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Case Report

Retrograde parallel wire technique using a dual lumen catheter can be useful for percutaneous coronary intervention with chronic total occlusion

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ABSTRACT

The patient was a 61-year-old male with chronic total occlusion (CTO) of the right coronary artery (RCA). We performed percutaneous coronary intervention (PCI) to RCA-CTO with the bidirectional approach via the left anterior descending artery. In retrograde approach, the first wire entered the false lumen at the segment of severe stenosis of the CTO distal site. We performed parallel wire technique using a dual lumen catheter to avoid branch loss and succeeded to get the proximal true lumen through the second wire. When the first wire enters the false lumen, continued advancement of this wire easily should be avoided as it can collapse the true lumen and make reentry difficult. On top of that, in retrograde approach, it is difficult to perform parallel wire technique without using a dual lumen catheter. This case reveals that retrograde parallel wire technique using a dual lumen catheter is an extremely effective strategy to treat CTO.

<**Learning objective:** The dual lumen catheter is one of the most helpful devices. However, in the field of percutaneous coronary intervention for chronic total occlusion (CTO-PCI), especially retrograde approach, the usage of them has not been established. Retrograde parallel wire technique using a dual lumen catheter may be useful for CTO-PCI.>

Introduction

Percutaneous coronary intervention for chronic total occlusion (CTO-PCI) remains one of the most challenging areas in interventional cardiology. New devices (guidewires, micro-catheters) and extraordinary technical advancement have increased the success rate of CTO-PCI [1–4]. Above all, the development of the dual lumen catheter and establishment of new usage was innovative. At first, the dual lumen catheter was designed with the express purpose of managing bifurcation lesions [5,6]. Nowadays, it has been used not only for bifurcation lesions but also CTO lesions. But, there are few reports about the usage of a dual lumen catheter in the CTO-PCI. Here, we report the case of a CTO-PCI that was successfully treated with retrograde parallel wire technique using a dual lumen catheter.

Case report

A 61-year-old male was diagnosed with unstable angina pectoris (UAP) at another hospital several months previously. Emergent coronary angiography (CAG) showed the right coronary artery (RCA) had totally occluded and the left coronary artery (LCA) had a severe stenotic lesion in the proximal left circumflex artery (LCX) and left anterior descending artery (LAD). The causative lesion of UAP was judged as LCX, and two zotarolimus-eluting stents (ZES) were implanted there at the same time. One month later, another ZES was implanted in the LAD. And then he was referred to our hospital for PCI to RCA-CTO.

CAG at the previous hospital revealed the RCA was totally occluded at the ostium just after branching of the conus. We could detect the peripheral filling through the right superior septal perforator (RSSP) artery to right ventricular (RV) branch (Fig. 1A). LAD had collateral artery from the apex to the distal posterior descending artery (PD). Collaterals from the septal branch were undetectable actually (Fig. 1B).

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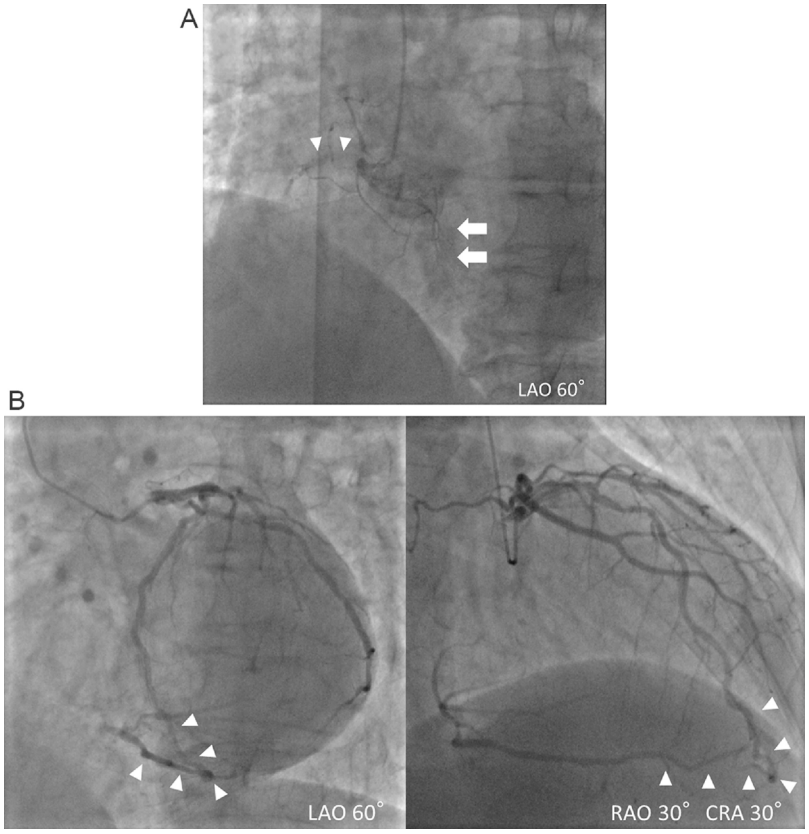

Fig. 1. CAG at previous hospital. (A) RCA was totally occluded at the ostium after branching the conus. White arrow heads indicate CTO lesion. White arrows indicate RSSP. (B) LAD had collateral artery from the apex to the distal PD (White arrow head). Collaterals from the septal branch were undetectable actually.
CAG, coronary angiography; RCA, right coronary artery; CTO, chronic total occlusion; RSSP, right superior septal perforator; LAD, left anterior descending artery; PD, posterior descending artery.

PCI was performed with bilateral femoral approach. An 8Fr Launcher JR4.0 SH guiding catheter (Medtronic Inc., Fridley, MN, USA) was inserted into the RCA, and an 8Fr Launcher EBU3.5 SH guiding catheter was inserted into the LCA. We performed simultaneous left and right CAG (Fig. 2A). However, the exit of CTO was unclear exactly. Initially, we tried antegrade approach, but could not deliver the intravascular ultrasound (IVUS) catheter and balloon catheter toward the conus branch. Therefore, we switched to retrograde approach. A SION guidewire (Asahi Intecc Co., Ltd., Aichi, Japan) with a Corsair micro-catheter (Asahi Intec) was introduced into the septal branch. Selective tip injection through the Corsair revealed a misty connection toward PD. A XT-R guidewire (Asahi Intecc) with the Corsair was successfully introduced into PD, and the Corsair was advanced into the PD. Tip injection through the Corsair from PD was performed, which confirmed that the exit of the CTO was a branching part of the RV and the distal part of CTO had a severe stenotic lesion (Fig. 2B). And then the guidewire was exchanged for the SION and advanced into the distal severe stenotic lesion. But, the SION entered the false lumen (Fig. 2C). So, we tried to perform the parallel wire technique [7] using a SASUKE dual lumen catheter (Asahi Intecc). The Corsair was exchanged for the SASUKE. It could be passed through the septal channel easily. The SION was left in place, and a SION black guidewire (Asahi Intecc) was passed parallel to the SION aiming for the proximal true lumen (Fig. 2D). The SION black was successfully introduced into the acute marginal branch (Fig. 2E). The SASUKE was exchanged for the Corsair again. It was passed through the distal severe stenotic lesion. The SION black was exchanged for the ULTIMATE bros3 guidewire (Asahi Intecc) and advanced retrograde into the CTO. Because the retrograde wire was not advanced into the proximal true lumen, a Gaia Next 2 guidewire (Asahi Intecc) with the Corsair was advanced antegrade toward the retrograde guidewire. And then reverse controlled antegrade and retrograde subintimal tracking (CART) technique [8] was performed with a 3.0 × 15 mm LAXA balloon (Goodman Co., Ltd., Aichi, Japan) (Fig. 2F). Finally, The SION black was successfully introduced into the proximal true lumen. The retrograde wire was advanced into the antegrade guiding catheter with the Corsair and exchanged for a 330 cm RG3 guidewire (Asahi Intecc). Wire externalization was then completely achieved.

Subsequently, the SION blue guide wire was introduced antegrade into the atrio-ventricular branch (AV) with the SASUKE. After pre-dilation, 4 biodegrable polymer-everolimus-eluting stents (SYNERGY) (3.0 × 24 mm, 3.0 × 28 mm, 2.75 × 38 mm, 2.5 × 38 mm) (Boston Scientific Inc., Natick, MA, USA) were deployed from the proximal to the distal RCA. Final coronary angiography revealed a good result (Fig. 3).

Discussion

Because of modern-era improvements in PCI techniques and devices, the technical and procedural success rates and long-term outcomes of CTO-PCI have significantly improved [1,2]. The introduction of the retrograde approach, especially the reverse CART technique, has contributed to the improved success rate of wire crossing [3,4]. In the PCI devices, one of the most useful devices was the dual lumen catheter. Dual lumen catheters are the type of micro-catheter that have both monorail lumen and over the wire (OTW) lumen. They allow the operator to deliver a second wire through the OTW lumen while leaving the guidewire in the

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