Facilitated Stent Delivery in a Tortuous Right Coronary Artery Using Buddy Balloon Anchoring Technique

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Received: August 05, 2020; Published: August 31, 2020

Abstract

Calcification in the background of tortuosity is often a challenging substrate to deliver the stent. Here, we are describing a simple technique using a second guidewire and balloon (Buddy Balloon Anchoring Technique; BBAT) to facilitate delivery and deployment of distal stent through a proximally deployed stent in a calcified and tortuous right coronary artery (RCA). A 71-year-old hypertensive and smoker male presented with unstable angina and coronary angiogram revealed mild shepherd crook right coronary artery (RCA) with diffuse lesion in proximal and mid segment of RCA. It was stented proximally with 3.5 x 28 mm Xience Prime everolimus eluting stent (Abott Vasc, USA). To stent residual distal lesion, second stent could not be delivered in usual fashion. It was successfully delivered using above technique by parking another shorter balloon and inflating it at lower pressure distal to the lesion over a buddy wire which acted as an anchor. Once the stent was delivered to its target lesion, buddy balloon was deflated and pulled out along with buddy wire. Distal stent was successfully deployed overlapping with distal edge with proximal stent to achieve complete revascularization.

Keywords: Balloon Anchoring Technique; Buddy Balloon; Shepherd Crook Right Coronary Artery

Introduction

Long and multiple lesions especially in the background of tortuous coronary artery often require multiple stents. Sometime, another stent might be needed to treat focal dissections at the distal edge of the deployed stent. The entry and passage of second stent through an already deployed stent becomes challenging because of poorly expanded stent struts, calcified tissue blocking passage of stent, underlying tortuosity, highly angulated takeoff of the vessel, and lack of co-axiality. Bulky stent transport systems and longer stent further add to the problem. Mother-in-child catheter system (GuideLiner, GuideZilla), buddy wire, deeper intubation of guide catheter, and balloon anchor are few of the bailout solution to such problems.

Case Report

A 71-year-old hypertensive and smoker male presented with acute coronary syndrome-unstable angina. For past eight months, he was being treated for exertional angina- Canadian Cardiovascular Society (CCS) class III angina. His had strongly positive treadmill test for reversible myocardial ischemia but it was fairly controlled with medications. Electrocardiogram revealed dynamic ST-T changes in II, II, and aVF leads. Echocardiogram showed mild concentric left ventricular hypertrophy, grade II diastolic dysfunction, and normal ejection fraction. He was preloaded with aspirin-325 mg, ticagrelor-180 mg, and rosuvastatin-40 mg and shifted to catheterization laboratory. Coronary angiography was performed through right transfemoral route after proper consent which revealed mild shepherd crook right

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coronary artery (RCA) with diffuse lesion in proximal and mid segments (Figure 1A). Lesion was mildly calcified and moderately tortuous. RCA was cannulated using 6F Judkins Right catheter (JR, Medtronic Inc; USA) and wired with Sion blue (Ashahi Inc; Japan). Lesion was predilated with 2.5 x 15 and 3 x 15 mm Euphora semicompliant balloon (Abott Vasc; USA). As lesion was adequately dilated, rotational atherectomy was not considered. It was stented proximally using 3.5 x 28 mm Xience Prime everolimus eluting stent (Abott Vasc, USA) at 12 atm pressure (Figure 1B). However, lesion was not fully covered with stent and was decided to deploy another stent at the distal edge of first stent (Figure 2A). But another 3 x 13 mm Xience Prime stent could not be delivered because of difficult passage and lack of proper support of guide catheter. It was decided to seek help from buddy wire technique by parking another Sion blue in distal postero-lateral branch (PLB) of RCA. While parking the wire, concertina effect was observed (Figure 2B and 2C). We delivered small, semicompliant 1.5 x 10 mm Sprinter balloon (Medtronic Inc; USA) on the buddy wire beyond the lesion. It was inflated at lower pressure (6 atm) to make it work buddy balloon (Figure 3A). By garnering extra support from buddy balloon and further deepening the intubation of JR guide, another 3 x 13 mm stent was successfully tracked beyond the proximally deployed stent in distal RCA (Figure 3B). Buddy balloon was deflated and gradually pulled out along with buddy wire of the guide catheter. Distal stent was gradually pulled to make an overlap with proximal stent (Figure 3C) and deployed at 14 atm pressure (Figure 4A). There was wire bias at the distal edge of stent. Post dilatation was performed using 3 x 10 mm and 3.5 x 10 mm sprinter balloon at 20 atm pressure achieving TIMI III flow. Wire bias completely disappeared after removal of the wire (Figure 4B). He was discharged in stable condition with appropriate advice.

**Figure 1:** Coronary angiography revealing mild shepherd crook RCA having diffuse lesion in proximal and mid segment (A); It was stented with 3.5 x 28 mm Xience Prime everolimus eluting stent (B).

**Figure 2:** Lesion at the distal edge of deployed stent (red arrow, A); While parking the wire, concertina effect (yellow arrows) was observed because of buddy wire in a tortuous segment (B, C).

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Discussion

Calcified lesions are one of the challenging substrate as they can be very difficult to treat as tracking of balloon and stent through the lesions can be very difficult. Calcification in the background of tortuosity further adds to problem [1]. Lesion modification by debunking using rot ablation or laser are few of the options but are technically demanding [2]. They may be relatively contraindicated in the background of tortuosity as wire bias may be risk for vessel perforation. In selected cases, cutting balloons are useful but their bulkier profile and rigid blades may hamper its trackibility in tightly calcified lesions [3,4]. Buddy wire (using two or more wires) along with more supportive guiding catheters like Amplatz may provide better trackibility and deliverability. Calcification and tortuosity were the underlying problems in this case which was further compounded by shepherd crook RCA and JR guiding catheter as they have less support.

Buddy wire alone in our case didn’t garner enough support to deliver the stent. Inflation of buddy balloon over the wire provided extra support as vessel was little straightened which facilitated the delivery of stent to its target site. However, there are certain limitations of

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this technique as vessel size needs to be large enough to accommodate two balloon catheters, and manipulation of multiple wires and balloon catheters may also cause endothelial injury, and rupture of new plaque which may cause thrombosis or acute occlusion. The advantage is that it can be easily performed using 6F guide as it can well accommodate one stent and one balloon. One should be cautious enough to pull the buddy balloon and wire before stent deployment to prevent their jailing. The distal buddy balloon helps in deeper seating of guide catheter, and by straightening the proximal segment of vessel causing less wire bias. Other options should be to securing more stable guide, larger guide or one with different curve to achieve better back up support, tracking the stent on stiffer buddy wire which makes artery straight, constant forward pressure on stent catheter while pulling wire back to reduce the friction inside stent catheter lumen at the same time asking the patient to take a deep breath in order to elongate the artery, and at times stents may be advanced more easily over a softer wire.

Conclusion

Calcification with proximal tortuosity makes the delivery of stent difficult especially in cases of tortuous RCA with shepherd crook origin. Tracking the stent over stiffer wire like Grand slam produces concertina which further complicates the issue. Anchor wire aids to the support but sometimes not adequate enough especially when lesion is located beyond the mid part of RCA. Buddy balloon technique is another very useful and novel technique to facilitate stent delivery as it not only straightens the artery by distal anchoring but also enhances the support. This is also economical and carries less risk of complication compared to mother-in-child system which comes as ultimate bail out.

Bibliography


Volume 7 Issue 9 September 2020
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