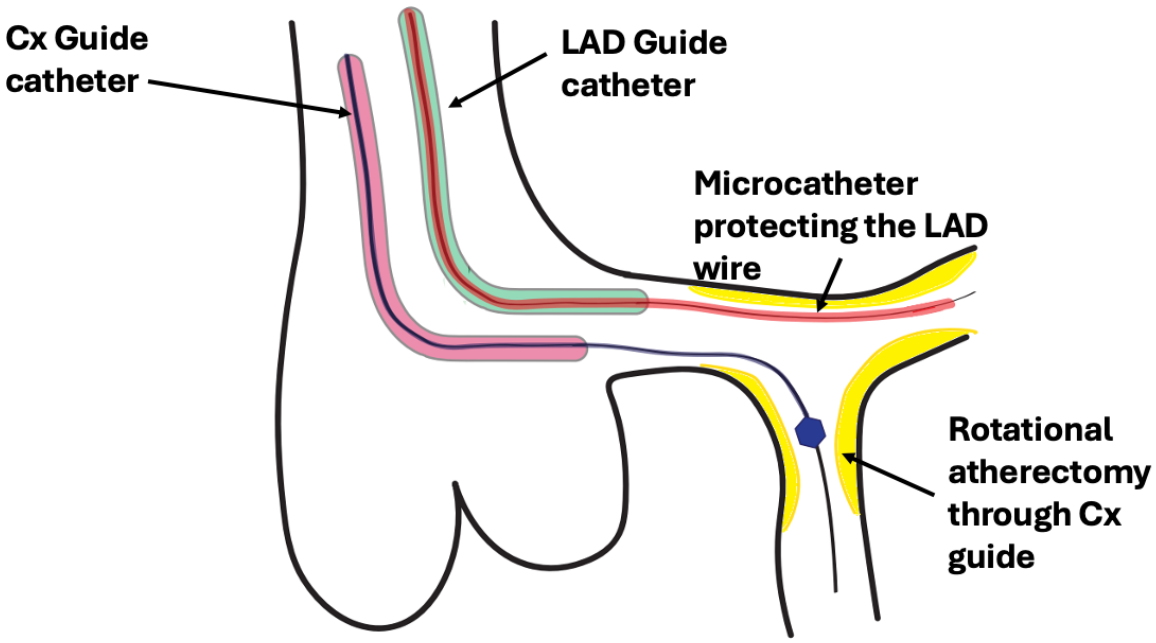
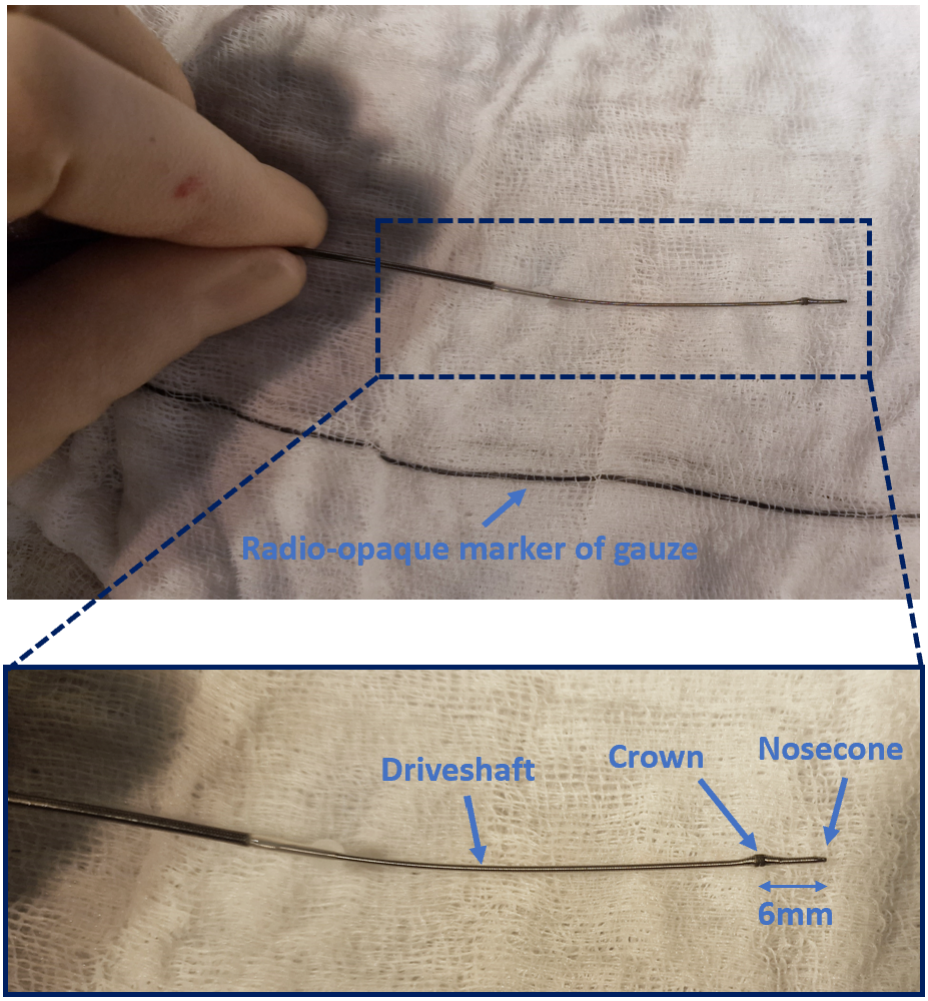
Keywords: Calcium modification, coronary intervention, rotablation, orbital, laser

Supplementary Figure 1: Ping Pong technique: Showing dual access with two guide catheters. One has a guidewire placed in the main vessel and the other one has a guidewire placed in the side branch. Rotational atherectomy through one guide catheter whilst protecting the side branch wire with a microcatheter. The microcatheter structure gives protection as it is made of braided stainless steel and has a hydrophilic coating. Process is then repeated with atherectomy undertaken in 2nd vessel.

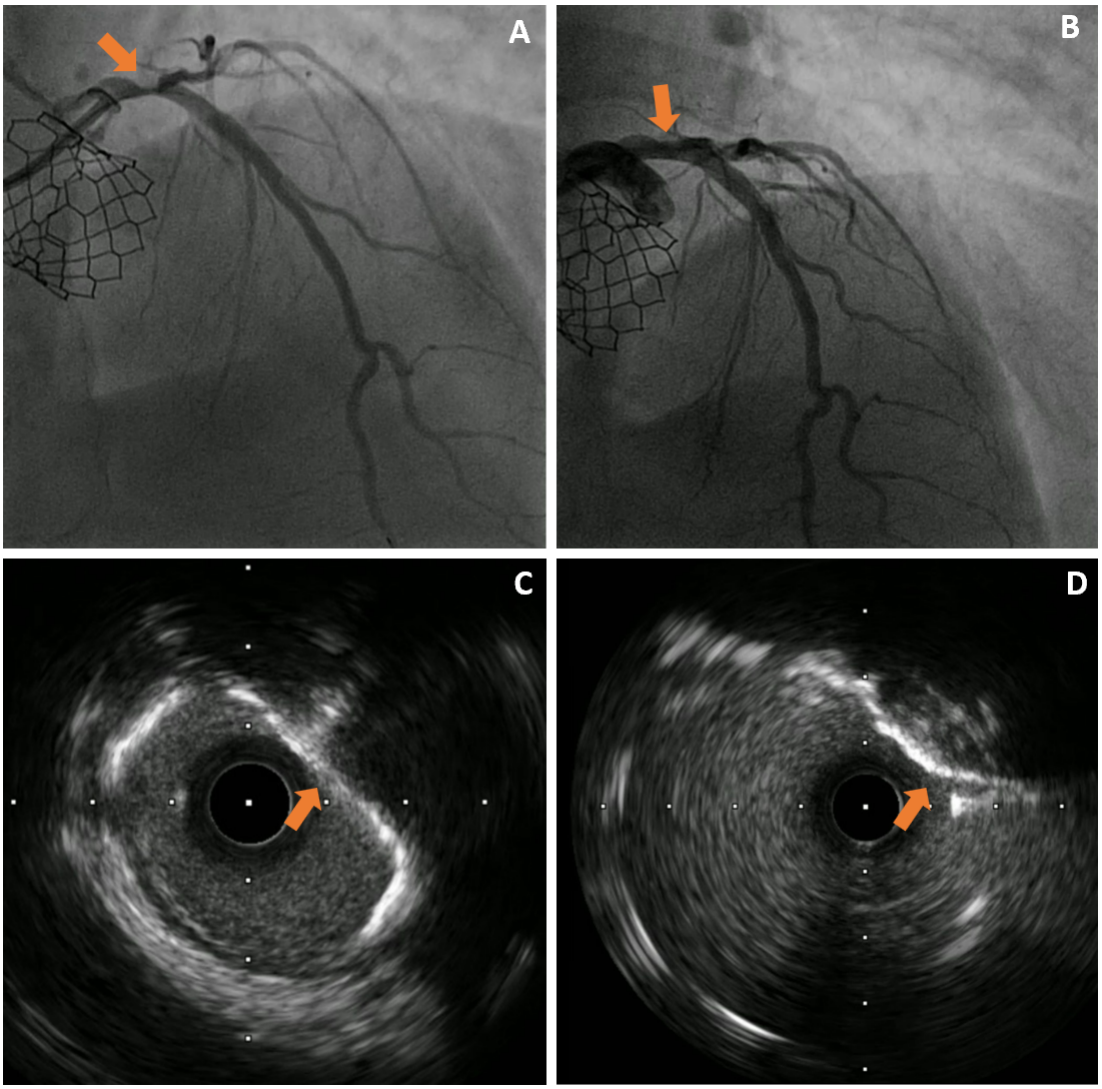


Supplementary Figure 2: Demonstrating the driveshaft, crown and nosecone of the orbital atherectomy system.



Supplementary Figure 3: Recommended method of controlling the knob of the orbital atherectomy device.

Supplementary Figure 4: A severe calcific lesion in the distal left main coronary artery on angiography (A) and IVUS (C), managed by orbital atherectomy and stent implantation seen after treatment on angiography (B) and repeat IVUS (D).



Supplementary Table 1: Contraindications to RA. * These contraindications are relative and in contemporary clinical practice there may be no feasible option but to use RA. ** In chronic total occlusion (CTO) cases opaque portion of the RotaWire has been advanced into the subintimal space or the proximal cap to allow for careful targeted ablation of a stubborn proximal cap.This method does have an increased risk of perforation and should only be attempted after careful consideration. *** Dissection is not an absolute contraindication and as long as the wire is in the true lumen, RA can be carefully used for plaque modification.

Relative contraindications to Rotational Atherectomy * (1,2)
Occluded artery through which a guidewire will not pass.**
Last remaining vessel with compromised left ventricular function.
Saphenous vein graft.
Angiographic evidence of thrombus.
Angiographic evidence of dissection at the treatment site. ***
Lack of available cardiac surgery and patient ineligible for coronary artery bypass graft (CABG)

Supplementary Table 2: Using the acronym ‘DRAW’ to test ROTAPRO prior to use in patient.

Testing ROTAPRO prior to use in patient (3)	
Drip	Ensure saline is dripping from bottom of advancer and catheter
Rotation	Burr is rotating and RPMs are stable
Advancer	Free movements of advancer knob. Lock advancer knob around 2-3cm from the end of the advancer before starting the procedure
Wire	Wire is visible and brake is functioning

Supplementary Table 3: Complications and management of Rotablation (4–6)

Complications	Avoidance	Management
Slow flow	Use of smaller burrs and at low speed for shorter runs. Use of flush cocktail	Intracoronary vasodilators such as nitrates, verapamil or adenosine. Optimise BP if low with IV fluids, inotropes or mechanical support.
Dissection	Avoid further rotablation once dissection identified. Carefully select cases and avoid overly tortuous coronary arteries.	Haemodynamic stabilisation • Fluids • Inotropes • Mechanical circulatory support system Patient may be managed conservatively, with stents or even require emergency coronary artery bypass grafting.
Perforation	Avoid wiring side branches, oversizing of burr, pushing of burr instead of 'pecking'. Avoid extreme angulated or small sized vessels.	Standard techniques are used to manage perforation such as covered stents and pericardiocentesis. May require utilisation of "ping pong" guide as the laceration can be quite significant. (Supplementary Figure 1)
Burr entrapment **(Kokeshi Phenomenon)**	1. Select burr size < 0.6 of vessel diameter 2. Adequate lubrication 3. Optimal rotational speed 4. Progressive advancement 5. Careful lesion assessment and patient selection 6. Experienced operator	A serious complication that may require cardiothoracic surgical intervention. Strategies to help free the burr: • Controlled push and pull on the burr drive shaft. • Positioning of a second wire, balloon inflation next to burr might free the device • Cautious deep intubation of the guiding catheter- mother-in-child catheter for more support. (4)

Transient AV block	Transient AV block might occur during rotablation of the right coronary artery or dominant left circumflex artery. Positioning a temporary PPM before rotablation might avoid this complication.	Temporary pacemaker. Use of aminophylline infusion. Recently described technique to allow pacing through the Rotawire. (7)
Transection of RotaWire	Avoid rotablation near radiolucent part of wire. Avoid excessive rotational speeds. Avoid kinking wire or advancing despite resistance	Retrieval similar to that of conventional guidewire.
Aortic regurgitation from aortic cusp laceration(8)	Use of extra support Rotawire in ostial lesions. Use of a supportive guide to minimise the chance of disengagement of the guide and retropulsion of the rota burr.	May require aortic valve surgery for significant aortic regurgitation.

Supplementary Table 4: Contraindications to OA (9)

Relative contraindications to orbital atherectomy
Unable to advance ViperWire
Target lesion within a bypass graft or stented segment
Angiographic evidence of thrombus or dissection at lesion site
Single remaining patent vessel
Evidence of dissection at lesion site
Stent ablation

Supplementary Table 5: Indications for ELCA

Indications	Explanation
Stent under expansion	ELCA is able to modify the underlying atheroma without affecting the stent architecture, resulting in improved stent expansion. (10)
In stent restenosis	Plaque modification and a reduction in plaque burden under the stent resulting in increased luminal gain. (11)
Calcified and long lesions (12)	ELCA disrupts calcific plaques, resulting in improved balloon and stent expansion. It's use is usually not the first option in calcific native vessels, other atherectomy devices such as RA, OA or intravascular lithotripsy are preferred instead.
Balloon uncrossable lesions and Chronic Total Occlusion (CTO)	ELCA is useful when a wire is across the lesion but there is difficulty in passing balloon or a microcatheter. It softens hard plaque allowing passage of devices.(13)
Previous failed angioplasty	Modification and softening of plaque in balloon uncrossable lesions

Supplementary Table 6. Contraindications for ELCA.

Relative contraindications for ELCA (14)
1. **Unprotected Left main stem**
2. **Lesion beyond acute bend or acute angulation of >45°**
3. **Guidewire unable to pass through the lesion**
4. **Lesion within a bifurcation**
5. **Patient not acceptable candidate for bypass grafting**

Supplementary Table 7. Recommended catheter sizing for ELCA (15)

Catheter size (mm)	Proximal vessel diameter (mm)	Guide
0.9	≥1.5	6F
1.4	≥2.1	6F
1.7	≥2.6	7F
2.0	≥3.0	7F

Supplementary Table 8: Indications for atherectomy techniques.

	RA (15)	**OA** (16)	**Laser** (14)
Tortuosity	+++ Tortuosity easier to navigate by the burr	++ OA better suited for straighter calcific segments	++
Ostial lesions	+++ Ideal for aorto-ostial lesions	+ If the crown can be advanced through the lesion, the lesion can be ablated backwards	+++
Presence of a stent	+	-	+++
Ca^{+2} nodule	++	+++	-
Balloon uncrossable	+++	+++	+++
Microcatheter uncrossable *	-	-	+++

+ consider ++ recommended +++ highly recommended

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