Complex percutaneous coronary intervention of highly calcified distal left main coronary artery supported with percutaneous left ventricle assist device in an octogenarian with severely decreased left ventricle ejection fraction

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Title:

Complex percutaneous coronary intervention of highly calcified distal left main coronary artery supported with percutaneous left ventricle assist device in an octogenarian with severely decreased left ventricle ejection fraction.

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Short title:

Complex coronary angioplasty assisted by left ventricle assist device.

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Conflict of interest: None declared.
An 86-year-old lady, with a history of hyperlipidemia, arterial hypertension, and chronic kidney disease, was admitted to our hospital to perform a high risk percutaneous coronary intervention (PCI). The patient was transferred from a remote hospital where she was hospitalized due to 3rd non-ST segment elevation myocardial infarction in the last 4 months. The coronary angiography revealed heavy calcifications in both coronary arteries, proximally occluded right coronary artery, critical stenosis of the distal left main artery (LM), ostial left anterior descending artery (LAD) and the circumflex artery (Cx) (Syntax Score 45 pts.) (Figure 1A). Proximal Cx and LAD (functional occlusion) were also significantly narrowed. The ultrasound showed reduced left ventricle ejection fraction (25%), with extensive abnormalities in wall motion but preserved viability.

Considering high risk of surgery (EuroSCORE II 15.16%, STS 9.814%) during Heart Team meeting the patient was qualified for a high-risk PCI facilitated by rotational atherectomy and supported by a percutaneous left ventricle assist device (pLVAD).

Currently, there are several pLVADs available. The iVAC2L device (PulseCath, Arnhem, Netherlands) stands out from other available devices due to the lower cost and easiness of use. The mechanism of the device is based on a 2-way valve integrated into a 17 Fr lumen catheter inserted into the left ventricle (Figure 1B). The catheter is connected to an extracorporeal 40 cc membrane pump compatible with any standard intra-aortic balloon pump console. In the systolic phase, blood is aspirated from the left ventricle through the tip of the catheter to the membrane pump. During the diastolic phase, the pump directs the blood into the ascending aorta using the 2-way valve (Figure 1C). This mechanism can secure up to 2 liters of additional cardiac output. Due to the petite statue of the patient, we decided that the 2 liters support will be sufficient to safely perform the procedure and the easiness of use will decrease the risk of complications.
The procedure was performed under general anesthesia with the surgical preparation of the right femoral artery for pLVAD insertion. The iVAC2L device was introduced into the left ventricle at the beginning of the procedure. The ostium of the left coronary artery was intubated afterwards with an extra backup 3.5/6F catheter (Medtronic, Santa Rosa, CA, USA) introduced via a second arterial approach from the right radial artery. Fielder XT wire (Asahi Intecc, Aichi, Japan) was placed in the distal part of LAD, which was later exchanged via Finecross MG microcatheter (Terumo, Tokyo, Japan) to Rota Wire Extra Support (Boston Scientific, Marlborough, MA, USA). Several runs with 1.25 burr (Boston Scientific) were sufficient to modify the calcified plaque and allow a full 2.0/20 mm semi-compliant Solarice balloon (Medtronic) expansion. The medial part of LAD was secured with 2.5/22 mm Resolute (Medtronic) drug-eluting stent (DES). The stenosis in the proximal part of Cx was predilated with 2.5/12 mm semi-compliant Solarice balloon (Medtronic) and secured with 2.5/9 mm Resolute (Medtronic) DES. Finally, the LM/LAD/Cx bifurcation was treated using the culotte technique with two Resolute DES (3.5/34 mm and 4.0/12 mm) (Medtronic). The procedure was finalized by kissing balloons inflation and proximal optimization treatment in LM with a 4.0/8 mm NC Solarice balloon (Medtronic).

The course of the procedure was uneventful with the optimal angiographic result (Figure 1D). The patient remained hemodynamically stable for the whole procedure. The iVAC2L device was removed directly after the procedure, the access site was secured by the surgeon. Further hospitalization was uneventful, the patient was discharged home after 3 days in good condition.

For our knowledge, this was the first successful procedure with iVAC2L implementation in Poland. The device is user-friendly with a short learning curve. It also ensures sufficient support to perform even highly complicated PCI in the selected group of patients.
Figure 1

Panel A. Left coronary artery before the procedure.
Panel B. iVAC2L system; source: Medaccess.
Panel C. iVAC2L catheter; source: Medaccess.
Panel D. Final result.