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IVUS-guided rotational atherectomy for unexpandable paclitaxel-eluting stent: A case report and review of literature

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Abstract

We describe a patient suffering from late stent thrombosis in a paclitaxel-eluting stent which had an underexpanded ring due to the three-hundred-sixty-degree circumferential calcified plaque. Intravascular ultrasound (IVUS) revealed rotational atherectomy could successfully ablate both the metallic ring and the calcified ring. The ablated segment was scaffolded with a new paclitaxel-eluting stent, well expanded and documented by IVUS. To our knowledge, this is the first case report of stent ablation for an unexpanded paclitaxel-eluting stent. From the Medline index, there were only six case reports of stent ablation. We review and summarize the operation details of stent ablation from these reports.

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1 Introduction

Coronary stent implantation over a severely calcified plaque may result in stent underexpansion, thus potentially leading to instent thrombosis. Herein, we report a patient presenting with acute coronary syndrome, who had an unexpanded Paclitaxel-eluting stent in the left anterior descending artery. Stent ablation was performed and then another stent was deployed with full expansion.

2 Case presentation

A 76-year-old, non-diabetic and non-hypertensive female was referred to our emergency department with a diagnosis of acute coronary syndrome. Three months earlier, she underwent percutaneous coronary intervention (PCI) with a Taxus Liberte 2.75 × 24 mm stent (Boston Scientific Co. Natick, MA) implanted in the left anterior descending (LAD) artery for refractory angina, and had been on aspirin 100 mg and clopidogrel 75 mg a day. Upon arrival, her vital signs were stable, and there were no signs of heart failure.

The electrocardiographic findings and elevation of troponin-I (6.8 ng/dL) were consistent with non-ST elevation myocardial infarction. Transthoracic echocardiographic findings, including left ventricular function, were normal. Intravenous infusion of un-fractional heparin was initiated. Urgent coronary angiography revealed a well localized, hazy filling defect in the stented segment in mid-LAD (Figure 1A). Under the impression of late stent thrombosis, PCI with a non-compliant 3.25 × 12 mm balloon (Quantum balloon, Boston Scientific Co. Natick, MA) was performed. However, the balloon could not be fully expanded even with inflation pressure up to 28 atm. (Figure 1B). Intravascular ultrasound (IVUS) (Atalantis 2.9 Fr; Boston Scientific Co., MA) interrogation of the stented segment revealed an underexpanded stent (Figure 1C, 1D). The narrowest part of the ring was 1.47 mm × 1.49 mm in diameter. Under intravenous tirofiban infusion, rota-ablation was performed for 11 runs, five with a 1.5 mm burr and six with 1.75 mm burr. In each run, the rotation speed was 150,000 r/min and the burr was advanced very slowly for < 20 s to prevent speed deceleration < 3,000 r/min, and maintain adequate coronary flow with good myocardial Blush noted. After rota-ablation, IVUS images confirmed adequate ablation of the pre-existing

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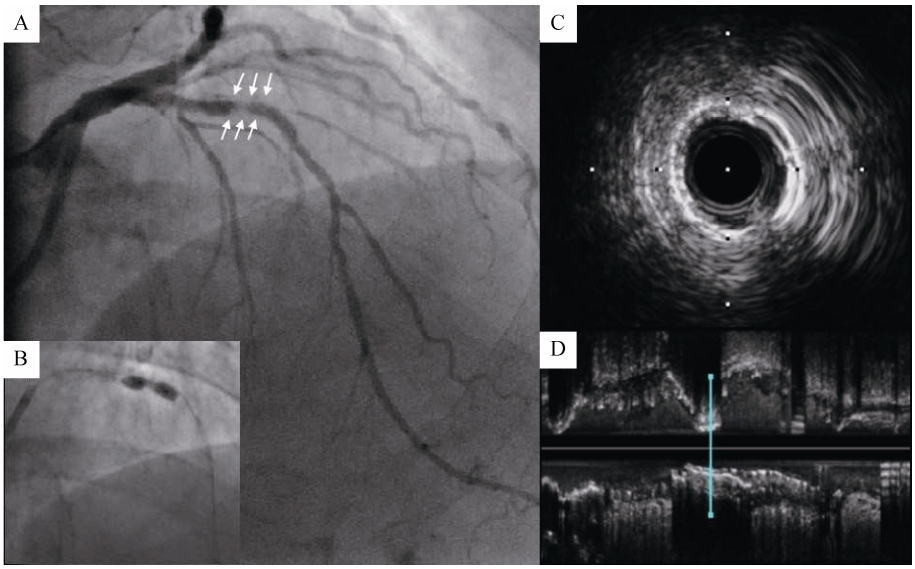

Figure 1. Undilated stent. (A): In the right anterior oblique projection, Taxus 2.75 × 24 mm stent (Boston Scientific Co.) which was deployed three months ago had a waist over mid left anterior descending artery (white arrows); (B): Non-compliant 3.25×12 mm balloon (Quantum balloon, Boston Scientific Co. Natick, MA) with 28 atm could not fully dilate previous stent in mid left anterior descending artery; (C & D): Intravascular ultrasound showed two layers of ring.

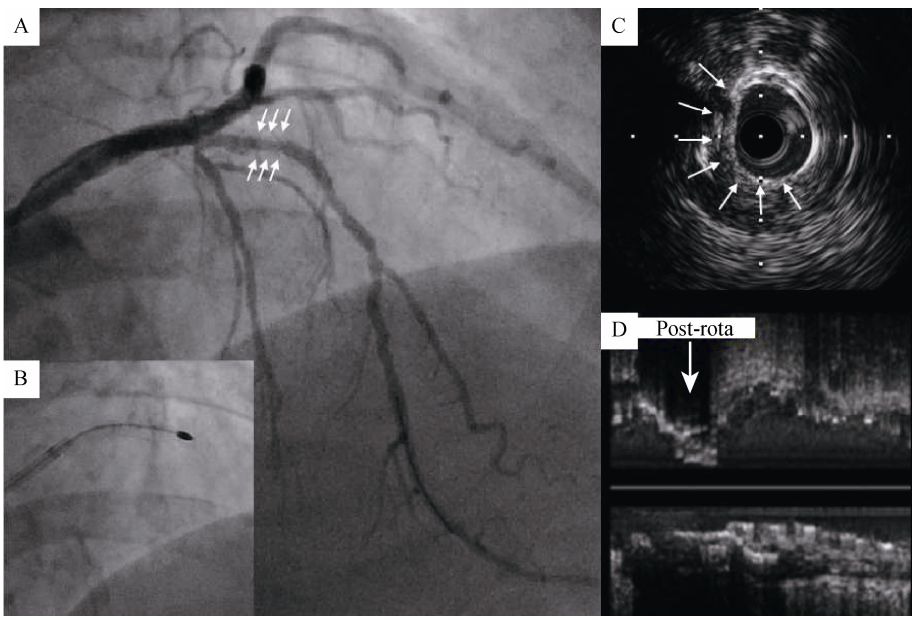

Figure 2. Stent rota-ablation. (A): After stent rota-ablation, angiogram revealed mild improving of mid LAD lesion (arrows); (B): 1.5 mm burr was advanced very slowly to avoid entrapement of burr in the stent; (C&D): Post-ablation IVUS showing complete ablaton of stent and calcified layers from 5 to 11 o'clock direction (white arrows).

stent and calcified layers (Figure 2B). Post-dilation with a non-compliant 3.25 × 12 mm balloon (Quantum balloon, Boston Scientific Co., Natick, MA) at 8 atm achieved full expansion of balloon (Figure 1B). Thus, a Taxus Liberte 3.5 × 32 mm stent was deployed at 14 atm, and a satisfactory result was documented by angiogram and IVUS imaging, respectively (Figure 3B, 3C). The patient's PCI course was uneventful and discharge followed a few days later on aspirin and clopidogrel. Follow-up angiography nine months later revealed < 30% instent restenosis (Figure 4).

3 Discussion

Drug-eluting stent (DES) thrombosis is strongly associated with diabetes, heart failure and stent underexpansion.[1] In our patient, no diabetes mellitus (DM), with no heart failure, on dual anti-platelets, thrombosis is most likely related to stent underexpansion. Severe stent underexpansion was documented by IVUS in this case. During clinical practice, stenting over an underexpanded segment after balloon

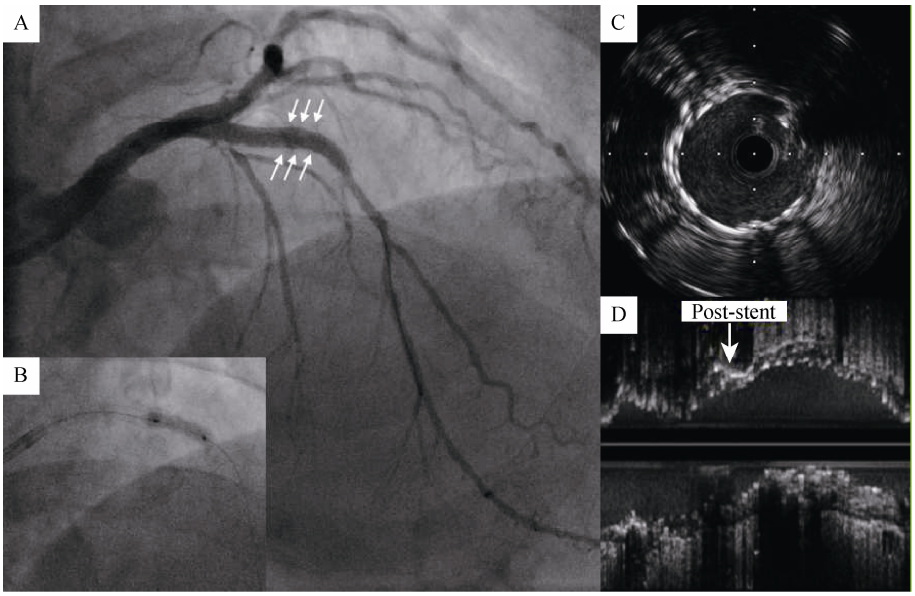

Figure 3. Full expansion of new stent. (A & C & D): Final angiogram and IVUS study revealed good result after stenting by Taxus 3.5 × 32 mm stent (Arrows; Boston Scientific Co); (B): Non-compliant 3.25 × 12 mm balloon (Quantum balloon, Boston Scientific Co., Natick, MA) achieved full expansion with 8 atm.

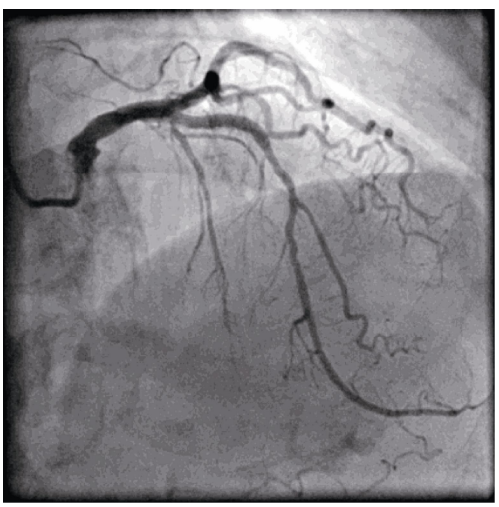

Figure 4. Follow-up angiography 9 months later revealed < 30% instent restenosis.

inflation was considered inappropriate. Debulking should be performed under IVUS-guidance.[2] However, balloon inflation is the first choice; if not feasible, debulking

Rotational ablation for an underexpanded stent has been performed previously.[3–6] In our circumstance, all authors were concerned of entrapment of the burr in the stent. Hence, very gentle advancement with relatively low speed of rotation was recommended (Table 1).

Metal particles produced during rotational ablation may cause micro-embolism and the heat generation during stent ablation was concerned. Some bench tests revealed the metal particle was smaller than the diameter of red blood cell.[6] But what happen after ablation of drug-coating and polymers was unknown. In our case, there was no slow flow, and the TIMI blush score was normal. Infusion of glyco-

Table 1. Reported cases of rotational ablation of under-expanded stents.

	Initial Stent	Ring size (mm)	1st Burr	2nd Burr	3rd Burr	Speed (r/min)	Glycoprotein IIb/IIIa Inhibitor	Added Stent
Kobayashi, *et al*.[3]	NA	1.4	1.5 mm	1.75 mm	2.0 mm	150,000	Tirofiban	IC γ RT
Medina, *et al*.[4]	Multilink 3/32 mm	1.2 × 1.6	1.25 mm	1.75 mm	2.0 mm	NA	Abciximab	Multilink 3/28 mm
Medina, *et al*.[4]	NA	NA	1.25 mm	1.75 mm	2.0 mm	NA	NA	3.5/13 mm
Hadjimiltiades, *et al*.[5]	Cypher 3.0/24 mm	2.0 × 2.5	1.75 mm	Nil	Nil	150,000	Abciximab	Taxus 3.5/18 mm
Okamura, *et al*.[6]	Cypher 3.5/18 mm	1.8	2.0 mm	2.25 mm	Nil	180,000	Nil	Cypher 3.5/23 mm
Present Case	Taxus 2.75/24 mm	1.5 × 1.5	1.5 mm	1.75 mm	Nil	150,000	Tirofiban	Taxus 3.5/32mm

NA: not available; Nil: no use.

protein IIb/IIIa inhibitors, in addition to the traditional Rota-solution was recommended (Table 1).

From the Medline index, there were four case reports of stent ablation. One case involved a bare metal stent, two were Sirolimus-eluting stents and the other was unspecified. To our knowledge, this is the first case report of stent ablation for an unexpandable paclitaxel-eluting stent with late stent thrombosis. Pretreatment with careful rota-ablation of the unexpanded stent and its underlying calcified plaque, enabled deployment of a well-expanded DES.

References

1 Fujii K, Carlier SG, Mintz GS, *et al*. Stent underexpansion and residual reference segment stenosis are related to stent thrombosis after sirolimus-eluting stent implantation: an intravascular ultrasound study. *J Am Coll Cardiol* 2005; 45: 885–998.

2 Okabe T, Mintz GS, Buch AN, *et al*. Intravascular ultrasound parameters associated with stent thrombosis after drug-eluting stent deployment. *Am J Cardiol* 2007; 100: 615–620.

3 Kobayashi Y, Teirstein P, Linnemeier T, *et al*. Rotational atherectomy (stentablation) in a lesion with stent underexpansion due to heavily calcified plaque. *Catheter Cardiovasc Interv* 2001; 52: 208–211.

4 Medina A, de Lezo JS, Melian F, *et al*. Successful stentablation with rotational atherectomy. *Catheter Cardiovasc Interv* 2003; 60: 501–504.

5 Hadjimiltiades S, Tsikaderis D, Louridas G, *et al*. Rotational ablation of an unexpandable sirolimus-eluting stent. *J Invasive Cardiol* 2005; 17: 116–117.

6 Okamura A, Ito H, Fujii K. Rotational atherectomy is useful to treat restenosis lesions due to crushing of a sirolimus-eluting stent implanted in severely calcified lesions: experimental study and initial clinical experience. *J Invasive Cardiol* 2009; 21: E191–E196.