Dislodgement of a sirolimus-eluting stent in the circumflex artery and its successful deployment with a small-balloon technique

Balonundan sıyrılan sirolimus kaplı stentin düşük profilli balon kateter yardımıyla başarılı bir şekilde yerleştirilmesi

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Summary – Coronary stent dislodgement or embolization before deployment is a rare but serious complication in interventional cardiology. A 60-year-old male presented with unstable angina five years after coronary artery bypass surgery. There was a stenosis (70%) in the obtuse marginal branch of the circumflex artery. During percutaneous coronary intervention, a sirolimus-eluting stent was stripped from its balloon mainly because of significant proximal angulation and incarcerated within the proximal circumflex artery. A smaller balloon dilatation catheter was advanced and pushed through the inside of the slipped stent. Using this technique, the stent could be advanced into the lesion and was successfully deployed. To our knowledge, this is the first case report on sirolimus-eluting stent dislodgement.

Özet – Girişimsel kardiyolojide, koroner stentin yerleştirilmesi sırasında yer değiştirmesi veya embolizasyonu nadir ama ciddi bir komplikasyondur. Altmış yaşındaki erkek hasta, geçirdiği koroner arter baypas greft ameliyatından beş yıl sonra kararsız angina pektoris ile başvurdu. Sirkumfleks arterin obtus marginal dalında %70'lik darlık saptandı. Perkütan koroner girişim sırasında gönderilen sirolimus kaplı bir stent, arterdeki ileri derecede açılanma yüzünden balonundan sıyrılarak sirkumfleks arterin proksimalinde kaldı. Daha küçük bir balon kateter gönderilerek stentin içerisine itildi. Bu teknikle, stentin lezyona yönlendirilmesi ve yerleştirilmesi başarıyla gerçekleştirildi. Bilgilerimize göre, sunulan olgu, sirolimus kaplı bir stentte sıyrılma ve yer değiştirme yaşanan ilk olgudur.

Stents are currently utilized in the majority of percutaneous coronary interventions. Intracoronary dislodgement and embolization of a stent during PCI may be hazardous to the patient and even necessitate emergency cardiothoracic surgery.[1] The incidence of stent loss during PCI have decreased in recent years, probably due to improvements in equipment design and universal use of premounted stents.[2] Drug-eluting stents are associated with lower rates of target vessel revascularization compared to bare metal stents.[3]

Abbreviations:

Cx	*Circumflex artery*
LAD	*Left anterior descending artery*
OM1	*First obtuse marginal branch*
PCI	*Percutaneous coronary intervention*

Here, we report on a case in which a drug-eluting stent was stripped from its balloon and deployed successfully using a small-balloon technique.

CASE REPORT

A 60-year-old male presented with unstable angina five years after coronary artery bypass surgery. His first cardiac episode was in 2003 when he suffered from unstable angina pectoris. Later in the same year, he underwent coronary angiography that revealed severe two-vessel disease, and coronary artery bypass graft surgery was performed with saphenous vein graft to the first diagonal branch of the left anterior descending artery and the posterior descending branch of the right coronary artery and a left internal mammary artery graft to the LAD artery. He had risk factors of hypertension and hyperlipidemia. His pulse rate was 85 beats/min and arterial blood pressure was 110/85 mmHg. Other physical examination findings were all normal. Admission electrocardiog-

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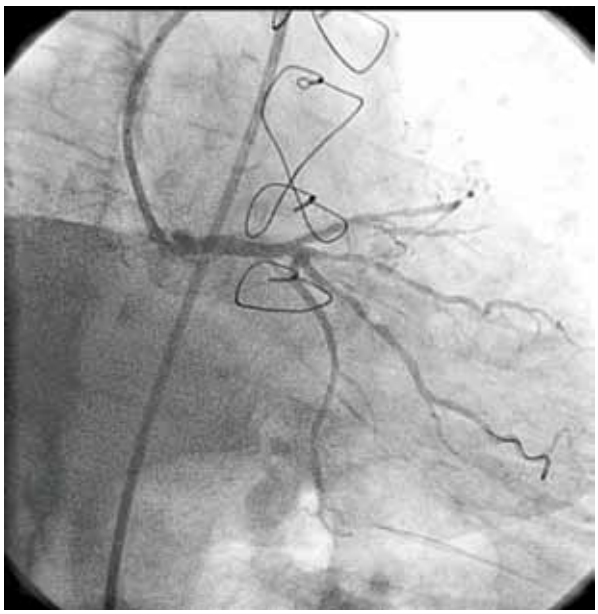

Figure 1. Coronary angiogram showing a critical stenosis of the highly angulated circumflex coronary artery.

raphy showed normal sinus rhythm and Q waves in inferior leads. Angiography was performed using 6 F Judkins left and right catheters, which showed three-vessel disease with total occlusion of the LAD after the first diagonal branch, 70% stenosis in the first obtuse marginal branch of the circumflex artery, and occlusion of the right coronary artery (Fig. 1). All the grafts were patent. We decided to perform PCI for the critical occlusion.

Prior to coronary angiography, antiplatelet agents (aspirin 300 mg, clopidogrel 600 mg) were used and heparin (5000 U bolus plus 1000 U/hour) was started. Activated coagulation time was maintained between 250 and 300 seconds throughout the procedure. A 6 F guiding catheter (Launcher, Medtronic, Minneapolis, USA) was introduced through the femoral route and placed into the left coronary ostium. The initial strategy was to stent the culprit lesion after predilation. A 0.014-inch floppy guide wire (ChoICE, Boston Scientific, Minnesota, USA) was advanced to the OM1. After predilation of the OM1 stenotic lesion with a 2.0 x 20-mm Sprinter Legend balloon dilatation catheter (Medtronic), a 2.5 x 18-mm sirolimus-eluting stent (Cypher Select, Cordis, Johnson & Johnson, Netherlands) was advanced but failed to cross the proximal Cx artery due to significant proximal angulation. During this attempt, resistance was felt. We observed that the stent had slipped distally from its normal position between the two marker bands on the delivery catheter. After an unsuccessful radioscopic search for the undeployed stent, the left coronary artery was filmed again. The undeployed stent was dislodged in the proximal Cx artery (Fig. 2a, b). The balloon was pulled out. A 1.5 x 20-mm Sprinter Legend balloon dilatation catheter (Medtronic) was advanced using a guiding catheter and the balloon was pushed through the guide wire and then through the inside of the slipped stent. We inflated the balloon to 6 atm and started to advance the stent over the balloon into the lesion (Fig. 2c). The Sprinter Legend balloon dilatation catheter was pulled out and a 2.5 x 18-mm balloon catheter was advanced and inflated, and the stent was finally deployed (Fig. 2d). After the procedure, serum cardiac enzyme levels were within normal limits, and no dynamic ST-T segment deviation was noted. Enoxaparin (60 mg, bid) and clopidogrel (75 mg) were given to the patient for anticoagulation. After two days, the patient was discharged on oral medication including a beta-blocker, ACE inhibitor, statin, aspirin, and clopidogrel.

DISCUSSION

Stent dislodgement and embolization are serious complications of PCI and may result in systemic or intracoronary stent embolization. These complications were more common with the first generation stents.[4] Brilakis et al.[5] published a series of 11,773 PCIs in which stent loss occurred in 38 cases (0.32%) with a successful retrieval in 86% thereof. The incidence of stent loss during PCI has decreased in recent years, probably due to improvements in equipment design and universal use of premounted stents.[2] There is an increasing trend for drug-eluting stents in PCI. Dislodgement and embolization of the new generation coronary stents before deployment are rare. To our knowledge, there have been no reports on dislodgement or embolization of a sirolimus-eluting stent. In our case, the sirolimus-eluting stent was stripped from its balloon, incarcerated within the proximal Cx artery, and eventually deployed successfully using a small-balloon technique.

Stent dislodgement refers to the loss of the stent from the delivery system. It most often occurs when a stent-balloon assembly is pulled back into the guiding catheter due to failure to reach or pass the target lesion.[6] Several risk factors for stent loss and dislodgement have been defined, including poor support of the

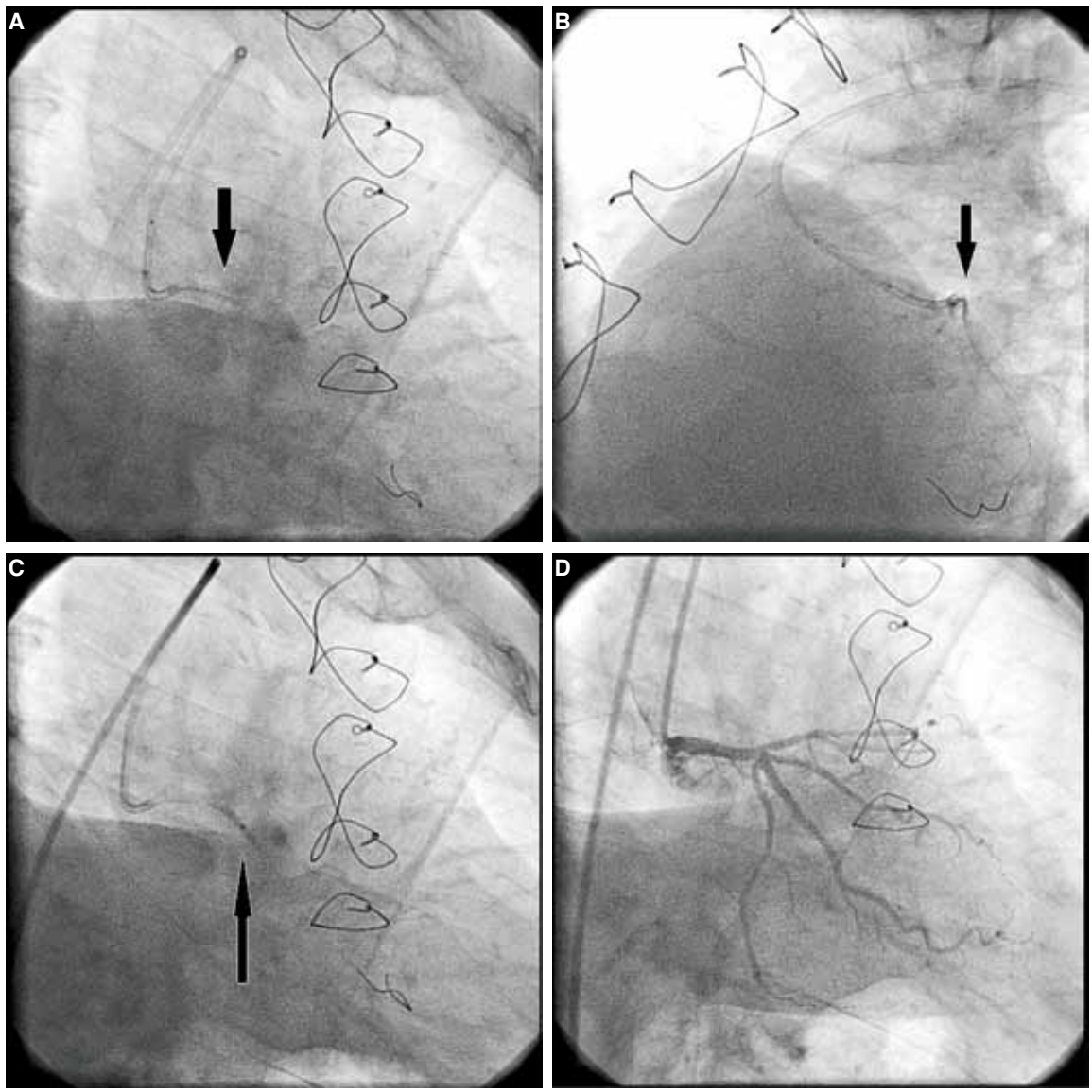

Figure 2. **(A)** Right anterior oblique and **(B)** left anterior projections showing the dislodged sirolimus-eluting stent over the proximal circumflex artery segment (arrows show slipped stent in the coronary artery). **(C)** The small balloon dilatation catheter inflated to 6 atm started to advance the stent over the balloon into the lesion. **(D)** Final result after successful deployment using the small-balloon technique.

guiding catheter or guide wire, vessel tortuosity proximal to the lesion, and severe vessel calcification.[7] Insufficient attention to the use of appropriate guiding catheters and wires may also contribute to stent loss. Compared to predilation, direct stenting may pose a higher risk for stent loss because there may be a greater resistance to stent advancement through the lesion.[8] In our case, the proximal Cx artery was heavily calcified and had significant angulation. After evaluating the calcification and angulation of the target vessel, we decided to perform drug-eluting stenting after predilation.

Several methods of retrieving dislodged stents from the coronary vessels have been described, including the use of myocardial biopsy and biliary forceps, two twisted guide wires, multipurpose baskets, loop snares, and small-balloon technique.[2,4,7] The latter is probably the simplest stent retrieval technique. Eggebrecht et al.[2] reported a high success rate (70%) using the small balloon technique. Because of the flexible design and small noninflated diameter of the balloon catheter tip, an unexpanded stent can often be crossed without major problems. With inflation of the balloon at low pressure, the stent frequently remains

attached to the balloon and can be retrieved through the femoral sheath without damaging the stent. Balloon catheters can also be used to advance the slipped stent directly and deploy it at the originally intended site. In our case, the proximal angulation and calcification of the proximal Cx artery prevented advancement of the sirolimus-eluting stent. Because the stent was in the proximal Cx artery but was still on the guide wire, a low-profile balloon catheter was considered to be the best device for retrieving the unexpanded stent. After balloon (nominal size 1.5 mm) inflation, the stent could be advanced to the target lesion and was successfully deployed. We had to inflate the balloon at a high pressure (6 atm) because inflation at lower pressures was not helpful to advance the stent.

The technique we used in this case may prove advantageous compared to other methods. It does not require specialized equipment. We found this method to be feasible and it may also be cost saving. A limitation of balloon-assisted stent retrieval is the inadvertent retraction of the guide wire, mostly as a result of dislodging the guiding catheter from the coronary ostium. If withdrawal of a slipped stent is not possible, overlying stent deployment or crushing may be a good alternative. If the stent is lost from the wire, a second wire and balloon may be passed alongside, thereby crushing the stent into the side wall of the coronary artery. Crushing or deploying the stent would probably be avoided if the stent is located in the left main artery, proximal LAD, or another critical location. Crushing or deploying the stent carry a risk for re-stenosis, although this risk may be lower when drug-eluting stents are used.[5] Surgical removal is required in a considerable number of cases.

In conclusion, the use of a low-profile balloon catheter in our case was successful to manage stent dislodgement and eventual implantation of the stent.

Conflict-of-interest issues regarding the authorship or article: None declared

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Key words: Angioplasty, balloon, coronary/instrumentation; equipment failure; stents.

Anahtar sözcükler: Anjiyoplasti, balon, koroner/enstrümantasyon; cihaz başarısızlığı; stent.