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Peripheral embolisation and retrieval of everolimus-eluting stent

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Abstract
A 78 year-old female with dyslipidemia, diabetes, and hypertension as cardiovascular risk factors underwent percutaneous coronary intervention of tortuous, diffusely diseased right coronary artery (90% stenosis) due to chronic stable angina (Canadian Cardiovascular Society class III) despite guideline-directed medical treatment. After predilatation, a 2.75 × 44 mm Xience Expedition everolimus-eluting stent (Abbott, USA) was tracked, which failed and embolised to the right deep femoral artery during its pullback. It was successfully retrieved by an EN snare: 6–10 mm (Merit Medical, USA) by contralateral femoral approach. Lesion was further dilated and successfully stented using a GuideLiner mother–and-child catheter (Vascular Solutions Inc., USA) by deploying two overlapping 2.75 × 33, and 3 × 23 Xience Expedition drug-eluting stents distally and proximally respectively showing proper stent expansion with TIMI-3 coronary flow. This case highlights trackability issues and the importance of adequate lesion preparation before stent deployment in a tortuous vessel with diffuse disease, especially with a very long stent.

Key words: chronic stable angina; EN snare, guideliner catheter; stent dislodgement; stent embolisation
Introduction

Stent dislodgement and its embolisation is an uncommon occurrence in percutaneous coronary intervention which is often associated with significant morbidity in the form of coronary thrombosis and subsequent myocardial infarction, sudden cardiac death, and acute limb ischaemia [1–3]. Manual crimping of stents, something which is rarely practiced these days, was commonly associated with a significantly increased risk of stent dislodgement and embolisation. In the modern era, this is rarely encountered, although it has not been completely eliminated, especially when delivering a long stent in a tortuous and/or calcified artery [4].

Case report

A 78 year-old female with dyslipidemia, diabetes, and hypertension as cardiovascular risk factors underwent percutaneous coronary intervention of tortuous, diffusely diseased right coronary artery (RCA 90% stenosis) due to chronic stable angina (Canadian Cardiovascular Society class III) despite guideline-directed medical treatment. Electrocardiogram was normal except for mild ST-T changes, and echocardiogram revealed mild concentric left ventricular hypertrophy with normal ejection fraction. Coronary angiography through the right transfemoral approach showed a diffuse disease with 90% narrowing in a tortuous and mildly calcified RCA (Figure 1A). Percutaneous transluminal coronary angioplasty (PTCA) of RCA was planned after proper consent. This was cannulated with a 6F Judkins right guiding catheter (Medtronic, USA) and a 0.014” runthrough wire (Terumo, Japan) was parked in the posterior descending artery (Figure 1B). Lesion was sequentially predilated with a 1.5 × 10 mm, a 2 × 10 mm, and a 2.5 × 10 mm Quantum Maverick semicompliant balloon (Boston Scientific, USA) at 10–13 atm pressure. A 2.75 × 44 mm Xience Expedition everolimus-eluting stent (Abbott, USA) was tracked across the lesion but it failed to cross the lesion because of tortuosity and underlying calcium. We attempted to withdraw the stent but it could only be partially pulled in. Therefore, the whole guiding catheter-wire-stent assembly was pulled out. During this process, the stent was dislodged and embolised to the right common femoral artery and the arterial sheath was also inadvertently pulled out (Figure 1C, D). After a few seconds, it migrated further down to the right superior femoral artery (Figure 1C, D). The contralateral femoral artery was accessed with a 7F sheath. A Judkins right (JR)
guiding catheter was carefully parked in the right common femoral artery over a terumo wire (Terumo Inc, Japan) (Figure 1D). Guiding catheter was slightly pulled up near to the embolised stent (Figure 2A, B). Wire was withdrawn and a 6–10 mm EN snare (Merit Medical, USA) was pushed through the catheter and opened at its tip to catch the stent (Figure 2A, B). Once caught, the snare was pulled and the guiding catheter was pushed to firmly trap the stent, leaving no space behind. Next, the whole stent-snare-guiding catheter assembly was pulled back under fluro surveillance while the sheath was firmly held with the left hand (Figures 3, 4). The RCA was again hooked and the lesion was aggressively prepared by using a 2.75 × 10 mm and a 3 × 10 mm Quantum Maverick noncompliant balloon at 14 atm pressure. Delivering the stent again failed. A 5.6F GuideLiner ‘mother-and-child’ catheter (Vascular Solutions Inc., USA) was parked in the mid RCA. Distal RCA was stented with a 2.75 × 33 mm Xience Expedition drug-eluting stent at 12 atm pressure (Figure 5A). The GuideLiner catheter was further pulled up and the vessel was proximally stented with a 3 × 23 mm Xience Expedition stent at 12 atm pressure with a little overlap with the distal stent (Figure 5B). Further post dilatation was performed with a 3 × 10 mm Pantera LEO (Biotronik, Germany) noncompliant balloon at 15 atm pressure, achieving TIMI-3 flow (Figure 6). Her hospital stay remained uneventful, and she was discharged with aspirin 150 mg, clopidogrel 150 mg, rosuvastatin 20 mg, metoprolol 100 mg, ramipril 10 mg, and gilbenclaimide 1 mg daily.

Discussion

With modern technology, the current generation of stents comes on a premounted system which has nearly, but not completely, eliminated embolisation, with an incidence of 0.32–8.4% [1]. The governing factors here are the anatomy of the concerned vessel, as for example marked coronary angulation, tortuosity, calcification, morphology such as diffuse disease, underprepared bed, and stent related factors such as underestimation of stent size, long length, and sometimes direct stenting. Stent dislodgement from the delivery system most often occurs when the stent balloon assembly is pulled back into the guiding catheter [5]. In our case, tortuosity and calcification was the hurdle in preparing the vessel for stenting. Despite graduated predilatation with multiple balloons, the vessel was still unprepared for stenting. Secondly, the vessel didn’t allow the stent to be delivered at the site as it was tortuous. Thirdly, the stent was very long (44 mm) which always carries the potential for dislodgement. In such situations, the underlying bed should be adequately prepared with a
larger balloon. Sometimes, rota ablation, a scoring balloon, or a cutting balloon may be helpful in modifying the plaque if they are calcified. In our case, the lesion was redilated at relatively higher pressure which signifies its underlying fibro-calcific nature. Therefore, stenting of a poorly prepared artery should be avoided. Fortunately, the stent was not dislodged around the coronary system and as soon as the demounted stent was found in the femoral artery, it was retrieved.

Many other percutaneous retrieval techniques may also be tried to retrieve embolised stents from the coronary and peripheral circulations, including low-profile angioplasty balloon catheters, gooseneck snares, myocardial biopsy forceps, and multipurpose baskets. In our patient, the stent was only partially pulled into the guiding catheter; therefore the whole assembly was withdrawn in toto, leading to embolisation to the iliac artery which migrated to the common femoral artery. In our case, it was more suitable and useful to catch the floating end of the stent than a simple loop, and therefore the retrieval technique was easy. The main advantages of an EN Snare are its availability in different sizes and the fact that it has three interlacing loops which gives it a unique shape when it is open, making it perfect to grasp an embolised stent (Figure 2A,B).

Several techniques are available to help deliver the stent in tortuous and calcified lesions. These include the stable guide position by co-axial arrangement, deeper intubation of the guide catheter, and the use of a buddy wire, stiffer guide wires, or anchoring balloons [6]. As a ‘mother-and-child’ system, the GuideLiner enables deeper intubation and therefore provides better coaxial alignment and stability. This means it gives active support and also cuts the distance required to deliver stents because it straightens the tortuosity. It is a coaxial catheter mounted on a monorail system, joined to a 125-mm compact metal hypotube, and a flexible extension of 20 cm with a radiopaque marker located 2.7 mm from the tip and an inner diameter which is 1-Fr size smaller than the guiding catheter.

Once the guide catheter and guidewire are placed, the GuideLiner catheter can be advanced over the guidewire through the haemostatic valve, providing an extension to the guide catheter. The more distally the GuideLiner is delivered, the easier the procedure becomes. This also negates the ‘razor blade effect’ produced by the sharp edge of the guide catheter tip which hampers the navigation of the guide catheter and can sometimes lead to dissection and even rarely perforation [7]. Subsequently, the procedure can be continued as usual, without the need for disconnection and reattachment.

References


**Figure 1.** Angiogram showing diffuse, tortuous, and calcified narrowing in right coronary artery (A); runthrough wire was parked in posterior descending artery (B); embolised stent seen in right common femoral artery (C,D white arrow)

**Figure 2A, B.** EN snare was pushed through the catheter and opened at its tip to catch the stent

**Figure 3A–C.** Once snared, whole stent-snare-guiding catheter assembly was pulled back under fluro surveillance
**Figure 4A, B.** Retrieved stent snared by EN snare

**Figure 5.** RCA was successfully stented using GuideLiner mother–and-child catheter (Vascular Solutions Inc., USA) by deploying two overlapping — 2.75 × 33 mm, and 3 × 23 mm Xience Expedition drug eluting stents distally and proximally (A:B — white up arrow showing the tip of GuideLiner catheter)

**Figure 6.** RCA showing proper stent expansion with TIMI-3 coronary flow