Concomitant surgery during ventricular assist device implantation

Alexander Stepanenko, Evgenij V. Potapov, Yuguo Weng, Miralem Pasic, Thomas Krabatsch, Roland Hetzer

Department of Cardiothoracic and Vascular Surgery, Deutsches Herzzentrum Berlin, Berlin, Germany

Correspondence to: Alexander Stepanenko, MD. Deutsches Herzzentrum Berlin, Augustenburger Platz 1, 13353 Berlin, Germany.
Email: stepanenko@dhzb.de.

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Today, ventricular assist device (VAD) implantation is an established treatment for end-stage heart failure. However, there are various cardiovascular pathologies that require concomitant treatments during surgical VAD implantation, which may render the procedure difficult or compromise VAD function. Furthermore, there are certain clinical situations that prohibit VAD implantation (1,2).

Aortic valve regurgitation or the presence of a mechanical aortic valve prosthesis are relative contraindications for implantation of left ventricular assist devices (LVADs). In such cases, one option is to undertake concomitant aortic valve replacement with a biological prosthesis. In stable patients, simultaneous aortic valve replacement and LVAD implantation are not associated with a poorer outcome. However, in patients with cardiogenic shock, concomitant aortic valve replacement may impair outcomes, and therefore alternative techniques should be considered (3).

In the case of significant aortic regurgitation causing a progressive increase in left ventricular diameter which cannot be compensated by increased pump output, two options are available. Firstly, a transplant candidate may be shifted to a high-urgency status on the waiting list, and secondly, conventional aortic valve replacement can be considered for patients who require permanent VAD support. New catheter-based technologies, such as transarterial aortic valve implantation or closure of aortic valves by devices similar to those used for septal defect closure, should first be evaluated in an experimental setting.

Mitral stenosis must be corrected during LVAD implantation, as the presence of a mitral valve prosthesis (mechanical or biological) is not a contraindication for LVAD placement.

The presence of pulmonary artery thrombi in patients scheduled for LVAD implantation significantly increases the risk of postoperative right ventricular failure (RVF). Right ventricular assist device (RVAD) support may be useful in isolated RVF after embolectomy and RVF following LVAD insertion (4).

Patients with active systemic infections should not be considered for LVAD support, as infection is a leading cause of morbidity and mortality. Implantation should be delayed for patients with localized infections that can be effectively treated, if clinically feasible.

Type A acute aortic dissection (AAD) is a life-threatening emergency that carries a high mortality rate without surgical treatment. Surgical outcomes of AAD have been improving with increasing experience and advances in diagnosis, surgical techniques and perioperative management. However, there continues to be individuals who require mechanical assistance immediately after life-saving surgery as a result of terminal heart failure following AAD. VAD or total artificial heart (TAH) therapy are feasible options for individuals who suffer from AAD and have undergone surgical treatment. Assessment of patients' clinical status (severity of shock and coagulopathy) and right ventricular function is paramount in the selection of an appropriate therapy (TAH *vs*. biventricular assist device *vs*. LVAD).

VAD implantation may also be part of the treatment for end-stage heart failure in adults with complex congenital heart defects (CHDs). These patients are managed by a collaborative team of specialists [pediatric surgeon, mechanical circulatory support (MCS) surgeon, MCS cardiologist, and VAD coordinator], who have a clear understanding of cardiovascular anatomy, pathophysiology of specific heart defects and additional risks incurred with surgery. The team must also be able to effectively evaluate the risk of biventricular

versus univentricular failure, the suitability of device types and configurations for different forms of CHD and individual anticoagulation management (5).

In patients with previous or repeated sternotomies, we prefer the left lateral thoracotomy approach when the goal is to achieve permanent assist device support.

Special consideration must be given to factors such as old age, severity of cardiogenic shock, and multi-organ failure, where additional procedures may likely increase the risks of LVAD implantation.

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