Case Reports

Longitudinal Deformation of Distal Edge in a New-Generation Stent

Caused by Guidewire Entrapment

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Longitudinal stent deformation, described in some older stent geometries, prompted design modifications such as reinforcing struts on the proximal end. However, distal edges of stents—also subject to longitudinal force—have not been reinforced. We report a case of guidewire entrapment that deformed the distal edge of a new-generation stent during percutaneous coronary intervention, and we describe our efforts to restore the stent to its initial length. This case highlights the risk of manipulating equipment beyond the position of a newly deployed stent, the ongoing potential for deformation of distal edges in newer stent platforms, and the advisability of treating distal lesions before proximal ones. ***(Tex Heart Inst J 2018;45(1):45-7)***

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Longitudinal stent deformation—the distortion or shortening of a stent's length after successful deployment—has caused certain stent designs to fail.[1] The initial reports of this problem led to mechanical reinforcement of the proximal ends of newer-generation stents. However, distal stent edges have not been reinforced. We report a case of longitudinal deformation at the distal edge of a newer-generation stent, caused by entrapment of a guidewire. To our knowledge, this is the first such case reported, and it highlights the potential weakness of nonreinforced platforms at the distal ends of these stents.

Case Report

In February 2016, a 68-year-old man presented with non-ST-segment-elevation myocardial infarction. Coronary angiograms showed subtotal occlusion of the mid right coronary artery (RCA), the distal left anterior descending coronary artery (LAD), and the first obtuse marginal artery. There was also severe proximal LAD stenosis. The patient was a poor candidate for surgical revascularization because of suboptimal distal targets and conduits, so we proceeded with multivessel percutaneous coronary intervention.

Using a 6F catheter from a right radial artery approach, we crossed the subtotal RCA occlusion with an ASAHI FIELDER XT Coronary Guide Wire (Abbott Vascular) and successfully treated the lesion with a 2.25 × 32-mm Promus PREMIER™ everolimus-eluting stent (Boston Scientific Corporation). We used a 6F JCL RAD 4.0 guiding catheter (Medtronic, Inc.) to intubate the left coronary system and then advanced an ASAHI PROWATER Guide Wire (Abbott Vascular) to the distal LAD.

We treated the LAD lesions with 2 Promus PREMIER stents: 2.25 × 32-mm distally and 2.75 × 12-mm proximally. Both stents were postdilated at high pressure with use of noncompliant balloons.

The results of angiographic evaluation were satisfactory (Fig. 1A). As we withdrew the PROWATER guidewire, it caught the distal edge of the proximal LAD stent. Gentle traction enabled removal of the wire; however, angiography revealed longitudinal deformation of the proximal LAD stent at its distal edge (Fig. 1B). With substantial difficulty, we used a new PROWATER guidewire to cross the deformed stent. Despite multiple attempts, including crossing of the stent with another wire, we could not pass balloons, a FINECROSS® MG Coronary Micro-Guide Catheter (Terumo Interventional Systems), or a Tornus support catheter (Asahi Intecc) through the deformed stent.

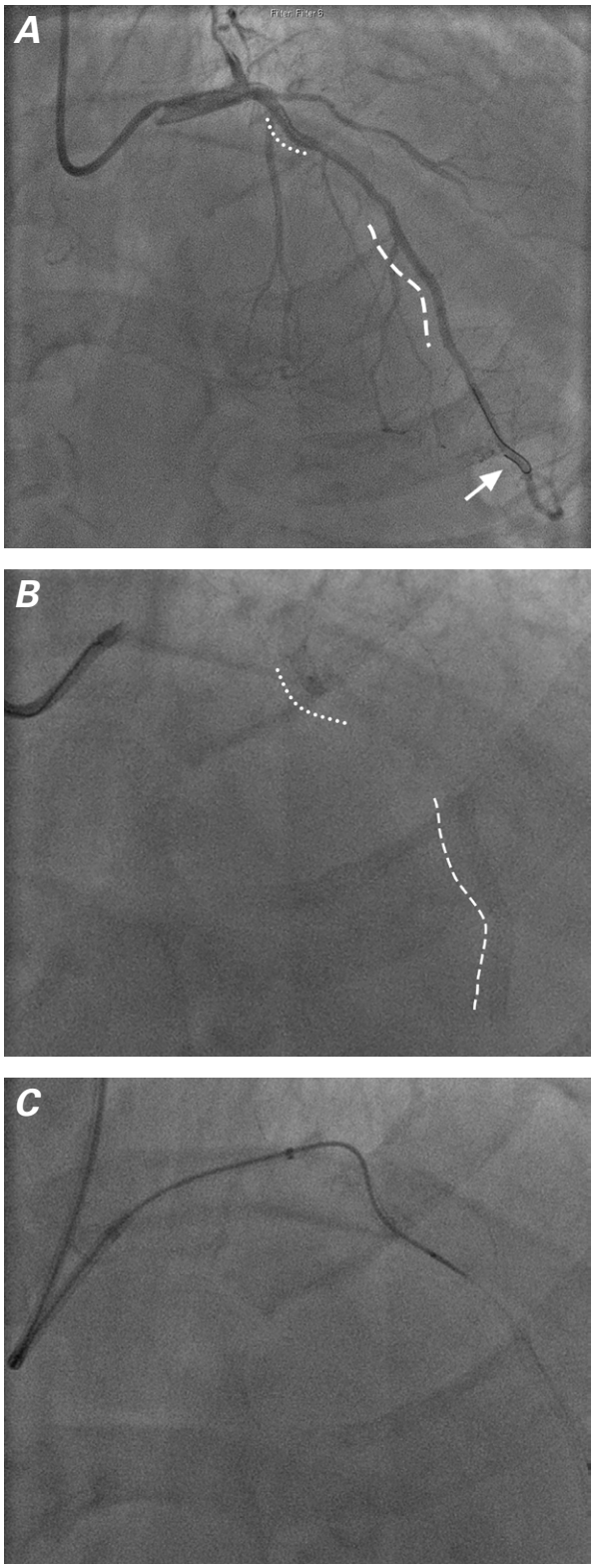

Fig. 1 ***A****) Angiogram after proximal (dotted line) and distal (dashed line) stent placement shows the hook-shaped guidewire tip (arrow) that led to entrapment at the distal stent edge.* ***B****) Noncontrast angiogram after guidewire withdrawal shows longitudinal deformation of the proximal stent at its distal edge.* ***C****) Angiogram shows crossing of the deformed stent with use of a Corsair microcatheter and a GuideLiner "child" catheter.*

Finally, with support from a GuideLiner™ "child" catheter (Vascular Solutions, Inc.) (Fig. 1C), we advanced a Corsair microcatheter (ASAHI Intecc) distally, which enabled serial balloon dilation of the stent. Restoration of the stent's initial length was angiographically verified.

Results of optical coherence tomographic (OCT) evaluation confirmed nearly complete restoration of stent length (Fig. 2A), albeit with a deep, distal-edge dissection associated with intramural hematoma (Fig. 2B). To complete the repair, we overlapped the distal edge with a 2.5 × 12-mm Resolute INTEGRITY™ zotarolimus-eluting stent (Medtronic). The angiographic and OCT results were excellent (Fig. 2C).

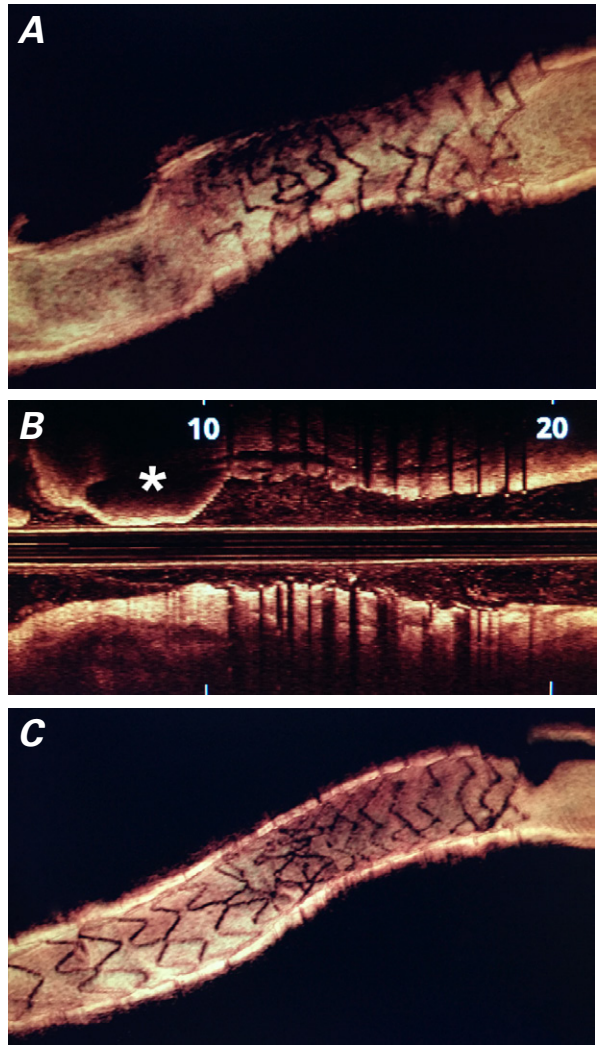

Fig. 2 *Optical coherence tomograms.* ***A****) Initial view shows nearly complete restoration of the deformed stent.* ***B****) Longitudinal view shows dissection and intramural hematoma at the stent's distal edge (asterisk).* ***C****) Final view shows the different architectures of the proximal Promus PREMIER stent (at right) and the more distally placed Resolute INTEGRITY stent.*

Discussion

Longitudinal deformation of the proximal stent edge, a well-described complication of certain stent designs, is thought to occur when secondary devices (such as postdilation balloons or imaging catheters) push on the proximal stent edge.[2,3] In response to reports about this phenomenon, manufacturers reinforced the proximal struts with additional connectors that have effectively eliminated edge deformation proximally.

Longitudinal force affects the proximal stent edges more often than the distal. In our patient's case, however, force to the distal edge severely compromised the stent geometry. After several attempts to cross the deformed stent and use of multiple wires and microcatheters, we successfully deployed and dilated a second stent, achieving nearly perfect restoration of its architecture.

Distal-edge deformation can compromise stent geometry, increase stent failure rates, and necessitate extensive manipulation of the stent and the artery. Although the consequences of stent deformation are difficult to ascertain because of the rarity and variability of cases, mechanical and clinical risks include underexpansion, malapposition, restenosis, and stent thrombosis. Our experience in this case suggests that reinforcing distal stent struts is warranted. Until such redesign, we recommend that operators treat distal coronary lesions first, when possible, to avoid withdrawing equipment that might press upon and deform the distal edge of proximally placed stents.

References

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