A Case of Thrombus-related Early Focal In-stent Restenosis after Everolimus-eluting Stent Implantation

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In-stent restenosis (ISR) is said to be caused by under-expanded stent, neointima, etc., which can result in late stent thrombosis. Therefore preventing restenosis is an important problem in the DES era. This report presents a case of focal thrombi-related restenosis on everolimus-eluting stent confirmed by angioscopy and optical coherence tomography. Given that the management of in-stent restenosis on drug-eluting stent (DES) has not been established, intracoronary imaging tools would play an important role in the treatment of ISR after using DES. Intracoronary imaging tools will give a more accurate diagnosis and will help in the prevention and treatment of ISR.

KEY WORDS: cardiac imaging techniques, coronary restenosis, drug eluting stent

I. Introduction

The use of an intracoronary drug-eluting stent (DES) has been the mainstay of percutaneous coronary intervention (PCI). However, in-stent restenosis (ISR), particularly focal ISR after PCI, still remains one of the major clinical problems in the DES era. So far, the mechanism or characteristics of ISR following DES have not been fully investigated.

II. Case report

We obtained informed consent and this case report was approved by an ethics committee.

A 78-year-old man, a current smoker, with coronary risk factors of hypertension and dyslipidemia presented to the department with angina pectoris. Elective coronary angiography (CAG) demonstrated a severely calcified stenotic lesion at the mid-right coronary artery (mid-RCA). The lesions were successfully treated by three everolimus-eluting stents (EESs) (3.5 × 18, 3.5 × 15, and 3.0 × 15 mm) (Xience; Abbott Vascular, Redwood City, CA, USA) after percutaneous transluminal coronary rotational atherectomy (PTCRA) (Fig. 1). The patient was prescribed aspirin 100 mg and clopidogrel 75 mg after PCI.

Quantitative CAG showed that the percentage of diameter stenosis and minimal diameter stenosis were improved from 62% and 1.34 mm to 38% and 2.54 mm after the treatment, respectively. Angiography and intravascular ultrasound images confirmed a well-expanded stent.

Routine follow-up CAG after 9 months of the first index procedure confirmed high-grade focal restenosis with a contrast filling transparency at the site of severe calcification in the mid-RCA. The present case was thus assumed as a focal, asymptomatic, and thrombi-related restenosis pattern in the EESs. Optical coherence tomography (OCT; ILUMIEN™ OCT Imaging System, St Jude Medical, Japan) showed residual thrombus overlying the stent struts. Coronary angioscopy showed white and red mixed-thrombus, protrusion of yellow plaque, and stent struts uncovered by neointima.

The lesion was treated with a cutting balloon (Lacross NSE catheter 3.0 × 15 mm, Goodman, Co, Lt.) after manual aspiration (Thrombuster III GR Kaneka, Osaka, Japan) guided by OCT and angioscopy (Fig. 2).

Although repeat CAG 9 months after the second index procedure showed no significant stenosis at the restenotic lesion, angioscopy showed uncovered stent strut at the site of stent overlapping (Fig. 3).

III. Discussion

The study subject had a focal thrombi-related restenosis on EES confirmed by angioscopy and OCT. Although DES has significantly reduced the incidence of ISR, ISR treatment with DES is challenging. Since the management of ISR on DES has not been established, intracoronary imaging tools would play an
Fig. 1  Initial coronary angiography and post 1st index procedure successfully treated by three everolimus-eluting stents after PTCRA.
A: Initial coronary angiography (CAG) demonstrated severely calcified stenosis in the right coronary artery (white arrow).
B, C: Index percutaneous coronary intervention with implantation of three everolimus-eluting stents (EESs) after percutaneous transluminal coronary rotational atherectomy. The final CAG showed successful EES implantation.
PTCRA: percutaneous transluminal coronary rotational atherectomy.

Fig. 2  Observations of optical coherence tomography and coronary angioscopy before and after 2nd index procedure.
A: Coronary angiography showed focal severe in-stent restenosis at the mid-portion.
B: Optical coherence tomography showed massive thrombus at the site of overlapping segments with extreme tortuosity.
C: Angioscopy depicted white and red mixed-thrombus formation, protrusion of yellow plaque, and stent struts uncovered by neointima.
D-F: After the second index procedure, optical coherence tomography depicted no thrombus in the fully expanded stent and coronary angioscopy showed uncovered stent strut.
important role for the treatment of ISR using DES.

In thrombus-related focal in-stent restenosis, three issues arise: 1) delayed healing due to overlapping stent in severely calcified lesion, 2) underexpansion in severely calcified lesion, 3) possible radial strength leading to greater stent recoil with thinner strut in second-generation DES than in bare metal stent.

The findings of undercovered stent strut detected through vascular angioscopy revealed that three EESs overlapping in a severely calcified lesion (hyper calcification and flexion lesion that required PTCRA) might circumvent the problem thought to have resulted in under-expanded stent. Delayed healing and promotion of inflammation at sites of overlap have been reported in the atherosclerotic rabbit model implanted with EES, suggesting the general detrimental effect and potential biohazard of overlapping devices. In previous studies, despite of use of new-generation DES, post-procedural stent underexpansion showed a trend toward higher incidence of stent thrombosis and silent focal thrombi-related restenosis.

IV. Conclusion

We experienced the educational case of a focal thrombi-related restenosis on EES confirmed by angioscopy and OCT. In daily practice, careful attention should be paid to achieving better stent expansion by using intracoronary imaging tools.

All authors declare no conflict of interest.

References


Fig. 3 Coronary angioscopy 9 months after 2nd index procedure. A: Angioscopy showed the right ventricular branch. B: Angioscopy showed yellow plaque and uncovered stent strut. C: Angioscopy showed yellow plaque, red thrombi, and stent strut.