

“Tip-In” method: a novel, wire rendez-vous method in need of retrograde CTO PCI

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Background

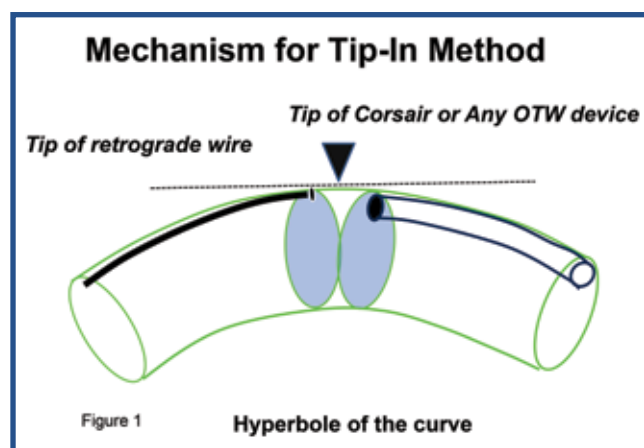
With an introduction of the Corsair microcatheter (Asahi Intecc, Japan), more epicardial collateral channels (CC) have become available in retrograde approach, increasing the chances for successful revascularization in CTO PCI. Once a retrograde wire crosses a CTO using reverse CART technique, advance the retrograde wire into the antegrade guide catheter, so that the wire is trapped inside the Guide to advance the retrograde Corsair or the microcatheter into the guide. When the tip of the microcatheter enters the guide, the retrograde wire can be replaced by a long “externalization” wire (either a Viper wire of 335 cm (Vascular Solution, USA) or a RG3 of 330 cm (Asahi Intecc, Japan) to thread through the Y connector of the antegrade guide. Subsequent procedure will be performed over the wire in an antegrade manner¹. Alternatively, one can advance the Corsair or other microcatheter over the retrograde wire until it reaches the antegrade guide in the aortic arch. Deliver the antegrade microcatheter to the retrograde microcatheter similar to the kissing technique. Wiring can be completed by threading an antegrade wire through the retrograde microcatheter and crossing the CTO (Rendezvous Method)².

There are, however, some limitations using either Externalization or Rendezvous Method. Most notably, both techniques require a retrograde microcatheter to reach the antegrade guide through CC and CTO.

This report represents 4 cases in which the retrograde guide wire entered the antegrade guide by reverse CART, but the Corsair could not cross through CC and/or CTO over the guide wire. A novel, but simple technique is to place an antegrade microcatheter at the aortic arch and deliver the retrograde wire into it. The antegrade microcatheter over the retrograde wire is advanced to cross the CTO and a softer floppy wire is placed once the Corsair or the micro catheter has reached a distal non-CTO segment. This is a modification of Rendezvous Method, in which one can switch retrograde wiring to antegrade microcatheter crossing without losing guide wire position. This new technique overcomes shortcomings of the contemporary retrograde recanalisation in need of “bail-out” situation.

Principle and application of the Method

This is a technique to deliver retrograde wire into the antegrade Corsair or the microcatheter in the curved segment of the antegrade guide after retrograde wire successfully entered the guide. One can confirm whether the retrograde wire is successfully introduced into the antegrade Corsair by advancing another wire through the Corsair and having both guide wires contact inside. Rotate the Corsair to advance over the retrograde wire antegrade, which then crosses the CTO and go beyond. After withdrawing the retrograde wire and delivering a soft workforce wire into the distal vessel, Corsair could be removed by a balloon trapping. The procedure can then finish as of any other current PCI. We name this technique “Tip-In” method.



Case 1

A 44-year-old male, who had been treated with two Cypher stents (Johnson and Johnson, Cordis) implantation of left anterior descending artery (LAD) (3.0mm x 28mm and 2.5mm x 23mm), was referred for Right coronary artery (RCA) CTO treatment. Final coronary angiography revealed Rentrop grade II collaterals from LAD and left circumflex artery (LCX). 6 month later, an attempt was made to recanalise CTO/RCA. Coronary angiography showed Rentrop grade II CC from right ventricular branch (RVB) to posterior descending artery (PD) of RCA (Figure 1-A, B). A Fielder XT guide wire (Asahi In-

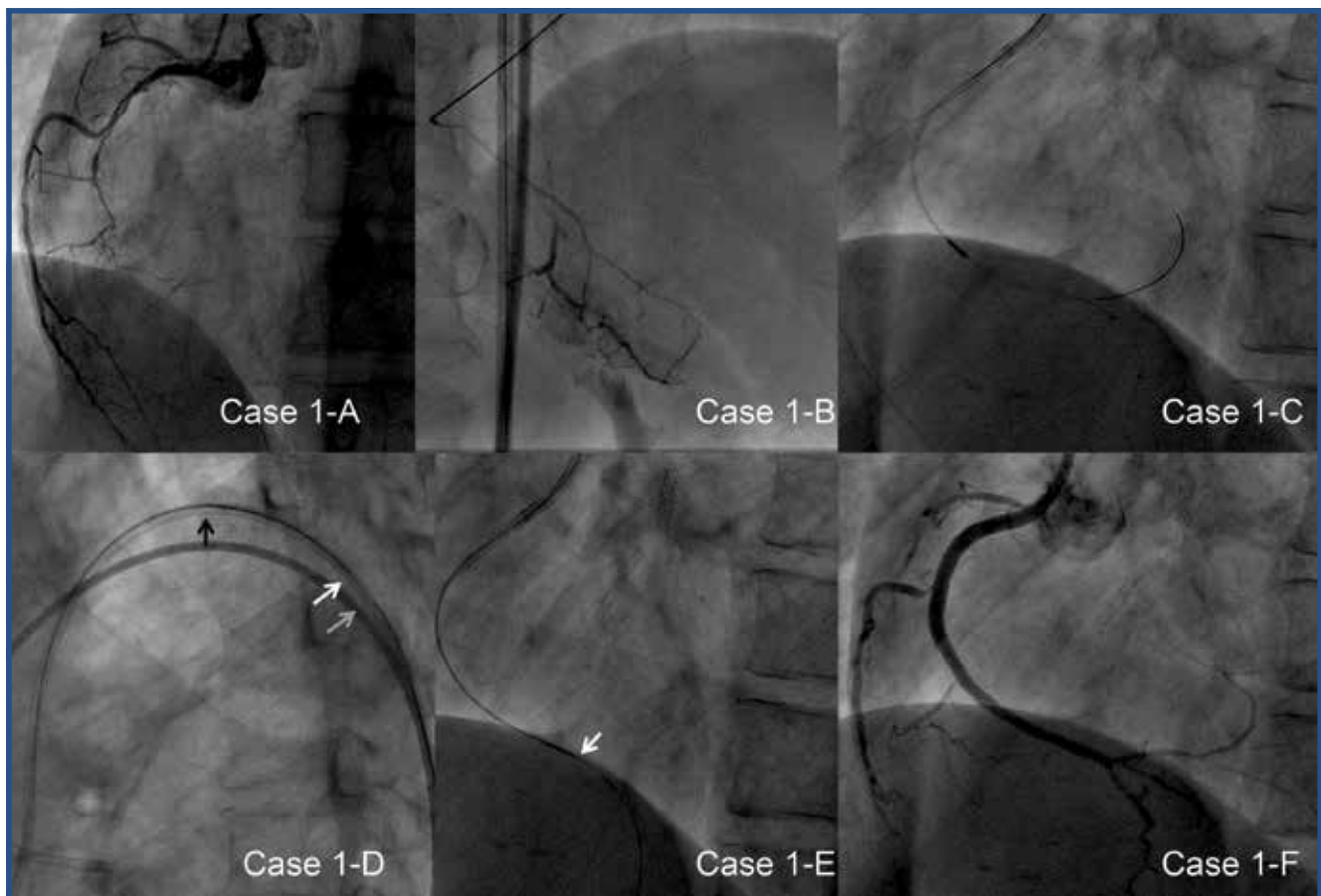


Figure 1. Once the retrograde wire into the antegrade guide, an antegrade microcatheter is advanced to the aortic arch (top of the curve) closer to the retrograde wire. The mechanical properties of wires or micro catheters tend to track the outer side of large curve inside the guide, where both can easily face each other in a straight line. Torque control of the wire allows the tip to enter the central lumen of the micro catheter (Figure 1).

tecc, Japan) and a Corsair were delivered to the distal RCA by antegrade, but the guide wire never reached the true lumen in the PDA. Retrograde approach from the RCA CC was then undertaken by Suoh wire (Asahi Intecc, Japan) over a Finecross microcatheter (Terumo, Japan). Eventually, a Fielder FC wire (Asahi Intecc, Japan) could cross the CC, but the Corsair failed to cross the CC due to its acute angle and tortuosity. Fortunately the Fielder FC guide wire successfully crossed the CTO into proximal true lumen by Reverse CART technique (Figure 1-C). Another Corsair was placed at the aortic arch and the retrograde Fielder FC was successfully introduced into it (Figure 1-D). The Corsair crossed the CTO over the retrograde wire (Figure 1-E) and a new soft floppy wire of Route (Asahi Intecc, Japan) was delivered into the Corsair and placed in the distal RCA after removal of the retrograde wire. The Corsair was then removed from the artery by a 2.5 mm balloon trapping method. Following the small-sized balloon dilation throughout the CTO, four Xience V stents (Abbott Vascular, USA) of a 2.5mm x 28mm, a 3.0 mm x 28mm, a 3.5mm x 28mm, and a 3.5mmX18mm were delivered and deployed. Angiography confirmed an excellent final result (Figure 1-F).

Case 2

A 63-year-old male was admitted to the hospital with ACS. Coronary angiography showed a 75-90% segmental disease of LAD, involving the proximal LAD diagonal branch and the total occlusion at the mid LAD. Rentrop grade III CC was noted from RCA via apical epicardial CC. Two Endeavor stents (Medtronic, USA) were delivered and deployed successfully without any complications, a 2.5mm x 24mm for the mid LAD to the diagonal branch as jailed for the CTO ostium and another 3.0mm x 18mm for the proximal LAD. 5 month later, CTO-PCI was attempted using epicardial CC from the PD of the RCA (Figure 2-A). A Fielder FC was advanced over a Corsair, which succeeded in crossing the CC to the distal LAD. Then a Confianza Pro 12 (Asahi Intecc, Japan) penetrated the previous stent struts at the mid LAD under IVUS-guidance (Figure 2-B). The retrograde wire was successfully introduced into the antegrade guide, where the retrograde Corsair couldn't cross because of possible stent-struts jail. Therefore, a guide wire externalization was not possible (Figure 2-C). Another Corsair was advanced to the aortic arch, where the retrograde wire succeeded in entering the Corsair (Figure 2-D), which crossed the CTO antegrade over the retrograde wire by simple back and forth rotation (Figure 2-E). After the CTO segment was dilated by balloon catheter, two DESs (a Xience V of 3.0mmx28mm at the distal of CTO and another

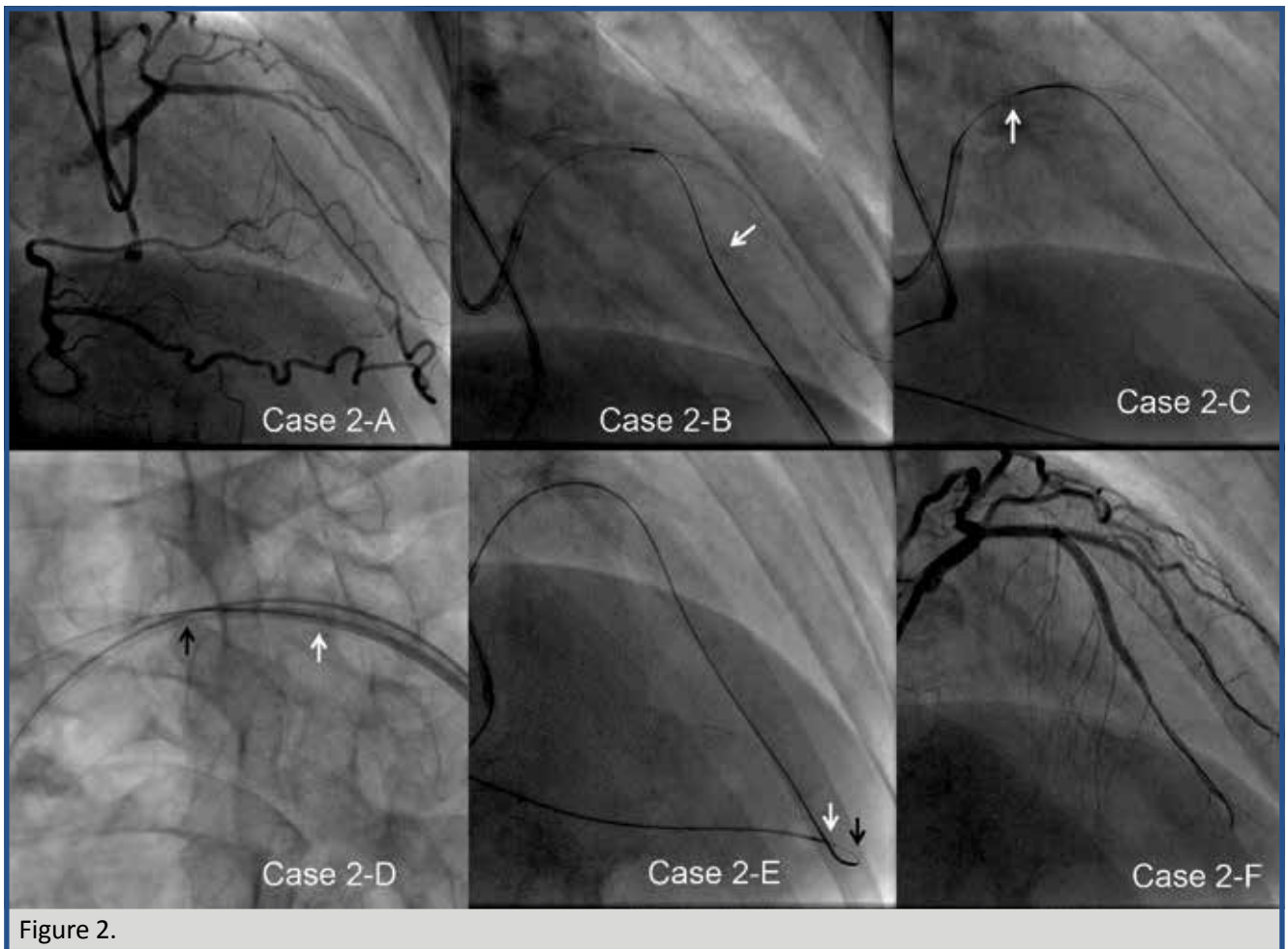


Figure 2.

3.0mmx18mm at the CTO) were implanted by culotte stenting, followed by KBT at 16 atm (Figure 2-F).

An excellent angiographic result was obtained.

Case 3

An 80-year-old male presented with low threshold angina and CAG disclosed a triple-vessel disease, including a CTO of the mid RCA (Figure 3-A). Rentrop grade II CCs were visualized from the septal branch near the LAD apex and ipsilateral bridging collaterals from the middle to the distal RCA (Figure 3-B, C). PCI was attempted after patient's decline to surgical option for treating CAD. After balloon dilatation of the LAD and LCX lesions, which were treated by V-stenting of the DES simultaneously, followed by KBT of a 3.5 mm and a 3.0 mm NC balloons. The RCA was engaged with a 7F SAL 1.0 SH (Launcher, USA). Since there was a poor target vessel beyond the CTO, an attempt to cross the CC was made from the LAD septal to the RCA, and a Fielder FC successfully crossed to the distal PDA (Figure 4-C). After a Corsair (150cm) advancement (Figure 3-D), a retrograde wire was successfully advanced to the antegrade guide by reverse CART (Figure 3-E, F). However, the Corsair could not cross the CC because of the strong resistance over the long CC, so another Corsair was advanced in the aortic arch in the guide and was able to receive a retrograde Fielder FC (Figure 3-G). The Corsair was then advanced over the wire and crossed the CTO (Figure 3-H). When it reached the distal RCA, the retrograde

wire was removed, an antegrade soft wire was placed over the Corsair, and the Corsair removed by a 2.5 mm balloon trapping. After 1.5mm and 2.0 mm balloon dilatation, 3 DESs were deployed (a 2.5mmx28mm, a 3.0mmx28mm, and a 3.5mmx28mm, respectively) and the procedure successfully terminated (Figure 3-I).

Modification of the technique inside a native coronary artery

Case 4

The case is a 57 year-old male with effort angina, and CAG demonstrated a high-grade calcified CTO in the proximal LAD with CC via the septal through the PDA/RCA and the epicardial cc through the LAD Diagonal (Figure 4-A,B). PCI attempt for the first time had failed due to inability to advance any device after successful wire crossing to the distal LAD.

The Second PCI attempt was made using an antegrade approach with a Gaia 1 wire (Asahi Intecc, Japan), which entered the distal true lumen without trouble (Figure 4-C). However, any device could not go through the CTO (those are a Corsair, a Finecross (Figure 4-D), and a Tornus Pro (2.1F) penetration microcatheter (Asahi Intecc, Japan) (Figure 4-E).

Also, neither a 1.0mm nor a 1.25mm balloon could go beyond the occlusion (Figure 4-F). A Sion black wire (Asahi Intecc, Japan) was tried through an epicardial CC between the intermediate and the LAD (Figure 4-G),

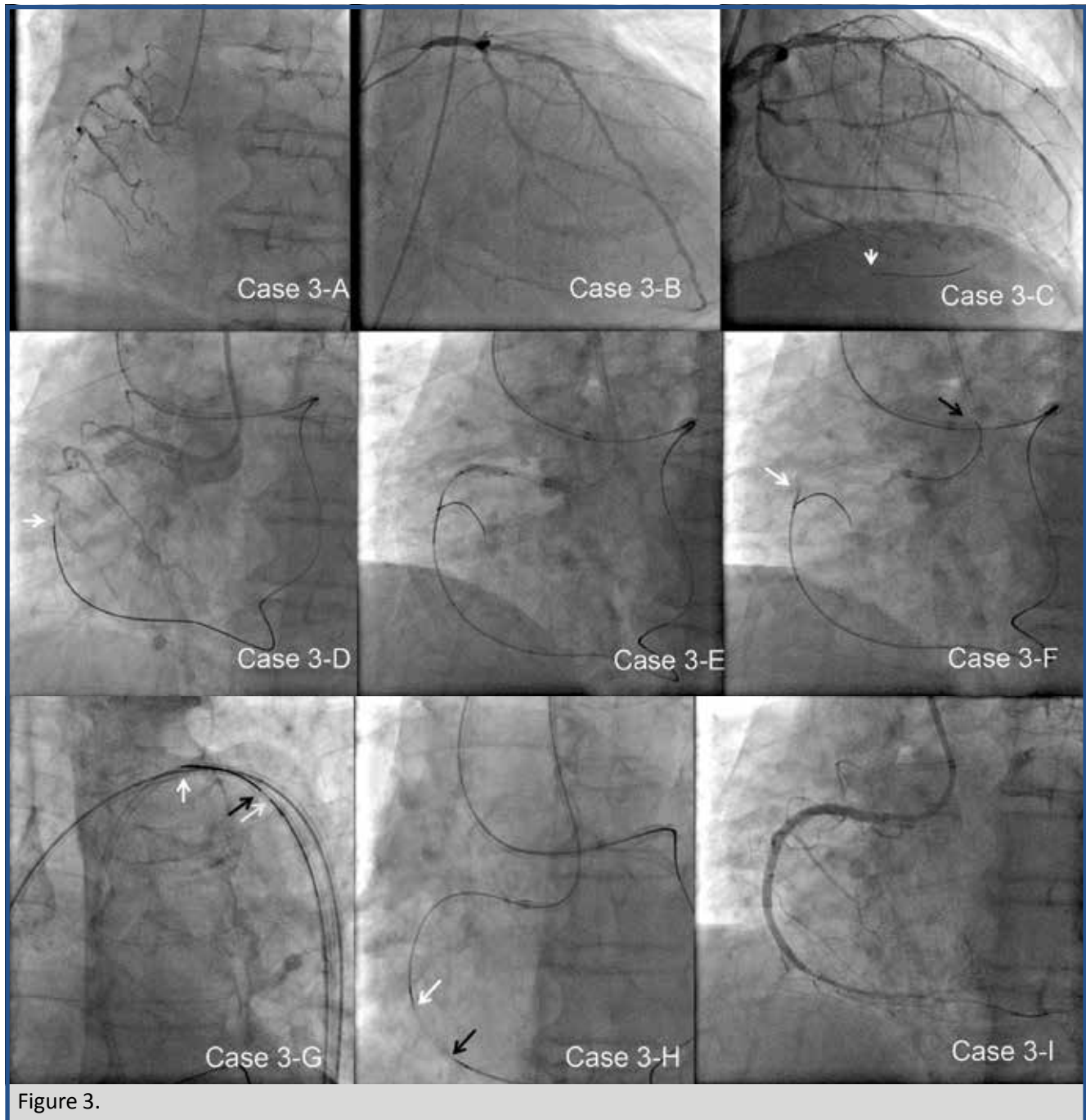


Figure 3.

which successfully crossed the CC and the CTO (Figure 11), and entered the antegrade guide (Figure 4-H, I). Of note, in this ipsilateral CC crossing, two 7F Guides (a 7F EBU3.5 SH, and a 7F SL3.5F SH,) were used to avoid confusion of the antegrade and the retrograde gears.

Even with a trapping by 2.5 mm balloon over the retrograde wire inside the guide, the retrograde Corsair could not enter the antegrade guide, so the wire alone was further advanced to the level of aortic arch (Figure 4-J). A Tornus 88Flex (2.6F) was placed in the aortic arch with an intension of “tip-in” method, which succeeded. Despite over the retrograde wire support, the Tornus could not go through the lesion (Figure 4-K). The retrograde Corsair was replaced by a 150cm Finecross, which successfully crossed the CTO, but was caught in the proximal calcified segment. An antegrade wire was exchanged to a “Rota floppy wire (Boston Scientific, Min-

neapolis, MN)” aiming at the Finecross lumen, using modified “tip-in” method inside of the curved segment of LAD (Figure 4-L). Rotablation was performed with a 1.25 mm burr (Figure 4-M), resulting in successful crossing, when bradycardia and hypotension (BP= 70 mmHg systolic) developed. Angiography demonstrated no flow over the entire left system with marked ST segment elevation in the precordial monitor leads (Figure 4-N).

Prompt 2.0 mm balloon inflation restored the flow toward the LCX and the intermediate branch, but ST-segment elevation persisted. A new 1.5 mm balloon successfully crossed the LAD lesion, followed by 2.0 mm balloon inflation (Figure 4-O). The DES of 2.25 mm x28 mm and of 3.0mm x 24 mm was deployed in the proximal segment at 18 atm (Figure 4-P). An excellent angiographic result was restored with marked resolution of ST elevation (Figure 4-Q).

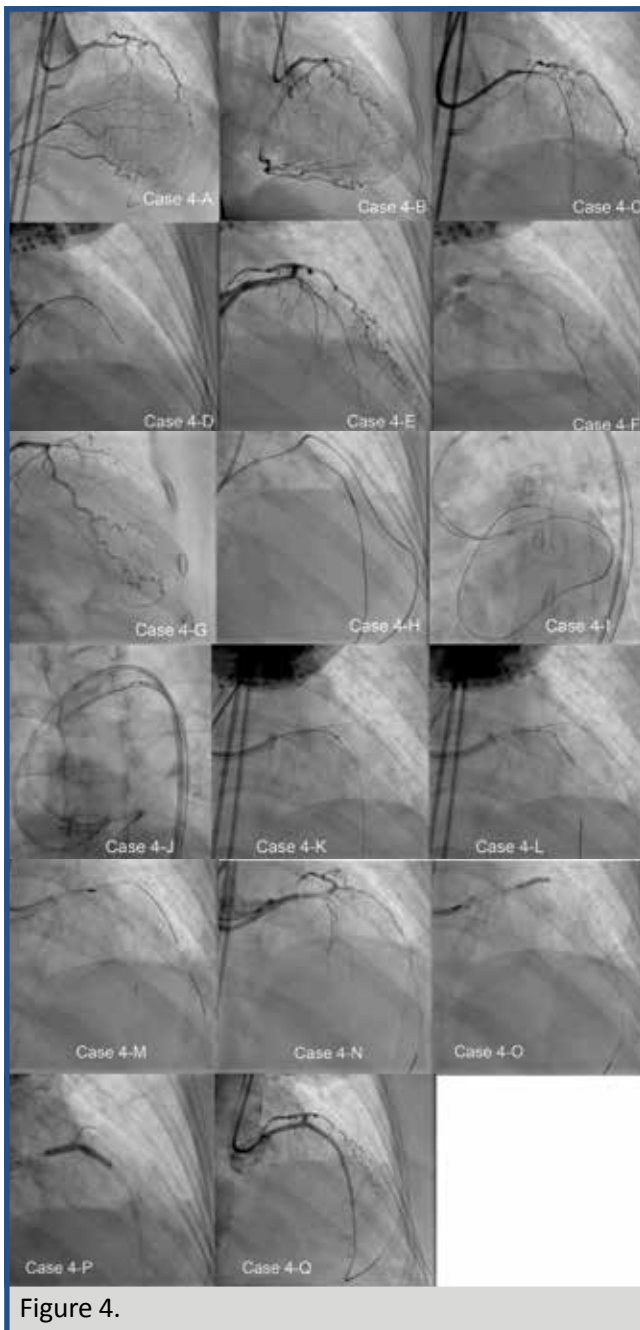


Figure 4.

Discussion

In retrograde CTO-PCI after successful CC wire crossing, wire externalization, using a long dedicated wire (>300cm) becomes almost default setting, once the retrograde microcatheter has engaged into the antegrade guide. Over the externalized long wire, excellent back-up support is obtained in delivering the long stent(s) beyond the tortuous, sometimes calcified, diseased segments. However, there are occasional difficulties in microcatheter crossing over the CC or CTO, due to the resistance or a shortage of the microcatheter. Excessive rotation and aggressive push of a microcatheter will increase the risk of vessel injury, dissection and rupture, in the worst case. One of the precautionary measures to overcome a shortage includes cutting a guide short by putting a piece of one size smaller sheath as a connecting tube, when the length of the retrograde guide permits³.

Tip-in method can provide rapid solution from problems associated with retrograde wire based PCI, once the retrograde wire has crossed to the proximal vascular lumen. Accordingly, the method cannot provide the strong support in delivering a balloon or a stent as externalization method can, due to inherent nature of the antegrade system.

Conclusion

Since retrograde CTO-PCI occasionally develops with an unexpected wire crossing over the least possible long epicardial CC, or with an unexpected resistance of CC and/or CTO, "tip-in" method could provide a simple, quick, but effective countermeasure for bailing-out of stagnation mode to a successful recanalization.

References

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