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COMMENT AND OPINION

Use of a novel short-term mechanical circulatory support device for cardiac recovery

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We read with great interest the article by Nair et al[1] regarding implantation of pulsatile-flow left ventricular assist device (LVAD) support as a bridge to decision in patients with end-stage heart failure (HF) complicated by pulmonary hypertension. This strategy was associated with a significant and immediate improvement in pulmonary hemodynamics and hence increased candidacy for heart transplantation.

We report a similar concept in the setting of acute decompensated chronic end-stage HF with the use of a novel pulsatile-flow short-term LVAD, the iVAC 3L (PulseCath, Groningen, The Netherlands). The iVAC 3L is a pulsatile-flow catheter pump that provides adequate mechanical short-term circulatory support in patients with post-cardiotomy low cardiac output syndrome and in cases of acute cardiogenic shock.[2] It consists of a 21F (6.9-mm) flexible polyurethane catheter with a single pivoting leaflet at its tip (Figure 1).

We used this device in a 61-year-old man with acute decompensation of chronic end-stage HF due to idiopathic dilated cardiomyopathy. The patient was in critical cardiogenic shock, assessed as Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) level 1, despite maximum inotropic and intra-aortic balloon pump (IABP) support.[3] The pump was implanted through an 8-mm vascular graft from the right axillary artery through the aortic valve and was positioned into the LV, with placement guided by transesophageal echocardiography.

The patient's hemodynamic status improved immediately, and pulmonary edema resolved while the IABP and inotropes were being weaned. Eventually, his clinical status returned to the pre-shock condition and he was downstaged to INTERMACS level 3. Cardiac output improved from 2.9 to 3.8 liters/min, and the transpulmonary gradient decreased from 18 to 11 mm Hg. A significant reduction in brain natruretic peptide levels was also noted. This allowed for successful weaning off the device after 10 days of support.

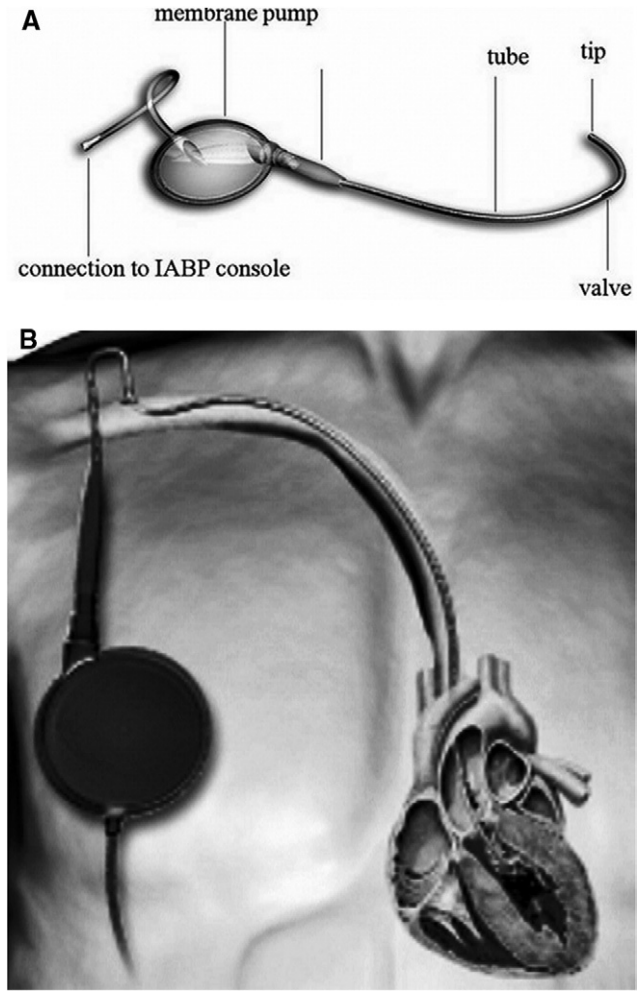

Figure 1 (A) Structure of the device. (B) Position and functioning. The tip of the catheter is inserted into the left ventricular cavity, the 2-way valve is positioned in the aorta, and the membrane pump, which is activated by a standard intra-aortic balloon pump driver, is located outside the body. The device provides circulatory support by actively aspirating blood from the left ventricle during systole and ejecting it into the ascending aorta in diastole.

Paracorporeal pulsatile-flow devices have been successfully used for medium-term and long-term support in both acute and chronic end-stage HF.[4] However, this policy applies to specialized HF centers with experienced surgical teams. The iVAC pump can be easily used in any cardiac center. It is a minimally invasive device that is easy to implant because it requires a peripheral route for access, and no additional technical equipment is needed

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beyond a standard IABP driver unit, which provides pneumatic energy, and transesophageal echocardiography, which secures accurate placement. The device provides up to 3 liters/min of cardiac output while it unloads the LV and improves myocardial perfusion. Current clinical experience extends from a few hours up to 5 days of support. Aortic valve injury and device dislocation during support have not been reported.

We tested the device for a significantly extended period with a promising result. Therefore, it may be considered as a valuable option in both the severe acute and chronic HF setting when IABP offers inadequate support and a paracorporeal LVAD is not readily available. The idea of use of this device for improving the clinical status of end-stage HF patients may expand the indications for its use, and it may prove valuable as a bridge to decision or even in increasing a patient's candidacy for a long-term LVAD implantation.

Disclosure statement

None of the authors has a financial relationship with a commercial entity that has an interest in the subject of the presented manuscript or other conflicts of interest to disclose.

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