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Case Report

Rewiring to the dissected branch along the jailed balloon (Real JAB technique)-A novel rewiring technique for the dissected branch in bifurcation lesion-case report

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ABSTRACT

Guidewire recrossing into the branch through the stent strut is difficult when that branch was injured or occluded after stenting in the true bifurcation lesion. A 72-year-old man with chronic total occlusion in both mid-left anterior descending coronary artery (LAD) and 2nd diagonal branch (D) was admitted to our hospital. We put a 2.25 × 38 mm drug-eluting stent from the LAD to the *D* with culotte stenting. However, the LAD occluded after stenting. Although we tried to recross, it was impossible because the guidewire migrated subintimal space which was caused by guidewire manipulation. So, we advanced a 2.25 mm balloon catheter on the 1st guidewire which had already been placed outside of the stent in the LAD, and inflated it at bifurcation to compress the subintimal space. Subsequently, we advanced another guidewire through the strut along the surface of the balloon catheter. Immediately after the deflation of the balloon, the guidewire slipped into the distal LAD without resistance. Large branch occlusion after stenting is a serious complication in true bifurcation treatment. Our new bailout technique is effective for recrossing a guidewire into the dissected branch to preserve it.

<**Learning objective:** In the treatment of bifurcation, the dissection at the branch ostium is a major cause of rewiring failure or periprocedural myocardial infarction. The Real JAB (Rewiring to the dissected branch along the jailed balloon) technique is a useful technique to re-cross the wire into the dissected branch. The principle of this technique is to occupy subintimal space with dilated jailed balloon that is used as navigator of guide wire into distal true lumen.>

Introduction

Any branch compromise is a serious complication that occurs after pre-dilatation or stent implantation in the treatment of a true bifurcation lesion [1–3]. Once it occurs, it is a difficult to solve situation in most cases. Therefore, we must utilize ingenious techniques to resolve this procedural challenge. We introduce a novel technique to recross the guidewire adequately into the dissected branch, named Rewiring to the dissected branch along the jailed balloon (Real JAB) technique.

Case report

A 72-year-old man with dyslipidemia, peripheral artery disease, and chronic kidney disease was admitted to our hospital in May 2019. As he suffered Canadian Cardiovascular Society Class III angina, we performed coronary angiography (CA) examination. The CA revealed severe stenosis in the proximal right coronary artery (RCA) (Fig. 1A), and a chronic total occlusion (CTO) in the mid-left anterior descending coronary artery (LAD) involving a diagonal branch (D) (Fig. 1C). We favored coronary revascularization therapy for this patient because his left ventricular wall motion was proven normal with echocardiography. As the patient refused surgical therapy, we decided to treat this patient with percutaneous coronary intervention (PCI).

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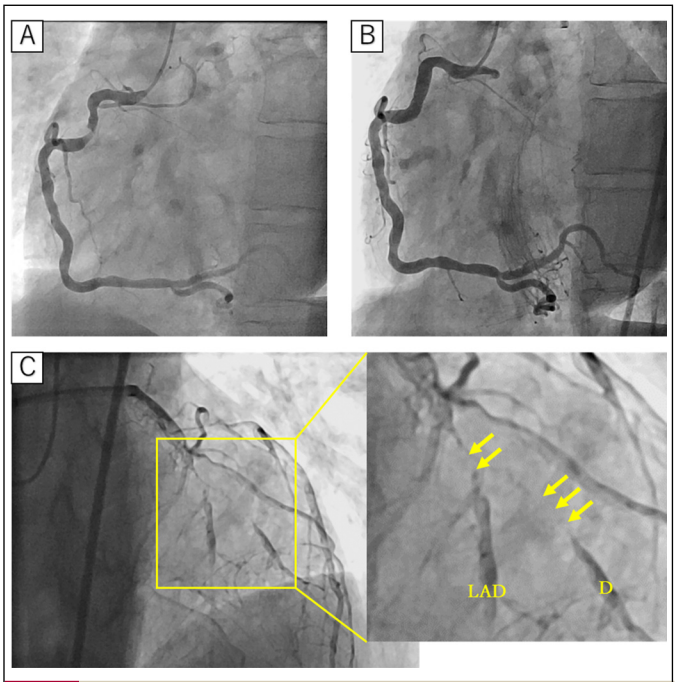

Fig. 1. (A) Basal angiography shows significant stenosis in the proximal part of the right coronary artery. (B) Angiogram after treatment with a drug-eluting stent. (C) Basal angiogram in the cranial view. Chronic total occlusion begins from the mid anterior descending artery (LAD) to the bifurcation of the 2nd diagonal branch (D) (arrow).

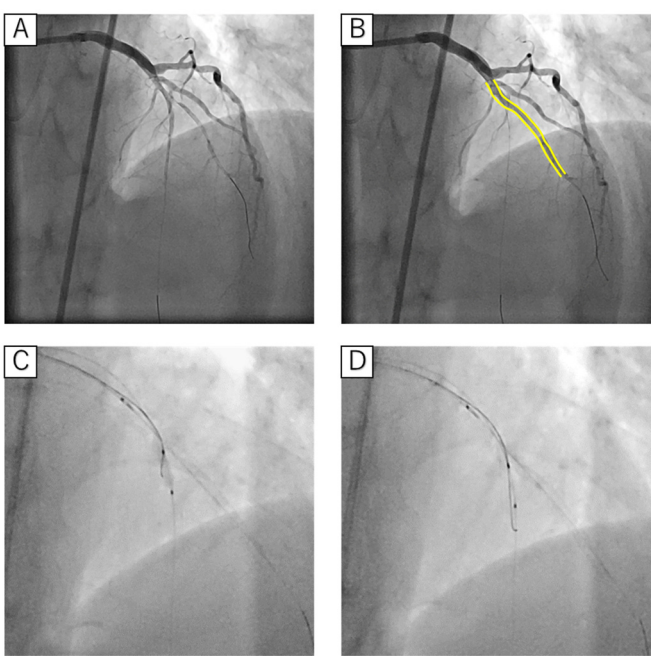

Fig. 2. (A) After kissing balloon inflation in both branches. Significant stenosis remains at the proximal part of the *D*. (B) After implantation of a drug-eluting stent from the mid LAD to the *D*, the LAD completely occluded at the bifurcation. (C) Another guidewire was advanced through the stent strut along the surface of the dilated balloon. (D) Immediately after the deflation of the balloon, the guidewire slipped into the distal LAD. **LAD,** left anterior descending artery; *D*, diagonal branch.

PCI was performed for the RCA with a drug-eluting stent (DES) in June 2019 (Fig. 1B). Even with optimal medical therapy after revascularization of the RCA, the patient was still symptomatic. Therefore, the CTO in the LAD and D was treated in July. We started with a Fielder XT-R guidewire with the support of a Caravel MC microcatheter (both Asahi Intecc Co., Aichi, Japan). They were advanced into the CTO in the LAD antegradely but failed to pass. Subsequently, we escalated the stiffness of the guidewire and a Gaia Next 1 (Asahi Intecc Co.) finally crossed the CTO lesion in the LAD. Consecutively, a Gaia Next 2 (Asahi Intecc Co.) was passed through the D by using the Slipstream technique [4]. Both branches were dilated with kissing balloon inflation (KBI) with non-compliant balloons to prevent the side branch (SB) compromise. As severe stenosis remained in the D after the KBI (Fig. 2A), we planned to apply culotte stenting for this lesion. To avoid the deformation of the stent in the main branch (MB) as much as possible, we deployed a 2.25 × 38 mm DES from the LAD to D first. After implantation of the DES, the LAD completely occluded (Fig. 2B). We tried to penetrate this lesion with another Fielder XT-R through a stent strut. However, the guidewire repeatedly migrated into the subintimal space that was created by multiple wiring attempts. Although we tried intravascular ultrasound (IVUS)-guided wiring to enter the true lumen, it was difficult because the guidewire interfered with both the IVUS catheter and the stent strut. In addition, compression of the true lumen by the growing subintimal space also seemed to be an important reason why the guidewire did not recross it. Therefore, we conceived a novel solution to advance the guidewire into the distal true lumen by closing the subintimal space. We tried to advance a 2.25 × 10 mm balloon catheter over the 1st guidewire, which already was placed outside the stent in the LAD. Although we felt some resistance between the stent and vessel wall when we advanced the balloon catheter, it was possible to wedge the balloon catheter in place by using the anchor balloon which was

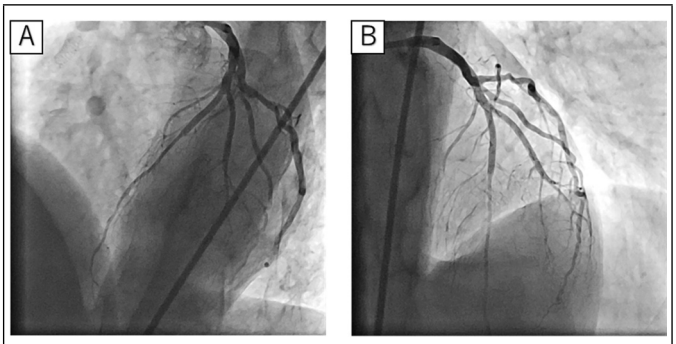

Fig. 3. The final angiogram after culotte stenting showed excellent results. (A) Left anterior oblique cranial view. (B) Cranial view.

placed in the stent of the *D* with nominal pressure. We advanced the balloon up to the bifurcation and inflated it to compress the subintimal space. Because we wanted to compress dissected space as much as possible, the balloon was placed slightly overlapping the stent and inflated at low pressure to minimize stent deformation. Then we inserted the Gaia next 2 guidewire through the stent struts along the surface of the balloon catheter, resembling the “reverse controlled antegrade and retrograde tracking (CART)” technique [5] (Fig. 3C). Immediately after the deflation of the balloon, the guidewire slipped into the distal LAD without resistance (Fig. 3D). After that, both branches were dilated with the NC balloon simultaneously and a 2.5 × 28 mm DES was implanted in the LAD.

A final angiogram after the KBI showed an excellent result (Fig. 3A,B). The patient remained asymptomatic at one-year follow-up.

Discussion

Coronary bifurcation lesions account for 15–20% of PCI cases and still now, they impose a challenge in having positive procedural or clinical outcomes [2,3]. As “keep it open” is a common rule [2] for the SB treatment, aggressive intervention of the SB must be avoided. If the SB has a severe lesion and SB compromise is likely to happen with the treatment of a bifurcation, we need to apply some type of SB wiring strategy before treating the MB.

In several available techniques for SB protection, the jailing wire technique is the most basic strategy [2,3]. Jailed balloon or jailed Corsair techniques are also effective for SB preservation [6,7]. However, even if we used these techniques, the risk of SB occlusion and recrossing failure into the SB after main branch stenting remains. Balloon dilation would be the last remaining method when SB compromise occurred. However, pre-dilatation of the SB to keep its patency also causes SB dissection in a true bifurcation lesion [2]. SB dissection, especially at the SB ostium, is a major cause of the SB recrossing failure or periprocedural myocardial infarction [2,3,8]. Once it happened, the guidewire for recrossing into the SB migrates easily into the dissected space. Moreover, as this space often becomes gradually larger by repeated wiring, it will be even more troublesome to make the guidewire get through the lesion.

The Real JAB technique is helpful in these types of wiring challenges. The basic principle of this technique is to navigate the guidewire into the true lumen by compression of the subintimal space with a dilated balloon and direct the guidewire into the distal true lumen by using a similar technique with reverse CART [5]. The advantage of this technique is to increase the probability to enter the true lumen in the dissected SB, even if the SB dissection is large.

More often than not, this technique will be applied for SB salvage. This is also useful to resolve the MB occlusion after stenting in the SB like this case. Although the patient’s hemodynamic status was stable during this procedure, because this lesion was a CTO, it is better to leave the balloon at the bifurcation in advance, if the SB loss is thought to introduce a critical situation. As our new technique is simple, it will be useful to recross the guidewire into SB in the treatment of bifurcation lesion regardless of any type of stent technique. Moreover, it will be more user-friendly when it is incorporated with the original jailed balloon technique.

There are some challenges with this technique that need to be addressed. Firstly, there may be some risks of the stent deformation or balloon entrapment since the balloon size is selected according to the SB diameter if the SB diameter is considerably large. In this case, we chose the 2.25 mm balloon. If the balloon is too small, the subintimal space cannot be compressed, and if it is too large, the stent will be deformed. To overcome this technical challenge, the latest generation balloon catheter should be used as they can be removed smoothly because of their better crossing profile. Secondly, in the case in which the stent length of proximal MB is long (more than 10 mm), it may be difficult to advance the balloon catheter between the vessel wall and stent. Applying the balloon anchor technique to advance it, or using the original jailed balloon technique will be helpful in such situations.

In conclusion, the Real JAB technique is a rational strategy to recross the guidewire into the dissected SB effectively. This will be a helpful approach for a reliable and safe way to rescue and preserve the dissected SB in the treatment of true bifurcation lesions.

Declaration of Competing Interest

The authors have no conflict of interest.

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