

IMAGES IN INTERVENTION

iVAC-2L to Facilitate Transcatheter Edge-to-Edge Repair of Mitral Valve Without Leaflet Coaptation



Jerzy Sacha, MD, PhD,^{a,b} Wojciech Milejski, MD,^a Jarosław Bugajski, MD,^a Natalia Pidzik, MD,^c Tomasz Pawłowski, MD, PhD,^{d,e} Marek Gierlotka, MD, PhD^a

Trascatheter edge-to-edge repair (TEER) is a therapeutic option for severe mitral valve regurgitation in patients with high surgical risk. However, because of technical considerations, the mitral valve must demonstrate at least minimal coaptation. Those without this feature are generally not eligible for the intervention.

Our patient presented with torrential mitral regurgitation with no coaptation (**Figures 1A and 1B, Videos 1 and 2**), but because of multiple comorbidities, including severe pulmonary hypertension and tricuspid regurgitation, the patient was deemed ineligible for cardiac surgery.

Left ventricular assist devices (LVADs) can reduce end-diastolic pressure and volume through ventricular unloading, thereby decreasing the size of both the ventricle and the mitral annulus. This could potentially lead to improvement in coaptation, enabling TEER. We used an iVAC-2L (PulseCath) pump (ie, an LVAD) to facilitate TEER in our patient, who did not require mechanical circulatory support. The iVAC-2L is a pulsatile system capable of generating output of up to 2 L/min. The iVAC-2L uses the intra-aortic counterpulsation console for driving, and

it aspirates blood from the left ventricle during systole and ejects the same blood into the aorta during diastole. By pumping blood out of the left ventricle, the iVAC-2L, similar to the Impella (Abiomed), unloads the left ventricle, but the iVAC-2L does not have a pigtail at its end, so it rarely entangles with the mitral apparatus.

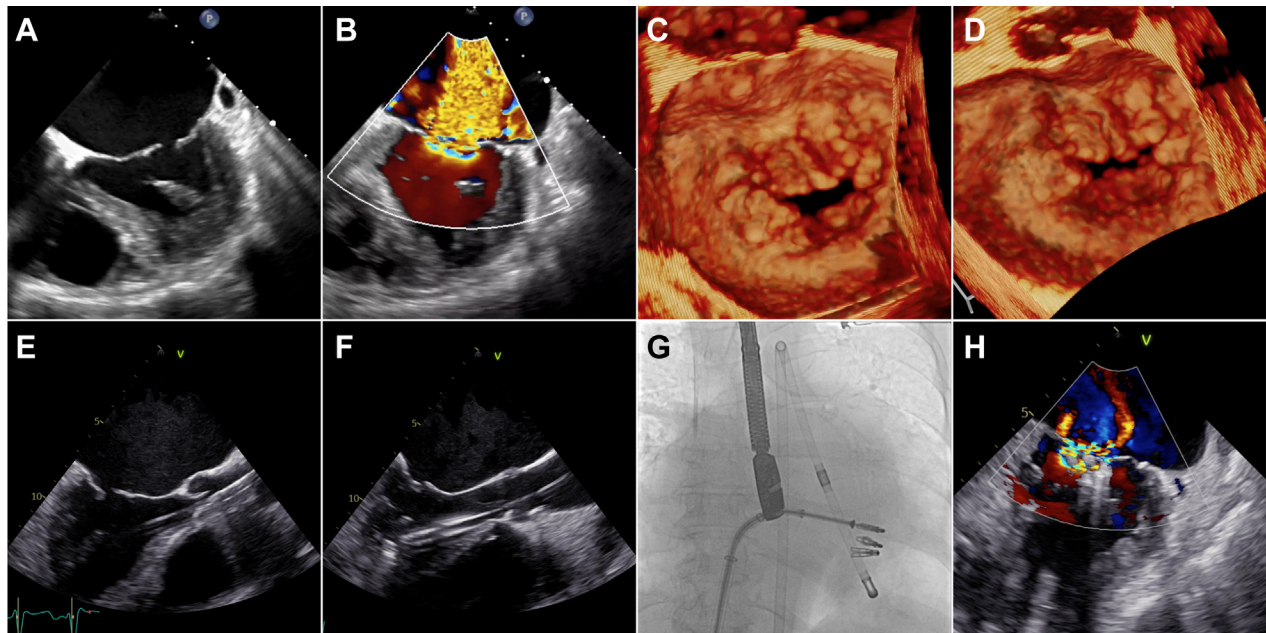
The iVAC-2L was inserted through the left common femoral artery and set to provide flow of up to 2 L/min. After 30 minutes of running, there was a notable improvement in the coaptation (**Figures 1C and 1D, Videos 3 and 4**), and we then initiated TEER with a MitraClip (Abbott). **Figures 1E and 1F** show the effects on leaflet coaptation when the iVAC-2L was switched off and on. The procedure went smoothly, and there was no interference between the delivery catheter of the MitraClip and the iVAC-2L (**Figure 1G, Video 5**). Three clips were successfully implanted, resulting in reduction of mitral regurgitation to a mild level (**Figure 1H, Video 6**). The patient remained hemodynamically stable, and the iVAC-2L was removed immediately after the procedure.

However, significant oxygen desaturation occurred because of a right-to-left shunt through the iatrogenic

From the ^aDepartment of Cardiology, University Hospital, Institute of Medical Sciences, University of Opole, Opole, Poland; ^bFaculty of Physical Education and Physiotherapy, Opole University of Technology, Opole, Poland; ^cDepartment of Anesthesiology, University Hospital, Institute of Medical Sciences, University of Opole, Opole, Poland; ^dDepartment of Cardiology, National Institute of Medicine of the Ministry of Internal Affairs and Administration, Warsaw, Poland; and the ^ePostgraduate Medical Education Centre, Warsaw, Poland.

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FIGURE 1 iVAC-2L to Facilitate TEER

(A) Absence of leaflet coaptation with a gap of 5 mm. (B) Torrential regurgitation. (C) Three-dimensional transesophageal echocardiography (TEE) shows a lack of coaptation before iVAC-2L insertion. (D) Notable improvement of coaptation after 30 minutes of iVAC-2L operation. (E) Two-dimensional TEE exhibits a lack of coaptation when the iVAC-2L is switched off. (F) Improvement in coaptation after switching the iVAC-2L on. (G) Transcatheter edge-to-edge repair with the iVAC-2L. (H) Final outcome. See [Videos 1 to 6](#).

atrial septal defect, leading to challenges in weaning off mechanical ventilation. Therefore, an 11-mm Amplatzer Septal Occluder (Abbott) was deployed, resulting in a good clinical outcome. It is worth mentioning that the iVAC-2L requires an 18-F sheath insertion, which can be problematic in patients with peripheral arterial disease. In such cases, an Impella CP with a 14-F sheath might be an option.

This case demonstrates an alternative application of an LVAD in a patient without indications for mechanical circulatory support, highlighting that left ventricular unloading with an LVAD can effectively reduce the gap between the mitral leaflets, enabling successful TEER.

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ADDRESS FOR CORRESPONDENCE: Dr Jerzy Sacha, Department of Cardiology, University Hospital in Opole, Al. Witosa 26, 45-401 Opole, Poland. E-mail: sacha@op.pl.

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APPENDIX For supplemental videos, please see the online version of this paper.