Case Report

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# Successful Management of a Rare Case of Stent Fracture and Subsequent Migration of the Fractured Stent Segment Into the Ascending Aorta in In-Stent Restenotic Lesions of a Saphenous Vein Graft

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Stent fracture is a complication following implantation of drug eluting stents and is recognized as one of the risk factors for in-stent restenosis. We present the first case of successfully managing a stent fracture and subsequent migration of the fractured stent into the ascending aorta that occurred during repeat revascularization for in-stent restenosis of an ostium of saphenous vein graft after implantation of a zotarolimus-eluting stent. Although the fractured stent segment had migrated into the ascending aorta with a pulled balloon catheter, it was successfully repositioned in the saphenous vein graft using an inflated balloon catheter. Then, the fractured stent segment was successfully connected to the residual segment of the zotarolimus-eluting stent by covering it with an additional sirolimus-eluting stent. **(Korean Circ J 2012;42:58-61)**

**KEY WORDS:** Coronary artery disease; Drug-Eluting stents; Complications.

## Introduction

Although drug-eluting stents (DES) have significantly reduced the rate of restenosis by effectively suppressing neointimal growth compared with that of bare metal stents, complications such as in-stent restenosis and stent thrombosis still occur. Stent fracture is also a complication of DES. The incidence of stent fracture is 1-8%.[1)] Most stent fractures are found in patients who were treated with a sirolimus-eluting stent.[2)3)] We experienced an unusual case of stent fracture after implantation of a zotarolimus-eluting stent (ZES), which occurred during repeat revascularization for in-stent restenosis lesions of a saphenous vein graft.

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## Case

A 72-year-old male underwent coronary artery bypass surgery 10 years ago. He was free of symptoms for several years after the coronary artery bypass surgery. One year ago, he suffered from exertional chest pain and underwent a follow-up coronary angiogram. Coronary angiography showed two newly developed significant stenotic lesions with 80% luminal narrowing at the ostium and 90% luminal narrowing at the mid-portion of the saphenous vein graft from the ascending aorta to the left anterior descending artery (Fig. 1A). The lesions were successfully treated with ZESs (3.5×15 and 3.0×30 mm, respectively) (Endeavor Resolute®, Medtronic, Santa Rosa, CA, USA) (Fig. 1B). He was discharged without any complications. Four months after stent implantation, he was admitted again due to exertional dyspnea. Coronary angiography revealed 90% in-stent restenosis at the ostium and a patent stent at the mid-portion of the saphenous vein graft (Fig. 1C). Fluoroscopic images showed angulation of the proximal portions of the ZES at the ostium (Fig. 1D). After angioplasty with a cutting balloon catheter (3.25×15 mm) (Fig.

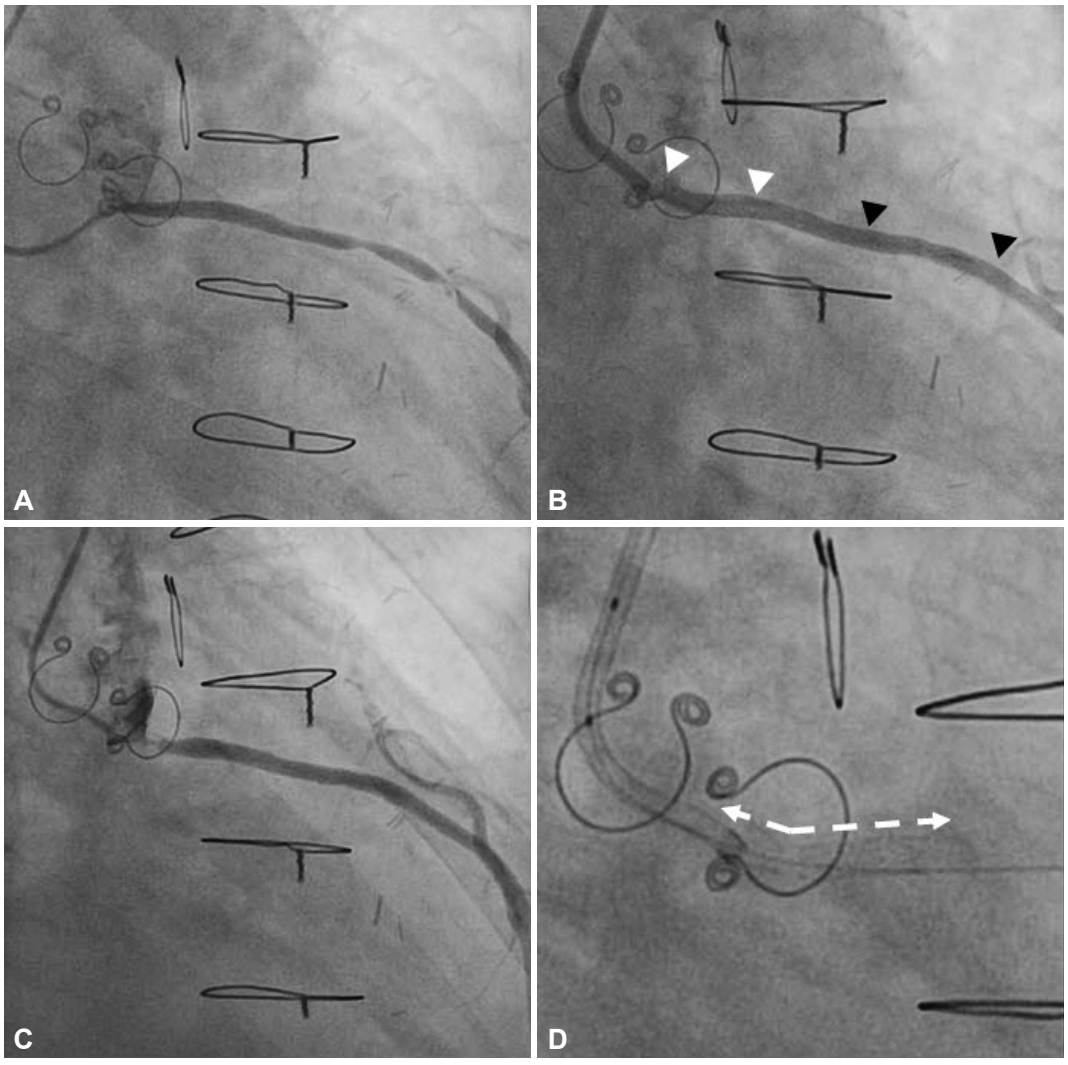


**Fig. 1.** Two significantly stenotic lesions were detected in the saphenous vein graft from the ascending aorta to the left anterior descending artery; 80% luminal narrowing at the ostium and 90% luminal narrowing at the mid-portion (A). These lesions were successfully treated with zotarolimus-eluting stent (ZES) (B). The 4-month follow-up angiogram after stent implantation showed 90% in-stent restenosis at the ostium and a patent stent at the mid-portion of the saphenous vein graft (C). Fluoroscopic images showed angulation (arrows with dotted line) of the proximal portion of the ZES at the ostium (D).

2A), the inflated balloon catheter was suddenly pulled back outside of the saphenous vein graft during adjunct balloon dilatation with a noncompliance balloon catheter (3.5×15 mm) (Fig. 2B). At the same time, a stent fracture occurred and the fractured stent segment and migrated into the ascending aorta along the inflated balloon catheter (Fig. 2B). The migrated fractured struts were successfully pushed into the ostium of the saphenous vein graft without deflating the balloon catheter (Fig. 2C) and were inflated at higher inflation pressure with the same noncompliance balloon catheter. Although a distal part of the fractured stent segment was attached to the ostium of the saphenous vein graft, a gap was evident between the fractured stent segment and the residual stent, and a proximal part of the fractured stent segment was located outside of the saphenous vein graft (Fig. 2D). There was a potential for systemic stent embolization of the fractured stent segment. Therefore, a sirolimus-eluting stent (3.5×18 mm) (Cypher™, Cordis, Miami, FL, USA) was deployed to connect the distal part of the fractured stent and the proximal part of the residual stent to prevent systemic stent embolization (Fig. 3A). Fluoroscopic images after implantation of the sirolimus-eluting stent showed that the separated ZES segments were well connected without a gap after using an additional stent (Fig. 3B). The final angiogram with a noncompliance balloon catheter after adjunct angioplasty showed no residual stenosis (Fig. 3C).

## Discussion

Stent fracture is sometimes observed after DES implantation. The most notable mechanisms of stent fracture are metal fatigue due to mechanical forces and shearing stress.[1] The right coronary artery, tortuous vessels, and long stents are predictors of stent frac-


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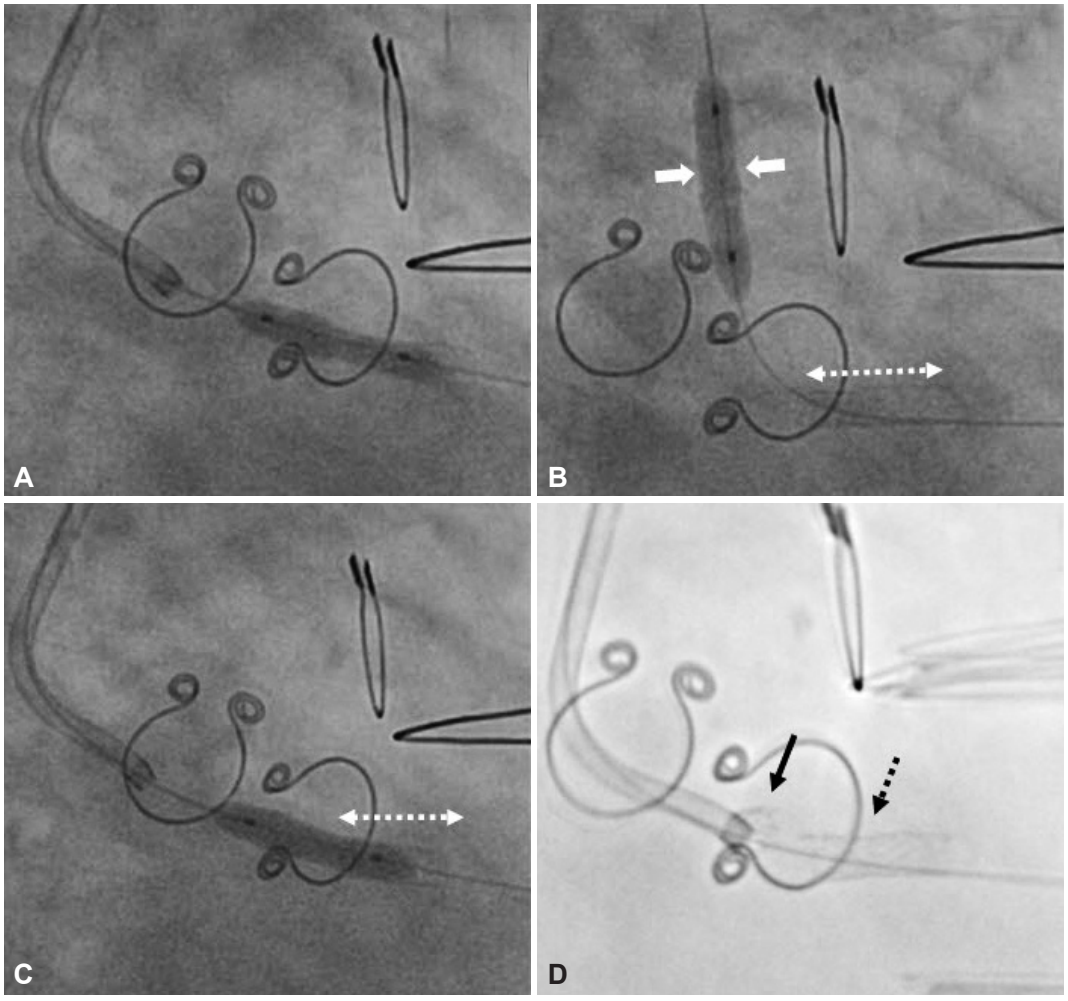


**Fig. 2.** Balloon angioplasty with a cutting balloon catheter was performed (A) A stent fracture occurred during adjunct balloon dilatation with a noncompliance balloon catheter and the fractured stent segment (two white thick arrows) had migrated into the ascending aorta along the inflated balloon catheter (B, arrow with dotted line: residual stent part). The migrated fractured struts were successfully pushed into the ostium of the saphenous vein graft without deflating the balloon catheter (C). Fluoroscopic image shows a gap between the fractured stent segment (black arrow with solid line) and the residual stent part (black arrow with dotted line) (D).

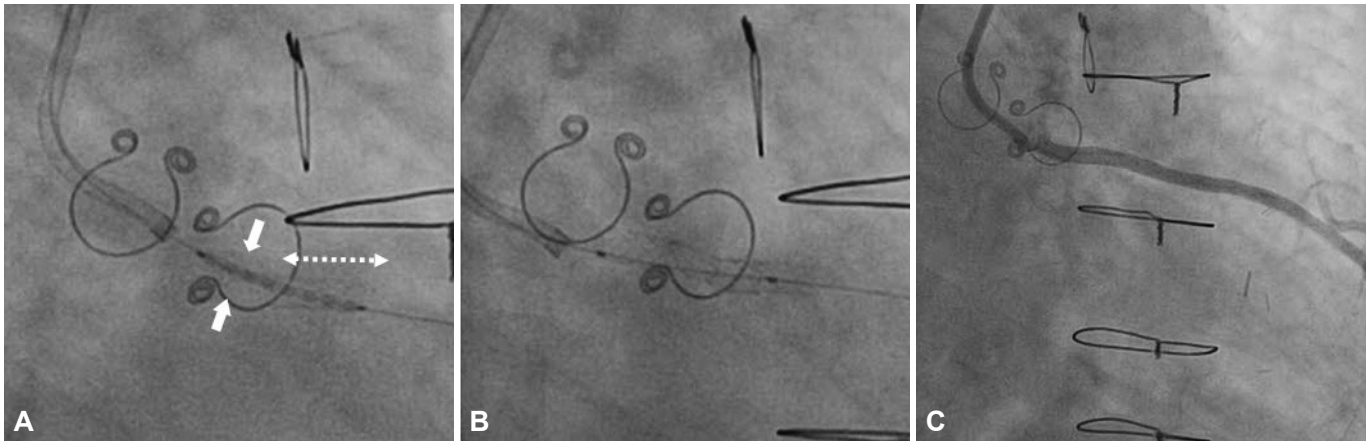


**Fig. 3.** A sirolimus-eluting stent was deployed connect the distal part of the fractured stent (two white thick arrows) with the proximal part of the residual stent (arrow with dotted line) to prevent systemic stent embolization (A). Fluoroscopic images after implantation of the sirolimus-eluting stent showed that the separated zotarolimus-eluting stent segments were well connected without a gap using an additional stent (B). Final angiogram revealed no residual stenosis (C).

ture.[1)3)4)] Additionally, stents implanted in saphenous venous grafts seem to be more susceptible to fracture.[5)] The type of implanted DESs is also strongly related to stent fracture. Of those, the sirolimus-eluting stent, which has a more rigid closed-cell stent design, has a tendency for more frequent fracture, compared with ZES, which has an open-cell stent design.[2)3)]

In this case, we experienced a rare case of ZES fracture in an ostial in-stent restenostic lesion of the saphenous vein graft. Stent angulation could be one of the contributing factors for stent fracture. Furthermore, balloon dilatation for repeat revascularization of in-stent restenosis could be an additional aggravating mechanical force for stent fracture and separation of a DES implanted in angulated segments. Because the fractured stent segment migrated with the dilated balloon catheter along the guidewire system, we easily moved this fractured segment into the remnant distal segments for re-union. This case shows how to manage the migration of a fractured ZES using balloon dilatation in a restenotic ostial lesion of a saphenous vein graft followed by additional DES implantation.

## REFERENCES

1. Chakravarty T, White AJ, Buch M, et al. *Meta-analysis of incidence, clinical characteristics and implications of stent fracture. Am J Cardiol 2010;106:1075-80.*
2. Nakazawa G, Finn AV, Vorpahl M, et al. *Incidence and predictors of drug-eluting stent fracture in human coronary artery a pathologic analysis. J Am Coll Cardiol 2009;54:1924-31.*
3. Canan T, Lee MS. *Drug-eluting stent fracture: incidence, contributing factors, and clinical implications. Catheter Cardiovasc Interv 2010;75:237-45.*
4. Sianos G, Hofma S, Ligthart JM, et al. *Stent fracture and restenosis in the drug-eluting stent era. Catheter Cardiovasc Interv 2004;61:111-6.*
5. Aoki J, Nakazawa G, Tanabe K, et al. *Incidence and clinical impact of coronary stent fracture after sirolimus-eluting stent implantation. Catheter Cardiovasc Interv 2007;69:380-6.*


http://dx.doi.org/10.4070/kcj.2012.42.1.58