Clinical Case Report

POT NC Balloon in Complex Left Main PCI

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Introduction

A 72-year-old man with a background of hypertension and arthritis went on Holiday to France. Whilst there, he developed acute dyspnoea and tested positive for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). A murmur was detected and the patient underwent transthoracic echocardiography which showed moderate functional mitral regurgitation due to severely impaired left ventricular (LV) systolic function (left ventricular ejection fraction 25%). A cardiovascular magnetic resonance (CMR) scan found subendocardial infarction in the inferolateral territory. A coronary angiogram found severe three vessel coronary artery disease with a chronic total occlusion (CTO) of the right coronary artery (RCA) and left circumflex artery (LCx). There was severely calcified disease in the left main stem (LMS) and left anterior descending artery (LAD) with a critical lesion in the proximal LAD which was the last remaining vessel (**Figure 1**).

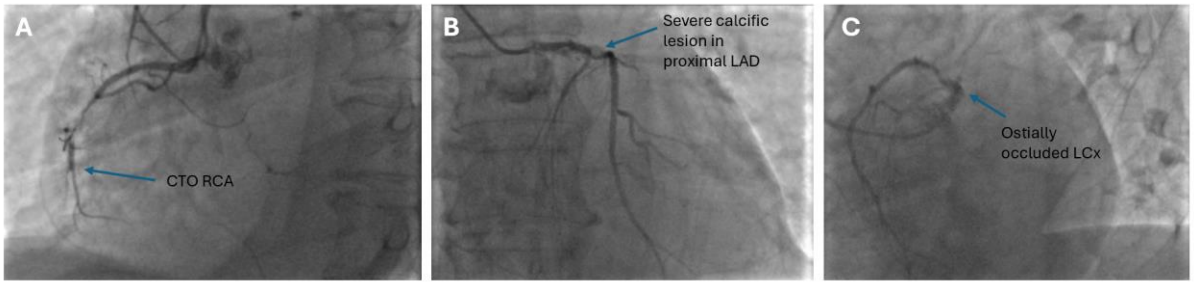

Figure 1: Coronary angiography revealing a CTO of the RCA in the left anterior oblique (LAO) view (A), severe calcific disease in the proximal LAD (B) in the cranial view and ostially occluded LCx (C) in the LAO caudal view

He was repatriated to the United Kingdom where he was initially accepted for inpatient coronary artery bypass grafting (CABG). However, during his inpatient stay, he was noted to have persistent hypotension and tachycardia. An ECG one morning performed due to worsening tachycardia found profound ST depression despite no chest pain.

Figure 2: Left panel: Baseline ECG; Right panel: ECG during episode of hypotension and tachycardia

On this basis, his case was discussed with the on call cardiac surgeon where it was felt that the patient was at prohibitive risk for cardiac surgery. The patient's care was taken over by the interventional Cardiology team. An intra-aortic balloon pump (IABP) (7.5Fr 40cc Mega, Getinge, Gothenburg, Sweden) was inserted via the right femoral artery using ultrasound (US) guidance as a temporizing measure while multivessel percutaneous coronary intervention (PCI) could be planned.

Procedure overview

CTO-RCA

The patient remained stable on the IABP which was removed a few days prior to PCI. He underwent PCI to the CTO-RCA, LMS and LAD. The CTO-RCA was addressed using an antegrade approach with a 7Fr Judkins Right (JR) guide catheter via the right femoral artery. A 6Fr Voda Left (VL)-4 guide catheter was used to engage the left coronary system for contralateral injections. Antegrade wires were escalated from a workhorse RunThrough Floppy (Terumo, Japan) to a Gladius wire (ASAHI Intecc, Tokyo, Japan) which eventually crossed the lesion and was positioned in the distal vessel (**Figure 3A**). After de-escalating the wire over a microcatheter, the vessel was prepared by sequential balloon dilatation using 2.0mm, 2.5mm and 3.0mm semi-compliant balloons. Intracoronary imaging was performed using intravascular ultrasound (IVUS) (Boston Scientific, Massachusetts, USA) which showed concentric calcification (**Figure 3B**). Intravascular lithotripsy with a 3mm Shockwave balloon (Shockwave, California, USA) was performed to modify and disrupt this calcium (**Figure 3C**).

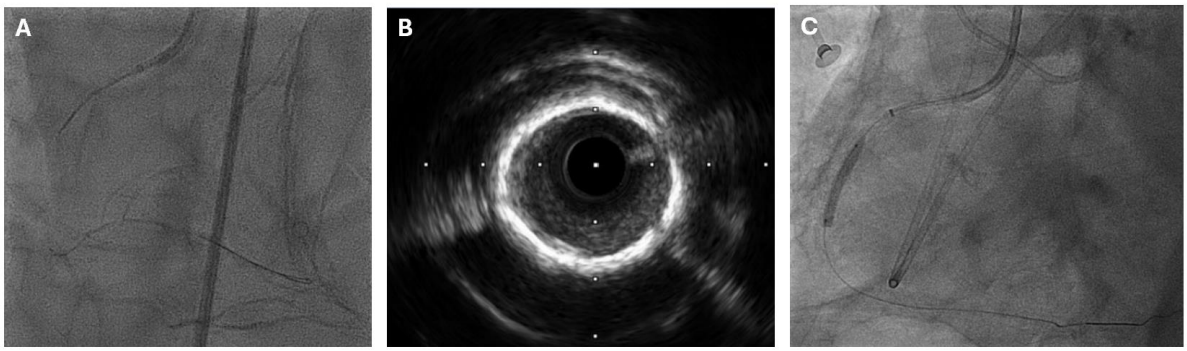

Figure 3: Vessel wired with the Gladius wire (A); IVUS demonstrating concentric calcification (B); Calcium modification with intravascular lithotripsy

The vessel was finally prepared for stenting by inflating a 2.5mm and 3.0mm non-compliant (NC) balloon to high pressure. A 3.0 x 33mm Biomatrix drug eluting stent (DES) was implanted and overlapped with a further 3.0 x 33mm Biomatrix DES proximally, landing at the ostium of the RCA (**Figure 4A + 4B**). The stented segments were post-dilated to high pressure with 3.0 and 3.5mm NC balloons, producing an excellent angiographic result in the stented segments (**Figure 4C + 4D**). IVUS confirmed excellent stent apposition and expansion and a minimal stent area (MSA) of 7.8mm^2. The distal vessel was of small calibre and diffusely diseased therefore untreated.

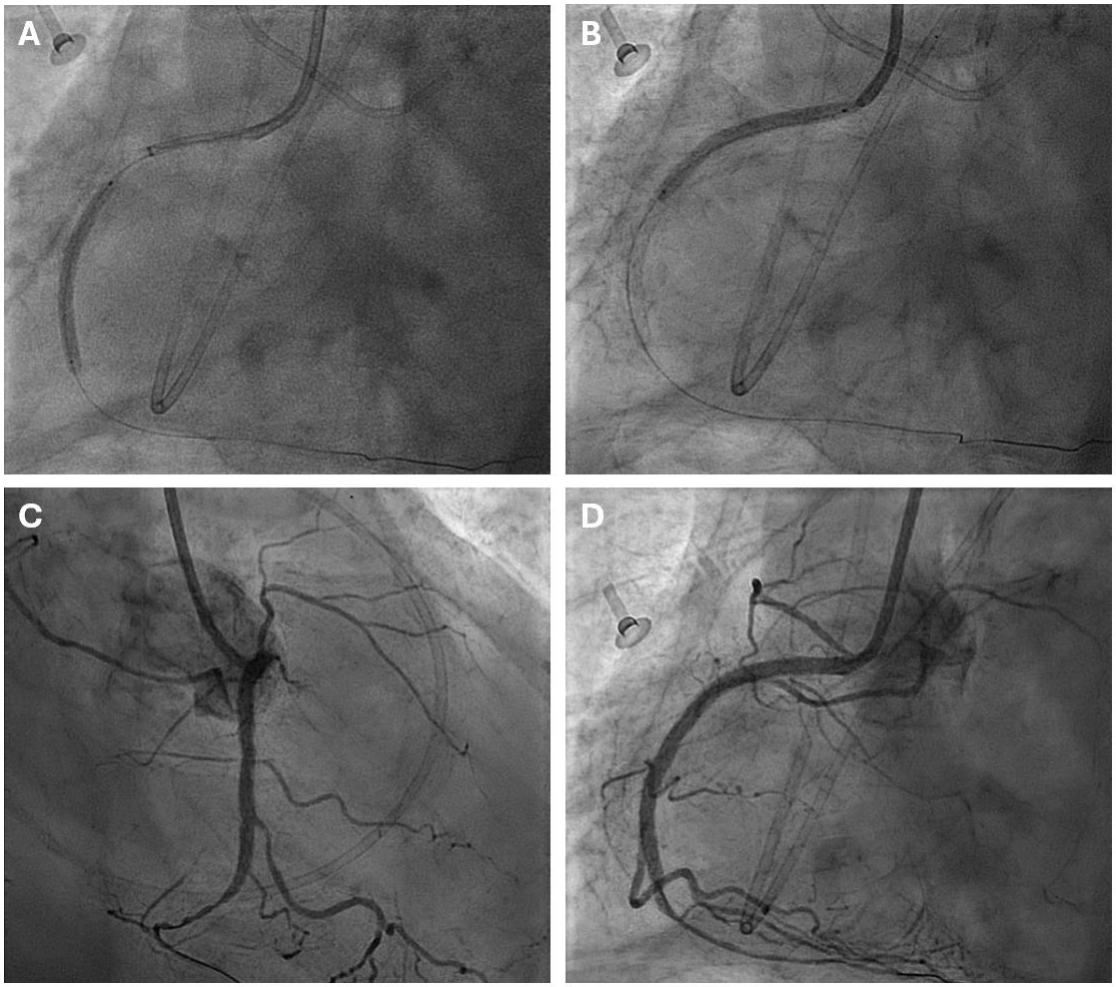

Figure 4: Stenting of the vessel from mid-RCA to ostial RCA (A+B); Final angiographic images of the RCA post-stenting (C+D)

LMS / LAD treatment

The CTO-RCA was addressed in order to improve flow to the myocardium to facilitate treatment of the LMS and LAD. The LAD was wired with a RunThrough Floppy wire and basleline IVUS performed. Using a Caravel microcatheter (ASAHI Intecc), the workhorse wire was exchanged for a Rota wire. Rotational atherectomy was performed with a 1.5mm burr (**Figure 5**), successfully debulking the heavily calcified lesions within the LAD and LMS.

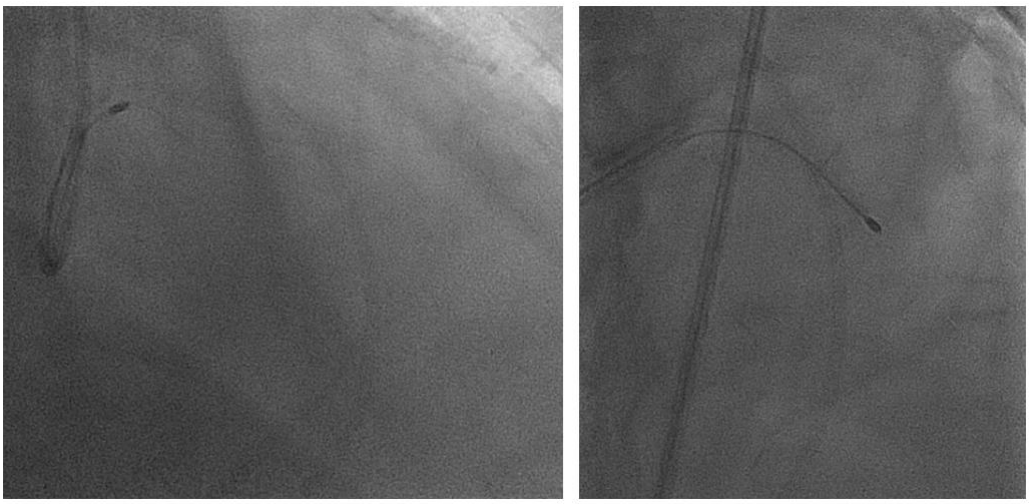

Figure 5: Rotablation performed in the LMS (Left panel) and LAD (Right panel)

Further lesion preparation was performed using a 3.0mm NC balloon to high pressure. The LAD was then stented with a 3.0 x 33mm Biomatrix DES, overlapped proximally with a 3.5 x 36mm Biomatrix DES landing at the ostium of the LMS (**Figure 6**).

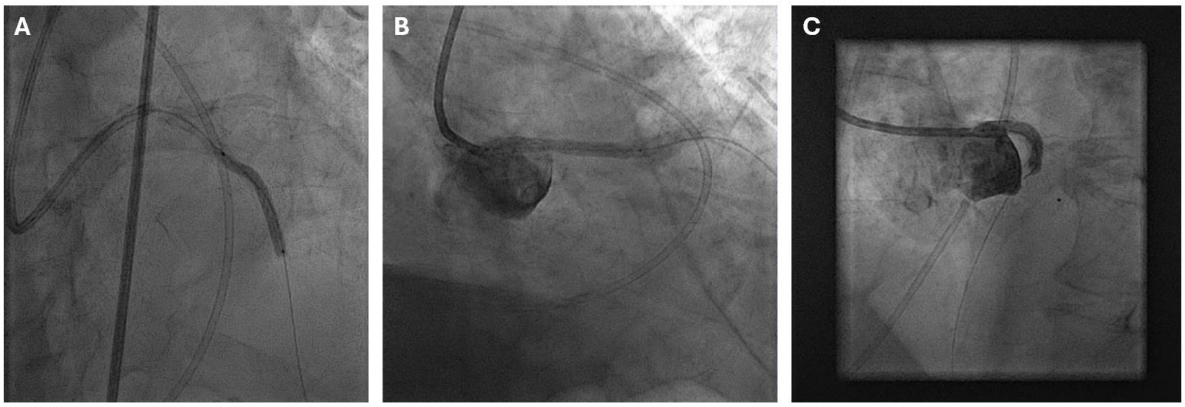

Figure 6: Stent deployment in the LAD (A) and in the LMS (B+C) in a caudal (B) and cranial (C) view

The stents were then post-dilated with a 3.5mm NC balloon and a 4.5 x 6mm POT balloon in the LMS (**Figure 7**). Final IVUS demonstrated excellent stent apposition and expansion and angiographic results were pleasing (**Figure 8**)

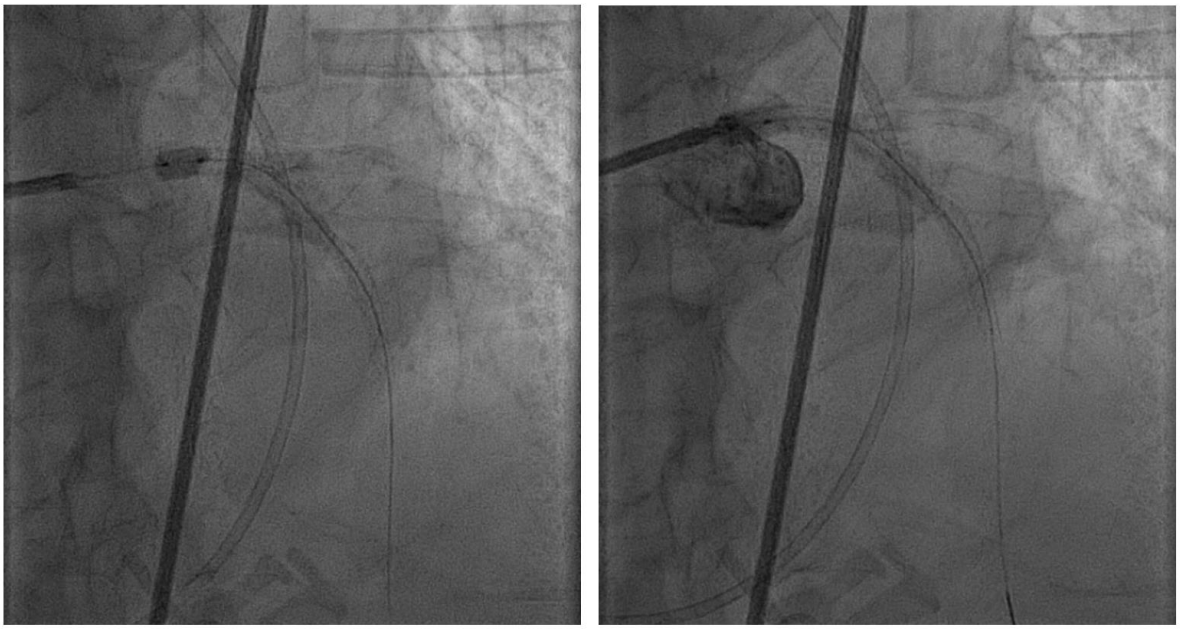

Figure 7: 4.5 x 6mm POT balloon used to post-dilate the LMS stent (Left panel) including at the ostium of the LMS (Right panel)

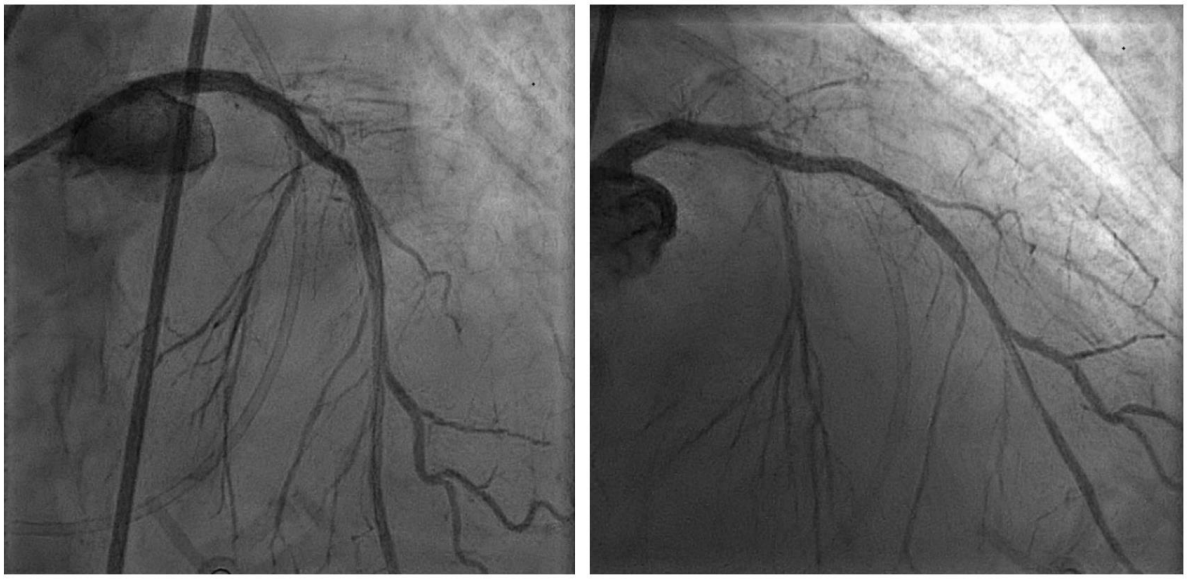

Figure 8: Final angiographic images of the left coronary system in the PA cranial (Left panel) and RAO cranial (Right panel) views.

Conclusion

This case demonstrated the successful use of the POT NC balloon to post-dilate the LMS stent. Given the size difference between the LMS and the proximal LAD, a short POT balloon of only 6mm length and extra short balloon shoulders was ideal in ensuring post-dilation only within the LMS portion without encroaching on the LAD, thus minimizing the risk of injury to the LAD.