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Case Report
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# Balloon Anchor Technique (BAT) Assisted Side Branch Balloon Re-Entry during Minicrash Stenting: Case Report

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## Abstract

Among the various bifurcation techniques, the mini-crush technique is widely employed because of its technical simplicity and good coverage of the SB ostium. Nonetheless, one needs to cross the three layer of strut for rewiring and side branch balloon placement for the final Kissing Balloon Inflation (KBI). A 59-year-old male with chronic stable angina was referred for PCI of true bifurcation lesion of proximal Left Anterior Descending (LAD) involving large diagonal branch (D1). D1 was stented with 2.75x23 mm sent and crushed with 3x33 mm stent in LAD. Then, the D1 was rewired with a Sion black wire. However, we were unable to advance a 1.5x10 mm balloon into the D1. Thus, a 3x10 mm non-compliant balloon was positioned just beyond distal edge of the D1 stent (anchored zone). Then, we inflated the 3x10 mm balloon with 12 atm (anchoring in the LAD stent) to enhance the support of the guiding catheter. At the same time, the 1.5x10 mm balloon was advanced and successfully crossed the LAD stent cell into the D1 to open its ostium. Finally, the kissing balloon inflation technique was applied to the bifurcation using non-compliant balloon 3x10 mm in LAD and 2.75x10 in D1 achieving good success.

**Keywords: Balloon Anchoring Technique; Bifurcation lesion; Kissing Balloon Inflation; Mini-crush technique**

## Introduction

Though single stent strategy as stenting of Main Vessel (MV) is considered as the default treatment strategy for a coronary bifurcation lesion, there are certain substrates where dedicated bifurcation strategy is considered better if Side Branch (SB) is too big to be compromised [1]. Among the various bifurcation techniques, the mini-crush technique is widely employed because of its technical simplicity and good coverage of the SB ostium [2]. Nonetheless, one needs to cross the three layer of strut for rewiring and at times, side branch balloon placement for the final Kissing Balloon Inflation (KBI) becomes difficult as KBI is mandatory in any two stent strategy to optimize stent apposition, correct stent deformation or distortion, reduce angiographic side branch stenosis, and improve outcomes [3]. KBI is also exercised during provisional stenting when an angiographically significant (>75% diameter stenosis, Thrombolysis In Myocardial Infarction [TIMI] flow<3) lesion after main vessel stenting implantation [4].

## Case Report

A 59-year-old male, diabetic, hypertensive, and smoker presented with exertional angina-Canadian Cardiovascular Society (CCS) class III angina despite guideline directed medical treatment for past three years with worsening in last eight months. His treadmill test was strongly positive for reversible myocardial ischemia. Coronary angiography was performed after proper consent which revealed true bifurcation lesion of proximal Left Anterior Descending (LAD) artery involving critical subtotal occlusion of large diagonal branch (D1) (Figure 1). Angiographically, it was labelled as Medina class 1, 1, 1 as Main Branch (MB) and Side Branch (SB) were all diseased [5]. As it was true bifurcation with bifurcation angle <70°, mini-crush strategy was planned. Left main artery was cannulated with 7F Extra Backup (EBU) guide catheter (Medtronic, USA). Both LAD and D1 were wired with runthrough wire (terumo, Japan). Briefly, after predilation of the LAD and D1 with 2.5x10 mm Sapphire semicompliant balloon (Orbus Neisch, Netherland), 2 stents were placed in each branch, with the D1stent retracted 1-2 mm into the LAD (Figure 2A). Next, the D1 stent (2.75x23 Xience Prime everolimus eluting stent; Abott, USA) was deployed at 12 atm pressure and its balloon and wire were removed (Figure 2B). The LAD stent (3x33 Xience Prime) was then inflated at 12 atm pressure, thereby crushing the protruding cells of the D1stent against the LAD (Figure 3A and B). LAD stent was post dilated by 3.5x10 mm Sapphire non-compliant

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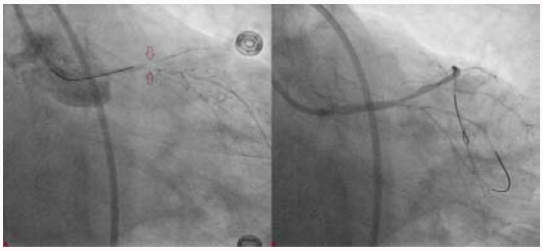

**Figure 1:** Coronary angiography showing true bifurcation lesion (Medina-1,1,1) of proximal Left Anterior Descending (LAD) artery involving critical subtotal occlusion of large diagonal branch (D1-A); Both LAD and D1 were wired with runthrough wire (B).

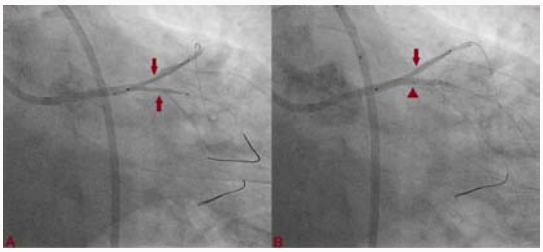

**Figure 2:** Stents (red arrow) were placed in LAD and D1, with the D1stent retracted 1-2 mm into the LAD (A); D1 stent (2.75x23 Xience Prime) was deployed at 12 atm pressure and its balloon and wire were removed (B).

**Figure 3:** The LAD stent (3x33 Xience Prime- red arrow) was then inflated at 12 atm pressure, thereby crushing the protruding cells of the D1stent (red arrowhead) against the LAD (A,B); D1 was rewired through its distal strut using Sion black (C).

**Figure 4:** 3x10 mm Sapphire NC balloon was parked just distal to distal edge of D1 stent into LAD (horizontal red arrow) and kept inflated at 15 atm pressure. Slowly, 2x10 mm Sapphire semicompliant balloon (vertical arrow) was crossed and gradually pushed into D1 (A; B; C).

balloon (NC) in its proximal part as a part of Proximal Optimization Technique (POT). D1 was rewired through its distal strut using Sion black (Ashahi, Japan) (Figure 3C). As a part of KBI, D1 was needed to be dilated to open its ostia but no balloon could be crossed as guiding catheter used to back out. 3x10 mm Sapphire NC balloon was parked just distal to distal edge of D1 stent into LAD and kept inflated at 15 atm pressure. Slowly, 2x10 mm Sapphire semicompliant balloon was crossed and pushed into D1 and inflated at 12 atm pressure to open its ostium (Figure 4A, B, and C). D1 balloon was removed

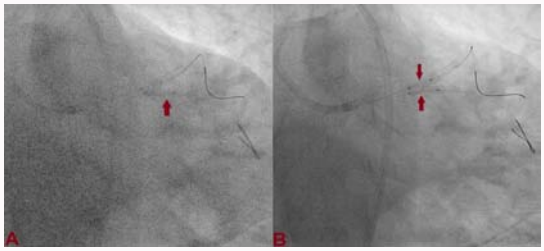

**Figure 5:** D1 balloon was removed and another 2.75 Sapphire NC balloon was placed into D1 (A), Final KBI was performed at 12 atm pressure (B).

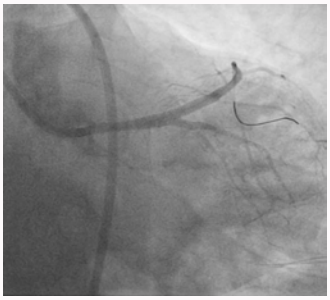

**Figure 6:** Post procedure showed TIMI III flow with well apposed stents in LAD and D1.

and another 2.75 Sapphire NC balloon was placed into D1 using the same manuover (Figure 5A). Final KBI was performed at 12 atm pressure (Figure 5B). Post procedure showed TIMI III flow with well apposed stents in LAD and D1 (Figure 6). He was discharged in stable condition with ticagrelor-180 mg, aspirin-75 mg, rosuvastatin-40 mg, metoprolol-100 mg, ramipril-10 mg, and gilbenclaimide-2 mg once daily. He is in regular follow up since then.

## Discussion

In true bifurcation stenting, KBI is final step in order to correct the stent deformation, and lower the restenosis and increase the rates of procedural success. However, KB is potentially difficult with a rate of success that varies between 64%-92% due to inability to advance the SB balloon across the Main Vessel (MV) stent structure [6]. On occasion the operator may not be able to regain access to the SB, which is associated with a suboptimal final result and worse outcome. The Balloon Anchoring Technique (BAT), first described by reported by Fujita et al., in 2003, was utilized to facilitate balloon/stent delivery across lesions in chronic total occlusion [7]. Dissection and acute occlusion are the potential complications at the site of balloon anchoring as a result of occlusion [8]. In anchoring balloon technique, the noncompliant balloon is inflated in the anchored zone where the intima is covered and protected by the stent, thereby negating any risk of dissection and injury even when balloon is inflated at higher inflation pressure (12-14 atm). Few things should be taken into consideration that anchoring balloon should be inflated just distal to distal edge of side branch stent in order to make movement of side branch balloon unhindered. Secondly, a short, noncompliant balloon is recommended because it is easy to position and covered by the stent. Finally, inflation time of anchoring balloon should be kept as minimum as possible in order to avoid ischaemia. Also, one should not inflate the balloon beyond the stent as it may lead to endothelial denudation, plaque rupture, and most importantly, dissection and acute occlusion could occur at the site of balloon inflation.

Carina, plaque shift, and presence of stent struts in the ostium are mainly responsible for impairing the delivery of balloon to side branch ostium during bifurcation intervention. Initially, one should attempt with low profile balloons in order to open the strut at the ostium of side branch, so that KBI could be performed with an appropriately sized balloon. Briguori et al., have reported use of dedicated glider balloon for recrossing stent struts when conventional low profile balloons fail [9]. The advantage with anchoring balloon technique is that no additional equipment is needed, and at the same time, KBI can be performed by using the same balloon. Therefore, this shortens the total procedural time as well as radiation exposure. In addition, if BAT fails, one can do KBI using a glider balloon. This technique may be more effective in cases of mini crush stenting as one need to cross three layers of struts covering the SB ostium to either during rewiring or during passage of balloon for KBI. As BAT gives more anchorage and stability to guide catheter, it will facilitate movement of balloon into SB. However the true incidence of coronary artery dissection is likely to be underestimated only on angiography, Therefore, intravascular ultrasound and optical coherence tomography would be more reliable. This case indicated that BAT is a safe and effective balloon delivery strategy for recrossing stent struts when conventional; low profile balloons fail for KBI.

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