A Novel Wiring Technique to Insert a Retrograde Guidewire Directly Into the Antegrade Guiding Catheter at the Ascending Aorta for Retrograde Percutaneous Recanalization of an Ostial Coronary Total Occlusion

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Summary

In recent years, the use of a retrograde approach has become a common practice in the treatment of chronic total occlusion (CTO) of the coronary ostium and artery with an anomalous origin. Use of this approach has increased the chances of a successful percutaneous coronary intervention (PCI). However, the approach requires capturing the retrograde guidewire within the aorta, which can often pose a problem. Therefore, we developed a technique in which the retrograde guidewire is passed through the CTO and inserted directly into the antegrade guiding catheter in the ascending aorta. This technique enabled the successful treatment of the ostial CTO of the right coronary artery using retrograde PCI. (Int Heart J 2016; 57: 503-506)

Key words: Percutaneous coronary intervention, Chronic total occlusion, Retrograde approach, Right coronary ostium

With the recent popularization of the retrograde approach, the initial success rate of percutaneous coronary intervention (PCI) for treating coronary chronic total occlusions (CTOs) has improved. The retrograde approach in particular has enabled initial success in treating CTOs with an anomalous origin as well as those of the coronary ostium, which are difficult to treat using antegrade PCI. However, coaxial positioning of the antegrade guiding catheter (GC) with the coronary artery is difficult in occlusal lesions such as these, which makes it difficult to insert the retrograde guidewire into the antegrade GC. Techniques for attaching the retrograde guidewire, such as the use of conventional snares or homemade snares, have been reported. However, these methods are time consuming, costly, and cause associated problems such as retrograde guidewire damage. We present here the case of a CTO lesion at the inlet of the right coronary artery for which externalization was successfully completed using a novel technique consisting of inserting the retrograde guidewire, which had been passed through the lesion by directly crossing the antegrade GC within the ascending aorta. This technique undoubtedly improved the safety and procedural duration pertaining to retrograde PCI in our case where it was difficult to insert the retrograde guidewire into the antegrade GC.

Case Report

The case subject was an 80-year-old man with coronary risk factors that included diabetes and a history of smoking. Thirteen years prior to the study he developed an anterior myocardial infarction for which a bare metal stent (BMS) was placed in the proximal left anterior descending artery. A BMS was also simultaneously placed in the proximal right coronary artery (RCA). Six years prior to the study, a sirolimus-eluting stent (SES) was placed in the central portion of the RCA to alleviate effort angina. However, shortness of breath on exertion persisted for 3 months so coronary angiography was performed. This confirmed total occlusion of the RCA in the ostium, and the contrast showed the RCA arising from the sinus (Figure 1A). With respect to the left anterior descending artery (LAD), although the BMS in the proximal region had good patency, moderate stenosis was observed in the distal portion. Collateral blood flow from the septal branch was well-established, and was observed on contrast up to the proximal portion of the RCA (Figure 1B and C).

PCI was initiated for CTO at the inlet of the RCA using an approach via the bilateral femoral arteries. We used Heartrail II JR4.0SH (Terumo, Japan), Mach1 IMA-SH, AL75ST-SH, and ART3.5SH (Boston Scientific, USA) as antegrade GCs; however, none of these could be engaged. Therefore, we decided to perform revascularization using the retrograde approach. A Heartrail II 7Fr. IFL4.0SH (Terumo) was...
engaged in the left coronary artery and a Pt-Cr everolimus-eluting stent (EES) (3.0 mm × 24 mm) was then placed in the proximal portion of the LAD to treat moderate stenosis. Thereafter, a 150-cm corsair microcatheter (Asahi Intecc, Japan) was advanced into the 3rd septal branch, and selective contrast-}

was good, a Sion guidewire (Asahi Intecc) was passed through and advanced to reach the proximal portion of the RCA. The corsair microcatheter was also followed, and selective contrasting was performed in a retrograde manner from the central portion of the RCA (Figure 2B). The guidewire was advanced in a retrograde manner, and retrograde guidewire crossing with the Miracle Neo 3 guidewire (Asahi Intecc) was ultimately
A novel method to insert retrograde guidewires

Achieved; the tip of the guidewire reached the inside of the ascending aorta (Figure 2C). However, coaxial positioning of the antegrade GC with the RCA could not be achieved, and the retrograde guidewire could not be inserted into the antegrade GC at the inlet of the RCA. Therefore, the corsair microcatheter was passed through the lesion site using a retrograde approach, and upon advancing into the aorta the retrograde guidewire was changed to an RG3 (Asahi Intecc). The left anterior oblique (LAO) view revealed that the retrograde guidewire was advanced to the aortic arch, and the tip of the antegrade GC (7Fr. IMA-SH) was advanced to the intersection crossing the retrograde guidewire. Thereafter, using the right anterior oblique (RAO) view, we confirmed that the retrograde guidewire was facing upwards along the posterior wall of the aorta. The antegrade GC was then rotated in a counter-clockwise direction so that its tip crossed over the retrograde guidewire (Figure 2D). In this state, the position of the antegrade GC was finely adjusted, while the retrograde guidewire was pushed and pulled back and forth to insert the tip into the antegrade GC (Figure 2E and movie). The retrograde RG3 was then advanced into the antegrade GC, thus completing externalization. The occluded section was expanded using an antegrade approach with balloons of 2.0- and 3.5-mm diameters and a Zotarolimus-eluting stent (3.5 mm x 34 mm) was placed. After additional expansion using a balloon of 4.5-mm diameter, a Co-Cr EES (3.5 mm x 38 mm) was placed in the distal portion of the RCA. Final contrasting confirmed that good revascularization was achieved without any problems (Figure 2F).

Discussion

With the recent popularization of the retrograde approach, the initial success rate using PCI for coronary CTOs has improved. In particular, for CTO of the coronary artery with an anomalous origin as well as for occlusions at the coronary ostium, the retrograde approach has enabled procedural success, even in cases where there was little hope of success with the antegrade approach. In general, the retrograde approach is considered for use when the antegrade approach is unsuccessful. However, when the antegrade GC is engaged in the coronary artery during PCI for such CTO cases, it cannot be positioned in a coaxial manner with the coronary artery; therefore, the retrograde approach is often the first option.

The retrograde approach requires a step where the retrograde guidewire is passed through CTO for insertion into the antegrade GC. However, in CTO of the coronary ostium and artery with an anomalous origin, the antegrade GC cannot be positioned coaxially with the coronary artery; therefore, it is often impossible to insert the retrograde guidewire into the antegrade GC. Methods of catching the retrograde guidewire in
the aorta have been reported, including the use of conventional snares or homemade snares. However, these methods have caused a number of problems such as guidewire tip damage and difficulty in releasing the snare. Furthermore, the techniques are costly and time consuming. The new technique that we have reported here solves these problems and enables the quick and easy insertion of the retrograde guidewire into the antegrade GC.

When the retrograde guidewire passes through CTO and is advanced in a retrograde manner, it is possible to advance the tip to the aortic arch, along the posterior and lateral wall of the greater curvature, from the central portion of the ascending aorta. Using the LAO view, the antegrade GC is advanced into the ascending aorta, and its tip is anchored at the site where it intersects the retrograde guidewire (Figure 3A). When observed using the RAO view, the tip of the retrograde guidewire can be seen advancing along the posterior wall of the ascending aorta (Figure 3B). When the antegrade GC is rotated in a counterclockwise direction with the tip facing the lesser curvature side, the tip subsequently faces the posterior wall of the ascending aorta (Figure 3C). While making fine adjustments at the site where the tip of the antegrade GC and retrograde guidewire overlap, the retrograde guidewire is pushed and pulled to ultimately be inserted into the antegrade GC (Figure 3D). If the retrograde guidewire has a length of 300 cm or longer, it can be advanced as is to complete externalization. If the retrograde guidewire is of a normal length (less than 200 cm), the tip is anchored using balloon expansion in the antegrade GC. When the retrograde guidewire is pulled, the antegrade GC is then automatically placed in the coronary ostium. When there is strong back-up using the anchoring technique, the retrograde microcatheter can be inserted into the antegrade GC, and changing to a long guidewire facilitates externalization.

The most important point of this technique is to locate the antegrade GC on the trajectory of the retrograde guidewire using the greater curvature of the aortic arch. Using the LAO and RAO views, by positioning the tip of the retrograde guidewire and the tip of the antegrade GC so that they overlap, the positional relationship of the vertical axis and the horizontal axis can be matched on 2 planes at almost right angles. Thus, the retrograde guidewire can be inserted into the tip of the antegrade GC, which is located on the trajectory of the retrograde guidewire. This technique requires no additional device, and enables the quick and easy insertion of the retrograde guidewire into the antegrade GC. We successfully performed it on 3 other cases with CTOs of the RCA with Judkins-right-shaped or Amplaz-shaped antegrade GCs within 5 minutes. Although using a snare in the aorta is standard, this technique has some advantages. We look forward to seeing the results of controlled trials in the future.

**Conclusion:** In the present case, it was not possible to achieve coaxial positioning of the antegrade GC at the inlet of the RCA; therefore, the antegrade approach could not be used. However, retrograde guidewire crossing was successful when using the retrograde approach. Conventionally, it is necessary to capture the retrograde guidewire in the aorta using a snare. However, using the present technique we were able to insert the retrograde guidewire directly into the antegrade GC in the ascending aorta. In retrograde PCI for CTO of the coronary artery with an anomalous origin as well as CTO of the coronary ostium, the present technique can be simple, easy, and economical externalization. Therefore, it may become a procedural option for use in managing CTO that is difficult to treat.

**Ethical statement:** The patient provided informed consent and the study was approved by the institutional ethical committee.

**Disclosure**

**Conflict of interest:** All authors have nothing to declare.

**References**