CASE REPORT

Sequential cataract surgeries in a patient with a left ventricular assist device (LVAD)

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SUMMARY

The population of patients on left ventricular assist devices (LVADs) has increased significantly since the 1990s, and with it, need for non-cardiac elective surgeries. Presence of an LVAD or heart failure, however, can cause physicians to perceive these patients to be at prohibitively high risk for elective surgery. Nevertheless, as one of the most common causes of poor vision in the elderly, cataracts can significantly limit improvements in quality of life that a patient may have otherwise gained from LVAD support. We describe the case of a 62-year-old man with an LVAD who underwent two uncomplicated sequential cataract surgeries following extensive cardiology evaluations and intraoperative monitoring by anaesthesia without intravenous sedation. The patient reported significant improvement in visual acuity and quality of life. Our case demonstrates the potential benefits of conducting cataract surgery relatively early in the disease course in patients with LVAD devices.

BACKGROUND

By improving life expectancy, left ventricular assist device (LVAD) implantation has created a growing population of patients dependent on this long-term circulatory support, along with an increasing need for elective non-cardiac surgeries.^{1,2} Improvements to many quality of life (QoL) metrics after implantation may depend on preserved and reliable vision,³ suggesting that the demand for cataract surgery should see a similar increase. They currently, however, are still very rarely done in LVAD patients, given concerns surrounding appropriate anaesthesia, surgical monitoring and anticoagulation management for what is perceived to be an elective procedure. With complications ranging from device thrombosis to intraocular haemorrhage or major gastrointestinal bleeding, intraoperative care presents unique haemodynamic challenges in this cohort.^{2,4,5} Therefore, proper precautions should be made in preparation for cataract surgery in this unique patient population. We describe a case demonstrating that with careful patient-specific management of these risks, cataract surgeons may nevertheless contribute to considerable improvement of daily QoL and functioning in this cohort.

CASE PRESENTATION

A 62-year-old man with a Heartmate II LVAD presented with complaints of decreased visual acuity affecting his ability to perform daily activities. His

pertinent cardiac history included atrial fibrillation with a biventricular pacer/automatic implantable cardioverter-defibrillator (AICD), mitral valve replacement with a mechanical prosthesis and tricuspid valvuloplasty. Nine months prior to his initial ophthalmology visit, he had implantation of a Heartmate II LVAD for progressive systolic congestive heart failure, which was complicated postoperatively by gastrointestinal haemorrhage requiring blood transfusions. For the 3 months prior to initial presentation to ophthalmology clinic, the patient had been tolerating 30+ min exercise sessions well twice weekly at cardiac rehabilitation. He was being treated with anticoagulation therapy, including 81 mg aspirin daily and warfarin daily, with a goal of international normalised ratio (INR) 2.0–2.5.

On initial examination, his best-corrected visual acuity was 20/40 and intraocular pressure was 10 mm Hg bilaterally. Slit lamp examination revealed mild bilateral peripheral band keratopathy and bilateral 2+ nuclear sclerotic and 1+ posterior subcapsular cataracts. The dilated fundus exam was unremarkable. We recommended phacoemulsification cataract extraction and intraocular lens implantation (CE/IOL) for the right eye cataract, which subjectively was having a greater effect on the patient's vision.

TREATMENT

Given the patient's extensive cardiac history, additional precautions were taken prior to, during and after surgery. During the 3 weeks prior, he was seen every 3–5 days at his cardiac rehabilitation clinic with rhythm strip monitoring. He continued warfarin and aspirin preoperatively. His INR was kept in the target range between 2.0 and 2.5. His LVAD device was interrogated the day before the surgery. He ensured his LVAD battery was fully charged and brought a backup battery on the day of the surgery.

The patient was determined to be American Society of Anaesthesiologists physical status classification IV by the anaesthesiologist, who planned for monitored anaesthesia care (MAC) without intravenous sedation. Topical tetracaine and intracameral lidocaine were used for local anaesthesia. The cataract was phacoemulsified by the divide-and-conquer technique and removed without difficulty. A one-piece intraocular lens was placed in the capsular bag. The patient tolerated the surgery well without complications. An LVAD nurse was present before, during and after his surgery. LVAD values

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during the case were speed, 9400rpm; flow, 6.1L/min; pulsatility index, 6.2; power, 6.3 watts. Mean arterial pressures were stable in the mid-high 70s by Doppler. Supplemental oxygen was administered by nasal cannula at 2L/min, and blood oxygen saturation was maintained between 95% and 100%. Surgical time was 18min. There was minimal blood loss during the surgery.

OUTCOME AND FOLLOW-UP

Postoperatively, the patient was treated with moxifloxacin, ketorolac and prednisolone acetate eye drops. The patient was pleased with his uncorrected visual acuity, which had improved to 20/25+21 day after the surgery. He desired cataract surgery for his left eye. One month later, the CE/IOL was performed in the left eye under MAC with topical tetracaine and intracameral lidocaine, with the same LVAD precautions and surgical technique. Surgical time was 13 min. The patient again tolerated the procedure well, with no infectious, thrombotic or bleeding complications. Vision was 20/20 bilaterally without correction 2 weeks after the second surgery and stable at 6 weeks follow-up. Patient was happy with the improvement in vision and able to resume his daily activities uninhibited. As of 16 months after the initial surgery, the patient continues to report satisfaction with the outcome and his current vision.

DISCUSSION

With continued improvements in LVAD technology and support, reported survival has been as high as 75% in 3 years.⁶ Although LVAD implantation does not come without significant risks and complications, growing acceptance of this therapy has meant recipients are increasingly older and presenting with more comorbidities.⁷ In turn, they are in need of more non-cardiac surgical procedures unrelated to their heart failure pathology, with studies demonstrating that 23%–27% of LVAD patients undergo non-cardiac surgery.⁸

Various assessments of QoL metrics, whether through the 36-item Short Form Health Survey, the Beck Depression Inventory score or functional independence measure scores, have all shown significant improvement after LVAD implantation.^{3 9} Notably, many tasks featured within these questionnaires rely on preserved vision, such as bathing and dressing, feeling and grooming, as well as the ability and interest to participate in activities patients may typically enjoy.

Despite the role vision may play in improvements to patient functionality and QoL, as well as steadily increasing numbers of elective non-cardiac surgeries performed over the years, cataract surgeries among LVAD patients remains a rarity. Only one other case of cataract surgery in LVAD patients has been reported in the literature.¹⁰ Eghrari *et al* reported two cases of cataract surgery for nuclear sclerotic cataracts of varying density in patients with LVAD support, conducted in only one eye each, both of whom received intravenous fentanyl and midazolam for sedation at the beginning of the case. They suggested a few points of caution for LVAD patients, including obtaining support from specialised LVAD staff, alternative or backup instruments and supplies for both LVAD and phacoemulsification equipment and use of bipolar cautery should intraoperative coagulation be needed. In addition, the authors cited the extreme density of one patient's lens as possibly contributing to the lengthened surgical time of his case, which thereby increased the amount of caution required to avoid surgical complications.

Overall, all LVAD patients are maintained on anticoagulation, which must be managed preoperatively. Given LVAD-related

complications of bleeding and device thrombosis, there is a substantial body of literature regarding best practices for preoperative management of anticoagulation.^{11–14} Spandorfer proposed an algorithm based on risk for bleeding associated with a procedure or surgery, as well as risk of thrombosis associated with patient history or comorbidities.¹⁵ For patients undergoing surgeries associated with a high risk of bleeding, the standard of care involves discontinuing warfarin a few days preoperatively, with or without heparin bridging until the morning of the planned procedure. For procedures with a low associated bleeding risk, the recommendation is not to discontinue the patient's warfarin but rather to preoperatively manage the dosage so that the INR goal remains in the low end of the therapeutic range. In the case of cataract surgery, our case would have been consistent with this risk category with regards to management of anticoagulation.

To the best of our knowledge, this case is the first to demonstrate that bilateral visually significant cataracts in these patients can be managed safely with sequential cataract extraction and no intraoperative intravenous sedation. Our case also highlights the potential benefits of cataract surgery relatively early in the disease course, such as once the cataract becomes visually significant. In contrast, operating on denser lens or in more elderly LVAD patients can potentially lead to suboptimal visual outcomes, lengthened case times, as well as increased risk of haemodynamic complications.^{4 5 10} To facilitate earlier identification and operation of cataracts, we would recommend regular ophthalmic screening and visual acuity exams in patients with LVAD implantation.

Learning points

- ▶ While LVADs have led to improvements in morbidity and mortality, cataract surgeries can significantly increase functional capacity and quality of life in the elderly.
- ▶ With appropriate planning and monitoring, sequential cataract surgeries can be safely performed in LVAD patients without intravenous sedation. Input from the patient's cardiologist, anaesthesiologist and specialised LVAD staff is vital to the success of this operation.
- ▶ We would recommend earlier and regular cataract screening for LVAD patients, as surgery on denser cataracts or more elderly LVAD patients can increase time in the operating room, suboptimal visual outcomes and haemodynamic complications.

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