

Laser for a complex PCI with ISR, undilatable, and uncrossable lesions

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A 72-year-old woman was referred to our center with recurrent chest tightness over the previous year which had exacerbated 1 week prior. The patient had a history of self-made polyurethane-covered stent (PU-CS) implantation 6 months prior because of a proximal left anterior descending (LAD) perforation after high-pressure post-dilatation. Diagnostic angiography revealed in-stent restenosis (ISR) at the PU-CS site, stent under-expansion at the middle LAD (undilatable with a 2.75 mm noncompliant balloon inflated at 24 atmospheres for 60 s), and tight stenosis with a heavily calcified lesion at the middle circumflex (uncrossable with a 1.25 mm compliance balloon). Optical coherence tomography (OCT) revealed excessive neointimal proliferation at the ISR site and under-expanded stent struts with circumferential peri-stent calcification. Laser debulking was used to pretreat the three lesions with a 0.9 mm coronary laser atherectomy catheter (X-80 Vitesse RX, Spectranetics®) with saline flush. After laser,

repeat OCT revealed a lamellar flap neointima at the PU-CS site. The OCT imaging after laser treatment in the middle circumflex region revealed calcified nodules and suspicious thrombi. The three different types of lesions were successfully fixed using one procedure (Fig. 1, Suppl. Video 1), and the patient's outcome was uneventful during nine-month follow-up. The unique OCT images of ISR may be attributed to the altered proliferation pattern of the covered stent, in which neointimal hyperplasia proceeds from the edges toward the center with minimal transgraft tissue penetration. The combined use of laser and OCT has unique advantages in terms of plaque modification and procedural success in complex coronary lesions.

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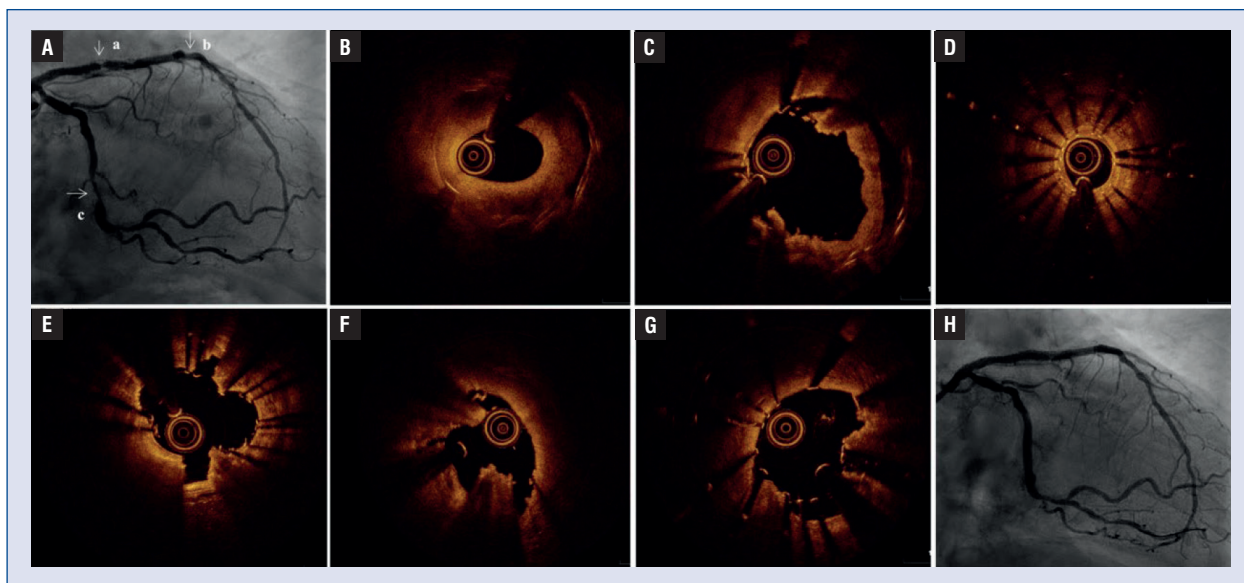


Figure 1. Representative images for the application of the laser atherectomy technique in a complex PCI. **A.** Diagnostic angiography demonstrates ISR at the PU-CS site (a), stent under-expansion at the middle segment of the LAD (b), and tight stenosis with a heavily calcified lesion at the middle circumflex (c); The PU-CS is made by a commercial drug-eluting stent covered with polyurethane-membrane cutting from 3M™ Tegaderm™ Transparent Film Dressing; **B.** OCT reveals excessive neointimal proliferation in the ISR site; **C.** After laser debulking, repeated OCT demonstrates lamellar flap neointima at the PU-CS site and a drug-coated balloon is deployed at the ISR site; **D.** OCT reveals under-expanded stent struts with circumferential peri-stent calcification at the middle segment of the LAD; **E.** OCT reveals optimal cross-sectional areas are obtained with the adjuvant of laser atherectomy and a non-compliant balloon dilatation for the under-expansion site; **F.** The OCT imaging after laser atherectomy at the middle circumflex reveals calcified nodules and suspicious thrombi; **G.** After a drug-eluting stent is implanted and a non-compliant balloon is sequentially dilatated at the middle circumflex, OCT reveals satisfactory result; **H.** Excellent angiographic results after the PCI procedure. PCI — percutaneous coronary intervention; ISR — in-stent restenosis; PU-CS — polyurethane-covered stent; LAD — left anterior descending; OCT — optical coherence tomography.