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CASE REPORT

Successful Coronary Stent Retrieval From a Pedal Artery

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Abstract The purpose of this article is to report complications from a coronary drug-eluting stent lost in the peripheral circulation. We report the case of successful retrieval of a sirolimus coronary stent from a pedal artery in a young patient who underwent coronary angiography for previous anterior myocardial infarction. Recognition of stent embolization requires adequate removal of the device to avoid unwelcome clinical sequelae.

Keywords Coronary stent · Microsnare technique · Peripheral embolization · Stent retrieval

The occurrence of stent loss during percutaneous coronary interventions appears to have decreased in recent years, probably due to improvements in equipment design and to the almost universal use of premounted stents. Unfortunately, dislodgement of a stent during its deployment is still an unwelcome complication in coronary stenting procedures and has been reported to occur in 1% to 8.4% of cases [1]. This event may result in coronary, cerebral, or peripheral embolization with potentially adverse sequelae [2, 3]. Improved deployment strategies, including new stent designs, are required to decrease procedural risk. We report the case of successful coronary stent retrieval in a patient in whom a drug-eluting stent was dislodged from a balloon catheter to the pedal artery after failed intracoronary delivery.

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Case Report

A 47-year-old man with coronary artery disease was admitted to our hospital because of dyspnoea occurring 2 months after anterior myocardial infarction. Physical examination was normal, whereas the electrocardiogram showed sinus rhythm and signs of previous anteroseptal myocardial infarction. Laboratory parameters were within normal limits.

Preoperative transthoracic echocardiography showed fairly decreased left ventricular function (ejection fraction 45%) associated with apical and distal septum wall akinesia and evidence of a thrombus stratification in the apex.

Coronary angiography was performed using a standard right femoral approach with the placement of a 6F short sheath. Selective left coronary angiography showed two-vessel disease, with evidence of spontaneous dissection in the middle segment of the left anterior descending coronary artery (LAD) and severe narrowing superimposed to an ulcerated plaque in the proximal segment of the right coronary artery (RCA). After coronary revascularization of the RCA, direct stenting of the lesion in the middle tract of the LAD was attempted with a 3.5 × 33–mm Cypher (Cordis Europa, Roden, The Netherlands) stent. During advancement of the stent, the device became entrapped, making it impossible to retrieve the stent in the guiding catheter because of the partial enlargement of its distal struts. Therefore, the guiding catheter and the stent-loaded balloon were carefully brought into the descending aorta as one unit to avoid embolization in the cerebral circulation. Unfortunately, during this manoeuvre the stent was dislodged from

the delivery balloon before being withdrawn through the femoral sheath. Angiography of the inferior limbs showed that the stent had migrated to the level of the right pedal artery (Fig. 1). The patient remained asymptomatic with no alterations of distal perfusion of right lower limb. No bleeding complications occurred at groin site, and the sheath was removed with standard manual compression.

Diagnostic angiography was performed after placement of a 7F 25-cm TERUMO long sheath introducer through an anterograde puncture of the omolateral common femoral artery. Examen showed a patent right pedal artery with evidence of tight spasm in the proximal part of the stent. A system consisting an over-the-wire low-profile balloon (2 × 40 mm) (Amphirion Deep, Invatec) catheter and an Extrasupport guide wire (0.014”, 182 cm length; Choice) was advanced in the anterior tibial artery, then a total amount of 200 μg nytroglicerin was injected through the balloon catheter to resolve the spasm. The guide wire was then inserted in the balloon and positioned distally in the pedal artery. After this step, the balloon was advanced and placed beyond the nonexpanded stent without resistance (Fig. 2, panels A through D). The balloon was then gently inflated and the entire system (balloon, stent, and guide wire) was retrieved at the level of the popliteal artery. A 4F gooseneck microsnare (Bard) was inserted in a parallel fashion, and the guide wire was retrieved in the opened loop of the microsnare, which was tightened at the proximal part of the stent. Finally, the snare and the stent were carefully withdrawn as a whole and successfully removed through the sheath (Fig. 2 [panels E through H] and Fig. 3). The patient tolerated the procedure well, and clinical follow-up was free of major adverse cardiac events.

Discussion

Coronary stent deployment failure and stent embolization is an uncommon but potentially hazardous complication of percutaneous transluminal coronary angioplasty. Stent dislodgement from the delivery system tends to occur when negotiating a tortuous artery with a balloon-mounted stent, especially if the artery is irregularly calcified or when applying a rigid stent. It often occurs when the stent–balloon is pulled back into the guiding catheter because the target lesion either can not be reached or passed. Factors predisposing to the inability to deliver a stent are poor support of the guiding catheter or the guide wire, vessel tortuosity, and severe vessel calcification.

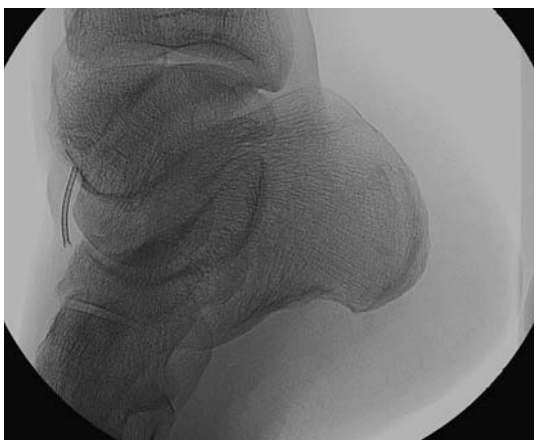

Fig. 1 Embolization of coronary stent at the level of the pedal artery

Several techniques have been proposed to facilitate stent deployment in difficult cases, such as selection of guiding catheters with appropriate configurations for strong backup support, deep-seating guiding catheters within the coronary artery, and the use of extra-supportive wires.

Intracoronary embolization of balloon-mounted stents is a serious complication associated with a high risk of coronary thrombosis and subsequent myocardial infarction [4–7]. Bailout cardiac surgery may be indicated if percutaneous retrieval attempts fail [8, 9]. Furthermore, systemic embolization may cause severe cerebrovascular events, whereas peripheral embolization usually is not associated with apparent clinical side effects.

Different retrieval procedures of unexpanded stents from the coronary vessel, including the use of multipurpose baskets, two twisted guide wires, balloon catheters, or loop snares, have been described in the literature [10–12].

In contrast, many retrieval techniques have been reported in the literature for peripheral stent recovery [13, 14]. Successful stent-retrieval manoeuvres have included use of a gooseneck catheter, small-sized balloon-crossing lost stent, Dormia system, biliary forceps, Cook-retained fragment retriever, and basket-retrieval device. Peripheral balloon angioplasty can be used to withdraw the stent into the arterial sheath and thus remove it from the patient. Nevertheless, in case of failure of all of these systems, surgical removal can be considered as an alternative option. In our case, we chose to use the small-balloon technique, which is probably the simplest system, coupled with the use of a loop snare.

We decide to retrieve the lost stent in the tibial artery because of the small diameter of the pedal artery, the patient’s age, and the unwelcome complications of angioplasty of a lost stent at the level of the ankle joint. Moreover, we preferred to avoid the fixation of lost stent in the same vessel where it migrates by means of angioplasty in situ, considering the consequences of a complication such as subacute thrombosis of a drug-eluting stent in the peripheral vascular bed. Finally, we preferred to retrieve the stent in the tibial artery to perform the retrieval manoeuvre in a larger vascular district.

In conclusion, coronary stent dislodgment or embolization in the peripheral circulation before deployment is a rare

Fig. 2 (**A**) Angiogram of inferior limbs showing the patency of the pedal artery with tight spasm in the proximal part of the dislodged stent. (**B**) A system consisting of an over-the-wire low-profile balloon and an Extrasupport guide wire was advanced through the lost stent. (**C**) Resolving the spasm after intrarterial administration of nytroglicerin. (**D**) Gentle inflation of the distal part of the small balloon through the stent. (**E**) Retrieval of the entire system (balloon, stent, and guide wire) into the popliteal artery. (**F**) Insertion of a gooseneck microsnare and advancement of the guide wire into the opened loop of the microsnare. (**G**) The loop of microsnare was retrieved and then cinched tightly at the proximal part of the stent. (**H**) Careful retrieval of the snare and the stent, as a whole, through the sheath

but challenging complication in interventional cardiology. With the increasing trend of using drug-eluting stents [15–17] in percutaneous coronary intervention, the likelihood of stent loss may increase. Using retrieval devices and appropriate techniques, it is possible to adequately manage this complication and safely retrieve the lost stent.

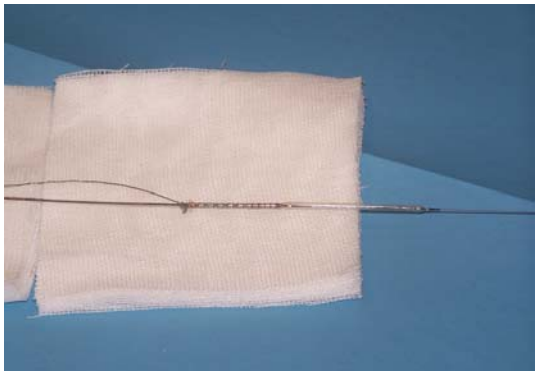

Fig. 3 View of the entire retrieved system comprised of the lost stent, the low-profile balloon, and the gooseneck microsnare

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