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Is the Impella Device Really Useful to Unload the Left Ventricle During Extracorporeal Life Support?



To the Editor:

We read with great interest the article by Tepper and colleagues [1]. This retrospective study provides insight on whether the use of the Impella Abiomed (Danvers, MA) confers an efficient left ventricular (LV) unloading when compared with surgical vent. The authors demonstrated that the Impella really can unload the LV during extracorporeal life support as efficiently as conventional surgical LV venting. The authors must be congratulated for their encouraging results in this very challenging clinical scenario. However, their results deserve some comments.

The surgical vent group is heterogeneous compared with the Impella group because three venting routes were used instead of only the LV apex. In the left atrium route, the authors do not report whether the venting catheter was introduced directly into the LV or whether the catheter was located inside the left atrium. In this latter setting, the LV might not be efficiently unloaded, especially when the mitral valve is competent. Venting of the pulmonary artery is considered an indirect venting, as previously described [2]. These three different routes may explain why pulmonary edema improved only in 24% of the surgical patients compared with 65% of the Impella patients and was unchanged in 52% compared with 25%, respectively.

The authors reported a myocardial recovery in 39% of Impella patients and in 27% of surgical vent patients. It is very interesting to know the criteria adopted for measuring myocardial recovery. They correctly considered the course of pulmonary edema, but echocardiographic and biomolecular data, such as troponin, brain natriuretic peptide, venous oxygen saturation, or blood lactate levels [3], were not mentioned.

Finally, surgical LV apex venting allows an easy switch from extracorporeal life support to a paracorporeal left assist device; in such a situation, the outflow cannula will be positioned in the femoral or axillary artery [4].

The authors have correctly stated that the Impella can also be used as a cardiac support after weaning from extracorporeal membrane oxygenation support. We strongly agree with this point, and it is certainly important to recognize the positive clinical effect, despite the high cost, which can limit the use of Impella in these clinical scenarios in many centers.

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Reply

To the Editor:



We thank Formica and colleagues [1] for their thoughtful response to our article [2]. We acknowledge that our comparison left ventricular (LV) vent group was heterogeneous and contained patients with multiple routes of LV venting. Because of the retrospective nature of our study and the limited population, this was unavoidable if we wanted to include a sufficient number of patients to make a meaningful comparison. With a larger, prospective study, patients with Impella could be compared with those vented through the LV apex only. The authors are also correct in their assertion that cannulas in the left atrium and pulmonary artery may not provide sufficient LV venting. At the time of surgical implantation, all LV vents placed through the left atrial route were positioned across the mitral valve into the left ventricle. In addition, only 3 of 22 surgical vent patients had indirect LV venting through the pulmonary artery. Despite heterogeneity, pulmonary artery (PA) pressures were significantly reduced in this group after 48 hours.

In regard to the authors' question about myocardial recovery, this referred to a subset of patients in each group who recovered sufficient cardiac function to allow extracorporeal life support (ECLS) decannulation without LV assist device (LVAD) support. This distinguished them from the 26% of Impella patients and 18% of surgical vent patients who were bridged from ECLS to LVAD.

Although we would have preferred to include echocardiographic data to examine LV unloading, the emergent nature of ECLS cannulation in most of our patients and the retrospective nature of our study meant that most patients did not receive echocardiograms before ECLS or at predetermined times after cannulation that would facilitate comparison. In addition to radiographic evidence of pulmonary edema, we also compared diastolic PA pressure between groups. This indicator was chosen because it is a representative measurement of LV unloading that was available in sufficient numbers of patients.

Similar to our study, several recent studies in 2017 have produced results that demonstrate the ability of the Impella device to unload the left ventricle during ECLS. In a series of 6 patients with cardiogenic shock supported by ECLS, the addition of Impella lead to significant improvements in PA pressure, pulmonary wedge pressure, and right ventricular stroke volume [3]. Moazzami and colleagues [4] also described a series of 10 patients who received Impella during ECLS. After Impella support initiation, wedge pressure significantly improved in all patients ($p < 0.001$), and follow-up echocardiograms demonstrated a significant decrease in LV end-diastolic volume ($p = 0.021$) [4].