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Favorable Plaque Sealing Process after Implantation of Endeavor Zotarolimus-Eluting Stent into Chronic Total Occlusion of Sirolimus-Eluting Stent

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Abstract

We here report a case with in-stent chronic total occlusion (CTO) of sirolimus-eluting stent (SES). The SES-CTO lesion was successfully treated with additional implantation of Endeavor-zotarolimus-eluting stent (E-ZES) into the lesion. During the follow-up period of 50 months, coronary angioscopy and optical coherence tomography revealed the favorable plaque sealing process after E-ZES implantation into SES-CTO.

Keywords

Sirolimus-eluting stent, Zotarolimus-eluting stent, Coronary angioscopy, Chronic total occlusion

Introduction

The best treatment strategy for in-stent chronic total occlusion (CTO) after drug-eluting stent (DES) implantation has not yet been established. One option would be implantation of the newer generation DES into DES-CTO. We here report a case with in-stent CTO of the first generation DES, sirolimus-eluting stent (SES) (Cypher®, Cordis, Miami Lakes, FL, USA). He was successfully treated with implantation of another DES, an Endeavor-zotarolimus-eluting stent (E-ZES, Medtronic, Santa Rosa, CA, USA) into SES-CTO. E-ZES is characterized by more rapid release of the bio-suppressive drug and the greater late loss than other DES. Coronary angioscopy (CAS) and optical coherence tomography (OCT) revealed the favorable plaque sealing process during the follow-up period of 50 months.

Case Description

In 2004, a 69-year-old man with unstable angina underwent percutaneous coronary intervention (PCI). The target lesion was severe stenosis of the first diagonal branch of his left coronary artery. His coronary risk factors were hypertension, dyslipidemia, and cigarette smoking. The lesion was successfully treated with the first generation DES, SES of 2.5x18mm.

In 2010, prior to his major surgery, he was subjected to coronary angiography (CAG). It showed CTO at the stented site, indicating silent ischemic insult (Figure 1A, see dotted line). After angioplasty with a balloon of small diameter, CAS (Visible™, Fibertech, Tokyo, Japan) revealed the inner appearance of SES-CTO, characterized by massive mural thrombi and yellow atherosclerotic plaques (Figure 1B,1C). We subsequently deployed the longer E-ZES of 2.5x24mm (Figure 1D, solid line) into the shorter SES (Figure 1D, dotted line), so that the luminal side of SES was fully covered by E-ZES.

We performed follow-up CAG and intracoronary imaging (CAS and OCT) at 8 months (Figure 2A), 15 months (Figure 2B), 33 months (data not shown) and 50 months after the E-ZES deployment (Figure 2C). Dual antiplatelet therapy (DAPT) had been continued since 2004, i.e. 100mg aspirin and 75mg clopidogrel once daily. CAG showed no in-stent restenosis (Figure 2). Intracoronary imaging data

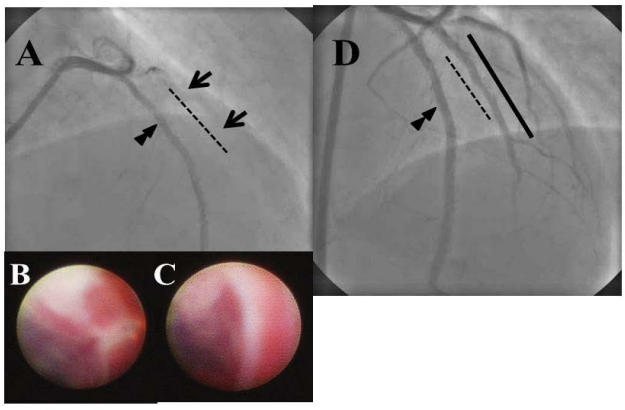

Figure 1: CAG and CAS at 6 years after SES deployment. CAG showed CTO at the SES-implanted diagonal branch of left coronary artery (dotted line in A). After recanalization with a balloon of small diameter, CAS revealed massive thrombi and yellow neointimal in SES (B, C). Proximal and distal arrows in A indicated the sites of angioscopic image B and C, respectively. The longer E-ZES (solid line in D) was successfully implanted into the SES-CTO. Angiograms were recorded from an anteroposterior and 30-degree cranial projection (A) and from 20-degree left anterior oblique and 30-degree cranial projection (D). Double arrowheads indicated left anterior descending artery.

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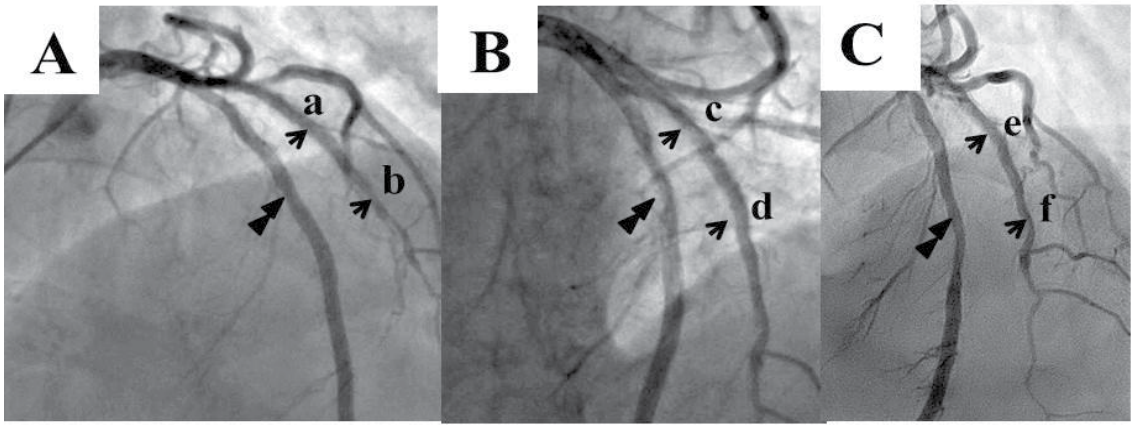

Figure 2: Follow-up CAG after E-ZES deployment into SES. The patient underwent CAG at 8 month (A), 15 months (B), and 50 months (C) after implantation of E-ZES into SES. The E-ZES at the diagonal branch had been patent throughout the follow-up period. Angiograms were recorded from an anteroposterior and 30-degree cranial projection (A) and from 20-degree left anterior oblique and 30-degree cranial projection (B,C). Double arrowheads indicated left anterior descending artery. Arrows (a-f) indicated the sites of angioscopic and OCT images in figure 3.

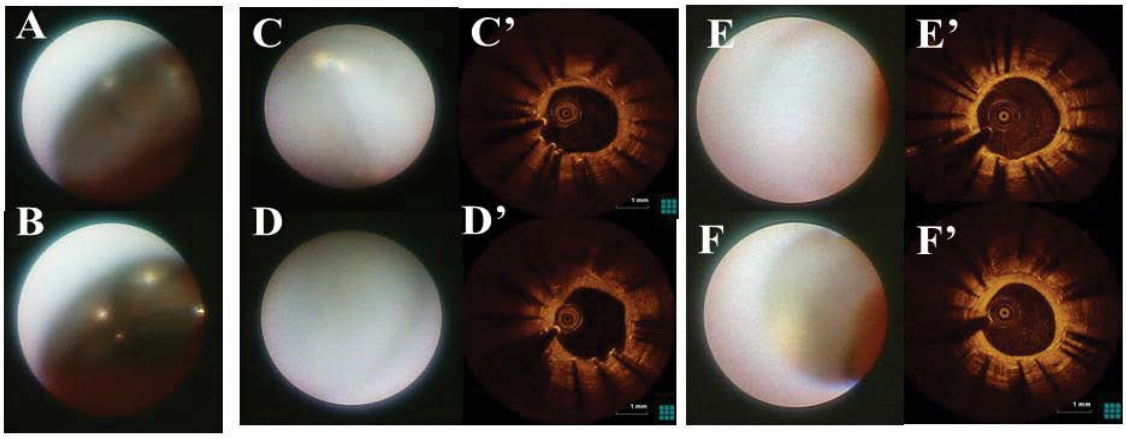

Figure 3: Follow-up CAS and OCT after E-ZES deployment into SES. In-stent CAS images were recorded at 8 months (A,B), 15 months (C,D), and 50 months (E,F). In-stent OCT images were recorded at 15 months (C',D') and 50 months after the E-ZES deployment (E',F'). Sites of angioscopic and OCT images were indicated by arrows in figure 2.

at 33 months were similar to those at 50 months. CAS showed the luminal appearance of E-ZES (Figure 3). At 8 months, stent struts were covered with the thin transparent neointima (Figure 3A,3B). At 15 months, stent struts were covered with white thicker neointimal but still bulged into the lumen without glossy appearance (Figure 3C,3D). At 50 months, stent struts were fully embedded with white neointimal and not visible (Figure 3E,3F). OCT (Dragonfly™ Imaging Catheter, St, Jude Medical, St. Paul, MN, USA) showed the relatively thinner neointimal stent coverage at 15 months (Figure 3C',3D') and the thicker homogeneous coverage at 50 months (Figure 3E',3F'), confirming the favorable plaque sealing after E-ZES implantation.

Discussion

Up to 50 months after E-ZES implantation into SES-CTO, CAG showed patency of the treated vessel (Figure 2). CAS and OCT showed the favorable plaque sealing with white neointima (Figure 3). Previously-proposed strategies for DES-CTO were cutting balloon angioplasty [1], additional implantation of SES or everolimus-eluting stents [2], and paclitaxel-coated balloon [3]. We would propose that additional E-ZES implantation into SES-CTO was another option for SES-CTO treatment.

We previously reported with CAS that SES-CTO was characterized by massive thrombi and yellow plaque (Figure 1B,C), indicating that neoatherosclerosis progressed after SES implantation [4]. We also reported the relatively rapid healing process of E-ZES-related coronary perforation [5] and pseudoaneurysm [6]. Although a comparative study with many patients is necessary to verify our proposal, this case report suggested that E-ZES implantation into SES-CTO might lead to favorable plaque sealing with white neointimal (Figure 3). Characteristics of E-ZES are rapid release of zotarolimus and the greater late loss at chronic phase, allowing us to speculate that vascular healing process after E-ZES implantation would be similar to that after implantation of bare metal stents (BMS). Previous study with CAS reported the plaque sealing phenomenon after BMS implantation in patients with acute myocardial infarction [7]. It still remains unclear whether BMS implantation into SES-CTO would result in a similar outcome to E-ZES implantation.

In-stent neoatherosclerosis has been well characterized *in vivo* with CAS and OCT. The former visualizes endothelial coverage on stent struts, in-stent mural thrombi, and yellow plaque [8]. The latter quantifies in-stent plaque burden. To diagnose plague vulnerability, CAS is superior to OCT.

In conclusion, we report a case with the favorable plaque sealing of SES-CTO after additional E-ZES implantation.

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