

Perioperative management of left ventricular assist devices

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ABSTRACT

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The use of mechanical circulatory support for patients with severe heart failure is on the rise. The preoperative, intraoperative and postoperative challenges the anaesthesiologists skills. These are discussed in this review.

Key words: Left ventricular assist devices; Perioperative management; Severe heart failure

INTRODUCTION

Left ventricular assist devices (LVADs) are devices for mechanical circulatory support for patients with severe heart failure. The anesthetic management of these cases can be broadly divided into pre-, intra-, and post-operative management.

PREOPERATIVE CONSIDERATIONS

A review of patient history and disease progression is essential. Optimization of therapy is key to a successful outcome. Assessment of fluid status and assessment of device compliance are important. A review of blood investigations, echocardiogram, pulmonary function testing, electrocardiogram/chest X-ray, and right heart catheter are mandatory. Appropriate fluid balance is important and if found in excess modifying diuretic therapy/fluid extraction by venovenous hemodialysis is mandatory. If extremely unstable usage of inotropes/intra-aortic balloon pump should be considered.

INTRAOPERATIVE CONSIDERATIONS

Consider full invasive monitoring. Use of a pulmonary artery catheter (PAC) is important. These patients invariably have an automated implantable circulatory device (AICD)/pacemaker *in situ*. The defibrillator if present needs to be turned off before surgery. Use of external defibrillator pads is prudent. Assessment of clotting profile by means of a baseline thromboelastogram (TEG) is useful.

Consider using cerebral oximetry as a pulse oximeter may not function well postbypass when the LVAD is operational. Limiting blood loss, usage of TEG to guide product replacement, use of cell salvage, and tranexamic acid are recommended. Transesophageal echocardiography (TEE) is vital to obtain a good outcome. A comprehensive TEE study is routinely performed preoperatively to evaluate patients for LVAD insertion. Important factors are listed in the underlying tables.

PRECARDIOPULMONARY BYPASS

- Check for patent foramen ovale, atrial septal defect, and ventricular septal defect
- Detect and quantify aortic regurgitation/stenosis
- Quantify mitral stenosis/regurgitation
- Quantify tricuspid regurgitation
- Assess right ventricular function
- Examine the cardiac chambers for the presence of thrombus
- Check for aortic atheroma.

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MANAGEMENT OF CARDIOPULMONARY BYPASS AND POSTCARDIOPULMONARY BYPASS

- Ensure adequate de-airing
- Evaluate inlet cannula position and blood flow velocity by continuous wave Doppler
- Recheck for intra-cardiac shunts
- Confirm proper LVAD function by evaluating left ventricular decompression, presence of the outlet cannula in the aorta with appropriate flow, and a centered ventricular septum.

Inotropic support should be tailored to the TEE and PAC findings. Use of a combination of inotropes, inodilators, vasoconstrictors, and nitric oxide may be needed.

POSTOPERATIVE CONSIDERATIONS

Aim for early extubation and weaning of inotropes and vasoconstrictor therapy. Maintain low right heart pressures with the aid of meticulous fluid and diuretic therapy. Postoperatively, physiotherapy and institution of anticoagulation for the device are crucial. A watchful eye for postoperative problems such as strokes, device thrombosis, infection, right ventricular failure, and timely intervention can ensure a possibility for a bridge to transplantation/destination therapy.

SUGGESTED READING

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Conflicts of interest

There are no conflicts of interest.

TAKE HOME MESSAGES

The author outlines briefly the preoperative and intraoperative considerations for anaesthetic management of patients with LVAD for mechanical support in the treatment of severe heart failure. Use of inotropes according to filling pressures and early extubation and weaning is emphasised in this review. Postoperative problems like stroke, device thrombosis, infection and right ventricular function should not be overlooked.