Longitudinal compression of the cobalt-chromium everolimus-eluting stent during Percutaneous Coronary Implantation: The first report of “accordion effect” in Xience prime family in vivo

LI CG¹, Dai YX¹, Shen Y², Ge JB¹
1. Department of Cardiology, Zhongshan Hospital, Fudan University, Shanghai 200032, China
2. Department of Geriatrics, Zhongshan Hospital, Fudan University, Shanghai 200032, China

LI CG and Dai YX contributed equally to the article; Address for correspondence: Ge JB, MD, FESC, FACC, FSCAI; Department of Cardiology, Zhongshan Hospital, Fudan University, Shanghai Institute of Cardiovascular Diseases, 180 Fenglin Road, Shanghai 200032, PR China, jbge@zs-hospital.sh.cn

Abstract:
Longitudinal compression (accordion effect) of modern thinner-strut stents has been recently recognized, but most of them happened in platinum-based platform (PtCr-EES) stents (Promus Element family). We report the first case of the cobalt-chromium everolimus-eluting stent (Xience prime family) during coronary implantation

Key words: Longitudinal compression, Xience prime drug-eluted stent

Case
A 72-years-old man presented with a subacute non–ST-segment elevation myocardial infarction. He underwent coronary angiography in another hospital revealing a 90% lesion in the left main coronary artery, 60% lesion in the proximal left anterior descending artery (LAD), 40% lesion in the ostial left circumflex artery (LCx), and 50% lesion in the middle right coronary artery (RCA). Combined with Chronic renal insufficiency, So they do the drug therapy and suggested a selective intervention in our Cardiovascular Center. Following the recurrence of symptoms, angiography was did again in our center 3 days later, showed the same result as above. The intravascular ultrasound (IVUS) (Boston Scientific, MN) assessment was also did and the plaque burden in the LM/LAD was 92.1%/74.6%. (Figue 1)
A 3.5 * 16mm Promus Element (Boston Scientific, Natick, Massachusetts) DES was implanted in the proximal LAD lesion at 14 atm and a 4.0 * 12mm Xience V (Abbott Vascular, Santa Clara, CA) in the LAD-LM lesion overlapped at 14 atm. Following post-dilation with a 3.5-mm noncompliant balloon in the LAD and a 4.0-mm stent balloon in the LM. Repeat IVUS showed satisfactory stent expansion and luminal area in both LAD and LM. (Figure 2)

During attempted retraction of the IVUS catheter, significant resistance was felt at the distal edge of the stent in the LAD. After repeated attempts at removal, the IVUS catheter was successfully removed from the vessel. Subsequent fluoroscopic and angiographic appearances confirmed significant stent shortening with a radiopaque double layer of stent struts visible at proximal stent in LM. Repeat IVUS confirmed significant stent shortening, with multiple layers of stent struts. (Figure 3)
The LCx was then rewired and kissing balloon inflations with a 3.0-mm balloon in the LCx and a 3.5-mm balloon in the LAD was performed. At last the LM was postdilated to high pressure with the former 4.0-mm stent balloon, resulting in a satisfactory end angiographic result. (Figure 4)

**Comment**

Longitudinal stent compression is a recently recognized complication of modern stent platforms.
The longitudinally shortened appearance of the stent on fluoroscopic imaging has given rise to the term longitudinal compression or “accordion effect” [1-5]. Although thin-strut stents have the advantage of increased deliverability and flexibility, they seem to have lower longitudinal strength than before[6]. In a laboratory experiment to assess the longitudinal strength of modern stents, a certain amount of force (50 gram force) was applied and the stents of the in-phase Peak-to-Valley design category (MULTI-LINK 8, Xience prime platform) had an average longitudinal compression of 1.25mm(longitudinal compression of 4.46%), showing a markedly higher resistance to longitudinal compression than the other platform. While the peak-to-peak design category (Element stent platform) had an average longitudinal compression of 13.20 mm(longitudinal compression of 47.07%), which has the lowest resistance in the test[4]. In a recent report, stent deformation was reported to occur in 0.097% of stents deployed. Longitudinal stent deformation was seen most commonly with Promus Element stents and the rate was reported to be 0.86%[3, 7]. But so far there was no report about the Xience Prime/Xience V stents longitudinal compression in vivo.

In the reported cases we usually see the phenomenon when re-crossed with other devices such as post-dilatation balloons, stent delivery systems or intravascular ultrasound (IVUS) catheters[1, 3]. As for the reason of the longitudinal compression in this case, maybe as follows: (1) Force of IVUS pull-back during post-deployment inspection of the deployed stent, (2) guide catheter contact with the stent after stent deployment due to LM ostial location. Then following post-dilatation with a 4.0-mm NC balloon the end-angiographic appearance was satisfactory. After the procedure, continuous application of tirofiban for 24-hours was given to the patient and there was no adverse events in the following 3 months.

**Conclusion**

Reports of concertina or longitudinal shortening occurring with the Promus Element DES platform was common[7], and this case showed that stent longitudinal compression was not just seen in the PE platform, also in other stents such as Xience prime, which has the highest resistance to the compression in the bench tests[4]. So the use of the new generation of DES might be careful when treating complex proximal lesions and should be used cautiously when jailing guide wires or using adjunctive imaging catheters, all of which increase the risk of longitudinal distortion and pose as a nidus for stent thrombosis[8].

**Reference**


