Combined Surgical Left Ventricular Reconstruction and Left Ventricular Assist Device Implantation for Destination Therapy in End-Stage Heart Failure

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End-stage heart failure is a growing problem associated with high mortality, using conventional medical care. Although heart transplantation remains the gold standard therapy for end-stage heart failure, it is a limited resource that is not applicable to a large portion of heart failure patients, particularly the elderly. An alternative strategy for patients who do not meet standard heart transplantation criteria is destination therapy with left ventricular assist device (LVAD) implantation. The implantation of nonpulsatile, continuous-flow LVADs has become a relatively routine procedure in large surgical centers that is associated with a relatively low complication rate. However, cannulation for LVAD implantation is occasionally challenging. In particular, patients who have undergone a LV restoration and patch volume reduction procedure (ie, “Dor procedure”) pose a particular challenge. We describe a favorable 1-year outcome for a severely symptomatic patient with chronic ischemic heart failure and a large LV aneurysm treated by a Dor procedure and simultaneous LVAD implantation.

Patient Presentation
A 52-year-old patient with ischemic heart failure was referred to our institution for further therapy and possible evaluation for heart transplantation. His medical history was pertinent for heart failure and multiple stenting of the left anterior descending artery. The patient had multiple previous myocardial infarctions resulting in a giant chronic aneurysm of the anterior wall of the LV. The magnetic resonance tomography revealed an excessively dilated LV cavity (end-diastolic volume, 600 mL), a large anterior aneurysm (9.0×3.0×9.5 cm), and a severely compromised LV ejection fraction of 10% (online-only Data Supplement Video). No viable myocardium was observed and revascularization was not indicated. Because of refractory malignant ventricular arrhythmias and a steadily deteriorating clinical situation, LVAD implantation (HeartMate II; Thoratec Corp, Pleasanton, CA) was considered. Because of existing comorbidities, the patient was planned for destination therapy and therefore an extracorporeal LVAD was deemed to be an unsuitable option.

Surgical Procedure
After full sternotomy, institution of cardiopulmonary bypass, and cross-clamping of the aorta, the LV was fully exposed and mobilized from mild adhesions. The LV aneurysm was opened parallel to the left anterior descending artery and examined for thrombi. A vent was positioned through the pulmonary vein into the LV cavity. An appropriate boundary for endoventricular circular patch repair (Figure, A) was defined between nonviable and healthy myocardium. A new LV chamber was thereafter created, using an oval-shaped Dacron patch as described by Dor (Figure, B). The Dacron patch was secured adjacent to the posterior mitral annulus and directly to the ventricular septum using a 3-0 running Prolene suture. A circular opening was then made in the middle of the oval Dacron patch, and a 28-mm Hemashield graft was sutured to this opening as a T-graft to facilitate positioning of the inflow cannula of the LVAD (Figure, C). The distal tip of the inflow cannula was placed in the proximal third of the T-graft and fixed with a running 4-0 Prolene suture (Figure, D). The axis of the inflow cannula was directed toward the mitral valve and away from the interventricular septum. The neo-LV cavity and LVAD inflow cannula were covered and stabilized with the original LV aneurysm sack (Figure, E). Finally, the LVAD outflow graft was sewn to the ascending aorta, and an appropriate LVAD flow of 5.5 L/min was observed. Postoperative chest radiography confirmed normal positioning of the LVAD (Figure, F). The patient’s postoperative course was uneventful, and he was discharged 18 days after LVAD implantation. The patient is alive and doing well 380 days after LVAD implantation and reports a good quality of life.

Conclusion
To the best of our knowledge, this is the first report of a successful 1-year outcome for a patient treated with a LVAD.
continuous-flow LVAD and simultaneous Dor procedure as destination therapy for end-stage heart failure and giant LV aneurysm. In patients with ischemic cardiomyopathy and LV aneurysm, LV reconstruction with the technique described by Dor has been shown to be associated with an improved ejection fraction and New York Heart Association functional status. However, completely nonviable and noncontractile LV myocardium with formation of an enormous aneurysm presents a surgical challenge, particularly if LVAD therapy is being considered. A concomitant Dor procedure, which geometrically changes the expanded LV into a more elliptical form, may be necessary in such patients to achieve a stable cannulation site for VAD placement and orientation. The technique that we used was thought to be a better alternative for our patient than insertion of an extracorporeal LVAD device with cannulation of the left atrium because our patient was not deemed to be a transplant candidate and thus destination therapy with an extracorporeal device would lead to a more restricted quality of life. A Dor reconstruction of the LV anterior wall and subsequent insertion of an LVAD may also be a suitable alternative in patients who are transplant candidates, particularly if their expected time on the waiting list is prolonged. The critical portion of our procedure was to obtain a stable and hemostatic fixation of the inflow cannula, leading to unhampered LVAD flow performance. We were able to create a neo-LV and inflow apparatus that ensured perpendicular implantation of the inflow cannula. The remaining LV was large enough to avoid any suction around the inflow cannula, and the surgically formed inflow cuff stabilized the orientation of the device toward to the mitral valve. Our experience indicates that the Dor procedure is compatible with LVAD implantation and is applicable for long-term circulatory support with good quality of life. Our approach may also be applicable to patients undergoing bridge-to-transplantation LVAD insertion.

Disclosures
None.

References

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