Longitudinal Stent Deformation Caused by Retraction of the Looped Main Branch Guidewire


A 66-year-old male was treated percutaneously for a bifurcation lesion of the left anterior descending coronary artery by provisional stenting using the jailed wire technique. After successfully stenting the main branch, retraction of the looped main branch guidewire was impossible. After using an intravascular ultrasound we discovered the guidewire was entangled with a stent strut. Thereafter, the proximal stent elongated after retraction. With the support of an over-the-wire microcatheter, we finally pulled out the entrapped guidewire. This rare complication should remind physicians that it is important to prevent the distal guidewire from being looped while retracting it through a stent, regardless of whether it is in the side branch or main vessel. If the guidewire becomes entangled with a stent, a microcatheter or low-profile balloon can be advanced to rescue it before the stent is damaged. Furthermore, the microcather should be maintained after successful retraction of the entangled guidewire to facilitate further wiring and subsequent rescue angioplasty as necessary.

Key Words: Complications • Percutaneous coronary intervention • Stent fracture

INTRODUCTION

The jailed wire technique is often used for bifurcation intervention. However, the longitudinal stent deformation may occur during retraction of the guidewire, which most frequently occurs at the side branch. Herein we reported the rare case of a patient who suffered from this complication during retraction of the looped main branch guidewire.

CASE REPORT

A 66-year-old man had a medical history of hypertension and coronary artery disease. He visited our outpatient department due to complaints of intermittent angina lasting for 3 weeks. When the patient’s exercise stress test was positive, we arranged for coronary angiography (CAG) which showed single-vessel disease with a bifurcation lesion in the middle part of the left anterior descending coronary artery (LAD) involving a large diagonal branch. We decided to perform provisional stenting with jailed wire technique. After engagement with a 6-Fr. EBU 3.0 guiding catheter (Medtronic, Minneapolis, MN, USA), we advanced a Runthrough Floppy guidewire (Terumo, Tokyo, Japan) to the distal LAD. A Fielder FC guidewire (Asahi Intecc, Aichi, Japan) was inserted into the diagonal branch for protection. After predilatation of the LAD lesion, we placed a 2.5 × 30 mm Integrity stent (Medtronic), followed by post-dilatation with a 2.75 × 8 mm Quantum Maverick balloon (Boston Scientific, Natick, MA, USA) at 18 atmospheres.
After the stenting was successfully completed, the LAD and diagonal branch were patent with TIMI 3 flow. At that time, we attempted to pull back the two guidewires. However, although the side branch guidewire was removed smoothly, the retraction of the main branch guidewire was not possible due to extreme resistance. In reviewing fluoroscopy, we found that the distal main branch guidewire was looped during the coronary intervention and the loop was entraped at the proximal LAD during retraction (Figure 1). We also found that the proximal portion of the stent struts had become coarse. Forceful pulling the guidewire only caused deep intubation of the guiding catheter, and this predisposed the patient to a risk of coronary dissection. After placing a Fielder FC guidewire (Asahi) in the left circumflex coronary artery (LCX) for protection, we carefully advanced a Runthrough Hypercoat guidewire (Terumo) across the lesion to the distal LAD. Then, we inserted an intravascular ultrasound (IVUS) catheter (Eagle eye platinum coronary imaging catheter, Volcano Therapeutics, Alajuela, Costa Rica) over the new LAD guidewire. However, the IVUS catheter did not reach the distal portion of the stent because it could not penetrate the stent strut cell. An IVUS image showed that the proximal stent struts were crowded on one side of the vessel wall and the looped guidewire was entangled with the deformed stent in the proximal LAD. Besides, the lumen size of the proximal stenting zone was 3.0 mm in diameter, as measure by IVUS, which was significantly larger than our stent. Otherwise, no coronary dissection or injury was found (Figure 2).

We then unsuccessfully attempted to utilize a balloon to retrieve the entrapped guidewire. Thereafter, we advanced a FineCross microcatheter (Terumo) over the entrapped guidewire, across the turning point of the loop. Then we pulled on the entrapped wire while pushing the microcatheter to gain support. After successfully extracting the guidewire from the stent, the microcatheter and the retrieved guidewire were removed together. We delivered a non-compliant balloon (2.75 × 15 mm Quantum Maverick Balloon Catheters, Boston Scientific) through the new guidewire, which was the only guidewire left after removal of the entangled guidewire and microcatheter. It was expanded to 20 atm to oppose the distally intact stent and to crush the proximally deformed stent. We inserted the IVUS catheter again, but it would not pass the deformed portion of the stent. We

**Figure 1.** A drug-eluting stent was implanted in the left anterior descending coronary artery across the diagonal branch using the jailed wire technique. Arrows mark the distal and proximal ends of the stent (A). The distal main branch guidewire was looped before provisional stenting (B). The main branch guidewire was entangled with proximal stent during retraction (C). Follow-up coronary angiography 6 months later showed total occlusion of left anterior descending coronary artery (D).

**Figure 2.** The IVUS revealed the proximal stent struts were crowded to one side of the vessel wall (black arrow) (A and B), and the guidewire was entangled with the stent struts (white arrow) (C). No coronary dissection was found in the left main coronary artery. Arrows indicate the proximal and distal parts of the looped guidewire; arrowhead indicates the LCX guidewire (D). IVUS, intravascular ultrasound; LCX, left circumflex coronary artery.
did not implant another stent for fear of stent jail during delivery. After checking the fluoroscopy and IVUS, no coronary injury was found and the proximal stent struts were crushed to one side of the vessel wall. However, 6 months later, the patient suffered another episode of angina. Follow-up CAG showed total occlusion of proximal LAD. Then, the patient underwent coronary artery bypass grafting surgery.

DISCUSSION

According to Williams et al., longitudinal stent deformation occurred at a rate of 0.2% of cases and 0.0097% of stents deployed, with the highest rate in the Promus Element stent (0.86%). The common mechanisms for this complication include compression by post-dilatation balloons, guide catheter extensions, and proximal embolic protection devices. However, longitudinal stent deformation caused by guidewire retraction has rarely been reported, and prior reports suggest this complication always happens in side branch wire. Several techniques have been proposed to retrieve jailed guidewire from coronary stents. The general concept is to advance a small-caliber device over the jailed guidewire to allow selectively forceful retrieval. These devices included rapid-exchange low-profile balloons, over-the-wire balloons, and microcatheters.

Our case was different from previous ones because the entrapment occurred with the main branch guidewire, and it was actually caused by the retraction of looped guidewire. The mechanism may have been incomplete apposition of an undersized stent at a tortuous coronary artery, which left space for entrapment of the looped wire. Retraction of the entrapped guidewire resulted in elongation of the stent strut. After evaluating the lesion with IVUS, we tried to retrieve the entrapped guidewire with the support of balloon catheter by the method described earlier but failed. Finally, we advanced a microcatheter over the entrapped guidewire and then we could successfully retrieve it with selective support.

Several points should be considered to prevent this complication from occurring in the future. First, the stent should be adequately sized and well apposed, particularly in a tortuous vessel. Second, retraction of the distal guidewire through the stent should be observed under fluoroscopy, and the distal guidewire should not be looped. Third, if guidewire entrapment is found, a microcatheter or low-profile balloon can be advanced to facilitate retraction of an entrapped guidewire before damaging the stent. Fourth, if the stent is destroyed, another stent can be deployed to cover the deformed stent and prevent further restenosis. Finally, after successful retraction of the entangled guidewire, keeping the microcatheter in place instead of removing it may facilitate further wiring and subsequent rescue angioplasty. In this regard, a microcatheter or a low-profile over-the-wire balloon, rather than a monorail balloon, should be the choice in this situation.

To our knowledge, our case should be the first case of longitudinal stent deformation caused by retraction of the looped main branch guidewire.

CONCLUSIONS

This rare case reminds physicians that stent deformation caused by retraction of the looped main branch guidewire is an extremely rare but possible complication during percutaneous coronary intervention. Whether in the side branch or main vessel, we should prevent the distal guidewire from being looped while retracting it through a stent.

REFERENCES