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Case report

Longitudinal stent deformation during coronary intervention: A report of three cases

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ABSTRACT

Recently, longitudinal stent deformation (LSD) has been increasingly reported with 2nd generation drug eluting stents (DES). Though, the reported cases are with all type of stents, it is common with Promus Element stent. It is either caused by impact of guide catheter's tip at proximal or osteal stent site, or following secondary passage of catheters like balloon catheters, IVUS or OCT catheters, guideliner, etc. We hereby report 3 cases of LSD who had this technical complication because of three different reasons. All of them were successfully managed, and had favorable short term outcomes.

Introduction

The newer generation drug eluting stents (DES) have shown a greater safety and efficacy compared to first generation DES, because of thinner struts, nondurable polymers and coating with better anti-proliferative drugs.[1,2] Though, the current stent design of thin struts and cobalt alloy has improved the technical performance of various stents in term of trackability, conformability and flexibility; their poor longitudinal axial strength makes them susceptible for longitudinal stent deformation (LSD).[3] We recently came across LSD in three cases, which were successfully managed and had favorable short term outcomes. Various reasons for LSD and its management is discussed in the article.

Case 1

A 45-yrs old chronic smoker, diabetic male presented with acute anterior wall myocardial infarction (AMI) in emergency room. Echocardiography showed ejection fraction of 40%, hypokinetic left ventricle anterior wall with preserved thickness. Coronary angiography revealed total thrombotic occlusion of mid left anterior descending (LAD), which was successfully stented with 3 × 28 mm Promus Element Plus stent (Boston Scientific Co., Natick, MA, USA). A tortuous, calcified lesion at distal LAD was dilated with 2.5 × 15 mm balloon, however stent could not be tracked at the lesion site. The procedure was deferred for the next sitting after 6 weeks. There was TIMI-3 flow in LAD following mid LAD stenting (Fig. 1A).

At 6-weeks of follow-up, he was again taken up for percutaneous coronary intervention (PCI) of distal LAD. An extra backup 3.5, 6 Fr. EBU coronary-guide catheter (Medtronic Inc., Minneapolis, Minnesota) was used to cannulate the left coronary artery. Following pre-dilatation of distal LAD with 2.5 × 15 mm balloon, a stent could not be tracked down because of tortuous and calcified nature of the lesion. It could not track even after using buddy wire technique. Thereafter, a 2.5 × 12 mm scoring Scoreflex balloon catheter (OrbusNeich, Hong Kong, China) was used to dilate the calcified lesion. Subsequently, a 2.75 × 32 mm Promus Element stent (Boston Scientific Co.) was deployed (Fig. 1B), resulting in TIMI-3 flow of LAD. During removal of jailed buddy wire from distal LAD, the guide catheter got deeply engaged/intubated into mid LAD, resulting in LSD of mid LAD Promus Element Plus stent (Fig. 1C and D). An optical coherence tomography (OCT) catheter could not cross the deformed mid LAD stent. The LSD site was dilated with 2.5 × 15 mm balloon and stented with an additional 3.5 × 12 mm Xience V stent (Abbott Vascular, Snata Clara, CA, USA). It was post dilated with 3.5 × 12 mm balloon non-compliant balloon at 15 atms. TIMI-3 flow was achieved in LAD (Fig. 1E). Patient was discharged next day, and remained asymptomatic at 3 months of follow-up.

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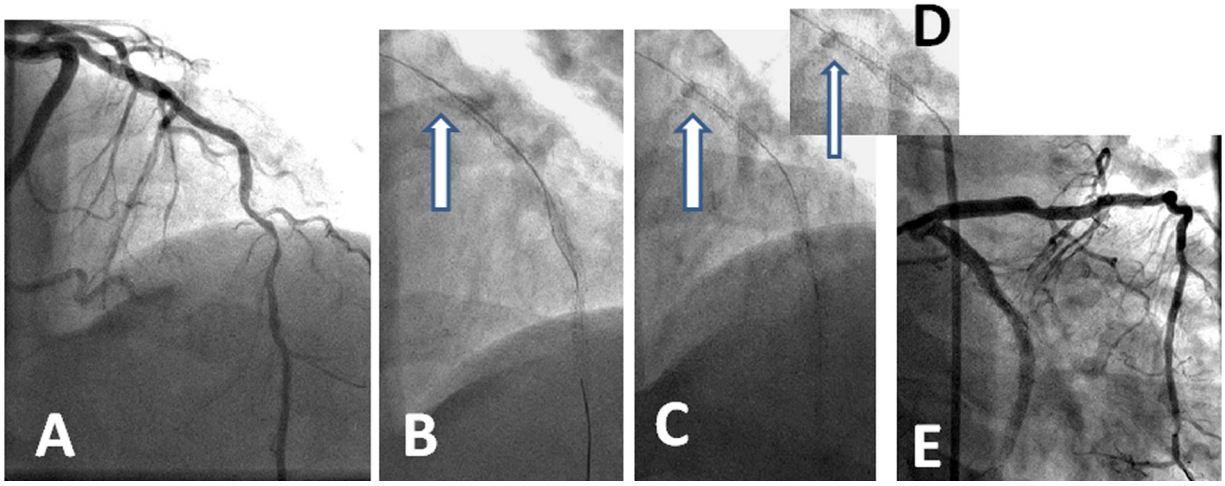

Fig. 1. Coronary angiography findings:- A. Patent mid LAD stent. Distal LAD has a tortuous, calcified, diffuse lesion. B. Fluoroscopy revealed normally outlined mid and distal LAD stents with buddy wires in-situ. C. Fluoroscopy revealed deformation of proximal end of mid LAD stent (white arrow). D. Magnified fluoroscopy view showing deformed proximal end of stent (white arrow). E. Final angiographic view showing TIMI-3 flow in LA.

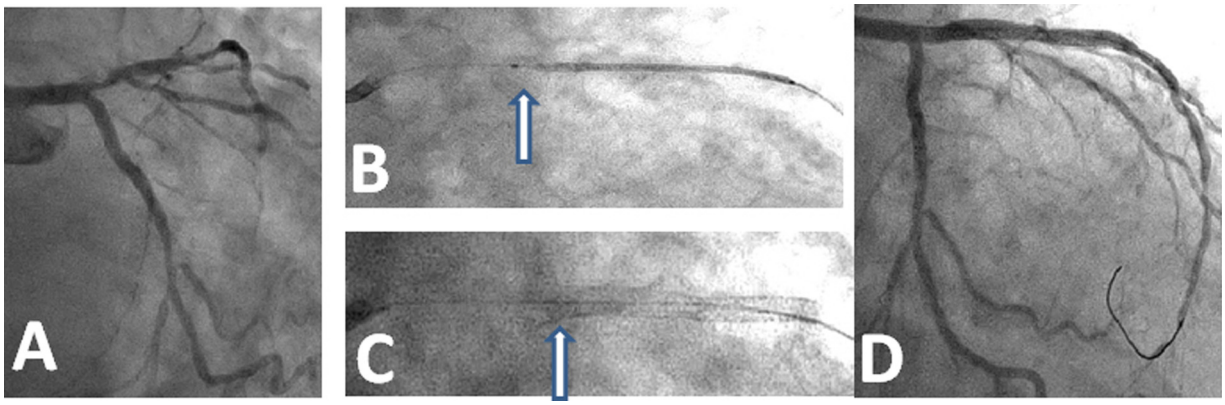

Fig. 2. Coronary angiographic findings:- A. Osteal- proximal LAD revealed 70% diffuse, eccentric, calcified lesion. B. Fluoroscopy revealed crimped, deformed proximal end of stent, getting separated from balloon marker of stent catheter (white arrow). C. Fluoroscopy revealed deformed proximal end of proximal LAD stent (white arrow). D. Final angiographic view showing TIMI-3 flow in LA.

Case 2

A 68-years old diabetic, hypertensive female presented with anterior wall MI in emergency room. Echocardiography revealed mild hypokinesia of anterior wall, ejection fraction of 45%. Coronary angiography revealed 70% diffuse, eccentric, calcified lesion of osteal – proximal LAD (Fig. 2A). Left coronary artery was cannulated with JL3.5, 6Fr. coronary guide catheter and LAD lesion was pre-dilated with 2.5 × 15 mm balloon. Initially, a 3 × 38 mm Promus Element stent (Boston Scientific Co.) could not cross the calcified LAD lesion. Following forceful manipulations, the stent could be pushed across osteal LAD lesion, however the proximal part of undeployed stent got longitudinally deformed (LSD) (Fig. 2B and C). It was deployed at same place, and the residual osteal LAD lesion was stented with an additional 3 × 15 mm overlapping Xience V stent (Abbott Vascular). The whole stented segment was post-dilated with 3 × 12 mm non-compliant balloon at 18 atms, resulting in TIMI-3 flow in LAD (Fig. 2D). She was discharged after 2-days, and remained asymptomatic at 6 weeks of follow-up.

Case 3

A 58-years old hypertensive male presented with non Q anterior wall MI in emergency room. Echocardiography revealed no regional wall motion abnormality, ejection fraction of 60%. Coronary angiography revealed diffuse 95% stenosis of proximal to mid LAD; diffuse 90% disease of osteal to distal left circumflex (LCx), and also major obtuse marginal (OM) (Fig. 3A). A left main (LM) to LAD cross-over stenting was planned. Left coronary artery was cannulated with extra backup 3.5, 6 Fr. EBU coronary-guide catheter (Medtronic Inc.) and LAD lesion was dilated with 2.5 × 15 mm balloon. A 3 × 38 mm Promus Element stent (Boston Scientific Co.) was deployed from LM to LAD at 15 atms. Proximal optimization (POT) of LM stent was performed with 4.5 × 10 mm non-compliant balloon (Fig. 3B). During passage of an additional 3 × 12 mm Xience V stent (Abbott Vascular) for a residual mid LAD lesion, there was a LSD of LM stent (Fig. 3C). Frequency domain optical coherence tomography (OCT) imaging (St Jude Medical, St Paul, MN, US) revealed mal-apposed deformed stent at LM position (Fig. 4A, D). A repeat POT was performed with 4.5 × 10 mm, followed by 5 × 10 mm non-compliant balloon. A repeat OCT imaging confirmed the well apposed LM stent (Fig. 4B, C). There was a TIMI-3 flow in LM-LAD. He was discharged next day, and remained asymptomatic at 6 weeks of follow-up.

Discussion

Longitudinal stent deformation (LSD) has been reported by various authors in newer generation DES. Though it is common with Promus Element stent, other stents such as Taxus Liberte (Boston Scientific Co.), Biomatrix (Biosensors Interventional Technologies,