

Dislodged Coronary Artery Stent Retrieved With an Endovascular Snare

Jonathan Senior, MBChB, MRCP
Marina Roelas Guillamo, LMS
Angie Ghattas, MBChB, MRCP
Luke Tapp, MBBS, MRCP

Advances in stent design and technology have made stent loss during percutaneous coronary intervention rare. When stent loss occurs, the risk of life-threatening procedural complications is high. We describe the use of an endovascular snare system to retrieve a dislodged stent from the proximal right coronary artery of a 54-year-old man during percutaneous coronary intervention after other conventional retrieval techniques had failed. (Tex Heart Inst J 2020;47(3):213-5)

Stent loss (or dislodgment) during percutaneous coronary intervention (PCI) is rare, with a reported incidence of 1.3%.¹ Predisposing angiographic characteristics include heavy calcification, with or without substantial angulation, and tortuosity.¹ Potential complications of stent loss include coronary occlusion, thrombosis, myocardial infarction, bleeding requiring transfusion, and emergency coronary artery bypass grafting (CABG). The risk of major complications (death, emergency CABG, and composite major adverse cardiac endpoints) is high; the estimated incidence is 16.9%.¹ Therefore, interventional cardiologists must be familiar with common stent retrieval techniques. These include the use of a loop snare, small angioplasty balloon, forceps, or basket retrieval device.^{2,3} We used an endovascular snare device to retrieve a lost coronary artery stent after attempts with multiple conventional techniques had failed.

Case Report

In July 2016, a 54-year-old man with exertional chest pain presented at our institution's rapid-access chest pain clinic. A pharmacologic stress test with myocardial perfusion imaging revealed a reduced left ventricular ejection fraction of 0.45, suggesting widespread irreversible ischemia. A computed tomographic coronary angiogram revealed minor coronary artery disease in the left coronary artery and substantial focal stenosis in the proximal dominant right coronary artery (RCA) (Fig. 1A).

Coronary angiography and subsequent PCI were performed through a 6F sheath introduced into the right radial artery. The RCA was cannulated with a 6F JR4 guide catheter (Medtronic) that had an outer diameter of 1.98 mm and inner diameter of 1.80 mm. The stenotic lesion was crossed with an Asahi Sion blue guidewire (Asahi Intecc) and predilated with a 2.5 × 15-mm Sprinter Legend balloon (Medtronic). Although this maneuver caused dissection within the lesion, Thrombolysis in Myocardial Infarction (TIMI) grade 3 flow was achieved (Fig. 1B). We then tried to stent the lesion back to the RCA ostium with a 3 × 22-mm Resolute Onyx stent (Medtronic). However, during deployment, the stent moved proximally because of guide catheter displacement and deep inspiration by the patient. As a result, approximately one third of the stent was deployed in the RCA, and the remaining proximal length extended back into the aorta (Fig. 1C). Despite this, the patient remained hemodynamically stable with normal coronary flow, no electrocardiographic changes, and no chest pain.

To prevent thrombosis, we decided to replace the lost stent with one that would cover the stenosis and the dissected area within the lesion. Care was taken to remove the lost stent intact to prevent any fragment from causing thrombosis, restenosis, or both. Also, because the vessel was dissected, we did not remove the angioplasty wire; if the vessel were to become occluded, rewiring would not be possible.

First, we tried advancing the deflated balloon distally beyond the lost stent, inflating the balloon, and removing the stent by traction. This failed. Next, we tried reinflating

Key words: Coronary angiography; device removal/methods; myocardial ischemia; percutaneous coronary intervention; stents/adverse effects

From: Department of Cardiology, University Hospitals Coventry and Warwickshire NHS Trust, Coventry CV2 2DX, United Kingdom

Address for reprints:
Jonathan Senior, MBChB, MRCP, Department of Cardiology, University Hospitals Coventry and Warwickshire NHS Trust, Clifford Bridge Rd., Coventry CV2 2DX, UK

Email:
jonathan.senior@nhs.net

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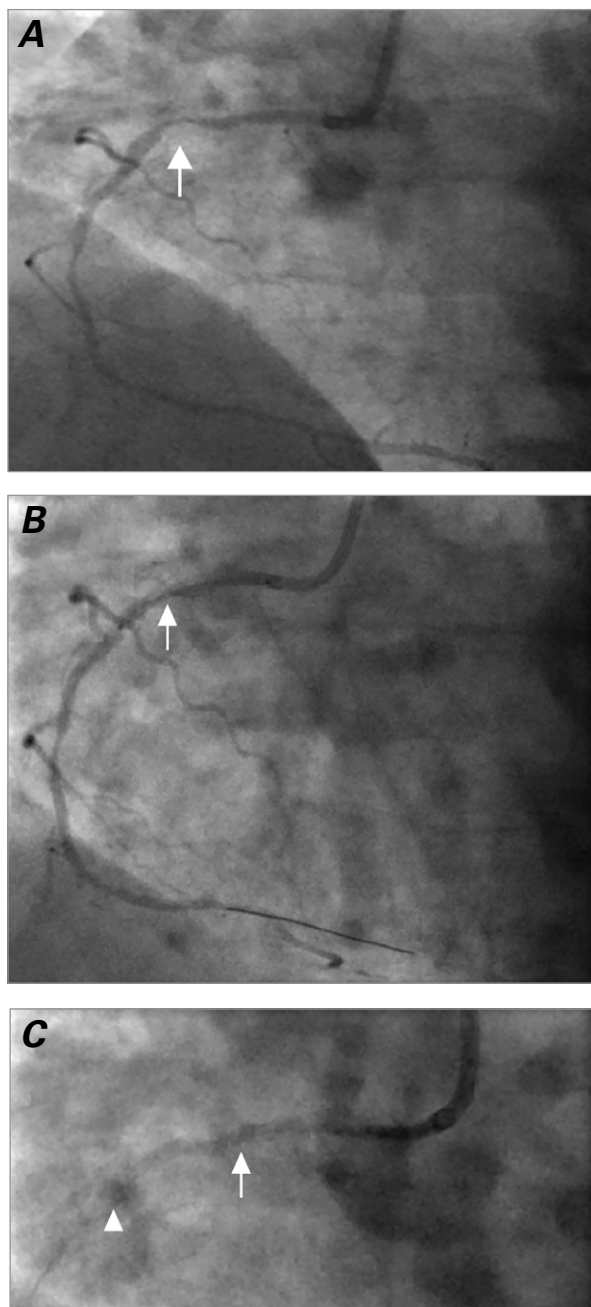


Fig. 1 Coronary angiograms show **A**) the severely stenotic lesion (arrow) in the right coronary artery (RCA); **B**) localized dissection (arrow) after predilating the lesion with a balloon; and **C**) approximately one third of the dislodged stent deployed within the RCA and the remaining proximal length extending back into the aorta (the arrow indicates the ostial RCA; the arrowhead indicates the distal end of the stent within the RCA).

the balloon within the stent at low pressure and removing the stent by gentle traction. This too failed. We then tried more advanced techniques.

We attempted to pass a low-profile 1 × 10-mm Falcon chronic total occlusion balloon (Medtronic) through and distal to the stent. However, without coaxial guide catheter support, the balloon could only be passed into

the proximal part of the stent. There, the balloon was inflated at high pressure and gentle traction was applied. However, the grip on the stent was insufficient to pull it out.

Next, we tried passing a 2nd wire into the RCA. Our rationale was 2-fold. First, passing the 2nd wire outside the lost stent (between the struts and vessel wall) might facilitate passage of a balloon distal to the stent that could then be expanded and used to dislodge the stent with traction. Second, the 2nd wire might weave in and out of the stent struts, thereby wrapping around the stent and gaining enough traction to pull it out. Unfortunately, we could not sufficiently advance the 2nd wire into the lost stent.

We then tried to snare the stent by advancing a 25-mm Amplatz Goose Neck™ snare (Medtronic) through the guide catheter. Although we were able to see the stent angiographically in multiple orthogonal views, we could not advance the snare far enough over the stent to gain enough traction to dislodge it (Fig. 2).

Conventional retrieval methods having failed, we decided to use an EN Snare® endovascular snaring device (Merit Medical Systems, Inc.). The device consists of 3 interlaced cabled nitinol loops that enable a firm grip on foreign bodies, and platinum strands intertwined with each loop enhance angiographic visualization. Previously, we had used it to snare dislodged transcatheter aortic valve implants and to retrieve a retrograde wire into an 8F guide catheter during PCI for chronic total occlusion.

According to the manufacturer's product specifications, the EN Snare's 7F delivery catheter (outer diameter, 1.88 mm) should have been too large to pass through—and therefore incompatible with—the 6F JR4 guide catheter (inner diameter, 1.80 mm). However, we were able to advance the EN Snare delivery catheter without resistance until the loops enveloped (Fig. 3A) and then collapsed around the stent to firmly grip it. We then gently retracted the delivery catheter until the lost stent was pulled in its entirety from the RCA and back into the guide catheter. The stent was then withdrawn from the patient. During retrieval, the RCA sustained no angiographically obvious injuries, the wire remained in situ, and TIMI grade 3 flow was maintained. The patient remained well, pain free, and hemodynamically stable throughout.

Next, we carefully implanted 2 stents to cover the original lesion and the length of the RCA back to its ostium. A 3 × 22-mm Resolute Onyx stent (Medtronic) was deployed proximally and overlapped with a 2.75 × 10-mm Resolute Onyx stent (Medtronic) to cover the dissected area of the lesion. The final angiographic result was excellent (Fig. 3B). No further procedural complications occurred, and the patient was discharged from the hospital on the same day. He was well at a follow-up visit 8 weeks later and underwent subsequent monitoring by our hospital's heart failure nurse specialists.

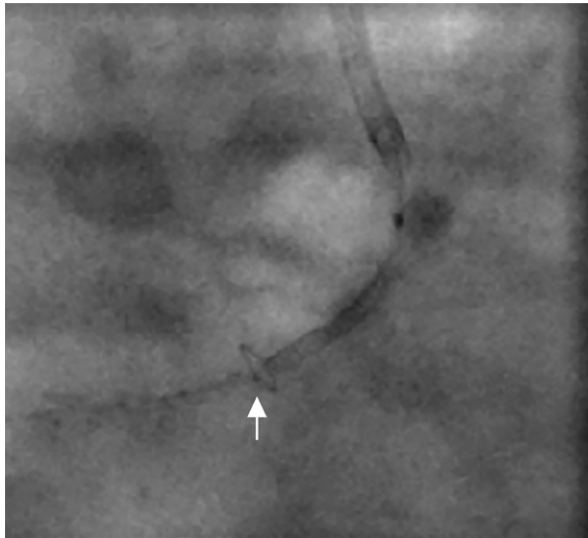


Fig. 2 Coronary angiogram shows the 25-mm Goose Neck snare grasping the end of the lost stent (arrow) in the right coronary artery.

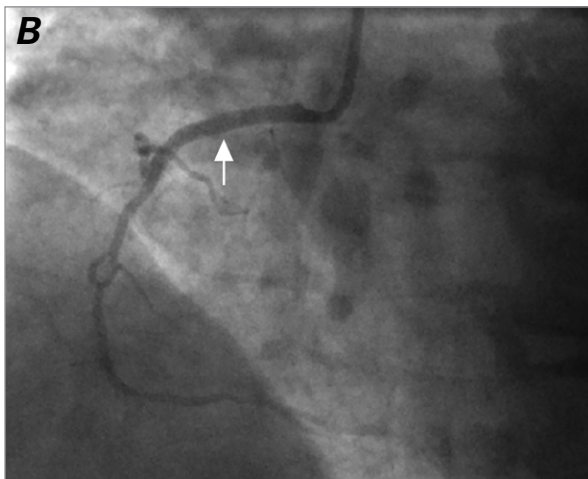
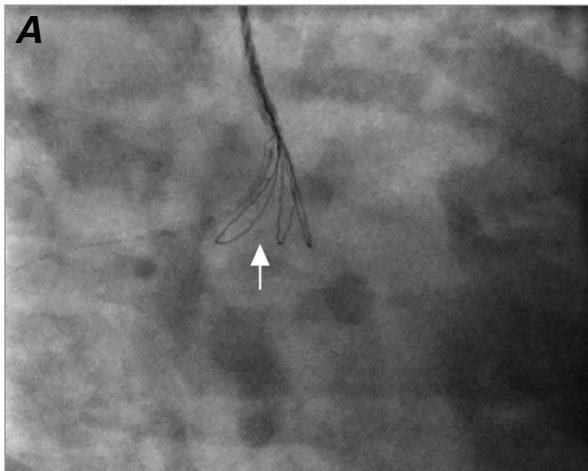


Fig. 3 Coronary angiograms show **A**) the EN Snare endovascular snaring device in the right coronary artery (RCA) as it envelops the lost stent (arrow) and **B**) the 2 overlapping stents (arrow) placed in the RCA after removal of the lost stent.

Discussion

Stent loss during PCI can be life-threatening. Interventional cardiologists must therefore be familiar with a variety of common stent retrieval techniques. If these fail, operators must think creatively and be prepared to use all equipment and expertise available to them in the catheterization laboratory to maximize the chances of a successful outcome. To our knowledge, ours is the first documented use of the EN Snare endovascular snare system to capture and retrieve a dislodged coronary artery stent. According to its manufacturer's product specifications, the EN Snare's 7F delivery catheter should not have been able to pass through a 6F guide catheter. However, in our case, it did so easily and without resistance. This facilitated our successful novel attempt at quickly snaring and removing from the ostial RCA a lost stent that had resisted retrieval by standard techniques.

References

1. Alomar ME, Michael TT, Patel VG, Altomare CG, Rangan BV, Cipher D, et al. Stent loss and retrieval during percutaneous coronary interventions: a systematic review and meta-analysis. *J Invasive Cardiol* 2013;25(12):637-41.
2. Brilakis ES, Best PJ, Elesber AA, Barsness GW, Lennon RJ, Holmes DR Jr, et al. Incidence, retrieval methods, and outcomes of stent loss during percutaneous coronary intervention: a large single-center experience. *Catheter Cardiovasc Interv* 2005;66(3):333-40.
3. Foster-Smith KW, Garratt KN, Higano ST, Holmes DR Jr. Retrieval techniques for managing flexible intracoronary stent misplacement. *Cathet Cardiovasc Diagn* 1993;30(1):63-8.