Peripheral intravascular lithotripsy paving the way for Impella-assisted multivessel high-risk percutaneous coronary revascularization

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In cases of challenging percutaneous coronary intervention (PCI) in patients with poor left ventricular ejection fraction (LVEF), when the risk of cardiosurgical treatment is unacceptably high, left ventricular assist devices (LVADs) increase safety by minimizing periprocedural ischemia, preventing hemodynamic instability, and allowing time for lesion preparation and optimization techniques [1]. Impella CP (Abiomed, Danvers, MA, US), which is the predominantly used LVAD in high-risk PCI cases, requires a minimum 19 French (F) access site, preferably with little tortuosity en route to the ascending aorta. Advanced peripheral atherosclerosis within the iliofemoral axis may pose a serious challenge during the introduction of an LVAD [2].

A 77-year-old male multimorbid patient with ischemic cardiomyopathy (LVEF, 35%) and a symptomatic chronic coronary syndrome (class III in the Canadian Cardiology Society functional scale) was qualified by the Heart Team for multivessel percutaneous coronary angioplasty, supported with an LVAD. The initial coronary angiogram revealed multivessel coronary disease with a significant left main lesion involving the proximal segments of the left anterior descending (LAD) and circumflex (LCx) arteries, a long lesion in the proximal and medial segments of the LAD (Figure 1A), and a subtotal ostial lesion in the right coronary artery (RCA) (Figure 1B). A computed tomography scan revealed severe tortuosity in the left iliofemoral axis and a significantly heavily calcified tandem lesion in the right common and external iliac arteries, with a minimum diameter of 3.4 mm (Figure 1C). The left subclavian artery was also stenosed, which excluded it as an alternative access site. Under angiographic control (using right radial access and a pigtail catheter), we obtained right femoral access with a 6 F sheath, subsequently deployed two automated mechanical sutures, and exchanged them for an 8 F sheath. We then performed intravascular lithotripsy (IVL) in the right common and external iliac arteries using a Shockwave C2 7.0/60 mm IVL catheter deployed with 4–6 atmospheres (Shockwave Medical, Santa Clara, CA, US), with eight applications (20 seconds each) and obtained optimal lesion resolution (Figure 1D). After changing to a 19 F sheath, we introduced the Impella CP System (Abiomed, Danvers, MA, US), with permanent support of 3.6 l/min. Initially, we performed RCA PCI with implantation of a 3.5/18 mm drug-eluting stent (DES) (Figure 1F). Consequently, using an extra backup 3.5, 7 F guiding catheter, we performed LM/LAD/LCx PCI using the double-kissing-crush technique with three DES (Figure 1E). All procedures were guided by intravascular ultrasound, which confirmed the optimal effect. The right femoral access site was closed using two Perclose ProStyle devices (Abbott Vascular, Santa Clara, CA,

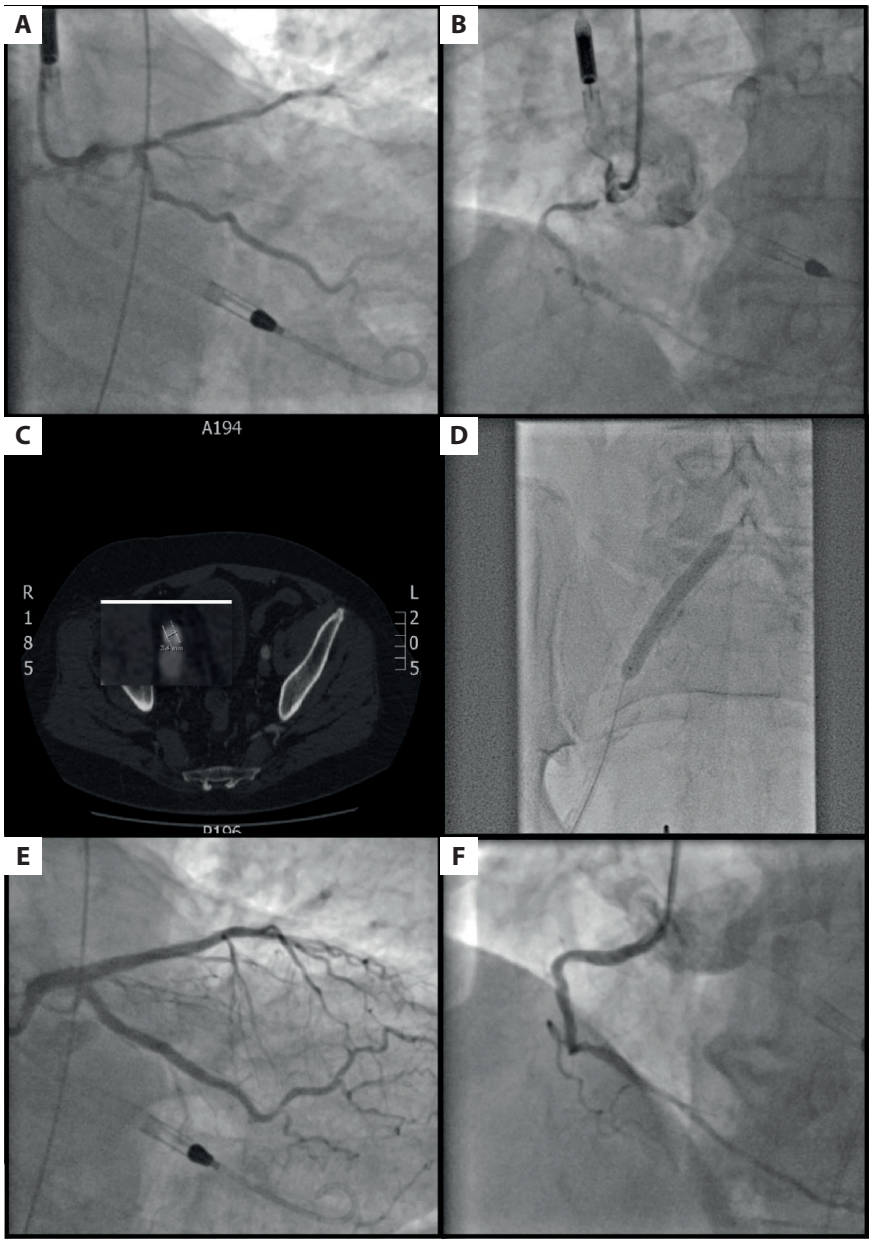

Figure 1. A. Coronary angiography of the left coronary artery showing severe diffuse disease. **B.** Coronary angiography of the right coronary artery showing a severe ostial lesion. **C.** Computed tomography angiography showing almost 360° calcification within the common and external iliac arteries. **D.** Peripheral intravascular lithotripsy with the optimal angiographic result. **E.** Final angiographic result in the left coronary artery. **F.** Final angiographic result in the right coronary artery

US) and one AngioSeal 8 F System (AS; St. Jude Medical, St. Paul, MN, US), with the optimal angiographic result [3] (Figure 1F). The dose length product was 1289 mGy, and the contrast dose was 180 ml.

Peripheral artery disease co-exists with coronary artery disease in more than 40% of cases [4]. Calcified lesions within the iliofemoral axis pose a serious challenge to using LVADs but may be overcome by applying contemporary techniques, such as IVL. Complications related to peripheral IVL are rare and include mainly device malfunction (56.5% in a recent report) [5]. In accordance with the manufacturer's guidelines, the device is contraindicated when the lesion is uncrossable with a 0.014 guidewire as well as in cases of in-stent restenosis.

Article information

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