Case Report: Stent Delivery Shaft Fracture during Percutaneous Coronary Intervention and Retrieval with Trapping Balloon Method

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Abstract

Stent dislodgement during percutaneous coronary intervention (PCI) is rare. A fractured stent delivery shaft followed by dislodgement is even rarer. If a broken stent delivery shaft is not retrieved immediately, it can cause severe complications. We report a case of a stent delivery shaft that fractured during PCI for a calcified lesion. The broken stent delivery shaft was retrieved successfully by the trapping balloon method.

Keywords: percutaneous coronary intervention, complication, broken stent delivery shaft, retrieval

Introduction

Device dislodgement in coronary arteries is uncommon, but could cause serious complications, such as intracoronary embolism or systemic embolism. With the development of various retrieval devices, most such cases can be managed by a nonsurgical approach. When dealing with this kind of complication, several factors should be taken into account, including the hemodynamic status, the nature and extent of breakage of the device, and the coronary artery flow. We report a case of stent delivery shaft fracture during PCI for a severely calcified left anterior descending (LAD) artery. The broken stent delivery shaft and the stent were successfully retrieved by the trapping balloon method.

Case report

A 75-year-old diabetic female patient with a history of hypertension presented to the emergency department with acute onset retrosternal chest tightness. Inferior wall ST-segment elevation myocardial infarction (STEMI) was diagnosed by 12-lead ECG, and primary PCI was arranged. The coronary angiogram (CAG) showed a discrete lesion with 99% stenosis at the middle right coronary artery (RCA) with TIMI 2 flow. Direct stenting was done with a 2.5 x 12 mm bare-metal stent (BMS). Additionally, an 80~95% diffuse lesion with severe calcification

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was found at the proximal to middle left anterior descending artery (LAD) (Figure 1). One month after the above-mentioned STEMI, staged PCI was performed. Vascular access was established through the right radial artery using a 6 Fr sheath. Initially, we used Sion black wire (Asahi Intecc, Aichi, Japan) crossing to the distal LAD. Pre-dilatation of the calcified lesion was performed by a 3.0 x 10 mm cutting balloon from 6 to 16 bar sequentially. After dilatation, type C dissection occurred, and a 3.0 x 48 mm drug-eluting stent (DES) (Synergy stent, Boston Scientific, Marlborough, Massachusetts) was deployed to the middle LAD with 10 bar, and post-dilatation was done with a non-compliant balloon.

Before stenting at the proximal LAD, the diagonal branch was protected by a small jailed balloon. Strong resistance was encountered while delivering the second stent. Once positioned at the proximal LAD the proximal and distal stent could only be partially inflated (Figure 2). Since we could not inflate the stent balloon manually

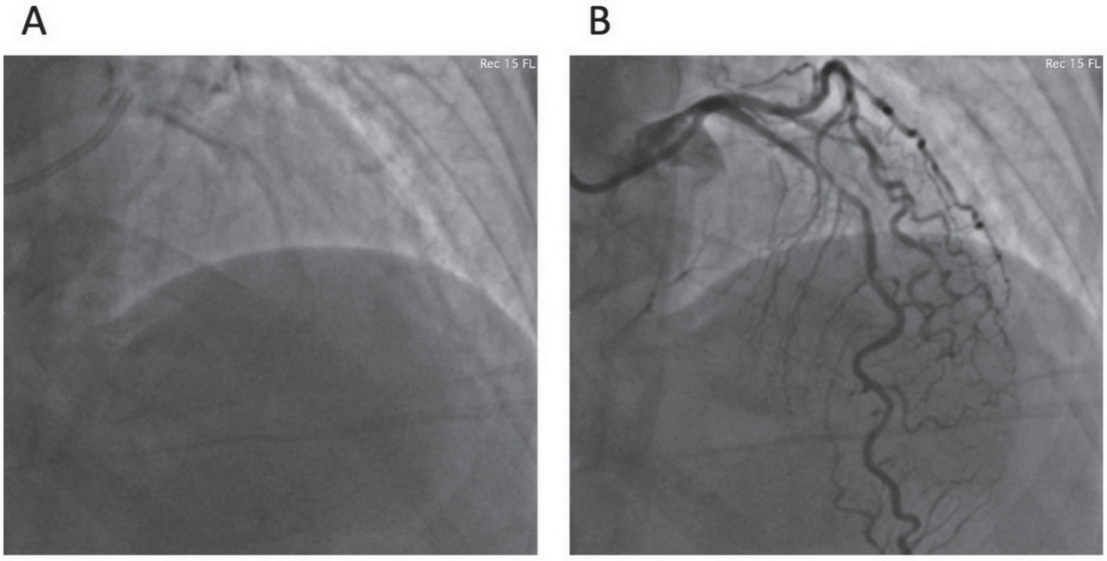

Figure 1. Fluoroscopy of the left coronary arteries. A. Severe calcification at the left anterior descending artery (LAD). B. A diffuse 80~95% stenosis at the middle LAD.

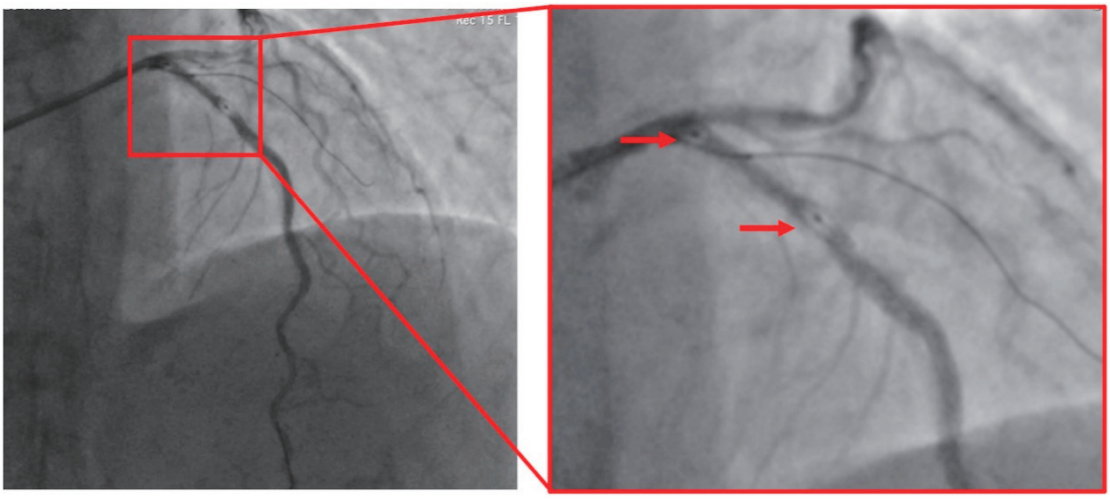

Figure 2. Partial inflation with air at the edges of the stent balloon.

we considered the deployment a failure. We immediately withdrew the stent balloon catheter and found that the stent delivery shaft had broken in half (Figure 3). The proximal part of the stent shaft was inside the guiding catheter, and the partially inflated stent and distal portion of the stent delivery shaft were dislodged in the proximal LAD. We gently used the wire to pull the stent delivery shaft back into the guiding catheter. We then used a 6F GuideLiner® catheter (Vascular Solutions Inc., Minneapolis, MN, USA) to trap the broken stent delivery shaft. A 2.5 x 12 mm trapping balloon was then delivered into the GuideLiner® catheter and inflated to trap the broken stent shaft inside the GuideLiner® catheter. After trapping the fractured stent delivery shaft, we smoothly withdrew the whole system, including wire, stent delivery shaft, trapping balloon and GuideLiner® catheter (Figure 4).

After removal of the fractured stent delivery

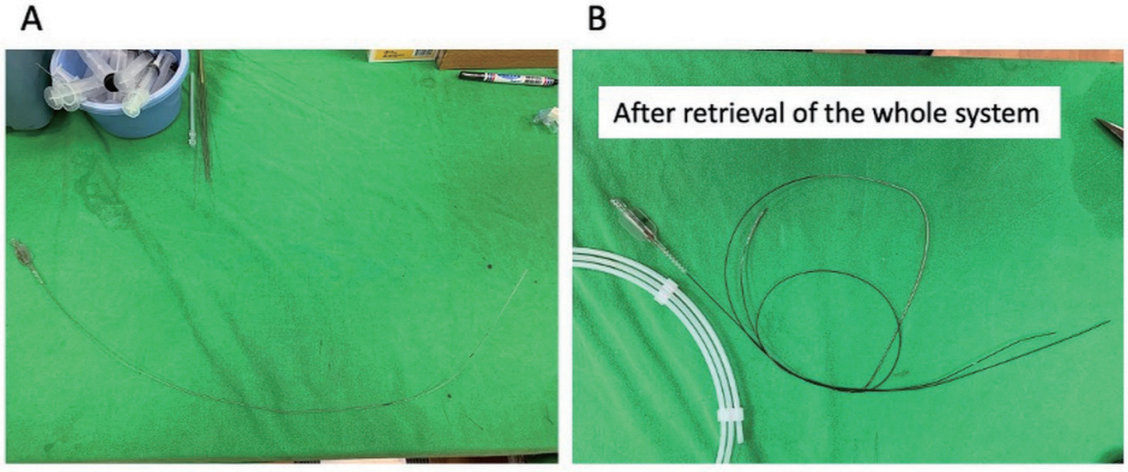

Figure 3. The stent delivery shaft broke in half.

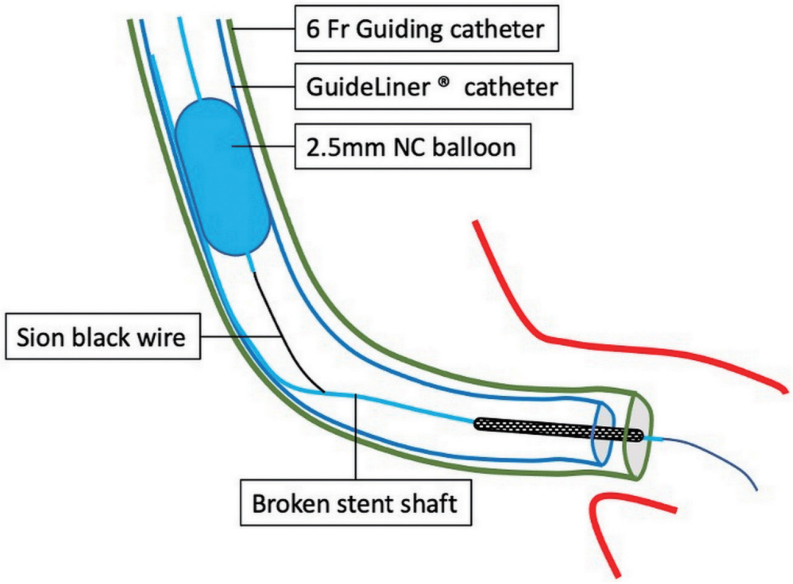

Figure 4. A GuideLiner® catheter was advanced in the guiding catheter over the fractured stent shaft with the trapping balloon inflated inside it.

shaft, a coronary angiogram showed TIMI 3 flow without thrombus formation. To protect the diagonal branch and leave enough space to advance the stent in the guiding catheter, we only rewired the diagonal branch without using a jailed balloon. This way, the 3.0 x 16 mm DES could be delivered to the proximal LAD smoothly and deployed at 12 bar. Post dilatation was performed using a 3.0 mm cutting balloon at a maximum pressure of 20 bar. The final angiogram showed minimal residual stenosis and TIMI 3 flow (Figure 5). Side branches were not jailed. The patient had an uneventful course during the 1-year follow-up period.

3. Discussion

The incidence of device dislodgment during PCI has been reported at a rate of 0.56% in a high-volume cath lab.[1] Balloon/stent shaft fracture usually occurs during more complex procedures, like chronic total occlusion lesions, long diffuse lesions or bifurcation lesions, in which the balloon shaft is either inadvertently kinked or forcefully pushed or wrapped with another balloon.[2-5] The management depends on where the fracture has occurred and whether the residual balloon/stent shaft are inside the guiding catheter or not. If the residual balloon system is still inside the guiding catheter, retrieval can usually be achieved by the trapping balloon method or modified Fogarty technique.[5-7] The modified Fogarty technique requires passing another balloon distal to the entrapped balloon or stent with low-pressure inflation. In this case, the stent balloon was already partially inflated, which may have made it difficult to pass another balloon by the stent, and carried the risk of dislodgement. When considering the use of a trapping balloon, an additional extension guiding catheter can improve the chances of a safe and successful retrieval by advancing the extension guiding catheter over the balloon/stent shaft fragment and inflating the trapping balloon inside it.[6] By using the extension guiding catheter, we were also able to avoid losing the guiding catheter position after the retrieval. In cases where the retained balloon fragment is outside the guiding catheter, snaring device and retrieval forceps are also feasible strategies.[6,8] In our reported case, adequate debulking of the calcified coronary artery had been achieved by sequential pre-dilatation of the cutting balloon. However, the lumen of the 6 Fr guiding catheter was too small to contain the jailed balloon and permit delivery of the second DES. The stent delivery shaft ultimately broke because the operator had used too much force to advance the stent system. Fortunately, the trapping balloon

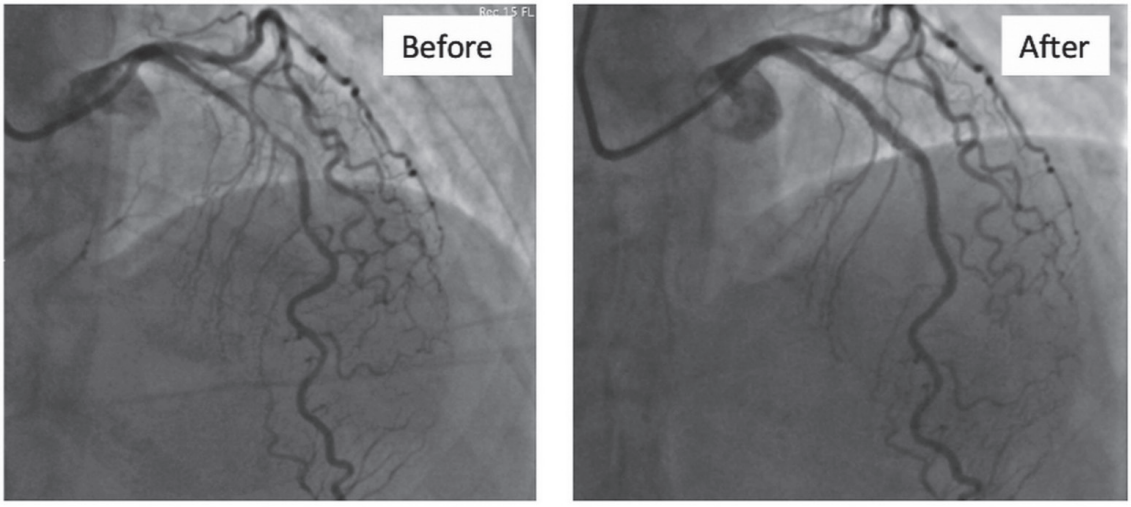

Figure 5. The final coronary angiogram showed residual stenosis of less than 15% with TIMI 3 flow.

method successfully retrieved the residual stent system. With the use of the GuideLiner® catheter, we could keep the guiding catheter in position, and PCI could be performed immediately after the retrieval. With the balloon trapping method, it is feasible to withdraw the residual stent delivery shaft without losing the guiding catheter.

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