Optical Coherence Tomographic and Angioscopic Assessments of Arterial Healing in Coronary Artery Perforation After Implantation of Zotarolimus-Eluting Stent

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Summary

We report the case of a 69-year-old male whose left circumflex coronary artery was perforated immediately after implantation of an Endeavor zotarolimus-eluting stent (E-ZES). Despite successful hemostasis by long balloon inflation, a coronary pseudoaneurysm remained at the E-ZES-implanted segment. Coronary angiography performed one year after the coronary perforation showed the pseudoaneurysm had disappeared. Simultaneous optical coherence tomography and coronary angioscopy revealed that stent struts of the E-ZES were fully covered with thick neointima. This is the first case report of a relatively rapid healing process for an E-ZES-related coronary pseudoaneurysm. (Int Heart J 2013; 54: 332-333)

Key words: Optical coherence tomography, Angioscopy

Case Report

A 69-year-old man with hypertension and dyslipidemia was admitted to our hospital with effort angina. An ECG revealed complete atrioventricular block so that a DDD pacemaker was implanted. Coronary angiography (CAG) revealed severe stenosis of the middle portion of the left circumflex (LCX) artery (Figure 1A). Subsequently, the patient underwent percutaneous coronary intervention (PCI). Intravascular ultrasound (IVUS) (Revolution™, Volcano Corporation, San Diego, CA) showed severe stenosis with moderate eccentric plaque and calcification (Figure 1B). After balloon angioplasty (NSE™, Goodman Corporation, Nagoya, Japan), IVUS showed an extended plaque with slight calcification. An Endeavor zotarolimus-eluting stent (E-ZES, 3.5 × 18 mm, Endeavor™, Medtronic Cardiovascular, Inc., Santa Rosa, CA) was implanted into the culprit lesion at the maximal pressure of 16 atm. Immediately after the stent implantation, CAG revealed coronary artery perforation of Ellis Type III at the proximal portion of the E-ZES (Figure 1C). The stent delivery balloon was immediately delivered into the perforation site and inflated at 8 atm three times for 10 minutes. CAG showed that the perforation site was adequately sealed (Figure 1D). Despite the successful hemostasis, final IVUS revealed a coronary pseudoaneurysm (Figure 1E). Echocardiography did not support cardiac tamponade. We found no significant elevation of creatine phosphokinase on the next day. Dual antiplatelet therapy with clopidogrel (75 mg/day) and aspirin (100 mg/day) once daily had been conducted since the PCI. For follow-up at 1 year after the E-ZES implantation, the patient was again admitted to our hospital. Surprisingly, CAG revealed no stent restenosis and no pseudoaneurysm at the site of the E-ZES implantation (Figure 2A). Interestingly, optical coherence tomography (OCT) (Dragonfly™, St. Jude Medical, Westford, MA, USA) revealed that the E-ZES stent struts were fully covered with thick neointima, indicating good arterial healing at the site of the coronary pseudoaneurysm (Figure 2B-E). Subsequent coronary angioscopy (Visible™, FiberTech, Tokyo) showed neither mural thrombi nor yellow atherosclerotic plaques (Figure 2F).

Discussion

We report here the first case of a relatively rapid healing process for an E-ZES-related coronary pseudoaneurysm. The LCX artery was perforated at the contralateral side of the calcification immediately after the ZES implantation (Figure 1E). Excessive pressure in the stent-mounted balloon (16 atm) was one of the reasons for the perforation. Although hemostasis was successful, the pseudoaneurysm remained at the ZES-implanted coronary segment (Figure 1D, E). At 1 year after the
PCI, the coronary pseudoaneurysm disappeared (Figure 2).

The healing process for a perforation-induced pseudoaneurysm depends not only on the severity of the vessel injury but also on whether a bare metal stent (BMS) or DES was implanted. The healing process for a BMS-implanted vessel might be more rapid than that of DES, because cytostatic drugs and polymer-induced inflammation affect the process. A representative first generation DES was the sirolimus-eluting stent (SES). A delayed healing process for SES-related pseudoaneurysms was reported. We also observed another case with an SES-related pseudoaneurysm. In this case it took 4 years for complete healing (data not shown). The drug-releasing profile of the SES was reported to be slower than that of the E-ZES stent. Late loss and neointimal coverage were found to be similar between BMS and E-ZES, whereas those of the SES were significantly less. These characteristics of E-ZES might contribute at least in part to the relatively rapid healing process observed in this case.

To follow the arterial healing process, we employed three imaging devices, ie IVUS, OCT, and coronary angiography. IVUS was powerful for visualizing extravessel structures, eg a coronary pseudoaneurysm (Figure 1E, arrow). Because of its fine spatial resolution, OCT showed that stent struts were covered with neointima (Figure 2B–E). Coronary angiography showed the inner surface of the stented segment was not yellowish and was without thrombi (Figure 2F). Although we did not perform IVUS at 1 year follow-up, we would speculate that the pseudoaneurysm observed by IVUS (Figure 1E) corresponded to the crescent shaped-space by OCT (Figure 2B–E). If so, the size of the hematoma decreased during the follow-up period.

To the best our knowledge, this is the first case report demonstrating a good healing response in an E-ZES related coronary pseudoaneurysm.

**REFERENCES**