

Treating the “Uncrossable” Lesion

Reviewing the most commonly used techniques for managing balloon-uncrossable coronary lesions.

BY DIMITRIOS BLIAGOS, MD

There are various techniques for dealing with the “uncrossable lesion.” Balloon-uncrossable coronary lesions are stenoses that cannot be crossed with a balloon or microcatheter after a guidewire has been confirmed to have successfully crossed into the distal true lumen. Elrayes et al recently published an article describing an algorithmic approach to dealing with these lesions,¹ which can represent 6% to 9% of chronic total occlusions (CTOs) but can also occur in non-CTO lesions.² The techniques used to cross these challenging lesions are meant to either increase guide catheter support or modify the plaque. There are also situations where a balloon successfully crosses a lesion and the operator is able to dilate it with a noncompliant balloon, but a stent will not cross due to either tortuosity and/or calcification proximal to the stenosis or in the stenosis itself. This article will focus on the balloon-uncrossable lesions.

The various techniques used to treat balloon-uncrossable lesions include the small balloon wedge technique, side

branch anchoring, increased guide catheter support with guide extension, microcatheter-facilitated wire exchange for rotational, orbital, or laser atherectomy (Figure 1).

SMALL BALLOON WEDGE TECHNIQUE

The first step to treating an uncrossable lesion is to reach for a low-profile, compliant balloon with a single marker. The diameter of the balloon should be 1 to 1.5 mm and longer than 15 mm because the widest part of the balloon is in the middle at the marker location. A longer balloon may increase the chance that part of it will engage the lesion, and inflating it while holding forward pressure will facilitate balloon crossing.

A modification of this technique is balloon-assisted microdissection, which requires that a low-profile balloon is advanced into the lesion as far as possible and inflated until the balloon ruptures. The contrast jet that is created can modify the plaque, resulting in successful crossing with a new balloon.³

INCREASE SUPPORT

Being able to increase support during these procedures is the key to success. Support can be increased by using a larger, 7- or 8-F guide catheter and more supportive shapes like the Amplatz left for the right coronary artery and the EBU (Medtronic) for the left main coronary artery. If using transfemoral access, a 45-cm long sheath is preferable. It is not always possible to switch guides in the middle of a procedure, so other options to increase support should be used, including balloon anchoring and guide extension.

A side branch anchor technique employs the inflation of a small balloon in a side branch—usually a conus or right ventricular marginal in the right coronary artery, a diagonal for the left anterior descending, or an obtuse marginal for the circumflex—to anchor the guide in place. The operator can then attempt to advance a balloon or microcatheter through the lesion.

A discussion on increasing support is not complete without a thorough explanation of the use of guide extension catheters (GECs). These include Guideliner/TrapLiner

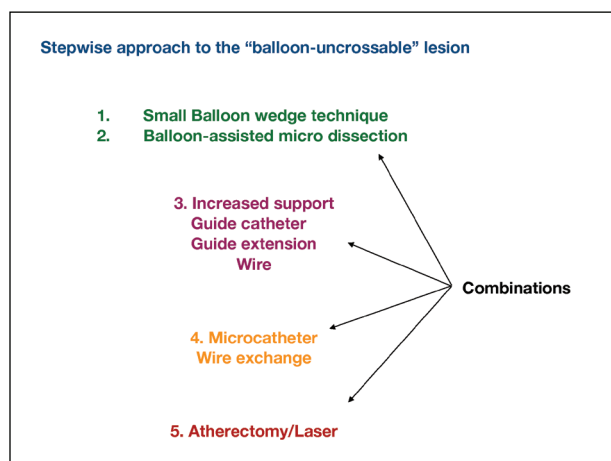


Figure 1. A stepwise approach to treating the balloon-uncrossable lesion. Modified from Elrayes MM, Xenogiannis I, Nikolakopoulos I, et al. An algorithmic approach to balloon-uncrossable coronary lesions. *Catheter Cardiovasc Interv*. Published online August 31, 2020. doi: 10.1002/ccd.29215

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to watch a video of a balloon-uncrossable lesion case.

(Teleflex), Guidezilla (Boston Scientific Corporation), and Telescope (Medtronic). These devices can greatly increase guide catheter support, depending on how deep inside the artery they're advanced, but they should not be advanced without a balloon leading forward. In situations where there is a proximal lesion or tortuosity, the "inchworming" technique is used. This is where a balloon is inflated halfway inside the guide extension, and the catheter is advanced forward as the balloon is deflated. Especially important is the availability of a 5- and 5.5-F GuideLiner. The small diameter allows for one wire to be placed into a side branch to anchor while the Guideliner is placed on the other wire across the lesion. A case where this is useful is discussed in the video.

It is important to note a few cautionary comments with GECs. After using a GEC, one must be very cognizant of the possibility for proximal dissection. Inspect the final angiogram with the GEC fully withdrawn while looking for this complication. When injecting contrast through the GEC, make sure you have reduced the flow rate, contrast volume, and pressure settings on the power injector.

LASER ATHERECTOMY

Excimer laser coronary atherectomy is a good approach to treating balloon-uncrossable coronary lesions because you can use any 0.014-inch guidewire, in contrast to orbital and rotational atherectomy. As a combination technique, laser can be used to facilitate a microcatheter to cross the lesion, which can then be exchanged for an atherectomy wire, followed by rotational atherectomy for plaque modification before ballooning and stenting.

ATHERECTOMY

Rotational or orbital atherectomy is a powerful weapon in the fight against a balloon-uncrossable lesion. Its Achilles heel is the need to exchange for a thinner atherectomy wire: 0.009-inch for rotational and 0.012-inch for orbital atherectomy. This exchange is not always possible through the balloon-uncrossable lesion. When all other maneuvers fail, one can sometimes "bury" the microcatheter tip into the lesion and wire directly with the atherectomy wire into the distal lumen. There can be great hesitation to use this maneuver because we are taught never to give up wire position. However, it can be a great technique if the lesion is not a CTO and a clear channel is present. Maneuvering the atherectomy wires is not easy, and the 0.009-inch rotational atherectomy wire is prone to kinking. Great care must be employed when primarily wiring with these wires.

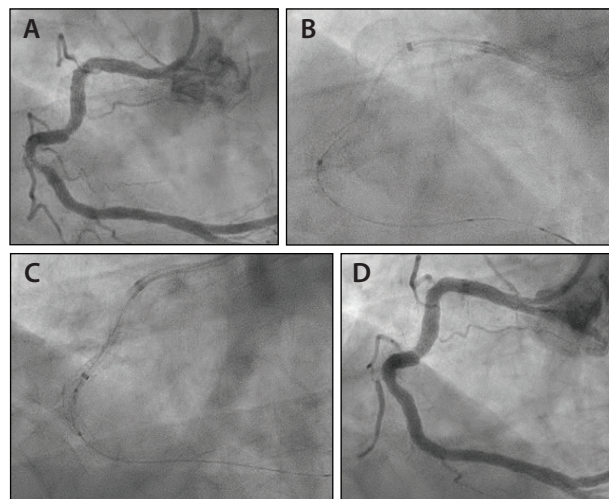


Figure 2. Still frame of an angulated heavily calcified stenosis in the mid right coronary artery; the proximal right coronary artery is stented up until the lesion (A). The guide catheter is a 7-F Amplatz Left 1 via the right radial. A 0.9-mm laser catheter is delivered to the lesion using a GEC (B). The guide extension is seen deep in the right coronary artery, with delivery of a scoring balloon (C). The final result after stent delivery (D).

COMBINATION TECHNIQUES

None of the techniques described previously are meant to be used in isolation. Frequently, a combination of these is necessary to successfully treat the balloon-uncrossable lesion. An example of a combination technique is shown in Figure 2.

CONCLUSION

Balloon-uncrossable coronary lesions are difficult to treat and will be more commonly seen as the field of interventional cardiology pushes into the complex and high-risk percutaneous coronary intervention arena. Hopefully, this review of the more commonly used techniques for treating such lesions has been helpful. The use of these techniques will allow you to treat a greater subset of patients who would otherwise be left untreated. As stated previously, none of these techniques have to be used in isolation; in most instances, a combination will lead to a successful percutaneous treatment. ■

1. Elrayes MM, Xenogiannis I, Nikolakopoulos I, et al. An algorithmic approach to balloon-uncrossable coronary lesions. *Catheter Cardiovasc Interv*. Published online August 31, 2020. doi: 10.1002/ccd.29215
2. Patel SM, Pokala NR, Menon RV, et al. Prevalence and treatment of "balloon uncrossable" coronary chronic total occlusions. *J Invasive Cardiol*. 2015;27:78-84.
3. Vo MN, Christopoulos G, Karmaliotis D, et al. Balloon-assisted microdissection "BAM" technique for balloon-uncrossable chronic total occlusions. *J Invasive Cardiol*. 2016;28:E37-41.

Dimitrios Bliagos, MD

Director of Interventional Cardiology
White Plains Hospital
White Plains, New York
dbliagos@wphospital.org
Disclosures: None.