Extraction of a Fully Deployed Coronary Stent during Retrieval of Another Dislodged Stent

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Coronary stent dislodgement is a rare and serious complication of percutaneous coronary intervention and is associated with major adverse cardiac events. Successful retrieval of the stent is recommended in this situation because it is important for the prognosis. Recently, a patient was referred to our hospital with a dislodged coronary stent. When attempting to percutaneously extract the dislodged stent, a challenging situation was encountered, as the stent was entrapped and tightly entangled with another fully deployed coronary stent. Extraction of a fully deployed stent is generally prohibited as it may result in severe complications. Nevertheless, we extracted both the dislodged stent and the fully deployed stent, as a last resort. Herein, we report about this case. Our case highlights if the operator had a thorough understanding of the surrounding circumstances regarding the fully deployed coronary stent, successful extraction of the fully deployed coronary stent without any complications could be possible. (Korean Circ J 2016;46(6):862–865)

KEY WORDS: Percutaneous coronary intervention; Stent; Complication.

Introduction

Although its incidence is decreasing, coronary stent dislodgement continues to occur in this modern era of percutaneous coronary interventions (PCI). It is often associated with significant morbidity, including systemic or coronary embolizations, acute myocardial infarctions (MI), emergency coronary artery bypass graft surgeries (CABG), and even death. Several factors are associated with stent dislodgement, including heavy vessel calcification, pronounced vessel tortuosity, diffuse disease, and an attempt to deliver a stent to a distal lesion through a previously implanted proximal stent. Unfortunately, coronary stents cannot be extracted or repositioned after deployment. Extraction of a fully deployed stent may cause endothelial injury, dissection, or perforation of coronary arteries. While many reports have previously described retrieval of a dislodged stent, reports on cases of fully deployed stent are rare.

We report a case of extraction of a fully deployed coronary stent during retrieval of another dislodged stent.

Case

A 65-year-old male patient visited a local hospital complaining of chest pain, but did not present with any cardiovascular risk factors. Coronary angiography (CAG) at a local hospital revealed severe three vessel disease. The patient was found to have 90% stenosis in the proximal segment of the left anterior descending artery (LAD), 90% stenosis at the proximal segment, total occlusion at the distal segment in the left circumflex artery (LCX), and the right coronary artery (RCA) showed diffuse, tortuous, and up to 90% stenosis at the proximal to mid segment with near total occlusion at the distal segment (Fig. 1A). A 2.75×26 mm drug eluting stent (DES)
was implanted in the proximal LAD and two DESs of 2.75×38 mm, and 2.75×22 mm (Xience Xpedition, Abbott Vascular, Santa Clara, CA, USA) were implanted in the proximal and mid segments of the RCA, respectively (Fig. 1B).

On the next day, staged PCI for distal RCA was attempted via the right femoral artery. After pre-dilation with a 2.5×20 mm balloon at the distal RCA, the operator made several attempts to deliver a 2.5×38 mm DES (Promus Premier, Boston Scientific, MN, USA) through a previous stent with no success. While pulling the undeployed stent back into the guiding catheter, it became entrapped by the fully deployed proximal RCA DES (Xience Xpedition, Abbott Vascular, Santa Clara, CA, USA). After several retrieval attempts, the undeployed stent was totally detached from the stent balloon. Fluorography revealed that part of the dislodged stent was almost located out of the RCA ostium, and flail motion of the stent, which was still entangled with a previous stent at the proximal RCA, was noted in the ascending aorta (Fig. 2A). During the procedure, the patient complained of chest pain and his electrocardiogram revealed ST segment elevation in leads II, III, and aVF. The patient was subsequently transferred to our hospital.

Through an 8 Fr guiding catheter (JR 4.0, Cordis, Bridgewater, NJ, USA), a snare catheter (6 Fr, 15 mm, Multi-Snare®, PFM Medical, Carlsbad, CA, USA) was positioned to capture the stent. After several attempts in the ascending aorta, we were able to seize the middle part of the undeployed stent and pushed and pulled the captured snare system several times with the aim of detaching it from the deployed DES (Fig. 2B). However, we failed to detach it from the deployed DES. On the contrary, the deployed DES at the proximal RCA had gradually elongated into the aorta (Fig. 2C). Thus, we decided to extract the two stents (dislodged and fully deployed elongated stent) as a last resort. After tugging with adequate manual force, the captured dislodged stent was bent in half and, successfully retrieved into the guiding catheter (Fig. 2D). Subsequently, both the undeployed and elongated deployed stents were successfully withdrawn into the guiding catheter under maximal manual retraction (Fig. 2E). After removal of the guiding catheter including the snare catheter and two stents, a follow-up CAG revealed dissection at the proximal RCA, without any
remnant part of the two stents. Two DES (3.5×34 mm at proximal RCA, 3.0×38 mm at d-RCA, Resolute Integrity, Medtronic, Santa Rosa, CA, USA) were successfully implanted under intravascular ultrasonography (IVUS, OptiCross, Boston Scientific, Natick, MA, USA) guidance. The final CAG showed acceptable results (Fig. 2F) and the patient was free of angina and subsequently discharged two days after the procedure.

Discussion

Coronary stent dislodgement is a catastrophic complication of PCI and is associated with arterial thrombosis, embolism due to retained stent fragments, and major adverse cardiovascular events (including myocardial infarction, stroke, and death). Successful retrieval is important as it is associated with a good prognosis.

There are two retrieval methods available, either surgical or percutaneous. Percutaneous retrieval can be a good therapeutic option when the clinical situation and the patient’s vital signs are stable. Several percutaneous retrieval techniques using a snare, wire, and balloon have previously been established and a number of unique cases have been reported.

In our case, the part of dislodged stent almost protruding into the ascending aorta and the distal remnant part was tightly entangled with the fully deployed stent in the proximal RCA. As we know, this is a situation that is rarely encountered and as such, common retrieval methods have several limitations. Our solution in this case was to first capture the middle portion of the undeployed dislodged stent using a multi-snare catheter in order to maximize the force of retraction, a unique point in our case. The dislodged stent was bent in half and safely and fully retrieved into the guiding catheter. Next, under normal manual retraction force, the proximal RCA deployed stent was gradually elongated. It was, however, not separated from the undeployed dislodged stent as the two were tightly entangled with each other. As we had no other option, we were forced to pull back on the two stents, finally extracting the fully deployed stent together with the dislodged stent without any major complications.

The successful extraction of a fully deployed stent in this case can be attributed to several factors. First, we performed IVUS of the RCA after both stents were removed and this showed that the vessel diameter of the proximal RCA was considerably larger (3.7 mm) than the previously deployed proximal RCA stent diameter (2.75 mm). IVUS also showed large amounts of remnant plaque burden, which suggests severe insufficient plaque modification. Moreover, the fully deployed proximal RCA stent had protruded marginally into the aorta. These findings suggest underexpansion and incomplete apposition of the stent, and paradoxically, would have facilitated stent extraction. Second, we attempted to remove...
the stent just one day after the first procedure had been performed. This time interval was not sufficient for endothelialization of the stents. Third, stent character may have been a factor. Under maximal manual retraction, the proximal RCA fully deployed stent was not disconnected but rather elongated. To elucidate the mechanism of this phenomenon, we stretched several different types of stents maximally in an in vitro setting. Our results showed that a stent with 3 connectors (Xience Xpedition, Abbott Vascular, Santa Clara, CA, USA) was not disconnected, while a stent with 2 connectors (Promus Premier, Boston Scientific, MN, USA) was fractured into four segments (Fig. 4). In our case, the deployed stent was fortunately made up of 3 connectors. We believe that the number of stent connectors is therefore critical when attempting this procedure. If the deployed stents were comprised of 2 connectors (for example, a Promus stent), we would have alternatively considered surgical removal.

A small-sized stent when compared to the reference diameter under insufficient plaque modification, and protrusion of the stent into the aorta are the main reasons for successful retrieval in this case. However, they are also the cause of complication. We have frequently encountered difficulties when attempting to deliver a stent to a distal lesion through a previously implanted proximal stent. To avoid a stent trapping while passing through a previous stent, sufficient plaque modification should be performed at the site of the lesion prior to implantation to ensure that the stent is appropriate for the luminal area. Implantation of the distal stent first, and the proximal stent last, is a more reasonable and recommended method.

In conclusion, extra care should be given to avoid stent dislodgement when the lesion itself has many risk factors. Should an event occur such as that described in our case, extraction of a fully deployed stent may be carefully executed, provided there is a thorough understanding of the surrounding circumstances.

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