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EC CARDIOLOGY
Case Series

A Novel, Simple and Cost-Free Technique for Increasing the Support of the Guiding Catheter for Crossing Challenging Lesions: 'Supportwire'

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Received: May 16, 2019; **Published:** June 20, 2019

Abstract

The support of the guiding catheters may not be enough to allow to pass the balloons and stents across the challenging lesions. To increase this support many well-known techniques are being utilized. Before using these techniques, I used 0.035 or 0.038" guidewires in the guiding catheters in order to achieve optimal support by increasing the stiffness of the guiding catheter. With this novel, simple and cost-free technique, I could successfully passed the balloons and stents across the challenging lesions. Apart from three case reports described, this technique has been used several times in other cases with a favourable success rate without any complications.

Keywords: *Percutaneous Coronary Intervention; Guidewire; Stents; Balloon Angioplasty; New Technique; Guiding Catheter; Challenging Lesions*

Abbreviations

Ao-S-LAD: Aortosaphenous Vein Graft to the Left Anterior Descending Artery; Ao-S-RCA: Aortosaphenous Vein Graft to the Right Coronary Artery; CTO: Chronic Total Occlusion; DES: Drug Eluting Stent; GC: Guiding Catheter; JL: Judkins Left; LAD: Left Anterior Descending Artery; LCx: Left Circumflex Artery; LMCA: Left Main Coronary Artery; PCI: Percutaneous Coronary Intervention ; RCA: Right Coronary Artery

Introduction

At the balloons or stents crossing the challenging lesions, the support of the guiding catheter (GC) is very important [1]. To increase this support many techniques such as deep intubation of the GC [1,2], changing it with a larger and/or different curved GC [1,7-9], extra support wire or buddy wire use [1,3,8,9], anchor wire or balloon in a proximal side branch [4,10], distal anchor balloon technique [5] and the use of mother and child systems [6,7] are being utilized. Apart from these techniques, I describe 3 cases of challenging lesions which were successfully crossed with balloons and/or stents, using a novel, simple and effective technique that increases the support of GC.

Case 1

A 72 year-old diabetic female patient was transported to our clinic because of acute coronary syndrome with intractable resting angina despite the use of medications. The patient had had coronary artery bypass surgery seven years ago, with an aortosaphenous vein graft to the left anterior descending artery (LAD) (Ao-S-LAD) and an aortosaphenous vein graft to the right coronary artery (RCA) (Ao-S-RCA). ECG revealed sinus rhythm, RBBB and ST segment depressions in V4-V6 derivations. Coronary angiography via the right femoral artery revealed patent Ao-S-LAD and Ao-S-RCA, an occluded RCA in the mid portion, osteal 90% stenosis of the left main coronary artery

(LMCA), calcific diffuse 75% stenosis in the proximal portion of the left circumflex artery (LCx) and osteal occlusion of the LAD (Figure 1A). Percutaneous coronary intervention (PCI) to the LMCA and LCx was decided and a 7 Fr EBU Launcher® guiding catheter (Medtronic, Minneapolis, MN) was used to intubate the LMCA. A BMW Universal guidewire (Abbott Vascular, Santa Clara, CA) was inserted into the distal LCx. The LMCA was predilated with a 3.0-14 mm balloon. However, severe stenosis in the LCx could not be passed with a 2.0-15 mm balloon, at which time we didn't have a smaller one. *As already the balloon was in the coronary artery*, to increase the support of the GC, a J curved 150 cm length, 0.038" guidewire (which is always used to guide the catheters to the ascending aorta and aortic branches) was inserted into the GC and transported to a point which the tip is 25 mm away from the distal ostium of the GC. At this time , with the help of the stiffened GC, the balloon could be passed through the lesion and predilatations were performed with 2.0-2.75 mm width balloons. After aggressive dilatations and no angiographic remarkable stenosis, I tried to implant a 2.75-38 mm drug eluting stent (DES) Xience (Abbott Vascular) into the LCx but couldn't be able to pass the LCx lesion because of the lesion with some calcific plaque, tortuosity and the longness of the stent. To use the same technique, *as the stent was in the coronary artery*, the 0.038" guidewire was inserted into the GC similarly, and the stent could be passed through the lesion and implanted (Figure 1B). After implanting another 3.5-18 mm Xience stent from the osteal LMCA to the LCx and postdilatations, the final result showed wide patency (Figure 1C).

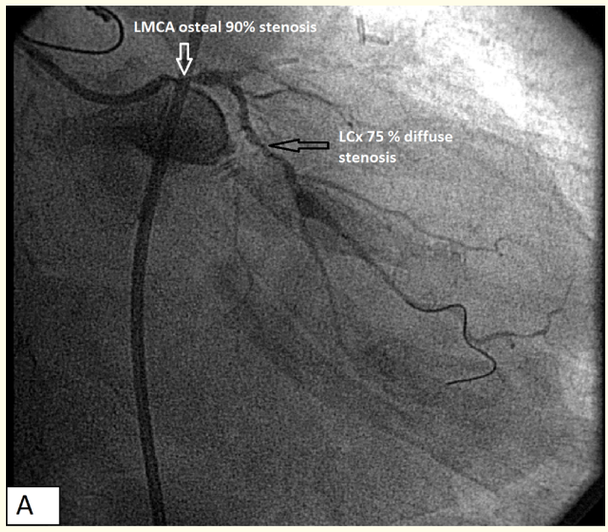

Figure 1A: *The left main coronary artery (LMCA) has 90% osteal stenosis and left circumflex artery (LCx) has diffuse 75% stenosis and some tortuosity.*

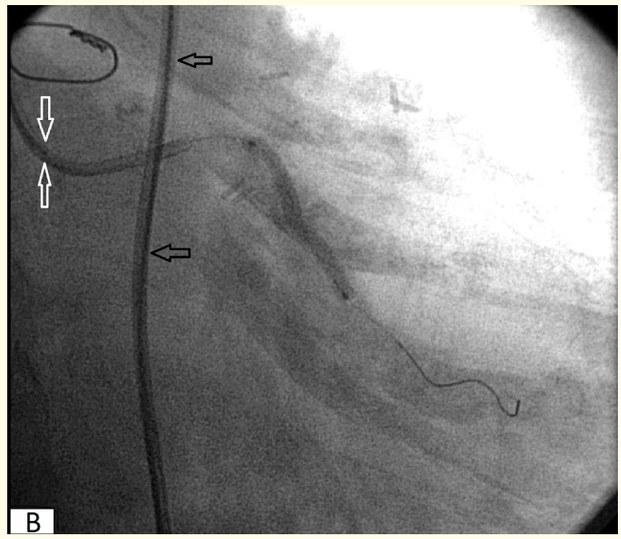

Figure 1B: *The stent could be passed and inflated in the left circumflex artery with the help of the 0.038'' guidewire 'Supportwire', which is seen in the ascending guiding catheter (black arrows). The tip of the 'Supportwire' is seen 25 mm away from the guiding catheter tip (white arrows).*

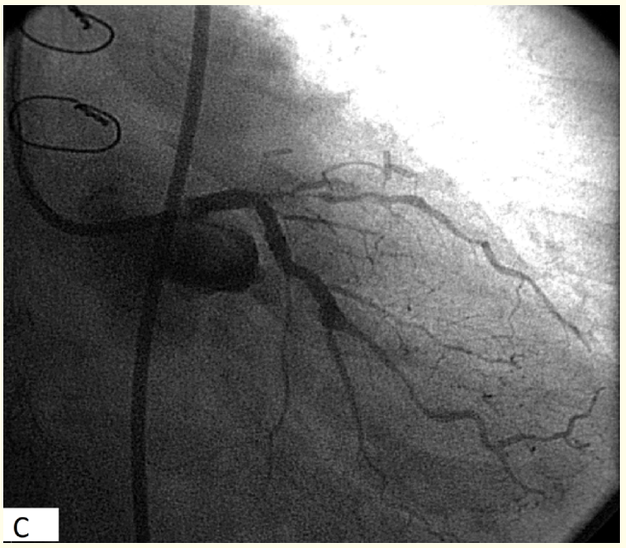

Figure 1C: *After the left main coronary artery stenting and postdilatations, the final result exhibited wide patency.*

Case 2

A 59 year-old male patient who had been diagnosed as acute inferior myocardial infarction and given thrombolytic therapy was transported to our clinic for rescue PCI, because of the persistent ST segment elevation and ongoing pain. Sinus rhythm, Q wave and 1 mm ST elevations in D2-D3-aVF derivations were detected in ECG. Coronary angiography via the right radial artery route revealed the LCx distal occlusion (Figure 2A) and no severe lesions in the LAD and RCA. A 6 Fr EBU 3,5 Launcher® (Medtronic, Minneapolis, MN) was used as the guiding catheter. To our surprise, a BMW guidewire (Abbott Vascular, Santa Clara, CA) couldn't be passed through the lesion. A 0.014 Intermediate guidewire (Asahi, Nagoya, Japan) was able to pass, but a 1.5-12 mm balloon couldn't be passed through the lesion because of the weak support of the GC due to the radial route and severity of the lesion. *Without moving the balloon in the coronary artery*, a J curved 0.035" guidewire was inserted into the GC and advanced until the distal tip is positioned 25 mm away from the distal ostium of the GC. At this time the lesion could be passed with the balloon and predilated (Figure 2B). However, 2.25 - 28 mm Xience (Abbott Vascular) couldn't be passed through the lesion again despite multiple predilatations. 0.035" guidewire was again used as above, which also provided the stent to pass the lesion. After stent implantation and postdilatations, the final result showed good patency (Figure 2C).

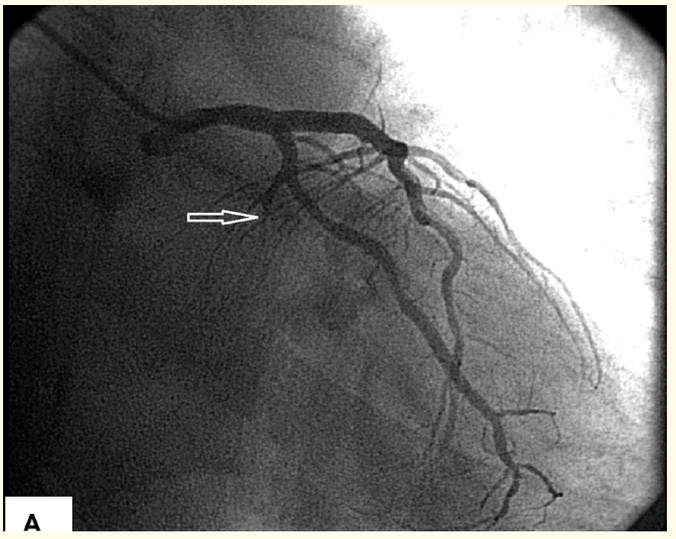

Figure 2A: *Occlusion of the distal left circumflex artery (arrow).*

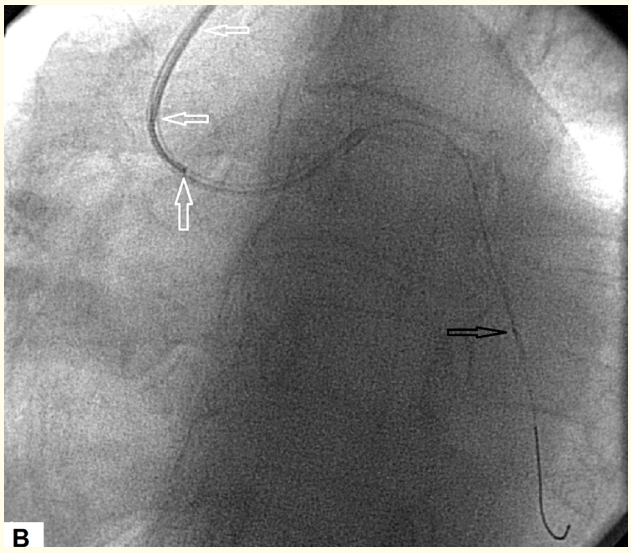

Figure 2B: *The balloon could be passed through the lesion (black arrow) with the help of the 0.035'' guidewire 'Supportwire', which is seen in the guiding catheter (white arrows). The tip of the 'Supportwire' is seen 25 mm away from the guiding catheter tip.*

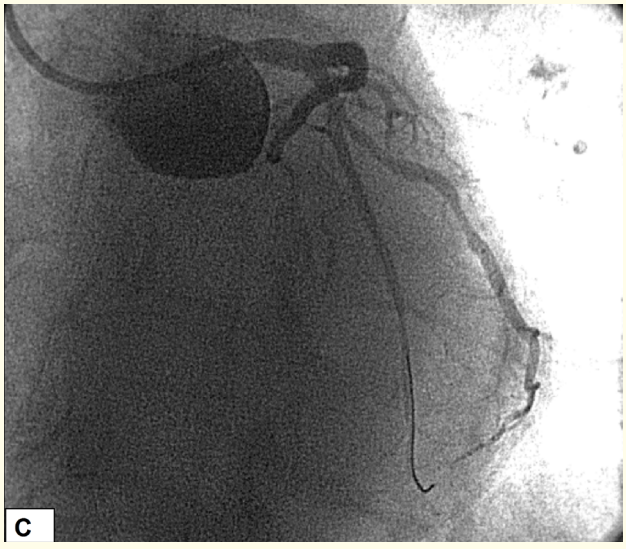

Figure 2C: *After stenting, the final result exhibited good patency.*

Case 3

69 year-old male diabetic, hemodialysis patient diagnosed as unstable angina pectoris was sent to our center for coronary angiography. Atrial fibrillation and nonspecific ST-T abnormalities were detected in ECG. Coronary angiography via right femoral artery revealed severe

long stenosis from the proximal to the distal LAD and chronic total occlusion (CTO) in the middle part of the RCA which had antegrade flow by collaterals (Figure 3A). The LMCA and LCx were normal. The patient rejected coronary artery bypass surgery and accepted PCI for the lesions. After the LAD was stented with two long DESs successfully, a 6F JR4 guiding catheter was used to intubate the RCA. An Intermediate guidewire (Asahi, Nagoya, Japan) was able to pass the lesion, but a 1.5 - 12 mm balloon couldn't be passed through the lesion despite deep intubation of the GC which was getting out of the RCA into the aorta at the attempts to pass the lesion with the balloon. I decided to apply the same technique, *as the balloon was in the coronary artery*,a J curved 0.035" guidewire was inserted into the GC which was deep seated into the RCA. 0.035" guidewire was positioned 15 mm away from the ostium of the GC (so 5-10 mm in the RCA) At that time, the balloon could be passed through the lesion with the observation of no movement of the stiffened GC (Figure 3B). After predilatations, a Xience (Abbott Vascular) stent implantation and postdilatations, the final result showed good patency (Figure 3C).

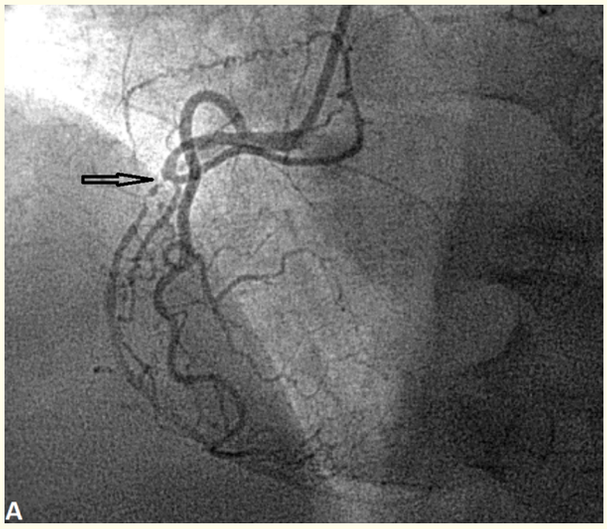

Figure 3A: *Total occlusion of the right coronary artery with ipsilateral collateral filling. The occlusion site is seen (arrow).*

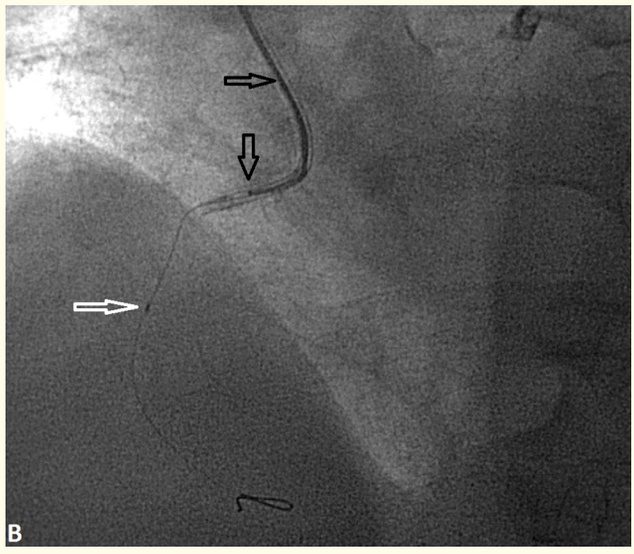

Figure 3B: *The balloon (white arrow) could be passed through the total occlusion after 0.035'' guidewire 'Supportwire' was inserted in the deep seating guiding catheter (black arrows). Note that the tip of the 'Supportwire' is 15 mm away from the tip of the catheter.*

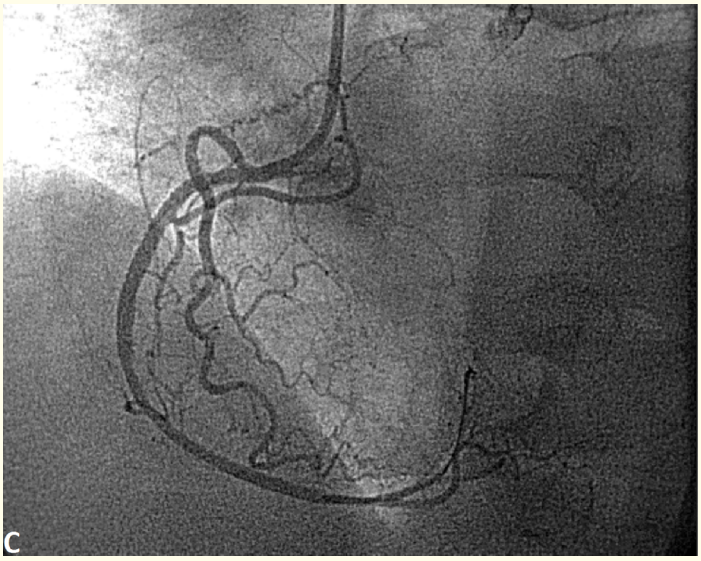

Figure 3C: *After stenting, the final result showed good patency.*

Discussion

At the balloons or stents crossing the challenging lesions, not only the guiding catheter must be coaxial, but also the support of the guiding catheter should be optimal [1]. To increase this support, many techniques such as deep intubation of the GC, changing it with a larger and/or different curved GC, extra support wire or buddy wire use, anchor wire or balloon in a proximal side branch, distal anchor balloon technique, the use of mother and child systems including Heartrail "five-in-six" catheter system (Terumo, Japan), GuideLiner, Trapliner (Vascular Solutions, Inc.) or Guidezilla (Boston Scientific, Inc.) catheters are being utilized [1-10]. Despite being very effective, all of these techniques need additional costs, some of them may be time-consuming and also the risk of extra problems and complications may increase with some of these techniques. For example, changing the GC with a different one could cause to lose the guidewire position, deep intubation of any GC or use of Amplatz tip GCs may cause coronary ostial and/or aortic dissections, buddy wires can cause tangling of the two wires and anchoring balloon techniques may also cause coronary dissections.

During coronary angiography or PCI procedure, every interventional cardiologist use J curved, 0.035 or 0.038" guidewires (usually 150-180 cm length) for guiding diagnostic catheters or GCs to reach the coronary or bypass ostiums. As shown in these 3 cases, by simply inserting these 0.035 or 0.038" guidewires, 'Supportwire', into the guiding catheter near the distal ostium of the GC, the stiffness and so the support of the GC were increased that provided the balloons and/ or stents to cross the challenging lesions. In case 1, the severity of the lesion, calcification and some tortuosity in the middle LCx was challenging, and the balloon couldn't be passed. 0.038" guidewire not only provided the balloon to pass, but also provided the long stent (38 mm) to pass the calcific and tortuous lesion although there wasn't any remarkable angiographic stenosis after aggressive multiple balloons predilatations, by increasing the support of the guiding catheter (Figure 1B and Figure 1C). In case 2, the right radial artery was used. It is well known that the support of the GCs via the radial artery, especially the right, is weaker than the femoral artery route. Apart from the weakness of the GC, although it was an extra back-up catheter, the lesion in this patient was very severe that couldn't be passed even with a 1.5 -12 mm balloon. However, again, by simply inserting

"Supportwire" into the GC, the balloon and thereafter the stent could be passed. In case 3, CTO was present, which are the lesions that need extra-support to pass especially the balloons [4]. 'Supportwire' provided enough extra-support to pass the CTO in this patient. As shown in this case 'Supportwire' can also be used *in addition to* the deep seating catheter maneuver when this maneuver fails (Figure 2B). Finally, in these three cases and also all the other patients I used this technique, no complications were seen.

However, when using this technique, there are some important points and limitations according to my opinions and experiences. First, the tip of the 0.035 or 0.038" guidewire should be positioned *at least 15 mm away* from the ostium of the GC and great care should be taken to the tip of the GC to avoid to touch or go in and so dissect or perforate the coronary artery. Second, 0.035 or 0.038" guidewire should be inserted into the GC *after* the balloon or stent is put in the coronary artery. Otherwise, not only the balloon and the stent passing is difficult, but also stent may be deformed. Fundamentally in practice, when the balloon or stent could not be passed, the operator leaves it in the coronary artery and simply inserts the "Supportwire" into the GC and tries to pass the lesion again with the balloon or stent as shown in these three cases. Third, in cases 1 and 2, extra backup guiding catheters (Medtronic, Minneapolis, MN) were used for left coronary artery lesions. If Judkins left (JL) guiding catheters are being used, during pushing forward 0.035 or 0.038" guidewire to the secondary and primary curves, the angles of the secondary and primary curves may be widened which can spoil the coaxiality of the JL guiding catheter. To avoid this, the coaxiality of the GC should be continuously monitorized when pushing forward the 0.035 or 0.038" guidewire beyond the tertiary curve. Fourth and finally, *at least 6 Fr* guiding catheter is required for this technique and 0.035" guidewire could be used for 6 Fr and both 0.035" or 0.038" guidewires could be used for 7 or 8 Fr guiding catheters. 0.038" guidewire could be difficult, if not impossible, to advance in 6 Fr guiding catheters when there is stent catheter in the guiding catheter, because maximum stent shaft outer diameters are between 0.033-0.037", so 0.038" + 0.033-0037" would be 0.071-0.075" which might marginally accomodate or exceed the inner diameter of 6 Fr guiding catheters of 0.070-0.072" [11]. However, 0.038" guidewires can be used as "Supportwire" for small balloons (1,5-2 mm) crossing in 6 FR guiding catheters.

Conclusion

To increase the support of the guiding catheter for crossing balloons and stents through challenging lesions, the use of 0,035 or 0.038" guidewires, 'Supportwire', in the guiding catheter is a simple, effective, cost and risk free technique. I suggest this new technique might be tried *before* using other well-known time-consuming, needing additional cost and complication risk-increasing techniques.

Conflict of Interest

The author reports no financial relationships or conflicts of interest regarding the content herein.

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Volume 6 Issue 7 July 2019