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Case Report
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Accidental Stenting Out of Stent: A Lesson from No-Reflow after New Stent Deployment Outside the Prior Stent

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An operator can be unaware that the guide wire has accidentally advanced into space outside the previous stent, which can result in deformation of the previous stent when a new stent is deployed outside the prior stent. We herein have reported a case of accidental guide wire advancement into a previously dissected lumen of right coronary artery (RCA), resulting in a new stent deploying outside the prior stent, resulting in deformity of the prior stent. Thrombus and friable atheromatous plaques dislodged and migrated to occlude distal RCA when attempting to restore the proximal luminal diameter by balloon inflation, resulting in profound shock with asystole. IVUS was successful in identifying the cause, and the thrombus was removed successfully by manual aspiration. Due to the poor endothelization of a recent stenting, clinicians should be particularly careful of possible wire advancing outside the stent structure, which can result in prominent thrombus or atheromatous debris occluding the distal vessel, and IVUS may be useful in confirming the cause of no-reflow.

Key Words: Coronary dissection • Intravascular ultrasound • No reflow • Recent myocardial infarction • Stent deformation

INTRODUCTION

When poor endothelization of a recent stenting occurs, an operator can be unaware of accidental guide wire advancement into space outside the previous stent, resulting in deformation of the previous stent when a new stent was deployed outside the prior stent. Early re-intervention, particularly after ST-segment elevation myocardial infarction (STEMI) stenting, carries a risk of wire placement outside a stent with unfortunate consequences.

CASE REPORT

This 68-year-old male presented to our institution with persistent exertional angina after a primary percutaneous coronary intervention (PCI) with bare metal stent (3.0 mm × 28 mm) deployed in the middle segment of the right coronary artery (RCA) three weeks earlier due to inferior wall STEMI. Further coronary angiography revealed an uncovered significantly stenotic lesion just proximal to the stent edge (Figure 1A, black arrow, compared with Figure 1B) and a small type C dissection outside the stent (Figure 1A, white arrow, compared with Figure 1B). Moreover, a chronic total

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occlusion of the left anterior descending artery (LAD) was also detected. When the patient refused suggested bypass surgery, we therefore performed PCI to remediate this recently discovered problem. Due to the presence of significant stenosis, we decided to perform a direct stenting to cover the whole lesion from proximal to the middle of RCA, leaving a small region of overlap with the previous stent. We attempted to advance the wire (Fielder FC, Asahi Intecc Co., Japan) to the distal RCA, but the wire did not proceed into the previous stent directly as planned. The guide-wire was accidentally advanced outside the stent into the type C dissection proximally and returned to the true coronary lumen during the middle portion of the stent (Figure 2A). However, the outside stent location of the guide-wire was unnoticed at that time.

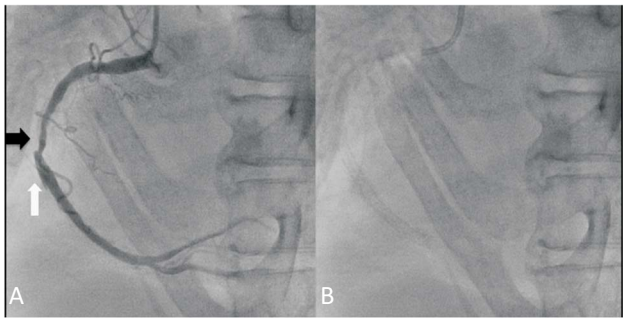

Figure 1. *Transcatheter coronary angiography of the right coronary artery (RCA) showing status post stenting in the RCA with residual significant stenosis and a type C dissection outside the prior stent. (A) Comparing the post-contrast medium injection image with the non-contrast image on (B) reveals residual significant stenosis was seen in the middle segment of RCA (black arrow) and a type C dissection outside the stent structure (white arrow).*

There was no appreciable resistance and it was easy to advance and deploy the second stent. When we deployed the new proximal stent (3.5 × 28 mm), deformation of the proximal edge of previous stent occurred (Figure 2B and 2C). We tried to advance intravascular ultrasound (IVUS, Volcano, CA, USA) into the crush site, but it could not pass the stent strut. In order to restore the proximal luminal diameter, we tried to advance an-

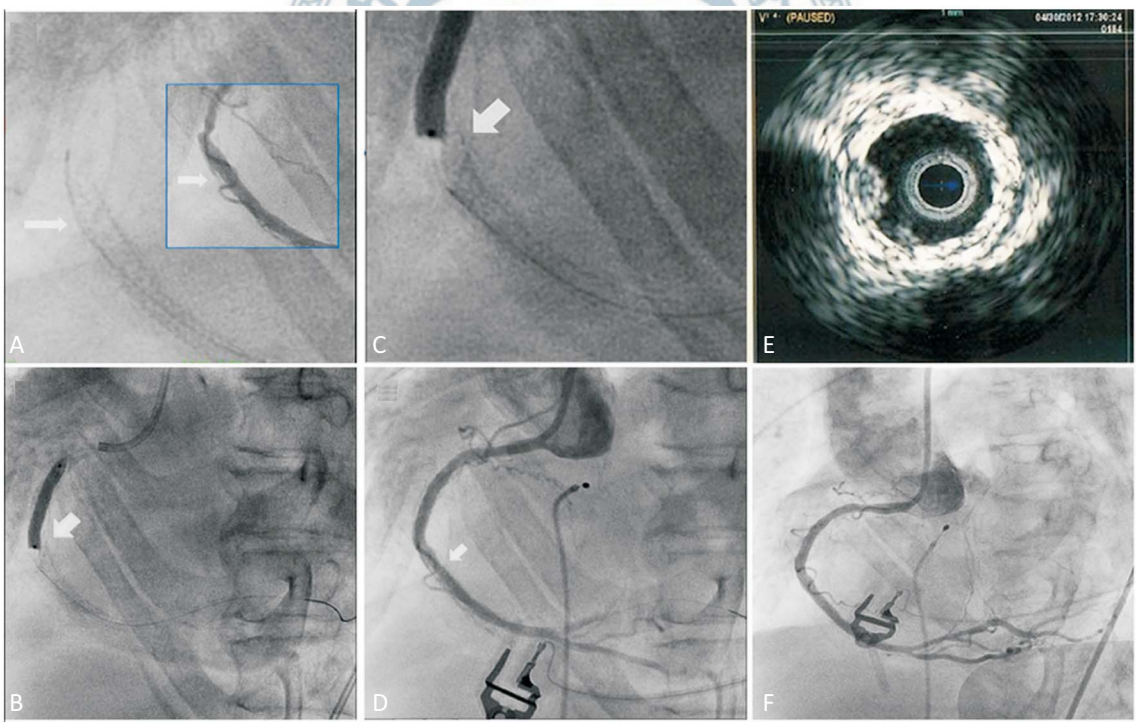

Figure 2. *Image of the angiography showing accidental guide wire advancement into the dissected space outside the stent and caused complications. Still image during advancement of the guide wire shows that the wire was accidentally advanced outside the stent into the dissection space. The location of the guide wire is denoted by white arrow. (Small box: magnified view during angiography). (B and C) New stenting inflation outside the previous stent resulted in deformation (arrow) of the previous stent. (D) Follow-up angiography showed some mosaic filling defects in distal in-stent lumen (arrow). (E) Intravascular ultrasonography (IVUS) showed significant debris over the stent structure. (F) Follow-up angiography of RCA after thrombus aspiration showed successful restoration of TIMI III flow.*

other guide wire (Runthorugh NS Hypercoat, Terumo, Japan) through the distal side hole of proximal stent into the distal in-stent lumen, followed by sequential balloon dilations with 1.25 mm, 2.0 mm, and 3.5 mm size balloons. However, after the balloon dilations, acute no-reflow developed in the middle RCA, resulting in profound shock with asystole. Immediate cardiopulmonary resuscitation was performed with temporary pacing wire and intra-aortic balloon pump. After the patient's hemodynamics were restored, a follow-up angiography showed some mosaic filling defects in distal in-stent lumen (Figure 2D). IVUS was used to evaluate the cause of no-reflow, which confirmed many segments of thrombus or friable atheromatous debris over the stent structure (Figure 2E). Repeated thrombus aspirations by manual thrombus aspirator (Fetch, Bayer, USA) and intra-coronary glycoprotein IIb/IIIa inhibitor injection were immediately performed, resulting in successful restoration of TIMI III flow of the RCA (Figure 2F).

DISCUSSION

The increasing use of percutaneous interventions for STEMI provides the restoration of normal epicardial flow in a growing number of patients, but PCI-related distal embolization from thrombus or/and friable atheromatous debris can result in inadequate myocardial perfusion, increased infarction size and mortality.[1] This patient received primary PCI three weeks before coming to our facility, but had inadequate stent coverage along with residual type C dissection or under-sizing of the previous stent. Regardless of dissection or under-sizing of stent, it is highly possible that some residual thrombus or friable atheromatous plaques were hidden in the dissection or the space outside the previous stent. During the expansion of the new stent, the thrombus or friable atheromatous debris dislodged and migrated into distal coronary resulting in no-reflow of the distal RCA. In addition, due to the inadequate collateral blood flow to LAD, the no-reflow of RCA caused catastrophic outcome in this patient.

In view of the circumstances of our case, there are several possible ways we could in the future prevent accidental outside wiring. First, by using the loop wire technique before the crushed strut, we could avoid malposition of the wire and ensure that the wire is within stent strut.[2] Second, before stenting, use of IVUS not only can check the vessel/stent size, but difficulty in advancing IVUS also implies malposition of the wire. Third, the pre-dilating balloon has the same function as IVUS. Therefore, direct stenting should be avoided in this situation.

A recent study using a newly developed stent with polyethylene terephthalate micronet mesh covering designed to trap and exclude embolism-prone material before distal embolization (MGuard) showed superior rates of epicardial coronary flow and complete ST segment resolution than regular bare-mental stent.[3] Utilization of such a type of stent may be useful to reduce similar complication as shown in our case.

CONCLUSIONS

Due to the stent malposition and undersizing of a recent stenting, especially after STEMI intervention, clinicians should be particularly careful to avoid advancing the wire outside the stent structure, which can result in prominent thrombus or atheromatous debris occluding the distal vessel. By implementing the looping wire technique, IVUS before stenting and using pre-dilation balloon can help prevent this from happening. In fact, IVUS may be useful in confirming the cause of no-reflow.

DECLARATION OF CONFLICTING INTEREST

The authors declare that there is no conflict of interest.

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