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CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

CLINICAL CASE

Crush Technique as Ultimate Bailout Treatment for Rotablator Burr Entrapment

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ABSTRACT

This case demonstrates the feasibility of a crush technique as an ultimate bailout treatment for Rotablator (Boston Scientific) burr entrapment during a complex percutaneous coronary intervention of the left main artery. This paper reports the case of a 77-year-old patient successfully treated by crushing the burr by a stent in the left main artery after complete burr entrapment. The patient had a calcified distal stenosis of the left main coronary with stenosis of the distal anastomosis of the saphenous vein graft to the obtuse marginal artery. The patient had several controls with optical coherence tomography imaging at 3 months. Immediate and 1-year clinical outcomes were satisfying. To our knowledge, this case is the first report of crushing technique as bail out option for entrapped rotablation burr. (JACC Case Rep. 2025;30:103129) © 2025 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

We describe a clinical case of a 77-year-old man admitted for non-ST-segment elevation myocardial infarction.

TAKE-HOME MESSAGES

- This case demonstrates the feasibility and safety of a crushing technique by a stent as a final bailout treatment for a Rotablator burr entrapment.
- Complex PCI procedures should be done with a 7-F GC or larger to be able to manage eventual complications.

PAST MEDICAL HISTORY

The cardiovascular risk factors are diabetes mellitus, dyslipidemia, and hypertension. The patient has coronary artery disease with a coronary artery bypass grafting in 2004 (left internal mammary to left anterior descending + saphenous vein graft [SVG] to first optus marginalis [OM1]).

DIFFERENTIAL DIAGNOSIS

There was not any differential diagnosis at this stage.

INVESTIGATIONS

The electrocardiogram at admission was normal; troponin level was at 7,400 ng/L. Transthoracic

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ABBREVIATIONS AND ACRONYMS

GC = guiding catheter

LM = left main coronary artery

OCT = optical coherence tomography

OM1 = first optus marginalis

PCI = percutaneous coronary intervention

RA = rotational atherectomy

SVG = saphenous vein graft

echocardiography showed left ventricular ejection fraction at 60%, with no wall motion abnormality or valvular disease.

Initial coronary angiography showed diffuse calcified multivessel disease (**Figure 1**), including a significant right coronary artery lesion previously known (**Figure 1C**), mid left anterior descending chronic total occlusion, and significant severely calcified circumflex to OM1 stenosis (Video 1). Left internal mammary graft was patent (**Figure 1D**), but the SVG presented a very heterogenous thrombotic and ulcered plaque on the distal anastomosis (Video 2).

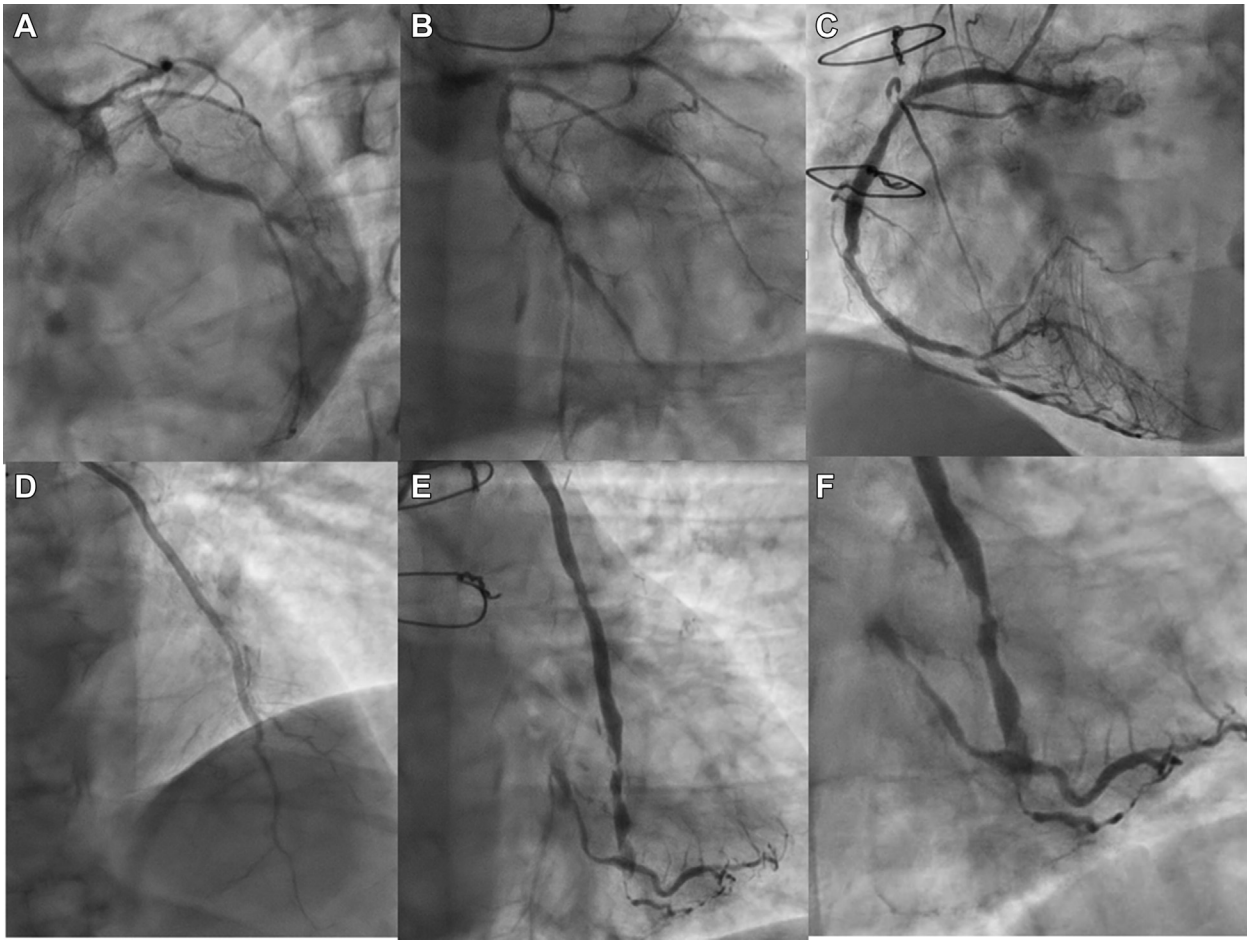
MANAGEMENT

We provided the patient with optimal medical therapy (aspirin 75 mg/d + ticagrelor 180 mg/d + enoxaparin 80 mg ×2/d) and planned a deferred percutaneous coronary intervention (PCI) of the SVG lesion. Unfortunately, the control angiography showed no improvement in the culprit lesion aspect.

After a heart team decision, we proposed PCI of the native left main coronary artery (LM) circumflex and OM1 lesions for the patient.

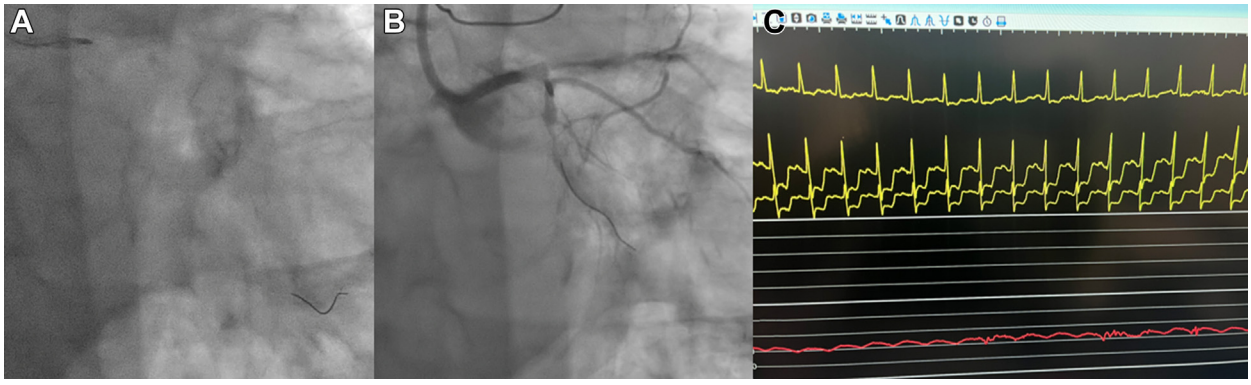
The procedure was performed through 6-F transradial access. An antegrade wire escalation strategy

FIGURE 1 First Coronary Angiogram



(A to C) First angiography. (D) Patency of left internal mammary. (F and F) Distal stenosis of the saphenous vein graft anastomosis.

FIGURE 2 **Burr Entrapment in the Ostial Circumflex**



(A) A 1.25-mm Rotablator burr starting rotational atherectomy in left main coronary artery. (B) Stuck burr in ostial circumflex. (C) Electrocardiogram modifications on the monitoring screen.

led to the final placement of a Rotawire (Boston Scientific) in the distal OM1.

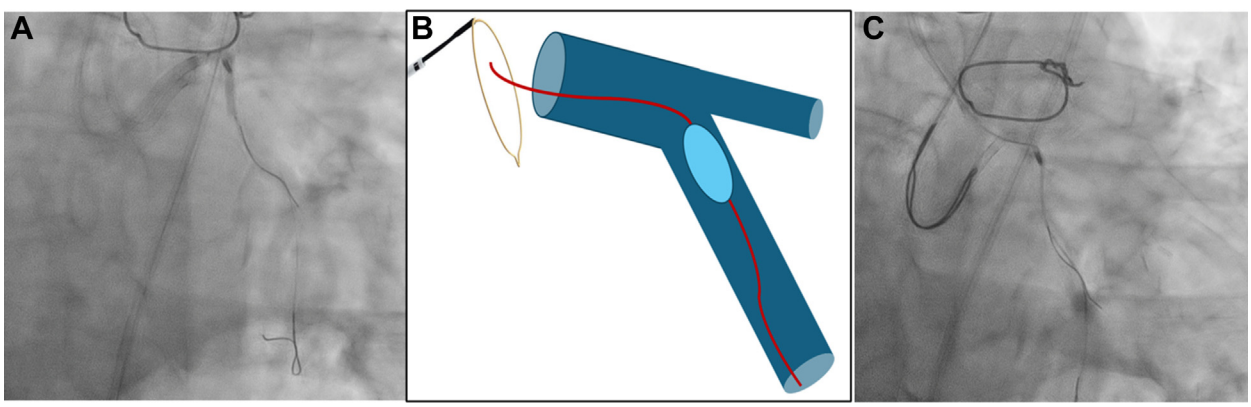
Rotational atherectomy (RA) was then applied from the distal LM to circumflex using 1.25-mm burr at 180,000 rpm. Unfortunately, the burr was entrapped in ostial circumflex during the 4th attempt to cross the lesion, leading to compromised flow, ST-segment depression on electrocardiogram, and chest pain (**Figure 2**, Video 3).

We applied different options to resolve the issue. First, we tried to pull the burr back gently into the guiding catheter (GC) without any success. We then decided to cut the proximal section of the burr to engage a GC extension that would dislodge the device, but the attempt was unsuccessful.

The next option was to use a ping-pong technique to deliver a wire in the distal OM1 between the entrapped burr and the vessel wall. A second 7-F Amplatz AL1 GC was inserted in the right femoral artery allowing the placement of an ASAHI SION blue in the target vessel. We performed balloon angioplasties while trying to pull out the burr after deflating the balloons without success. The flow in the circumflex and electrocardiogram signs improved, whereas chest pain decreased. Unfortunately, the distal part of the shaft finally broke. We tried to snare the remaining portion of the shaft but these attempts were unsuccessful (**Figure 3**).

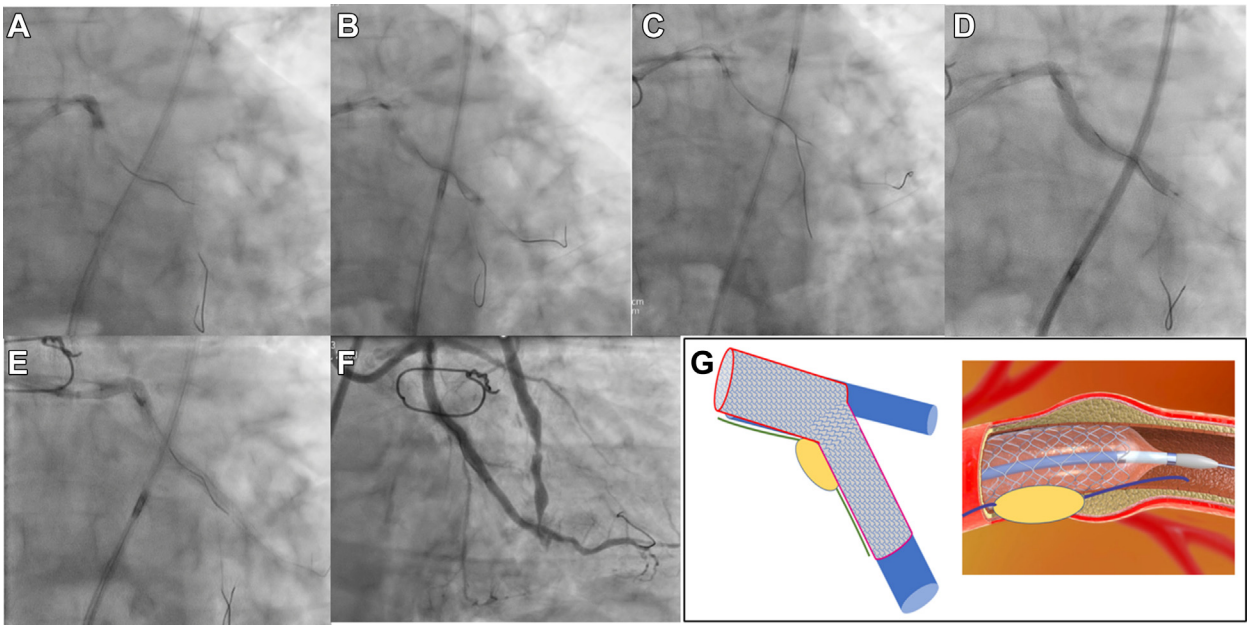
Ultimately, we decided to fix the issue by crushing the 1.25-mm burr on site and cover it with a stent as a

FIGURE 3 **Several Attempts to Retrieve the Burr**



(A) Ping-pong technique with balloon inflations near the burr. (B and C) Trying to snare the broken shaft of the burr with the 7-F femoral AL1 guiding catheter.

FIGURE 4 Advancing the Guide Extension Catheter and Stents Delivery

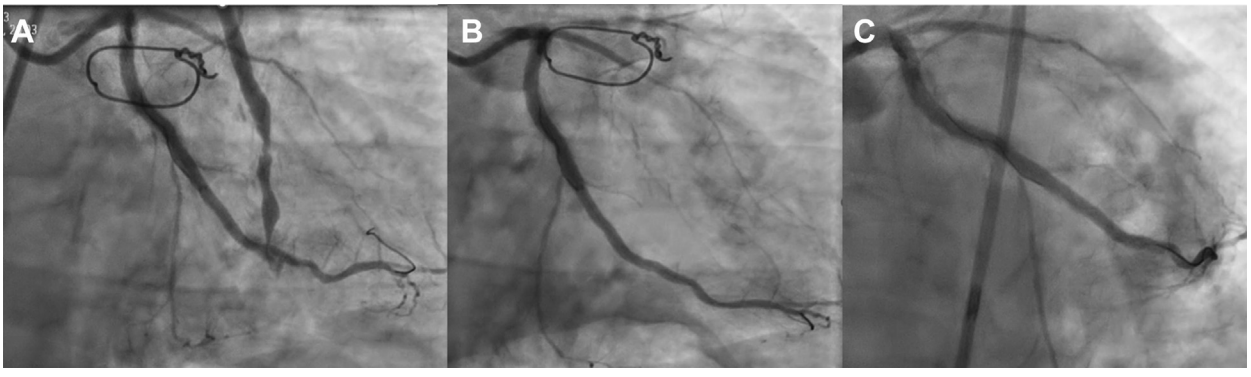


(A and B) Several noncompliant balloon pre-dilatations near the burr. (C) Success of advancing the guide extension catheter beyond the burr. (D) Proximal stent delivery in the first optus marginalis. (D) Post dilatation of the left main coronary artery and the proximal circumplex. (F) Intermediate result. (G) Illustration.

bailout technique. The first step was to cross the entrapped burr with a GC extension delivered through the 7-F AL1 GC in endorsement of the burr, using an anchoring balloon technique with a 3.0- × 20-mm balloon. The second step was to predilate the vessel from the circumflex to the OM1 using non-compliant balloons of increasing diameters. Then, we implanted a 2.75 × 32 mm (from circumflex to OM1) and a 3.5 × 48 mm (from LM to circumflex) Boston Scientific SYNERGY stent. Finally, aggressive post dilations were applied with a 4.0 × 15 noncompliant balloon in the LM (Figure 4).

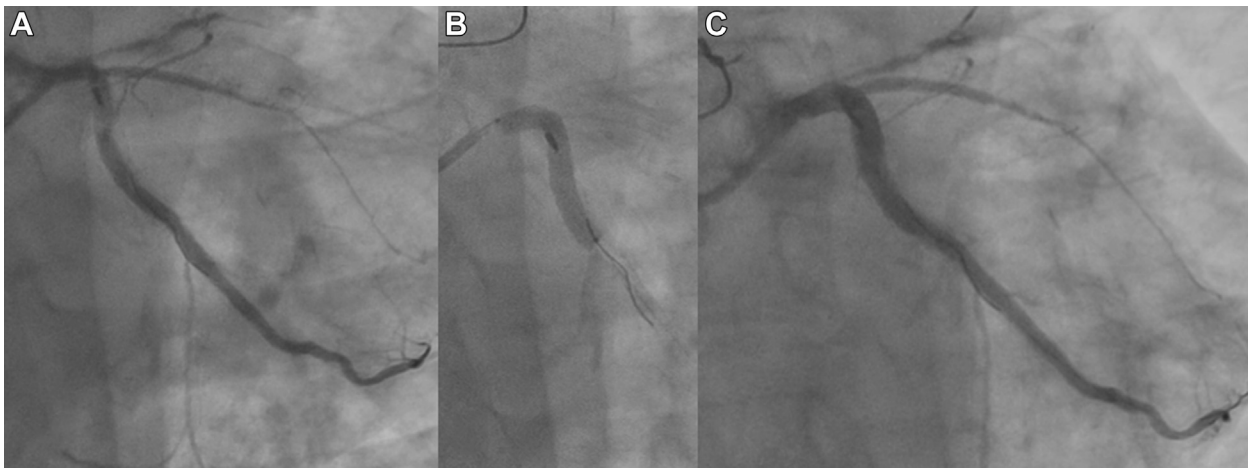
Although a satisfactory result was observed in the native vessel (Figure 5A), there was still a

FIGURE 5 First Procedure Final Angiographic Result



(A) Intermediate result with the retrograde flow of the saphenous vein graft. (B and C) Final angiographic results after covered stent implantation (Biotronik Papyrus 2.5 × 15 mm) to avoid competitive flow.

FIGURE 6 Angiography at 1 Month



(A) Heterogenous thrombotic image in the proximal circumflex. (B) Noncompliant balloon angioplasty in the left main coronary artery and circumflex. (C) Final angiographic result.

competitive flow arising the SVG, which led us to implant a covered stent (Biotronik Papyrus 2.5 × 15 mm) in the distal SVG/OM1 anastomosis to close the graft.

OUTCOME

The final angiographic result was good (**Figure 5**, Video 4). Despite an initial postprocedural troponin peak equal to 15,000 ng/L, the subsequent patient outcome was uneventful, and he was promptly discharged (discharge medication: clopidogrel 75 mg + aspirin 100 mg + apixaban 2.5 mg × 2/d).

FOLLOW-UP

The patient was scheduled for a control angiography 1 month later that showed a patent left main and circumflex artery, but a heterogenous hazy image was observed in front of the burr (Video 5). We performed high-pressure noncompliant balloon inflations in the distal LM with a 4.5- × 15-mm balloon with good final result (**Figure 6**, Video 6). The patient was discharged the next day after increasing the dose of apixaban to 5 mg twice daily in addition to clopidogrel and aspirin.

A subsequent control angiography + optical coherence tomography (OCT) analysis was scheduled 3 months after initial PCI. The heterogenous image in front of the burr remained on angiography (Video 7). The OCT imaging identified major stent under expansions on distal LM and mid circumflex. A limited thrombus burden was observed within the stent on the site of the crushed burr (**Figure 7**, Video 8). We decided to treat the stent under expansion by aggressive noncompliant balloon post dilation + larger stent (Megatron 5.0 × 20 mm, Boston Scientific) implantation from LM to circumflex. The OCT control was much better than the first run with better expansion of the stents (**Figure 8**, Videos 9 and 10). The patient was discharged on the same day; he went on a cardiac rehabilitation program. Apixaban was stopped 4 months after the last procedure. A 1-year clinical follow-up was very satisfying without any symptoms.

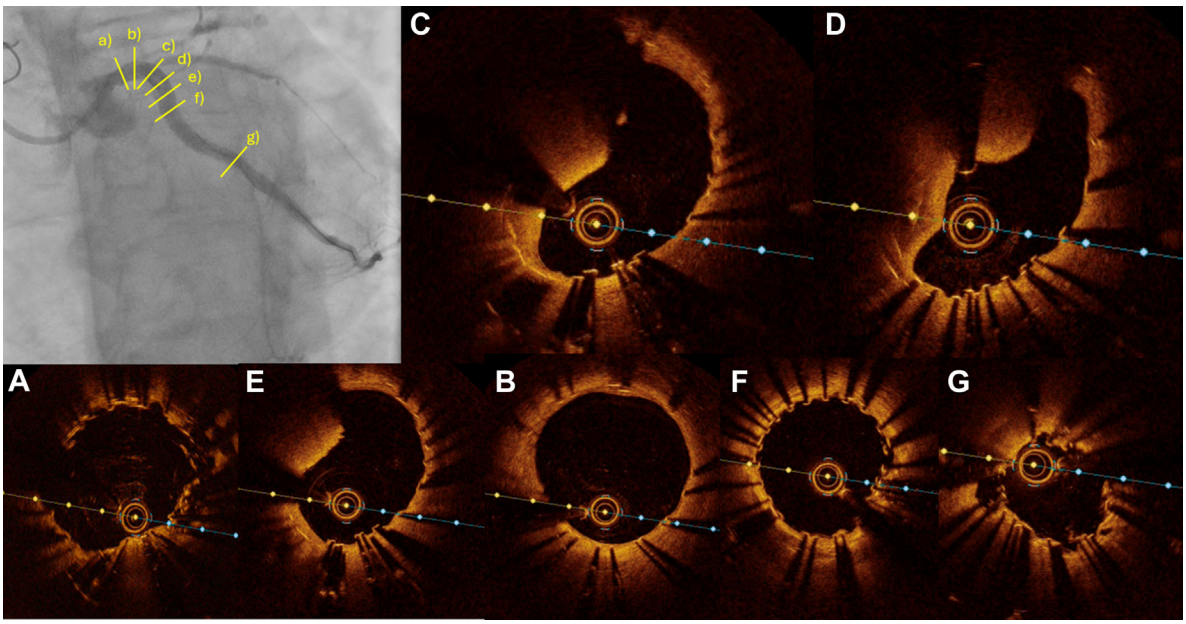
DISCUSSION

To our knowledge, our case is the first report of crushing technique as bail out option for entrapped rotablation burr.

Burr entrapment during RA remains a serious and challenging complication of the technique. Recently, Morita et al[1] reported the results of a large multicenter retrospective registry of patients treated with RA. Burr entrapment rate was limited (22 of 3,195 procedures [0.7%]), and all cases were successfully managed by traction.

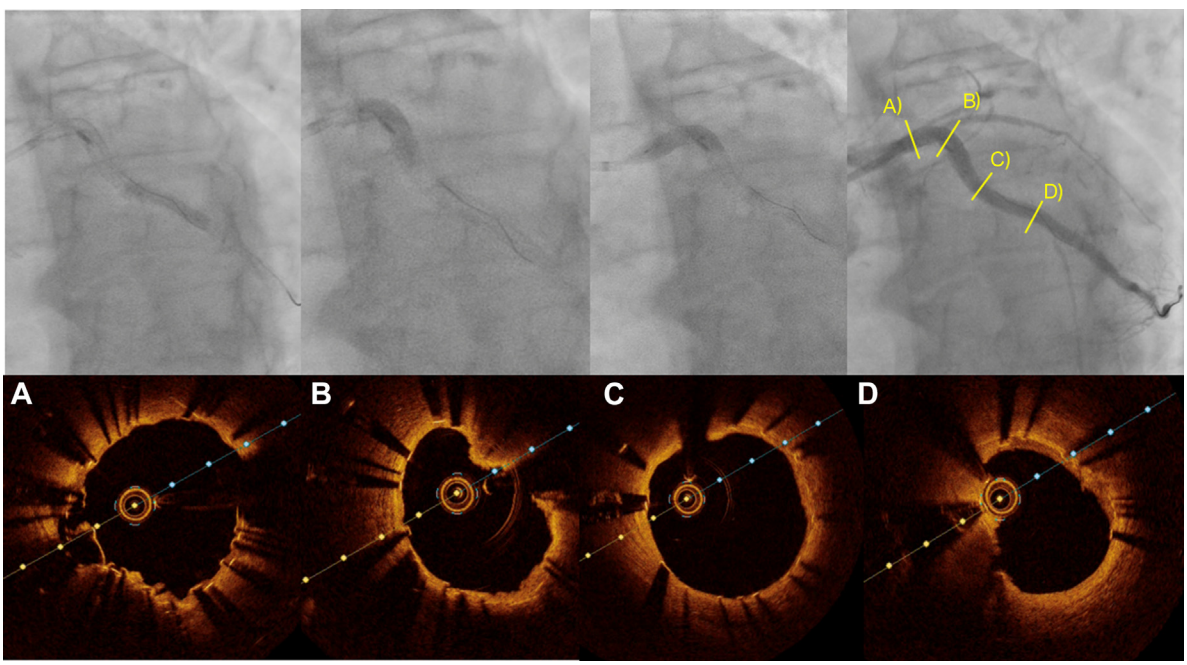
Our case illustrates the different options for burr entrapment, as previously reviewed by Sanz-Sánchez et al[2]; all the strategies (eg, traction, modification of the plaque, snaring technique, use of a guide

FIGURE 7 **Angiographic Control and Optical Coherence Tomography Imaging at 3 Months**



(A) Ostial left main. (B) Mid left main. (C to E) A thrombus in front of the burr and an under expansion of the stent. (F) Mid circumflex. (G) Under expansion of the first optus marginalis stent with calcifications beyond.

FIGURE 8 **Final Optical Coherence Tomography Control After Left Main Stenting and High-Pressure Ballon Inflation in the First Optus Marginalis**



(A and B) Several inflations of high-pressure noncompliant balloons in the first optus marginalis and distal left main coronary artery/proximal circumflex. (C) Stenting of the distal left main and proximal circumflex (Boston Scientific Megatron 5.0 × 20 mm). (D) Final angiographic results with optical coherence tomography imaging control.

extension catheter) were unsuccessful in our case. One might argue that the 6-F GC in which the burr was delivered to the target lesion might have limited the options (eg, it was impossible to trap the most proximal part of the burr's shaft by a balloon, impossible to use a 7-F guide extension catheter). However, the use of a second larger GC in a ping-pong approach allowed us to successfully cross GC extension and different noncompliant balloons downstream the burr, which opened potential for crushing technique.

CONCLUSIONS

The first lesson to learn from this case is to prevent burr entrapment by avoiding very angulated vessels as mentioned in recent experts' consensus in Japan.[3]

Even with the good evolution and 1-year follow-up of our patient, we cannot recommend the use of this crushing stent technique as first option, for a stuck burr, but we think this procedure could represent the ultimate bullet as a final bailout in urgent situations

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Dr Boueri has received training fees from Boston Scientific and consulting fees from Biotronik. Dr Souteyrand has received consulting fees for Abbott, Medtronic, B. Braun, and Terumo. Dr Amabile has received an institutional research grant from Abbott Vascular and consulting/lecturing fees from Abbott Vascular, Boston Scientific, General Electric Healthcare, and Shockwave Medical. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS complex PCI, crushing burr by coronary stenting, guide extension catheter use, PCI, Rotablator burr entrapment

APPENDIX For supplemental videos, please see the online version of this paper.