

Accordion Stent Deformation upon Retrieval of a Side-Branch Protective Guidewire

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In this case we herein report a dangerous complication from primary percutaneous coronary intervention, where an unnoticed loop of the guidewire was inadvertently made around the stent during provisional stenting. Since the guidewire and the stent were entangled, efforts to retrieve the guidewire only exacerbated the problem by compressing the stent like an accordion. We review those factors that may have influenced stent compression in our case, as well as possible ways to avoid it from occurring in the future.

Key Words: Catheterization • Coronary stenosis • Embolism • Myocardial infarction • Percutaneous coronary intervention • Stents

INTRODUCTION

When treating bifurcation lesions, the jailed wire technique can be used to avoid acute side-branch occlusion. However, entrapment of the side-branch-protecting wire between the stent strut and the arterial wall can still occur after provisional stenting. It is an infrequent though potentially dangerous complication of bifurcation lesion treatment, in which coronary arterial injuries and wire fracture occur upon forceful retrieval of the jailed wire. Unintended stent extraction during retrieval of the entrapped guidewire has been previously reported,¹ but its mechanism was not clearly explained. Here we report a case of accordion stent deformation after retrieving an entrapped side-branch protective

guidewire, with discussion of its mechanisms provided below.

CASE REPORT

A 61-year-old male with a history of hypertension and hypercholesterolemia presented to our emergency department with persisting chest pain for 10 hours. An electrocardiogram showed precordial ST segment elevation with Q wave formation over V1~5, suggestive of acute anterior ST-elevated myocardial infarction. Diagnostic coronary angiography revealed total occlusion in the proximal part of the mid left anterior descending (LAD) artery, and diffuse stenotic lesions over the left circumflex (LCX) artery and the right coronary artery (RCA). The patient received primary percutaneous coronary intervention (PCI), immediately for the LAD lesion after administration of tirofiban. The LAD was engaged with a 6 Fr. CLS 3.5 guiding catheter (Boston Scientific, MA, USA). A 0.014" Pilot 150 wire (Abbott Vascular, Temecula, CA, USA) was used to cross the total occlusion at the mid LAD and revealed a bifurcation lesion after pre-dilation with a 2.5 × 20 mm Maverick balloon catheter (Boston Scientific) (Figure 1). Provisional stenting was planned and another Runthrough Hypercoat wire

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(Terumo Corporation) was used to protect the diagonal branch (Figure 2A). It was not possible to pass the Xience V drug-eluting stent (Abbott Vascular) before ad-

ditional pre-dilation of the calcified lesion with a 3.0 × 20 mm Maverick balloon, and it was not until stent deployment did we notice entrapment of the protective guidewire in the diagonal branch. In order to free the protective wire, we pulled it back forcefully. Angiographs revealed deformation of the well-implanted stent during retrieval of the guidewire: as soon as the entrapped wire was removed through the guiding catheter, the Xience V stent underwent proximal migration and appeared to compress like an accordion (Figure 2D). Transcatheter extraction procedures were then attempted to remove the embolized stent that was potentially destructive to the LAD. The retrieval failed and we consulted a surgeon for emergent coronary artery bypass grafting (CABG) surgery. Although the patient did not develop significant chest discomfort after the complication, he refused it due to a fear of adverse outcomes of emergent CABG during acute myocardial infarction (e.g. peri-operative CABG-related bleeding). Intra-aortic balloon pump (IABP) was initiated before transferring the patient to ICU for further management and observations, and IABP was on for 3 days. Myocardial perfusion scan showed anterior infarction without residual ischemia, and medical treatments were recommended by

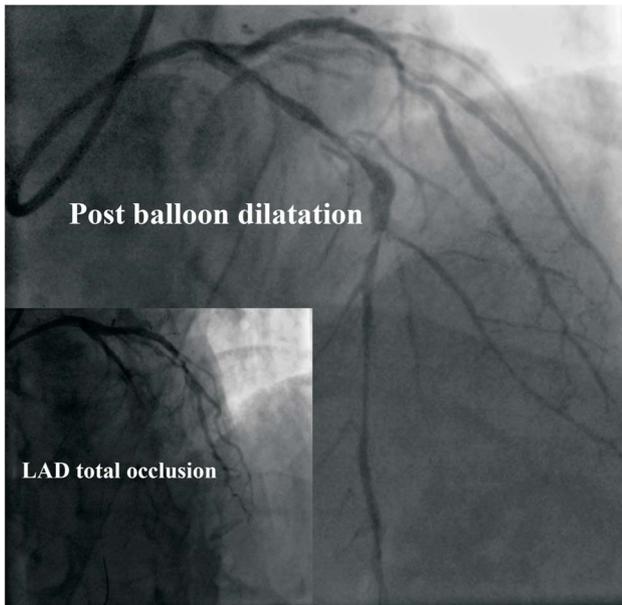


Figure 1. Result of balloon dilation of the totally occluded left anterior descending (LAD) artery. Coronary angiograph of the occluded LAD before balloon dilation is shown in the bottom-left vignette.

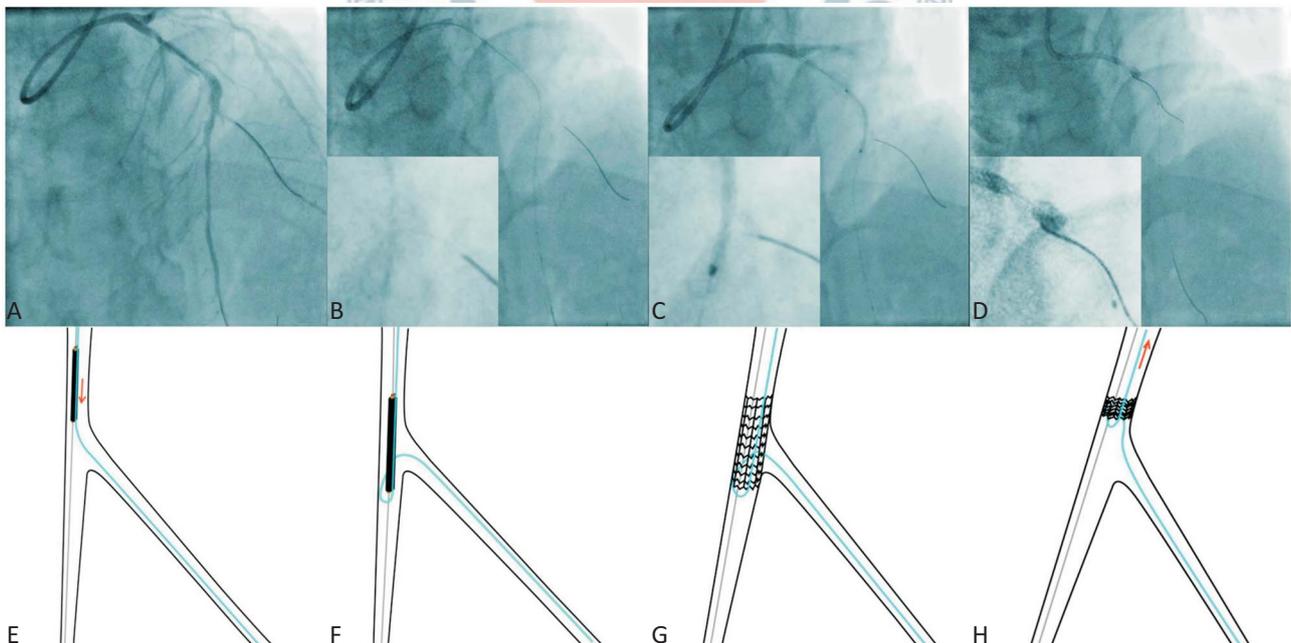


Figure 2. Balloon dilation of the totally occluded LAD revealed a bifurcation lesion. (A-D) Coronary angiographs of bifurcation lesion during provisional stenting and retrieval of the entrapped guidewire, showing LAD and its diagonal branch; the area around the stent is enlarged in (B-D), the wire loop is clearly visible in the bottom-left vignettes in (B-C), and the stent appears to be deformed in (D). (E-H) cartoons depicting scenarios of accordion-like stent deformation.

another cardiac surgeon. The patient was later regularly followed up in the outpatient department uneventfully for 3 years.

DISCUSSION

In our case, we initially used the jailed wire technique to protect the diagonal branch during provisional stenting (Figure 2A). It was not possible for us to pass the Xience V drug-eluting stent through the calcified lesion before a second pre-dilation step, however. While we tried to advance the balloon, we inadvertently looped the guidewire (Figure 2B), which we believed to be the cause of subsequent difficulty when we attempted to remove the guidewire after successful stent deployment. As the pulling force applied to the entrapped wire acted on the distal edge of the stent via the incidental wire loop, the stent hitched up and gradually shaped like a compressed accordion (Figure 2C-D; the mechanisms were illustrated as cartoons in Figure 2E-H). Because limited blood flow resulting from stent-obstructed lumen could have dramatically increased the risk of acute stent thrombosis, we next rewired the vessel using multiple guidewires, though we were still unable to advance beyond the deformed stent. We reasoned that the deformed stent may have contributed to our inability to cross over.

Retrieval of jailed wire is generally considered safe with acceptable risk of proximal coronary artery dissection by the guiding catheter. It has been reported that entrapped guidewire can be retrieved successfully by either surgical removal or advancing balloon catheter, microcatheter, or penetrating microcatheter alongside the wire.²⁻⁵ For example, in order to loosen the tightly entrapped jailed wire, a narrow space between the stent and the vessel can be created by advancing the smallest balloon (i.e. 1.2 mm in diameter) alongside the jailed wire. After retrieving the jailed wire successfully, one can then carry out post-dilatation steps alongside the stent for appropriate apposition. Entrapped guidewire retrieval using this bail-out method has been achieved without major adverse cardiac events and binary in-stent or in-segment restenosis.³ Theoretically, it might have been possible for us to apply this technique had we noticed the wire loop at the distal edge of the stent

in advance before we started the retrieving maneuver, and it might have been even possible to avoid the accordion stent deformation altogether had we adopted this technique. Although this approach provides good clinical results, incomplete stent apposition may still occur. Moreover, advancing the balloon catheter through the entrapped wire may bring additional risks of axial and longitudinal stent deformations to the PCI procedures. Nevertheless, it might still be possible to salvage the entrapped wire using a bail-out method considering the extent of accordion stent deformation in our case, and we could have used a 1.2 mm or 1.5 mm balloon to move across the deformed stent alongside the main-branch wire. And after successful pre-dilatation and application of another larger balloon, we could have easily performed the stent-in-stent technique.

Stent types (e.g. thin-strut coronary stents) might influence or determine the probability of stent deformation.⁶⁻⁸ Although it is still controversial as to whether stent types affect longitudinal stent deformation rates, operators should take lesion characteristics and stent types into consideration when selecting their own retrieval procedures.

CONCLUSIONS

Our present report describes a rare complication during primary PCI and provides possible mechanisms. To the best of our knowledge, this is the first case of accordion stent deformation accompanying wire entrapment in the stent-jailed side branch reported in literature, which is by all means to be avoided in the future when treating bifurcation lesions.

DISCLOSURES

The authors report no conflict of interest regarding the content of this manuscript.

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