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CASE REPORT

ADVANCED

CLINICAL CASE

Stuck Between a Rock and a Hard Place

Management of an Entrapped Rotablator Burr

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ABSTRACT

Burr entrapment remains a serious complication of rotational atherectomy. This report describes an advanced technique for the management of entrapped atherectomy burrs. Commonly strategies were unsuccessful. A chronic total occlusion angioplasty technique was used successfully: the subintimal dilation and "external crushing" plaque modification technique. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2019;1:771–3) © 2019 The Authors. 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/).

PRESENTATION

A 76-year-old man presented to the emergency room complaining of retrosternal chest pain that occurred with minimal exertion.

MEDICAL HISTORY

Significant co-morbidities included diabetes, hypertension, dyslipidemia, sick sinus syndrome requiring permanent pacemaker implantation, and end-stage renal disease on hemodialysis.

DIFFERENTIAL DIAGNOSIS

A diagnosis of non-ST-segment elevation myocardial infarction was suspected.

LEARNING OBJECTIVES

- To know the standard management algorithm in the setting of a burr entrapment.
- To understand that advanced chronic total occlusion techniques (such as subintimal plaque modification) may be useful as a bailout strategy in the setting of a burr entrapment.

INVESTIGATIONS

Electrocardiography showed a complete left bundle branch block. Troponin concentration was elevated. Transthoracic echocardiography showed a preserved left ventricle ejection fraction with no significant valvular disease. Coronary angiography revealed significant 3-vessel disease. The right coronary artery (RCA) was dominant and tortuous with severe tandem lesions in its mid and distal segments with an occluded posterolateral artery (**Figure 1A**). All coronary lesions were heavily calcified.

MANAGEMENT

Following heart team assessment for surgical suitability, the patient was turned down for coronary artery bypass surgery. It was agreed that percutaneous revascularization was the most optimal strategy for this patient.

The RCA was chosen as the first target to revascularize by percutaneous coronary intervention (PCI) with rotational atherectomy (RA). A 7-F Amplatzer left 1 (AL1) guide was positioned through femoral vascular access. Guidewire (GW) passage across the

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Informed consent was obtained for this case.

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ABBREVIATIONS AND ACRONYMS

GW = guidewire

PCI = percutaneous coronary intervention

RA = rotational atherectomy

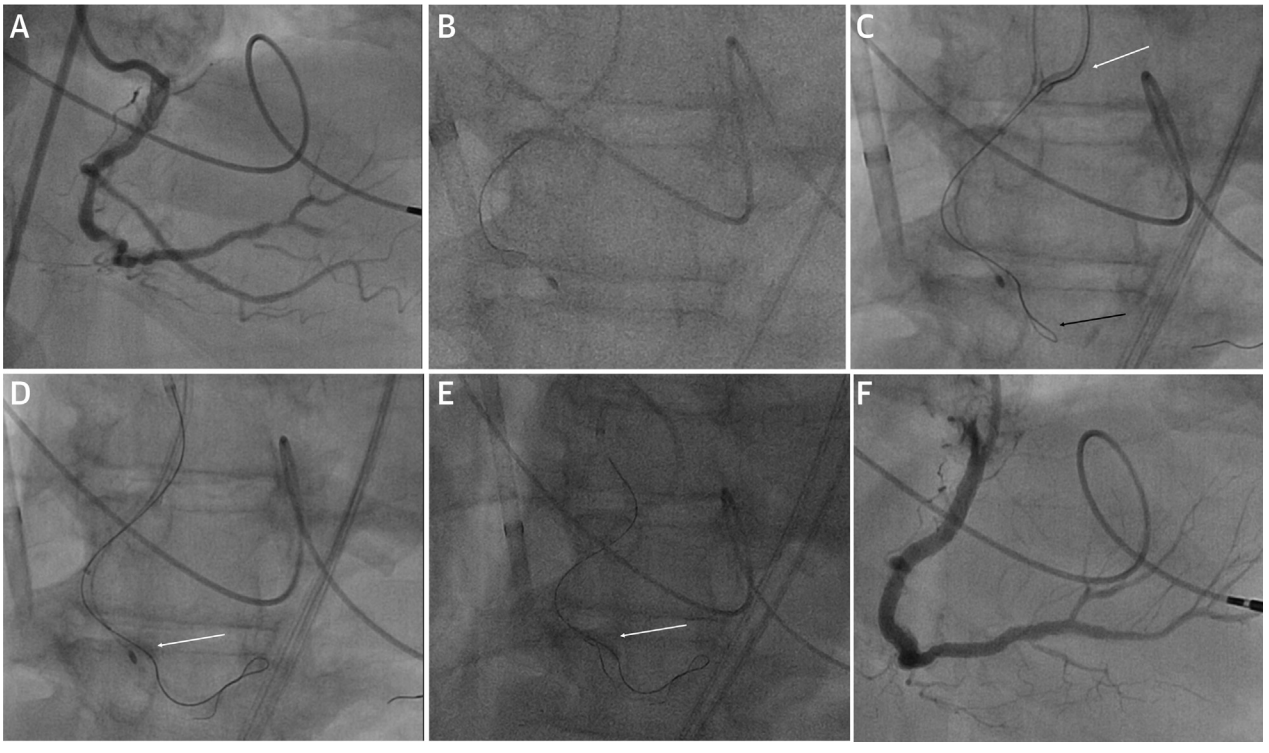
RCA = right coronary artery

RCA lesions was challenging but ultimately successful with a Fielder XTA GW (Asahi Intecc, Tustin, California). A microcatheter (Turnpike LP, US Teleflex, Morrisville, North Carolina) was used to exchange it for a Rotawire Floppy GW (Boston Scientific, Marlborough, Massachusetts). Despite the fact that the burr passages were extremely difficult, initial angiographic results post-RA with the 1.25-mm burr at 160,000 rpm were deemed satisfactory, without any complications. However, upon the first attempt with the 1.5-mm burr at 160,000 rpm, the burr immediately stalled beyond the first calcified RCA lesion (Figure 1B).

Multiple attempts to forcefully pull back the entrapped burr without and then with deep intubation of the guiding were made but all without any success. Subsequently, attempts to deliver a balloon next to the burr failed due to the tortuosity, calcification, and severity of the RCA lesion, which was now occluded by the entrapped burr, resulting in slowing of coronary flow. At this point, a second vascular (femoral) access was secured with the intent to proceed with a "ping-pong" technique (use of 2 guide catheter into the same coronary artery [1]). After cannulating with a second guide catheter (7-F AL1), loaded with a guide extender (Guideliner 6-F, US Teleflex), guidewire crossing and balloon advancement besides the burr again failed despite improved support.

While waiting for the feedback from the cardiothoracic colleagues, an "out-of-the-ordinary" management plan was suggested, and a decision was made to proceed with subintimal dilation and "external crushing" for plaque modification. This latter technique, used in chronic total occlusion (CTO) PCI to overcome undilatable or uncrossable lesions, where the subintimal space is accessed followed by

FIGURE 1 Baseline Coronary Angiogram Showing a Dominant, Tortuous, and Highly Calcified Right Coronary Artery



(A) Baseline coronary angiogram showing a dominant, tortuous and highly calcified right coronary artery with significant tandem lesions in its mid-segment, with a chronically occluded posterolateral artery. **(B)** Atherectomy burr entrapment **(arrow)** immediately following the first run of 1.5-mm burr at 160,000 rpm. **(C)** A "ping-pong" technique **(white arrow)** was used to "scratch-and-go" (access) into the subintimal space with the Gaia Third guidewire near the entrapped burr. This was followed by the "knuckle wire" technique **(black arrow)** to secure distal anchoring prior to attempts balloon dilatation. **(D)** External subintimal "crushing" and progressive dilation of the subintimal space surrounding the resistant lesion to dislodge entrapped burr. **(E)** Subintimal balloon trapping of the Rota-Floppy wire to maintain distal wire position in the true lumen access at the time of burr retrieval. **(F)** Final coronary angiogram with a good result.

balloon inflation in the subintimal space to modify a resistant plaque "externally" instead of "internally" (i.e., from within the lumen) (2).

Thus, a microcatheter (Turnpike LP) was advanced proximal to the burr. A Gaia Third GW (Asahi Intecc) was used to "scratch-and-go" into the subintimal space proximal to the burr. Once the subintimal space accessed the microcatheter, it was positioned parallel to the entrapped burr. The Gaia Third was exchanged for a Fielder XT (Asahi Intecc), with the intent of creating a "knuckle." The subintimal knuckle technique allows for a polymer-jacketed GW to be looped and then safely pushed along the vascular architecture, progressing beyond the CTO body, after which either antegrade or retrograde re-entry techniques are used to access the true lumen (3).

Through the wedged microcatheter, the Fielder XT (Asahi Intecc) was knuckled and pushed through the subintimal space beyond the entrapped burr (**Figures 1C and 1D**). The knuckle then tracked into the occluded posterior lateral artery. Progressive dilatations of the subintimal space with 1.25-, 1.5-, 2.0-, 2.5-, and 3.0-mm compliant balloons were performed. Afterward, forceful traction resulted in successful dislodgement and removal of the stalled burr (**Figure 1E**). Despite the forceful mobilization of the burr, the Rota-Floppy GW position was maintained in the true lumen distal to the lesion. Trapping of the latter was performed with the balloon still in place within the subintimal space, allowing a microcatheter to be used to exchange the Rota-Floppy GW for a more supportive GW (Extra'Sport, Guidant, Advanced Cardiovascular System, Marlborough, Massachusetts). This was followed by aggressive pre-dilations of the calcified RCA lesions which were now less resistant. Finally, successful implantation of a total of 4 drug- eluting stents (Xience Xpedition 2.5- × 26-mm, 3.0- × 38-mm, 3.5- × 38-mm, and 3.5- × 38-mm) was performed. All post-dilated with a 4-mm NC TREK balloon 4.0- × 20-mm cardiovascular therapy [Abbott]) in the mid RCA with a good final result (**Figure 1F**). The decision was made to defer and stage PCI of the remaining coronary lesions in order to achieve complete revascularization.

DISCUSSION

Burr entrapment remains a serious complication of RA. In this report, retrieval of the entrapped burr using the standard described techniques, including forceful burr traction with deep-seated guide catheter or mother-child catheter setup, and side-ballooning dilation of entrapped burr were unsuccessful (4). A snare could have been used, but the risk of wire section was estimated to be high. The external subintimal plaque modification technique has been described in CTO PCI and used in the management of "balloon uncrossable" lesions (5). This CTO technique should be kept in mind as a bailout strategy in case of failure of standard retrieval techniques for entrapped RA burrs.

FOLLOW-UP. After 48 h, staged PCI-RA of the LAD and circumflex was performed without any complications. The patient's in-hospital course was unremarkable, and the patient was discharged angina-free.

CONCLUSIONS

Chronic total occlusion angioplasty technique such as the subintimal dilation and "external crushing" plaque modification technique may be useful when used in case of failure of standard techniques for entrapped RA burrs.

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