Successful intravascular lithotripsy for severely calcified left anterior descending coronary artery stenosis

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A 55-year-old male reported chest pain and was found to have ECG changes anterolaterally. No previous cardiac history was reported. His troponin was significantly elevated. Coronary angiogram showed heavily calcified severe (95%) proximal LAD stenosis with associated coronary aneurysm (Figure 1A). Multiple attempts to predilate the lesion with semi-compliant and non-compliant balloons at high pressures were unsuccessful. The OCT confirmed extensive circular calcification in proximal LAD (Figure 1A). The distal RVD (reference vessel diameter) was 3.5mm and minimum lumen diameter approximately 2mm, making the vessel not suitable for rotational atherectomy, so coronary lithotripsy angioplasty was performed. We used 3.0/12mm Shockwave balloon (Shockwave Medical, Fremont, California) inflated to 4 atm and performed five cycles of lithotripsy (10 pulses each). OCT confirmed cracks of calcification and significant increase in lumen diameter (Figure 1B). Subsequently a 3.5/28mm drug-eluting stent was implanted and post-dilated at high pressure. Final angiography showed an excellent result, also confirmed in optical coherence tomography (OCT).

Discussion

Percutaneous coronary intervention (PCI) of heavily calcified, resistant stenoses remains a challenge to interventional cardiologists despite developments in procedural techniques and technology. Inadequate lesion preparation may lead to stent under-deployment, which consequently predisposes to in-stent restenosis and stent thrombosis. Over the years, high-pressure balloons, cutting balloons and atherectomy devices have been used to tackle such lesions. Treatment of heavily calcified lesions is associated with higher procedural risk and overall increased risk of adverse cardiovascular events at two-year follow-up related mainly to higher TVR (target vessel revascularisation) rate.
Lithoplasty is a novel approach of lesion modification using intravascular lithotripsy (IVL, shockwave) in a balloon developed to treat calcified coronary lesions. The technology utilises high-speed sonic pressure waves which selectively disrupts superficial and deep calcium within the vessel and has minimum impact on healthy tissue.\(^3\) The data from the Disrupt CAD study is very promising showing that the lithoplasty balloon-based therapy resulted in 98% device success and facilitated 100% stent delivery.\(^3\) It also demonstrated a low major adverse cardiac event rate with minimal vascular complication.\(^3\) The efficacy of IVL has been also confirmed in OCT showing a significant increase in acute area gain and favourable stent expansion.\(^4\) Together with other advantages such as the ease of use and less procedural complications, intravascular lithotripsy has become an attractive alternative for treatment of heavily calcified complex lesions, especially in the presence of increased calcified burden in the ageing population. The intravascular lithotripsy is now also available in Christchurch Hospital, which will allow for this treatment method to be used routinely in patients with severe calcified coronary artery disease from our region.

Figure 1: Angiographic view and OCT (cross section, longitudinal view and 3D view of the vessel) showing a heavily calcified proximal LAD stenosis before treatment (A), the result after lithoplasty with calcium cracks (B) and after stent implantation (C).
Competing interests:
Nil.

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