



Undermining and Ballooning the Proximal Part of the Left Main Coronary Artery Stent Resulting in an Iatrogenic Stent Deformation

Han Saem Jeong, Soon Jun Hong, Sung Ho Hwang, Kyoung Ho Ko, Tae Yeon Hwang, Cheol Woong Yu, Do-Sun Lim

Department of Cardiology, Cardiovascular Center, Korea University Anam Hospital, Seoul, Korea

We present a case of a 52-year-old woman with iatrogenic stent deformation occurred after deployment of the left main (LM) stent due to the unintentional undermining of the proximal part of the LM stent with subsequent balloon dilatation. We tried to crush the deformed part of the LM stent against the left coronary cusp by pushing it with a guiding catheter. The deformed stent was stabilized after stent crushing and the patient didn't have any cardiovascular events. This case highlights that stent deformation could be successfully managed by crushing the deformed part of the stent to the coronary sinus.

Key Words: Coronary Angiography, Stent Deformation, Multidetector Computed Tomography

INTRODUCTION

Coronary stent deformation is a relatively rare complication of percutaneous coronary intervention. Stent deformation is axial shortening or lengthening of a stent after implantation, resulting from interaction with an ancillary device such as a guide catheter, post-dilatation balloon, or intravascular ultrasound (IVUS) catheter. When the stent deformation protruding to coronary cusp occurs, three therapeutic options can be considered: percutaneous retrieval, surgical removal, or leaving it in-situ. We report a patient with iatrogenic proximal left main stent deformation protruding to the left coronary cusp, successfully managed by crushing the deformed part of the stent to the coronary sinus.

CASE PRESENTATION

A 52-year-old woman was referred to the emergency department because of new onset resting chest pain aggravated with exercise in substernal area. Electrocardiogram showed T wave inversions from precordial V3 to V6. Transthoracic echocardiography showed ejection fraction of 48~53% with severely hypokinetic mid lateral wall, mid septum, mid to apical anterior wall, apex and apical lateral wall suggesting ischemia in the territory of proximal left anterior descending (LAD) coronary artery.

Coronary angiography showed tubular eccentric 90% subtotal stenosis with lesion type (ACC/AHA) B2 in proximal left circumflex artery (LCX), tubular eccentric 75% stenosis with lesion type (ACC/AHA) B2 in mid- LAD

Received: September 10, 2015 | **Corresponding Author:** Soon Jun Hong, Department of Cardiology, Cardiovascular Center, Korea University Anam Hospital, 126-1, 5ka, Anam-dong, Sungbuk-ku, Seoul 136-705, Korea
Revised: October 6, 2015 | **Tel:** +82-2-920-5445, **Fax :** +82-2-927-1478, **E-mail:** psyche94@gmail.com
Accepted: November 27, 2015

This is an Open Access article distributed under the terms of the creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

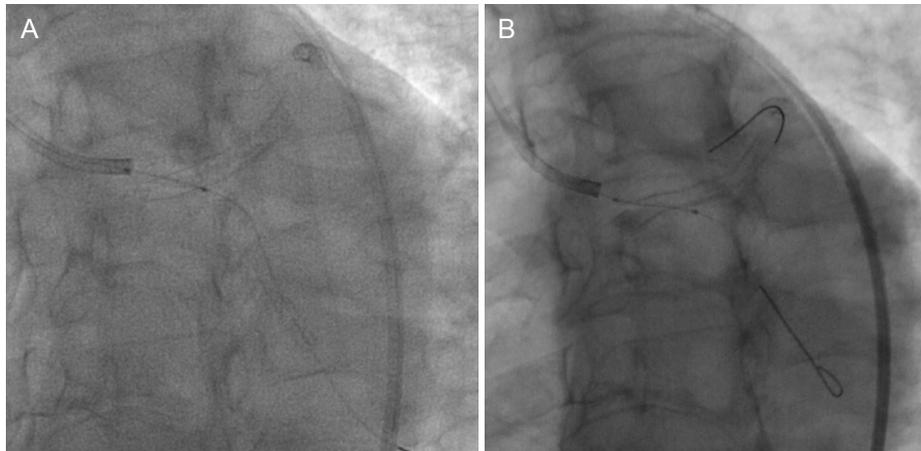


Fig. 1. (A) Coronary angiogram shows that the Choice PT wire undermined the proximal part of left main stent. (B) Deformed left main stent was hanging at the left coronary cusp.

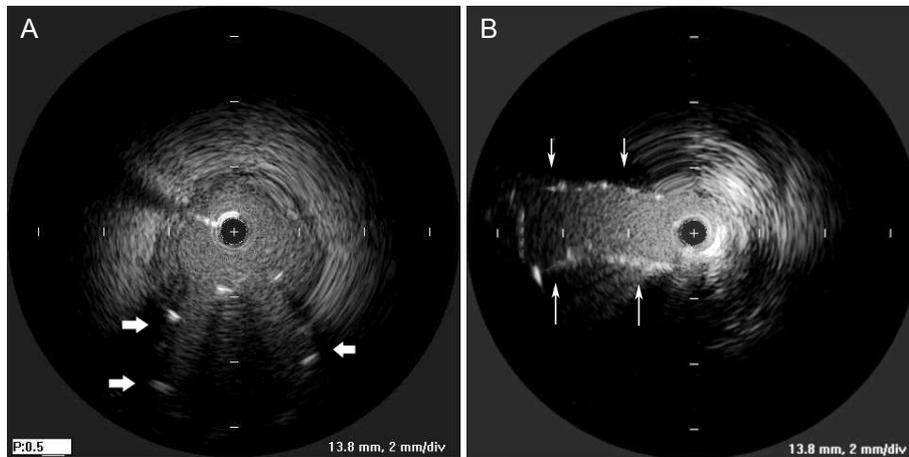


Fig. 2. (A) Intravascular ultrasound (IVUS) showed the deformed stent protruding to the left coronary cusp, (B) Follow-up IVUS showed the crushed stent struts (arrows) toward the left coronary cusp.

and tubular eccentric 90% tandem stenosis with lesion type (ACC/AHA) C in LM ostium to proximal LAD. We deployed Xience Xpedition™ (Abbott, US) 2.75 mm by 18 mm stent at LCX, Xience Xpedition™ 2.75 mm by 18 mm at mid LAD, Xience Xpedition™ 4.0 mm by 33 mm at LM ostium to proximal LAD. After the LM stent implantation, Choice PT wire was used to rewire at LCX, and a Lacrosse 2.5 mm by 15 mm balloon (Goodman Co, Ltd, Sakae, Japan) was forcefully advanced to the LCX ostium. After the balloon dilation to the LCX ostium extending to the proximal LM, we found out that the Choice PT wire undermined the proximal part of the LM

stent (Fig. 1A), resulting in deformation of the LM stent, which was left hanging at the left coronary cusp (Fig. 1B). IVUS showed the deformed stent protruding toward the left coronary cusp (Fig. 2A). We tried to crush the deformed part of the LM stent against the left coronary cusp by pushing it with a guiding catheter three times (Fig. 3A, 3B). Follow-up IVUS showed the crushed stent toward the left coronary cusp (Fig. 2B). In order to accurately evaluate the deformed stent, three-dimensional contrast-enhanced coronary CT angiography (Fig. 4A, 4B) was conducted to accurately evaluate the deformed stent. It showed that coronary artery stents in the LM, LAD and

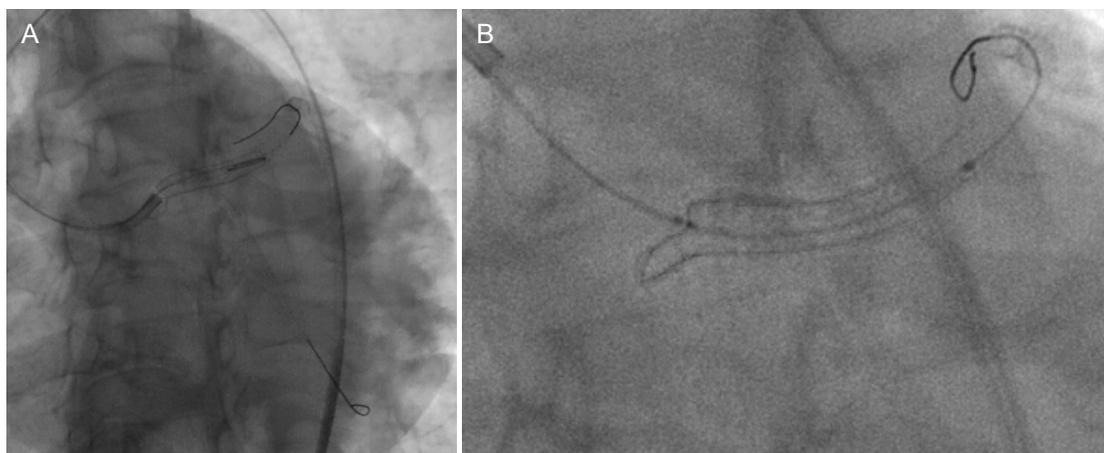


Fig. 3. (A) Crushing the deformed part against the left coronary cusp by pushing the protruded stent with the guiding catheter, (B) Coronary angiogram showed the crushed stent.

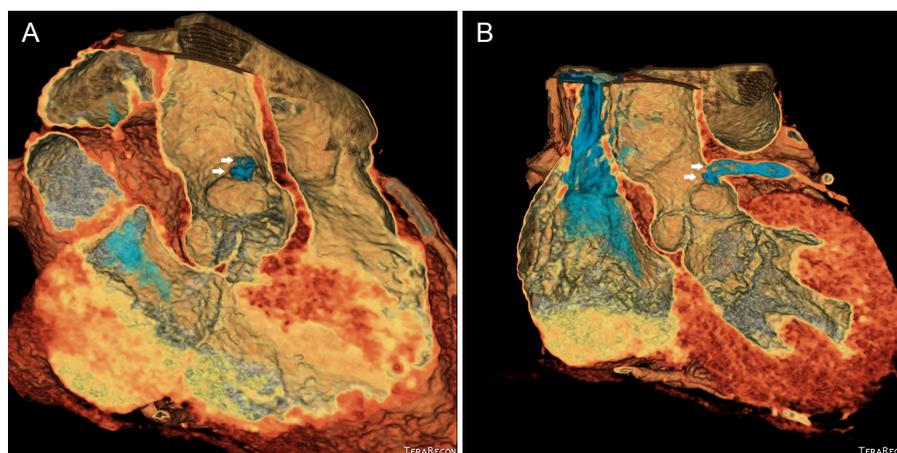


Fig. 4. (A) The three-dimensional (3D) contrast-enhanced coronary CT angiography showed a segment (4 mm in size) of the left main coronary stent protruding from the coronary artery orifice into the aorta after crushing the deformed part with the guiding catheter, (B) 3D contrast-enhanced coronary CT angiography showed the crushed stent at oblique view. Arrows indicate stent struts.

LCX were patent. It seemed like the deformed stent was stabilized after stent crushing. After the procedure, the patient didn't complain of any chest pain. Dual anti-platelet agents (aspirin and clopidogrel) were prescribed, and the patient didn't have any cardiovascular events during 6-month follow-up.

DISCUSSION

Coronary stent deformation is a relatively rare but considerable complication of percutaneous coronary

intervention. Stent deformation occurs by secondary devices either into or withdrawing back through a stent and by overpressure beyond its ultimate tensile stress limit or stent fatigue.¹ Degree of deformation can be partial or complete along the stent body in the length or circumference. Stent deformation is usually discovered with in-stent restenosis, stent thrombosis or rarely embolization of deformed stent and aneurysm, however, it can be incidental finding.

The most iatrogenic stent deformation occurs unintentionally due to partial overloading during deployment.

When stent deformation occurs, clinical decision depends on severity of the deformation, hemodynamic instability and functional integrity. At this case, three therapeutic options of the stent deformation are similar those of retained guide-wire.² Percutaneous retrieval, surgical removal, or leaving the stent in-situ can be considered. The most desirable one is the retrieval of deformed stent depending on the operator's comfort and experience.³⁻⁷ However, this procedure has some risks such as vessel injury, coronary spasm, new fragmentation, and distal ischemia. Other option is the surgical removal combined with bypass grafting or direct coronary arteriotomy. When the deformed stent is unlikely to cause complications, leaving the stent in-situ and stent crushing can be one of the options.⁵

In this case, iatrogenic stent deformation occurred after deployment of the LM stent due to the unintentional undermining of the proximal part of the LM stent with subsequent balloon dilatation. Remaining LM stent fully covered the target lesion of LM to proximal LAD, and protruded part of the deformed stent did not disturb coronary artery flow and not cause any other symptoms related to flow insufficiency. We decided not to perform surgical stent removal in the left coronary cusp because she was hemodynamically and functionally stable. We judged that retrieval of the deformed part of the protruded stent had high risks of vessel injury, coronary spasm, new fragmentation, and distal ischemia. To prevent diminished flow by the protruded stent later on and to ensure the hemodynamic stability by preventing possible thrombus formation at the left main ostium later during the follow-up, we decided to crush the protruded deformed

part of the stent. The deformed part of the protruded stent was stabilized after stent crushing with guiding catheter. However, the crushed stents had remnant risks of stent thrombosis or embolization. Hence, we should consider follow-up coronary CT angiography or echocardiogram to confirm that no embolization of deformed stent occurs during the follow-up.

REFERENCES

1. Ota H, Kitabata H, Magalhaes MA, Bui A, Kardenas K, Thomas CH, et al. Comparison of frequency and severity of longitudinal stent deformation among various drug-eluting stents: an intravascular ultrasound study. *Int J Cardiol* 2014;175:261-267.
2. Al-Moghairi AM, Al-Amri HS. Management of retained intervention guide-wire: a literature review. *Curr Cardiol Rev* 2013;9:260-266.
3. Trehan V, Mukhopadhyay S, Yusuf J, C Ramgassetty U, Mukherjee S, Arora R. Intracoronary fracture and embolization of a coronary angioplasty balloon catheter: retrieval by a simple technique. *Catheter Cardiovasc Interv* 2003;58:473-477.
4. Collins N, Horlick E, Dzavik V. Triple wire technique for removal of fractured angioplasty guidewire. *J Invasive Cardiol* 2007;19:E230-E234.
5. Alomar ME, Michael TT, Patel VG, Altomare CG, Rangan BV, Cipher D, et al. Stent loss and retrieval during percutaneous coronary interventions: a systematic review and meta-analysis. *J Invasive Cardiol* 2013;25:637-641.
6. Cha KS. Surgical retrieval of dislodged stent during transradial coronary intervention. *J Invasive Cardiol* 2012;24:E179-E181.
7. Prasad A, Ilapakurti M, Ravandi A. Successful retrieval of a frayed coronary stent using the peripheral crossover technique. *J Invasive Cardiol* 2011;23:E69-E71.