

Impella CP in cardiogenic shock due to acute myocardial infarction: From primary angioplasty to LIMA-LAD grafting

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Percutaneously implanted mechanical circulatory support devices constitute a significant advance in the treatment of cardiogenic shock, especially in acute myocardial infarction (MI), where they support myocardial revascularization and recovery [1].

A 66-year-old diabetic woman, after 4 anterior MIs, was admitted with cardiogenic shock due to another anterior MI. Three months earlier, during the last MI, the patient underwent the percutaneous coronary intervention of the left anterior descending artery (LAD) with lithotripsy (shockwave balloon 3.5 mm, 80 applications) and the high-pressure balloon angioplasty (OPN NC[®] balloon [SIS Medical AG, Frauenfeld, Swiss], 40 atm) of the calcified lesion covered with previously implanted 2 under-expanded stents. The intervention was ineffective since the final minimal stent area was 2.7 mm² (Figure 1A); however, the patient refused coronary artery bypass grafting (CABG) at that time.

On the present admission, the patient was in shock with pulmonary edema: the blood pressure was 100/60 mm Hg on noradrenaline infusion, the lactate level was 3.54 mmol (cardiogenic shock stage C in the Society for Cardiovascular Angiography and Interventions [SCAI] classification) [2], and the glycemia level was 439 mg/dl. On echocardiography, the ejection fraction was 30% with akinesia of all apical segments and the mid-septal segment. In the emergency room, the patient was intubated and transferred to the catheterization laboratory.

Coronary angiography revealed stent thrombosis in the proximal and mid LAD (Figure 1B), chronic total occlusion of the distal circumflex artery, and the stenosed

hypoplastic right coronary artery. After the Impella CP[®] (Abiomed, Danvers, MA, USA) insertion (via the left femoral access), the balloon angioplasty of the LAD was performed, restoring a normal blood flow (Figure 1C). Since the target lesion could not be dilated even with lithotripsy, the patient was scheduled for CABG after clinical stabilization. On the Impella support, the arterial pressure was 110/105/107 mm Hg, and the pulmonary artery catheterization revealed: right atrial pressure 5/6/5 mm Hg, right ventricular pressure 21/1/5 mm Hg, pulmonary artery pressure 21/13/16 mm Hg, pulmonary capillary wedge pressure 6/8/6 mm Hg, cardiac output (CO) 2.03 l/min, cardiac power output (CPO) 0.48 W, pulmonary artery pulsatility index 1.6. However, if the Impella was stopped, the cardiac output parameters immediately dropped: CO, 1.53 l/min, CPO, 0.36 W.

Due to severe heart failure, decompensated diabetes mellitus, deep acidosis, polyuria, and respiratory failure, the patient required prolonged treatment in the intensive care unit. During that time, the patient was dependent on the Impella support; however, the noradrenaline infusion was gradually reduced, the creatinine concentration decreased from 1.2 mg/dl to 0.79 mg/dl, the lactate level returned to normal, and the pulmonary edema subsided. After 6 days the patient's condition improved sufficiently, and the off-pump (i.e. with Impella CP support) CABG was performed with LIMA-LAD anastomosis. During cardiac surgery, the position of the Impella was monitored by transesophageal echocardiography (Figure 1D; Supplementary material, Video S1).

The next day, the native cardiac output improved: CO, 2.7 l/min and CPO, 0.6 W (off

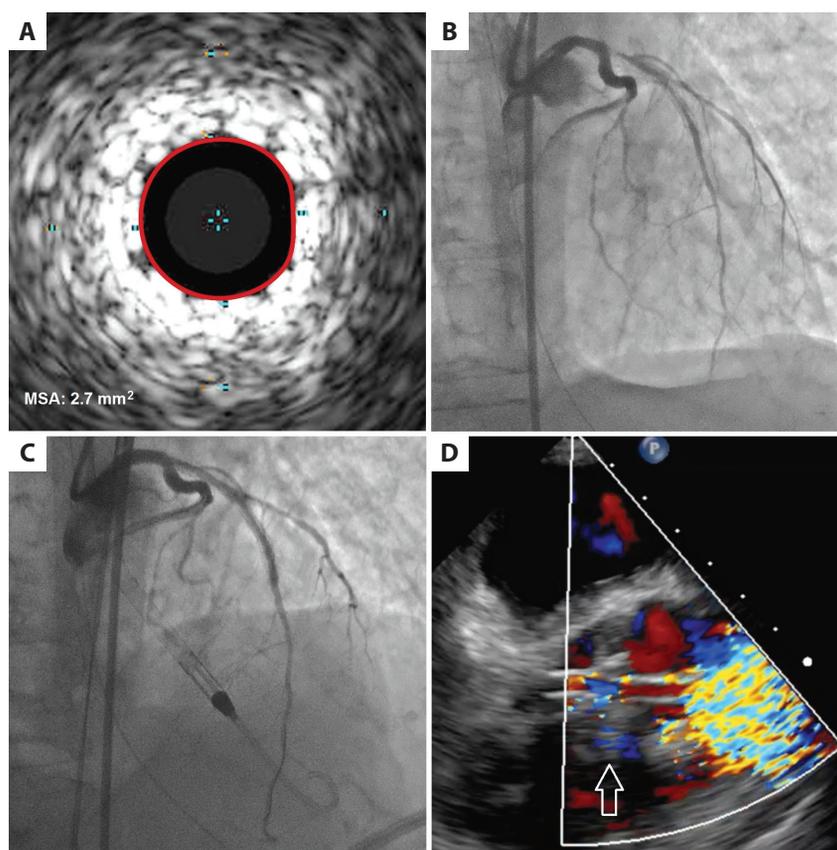


Figure 1. Impella CP during revascularization in cardiogenic shock. **A.** Intravascular ultrasound image shows 2 layers of under-expanded stents within the calcified circular lesion in the left anterior descending artery (LAD); the minimal stent area (MSA) is 2.7 mm². **B.** Left coronary angiography presents critical thrombotic lesions in the LAD and distal chronic occlusion of the circumflex artery. **C.** Effect of the balloon angioplasty of the LAD with the Impella support. **D.** Transesophageal echocardiography during cardiac surgery shows a proper position of the Impella pump (see Supplementary material, *Video S1*): the biggest colored "storm" (i.e. the blood flow from the outlet) is above the aortic valve (the arrow indicates aortic cusps)

Impella) with no catecholamines infusion, and the Impella was removed. The access site was closed with two Proglide sutures, which were placed before the Impella insertion. After 2 weeks, the patient was transferred to the rehabilitation center.

Several reports indicate that the Impella 5.0 may assist CABG [3, 4], but there is only one report on the Impella CP in off-pump CABG [5]. Our case shows that in cardiogenic shock during MI, the Impella CP can support the entire treatment, i.e. both primary percutaneous coronary intervention, hemodynamic and metabolic stabilization, as well as off-pump CABG.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

Conflict of interest: None declared.

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