

Anesthetic Considerations in Patients with Left Ventricular Assist Devices Undergoing Total Joint Arthroplasty.

Andrew Oligney DO, Annabella Deziel BS , Sridhar Musuku MD, Arup De MD, James Lee MD

Albany Medical Center Department of Anesthesiology, Albany Medical College



Albany Medical Center

Learning Objective: Incorporating an understanding of LVAD function and physiology in the preoperative assessment and planning for elective total joint arthroplasty. Evaluation of general and regional approaches to anesthetic management.

Introduction

- Heart failure is a significant cause of morbidity and mortality, but the creation and use of left ventricular assist devices (LVADs) has dramatically improved survival rates of patients with advanced heart failure
- LVADs used as destination therapy have been proven to be superior to medical management, with one trial showing 1-year-survival rates of 52% and 25%, respectively
- As the number of patients treated with LVADs increase, their improved survival corresponds to an increased need for noncardiogenic, quality-of-life surgeries, such as total joint arthroplasties (TJAs)
- As of 2023, there were no studies examining the preoperative management, intraoperative management, or outcomes of patients undergoing TJAs with a history of an implanted LVAD
- Thus, it’s becoming pertinent to understand the physiology and mechanics of LVADs and how they are affected by hemodynamic changes and stress on the body when these patient undergo the stress of surgery and anesthesia.

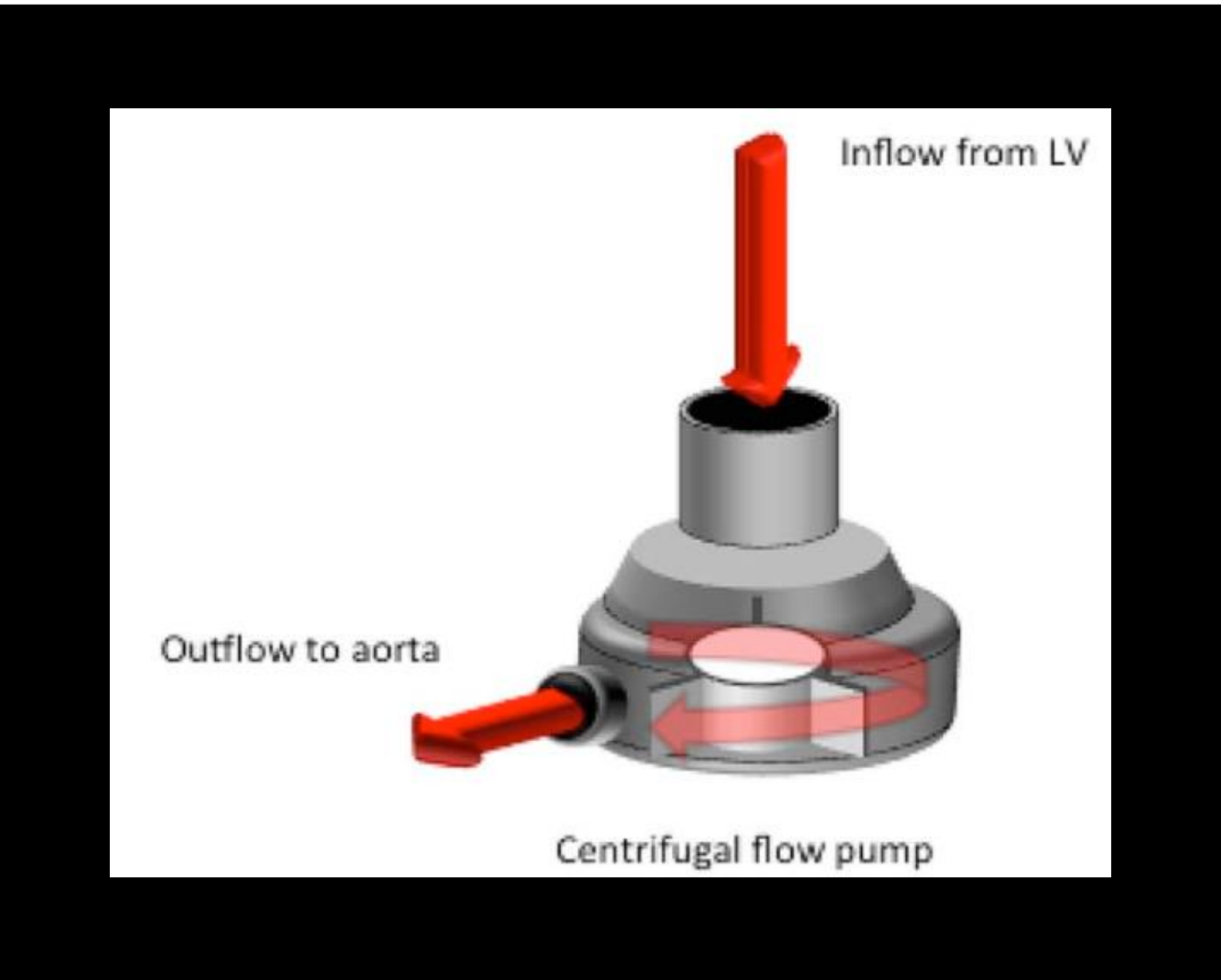


Figure 1: Schematic of Hartmate III Centrifugal flow pump

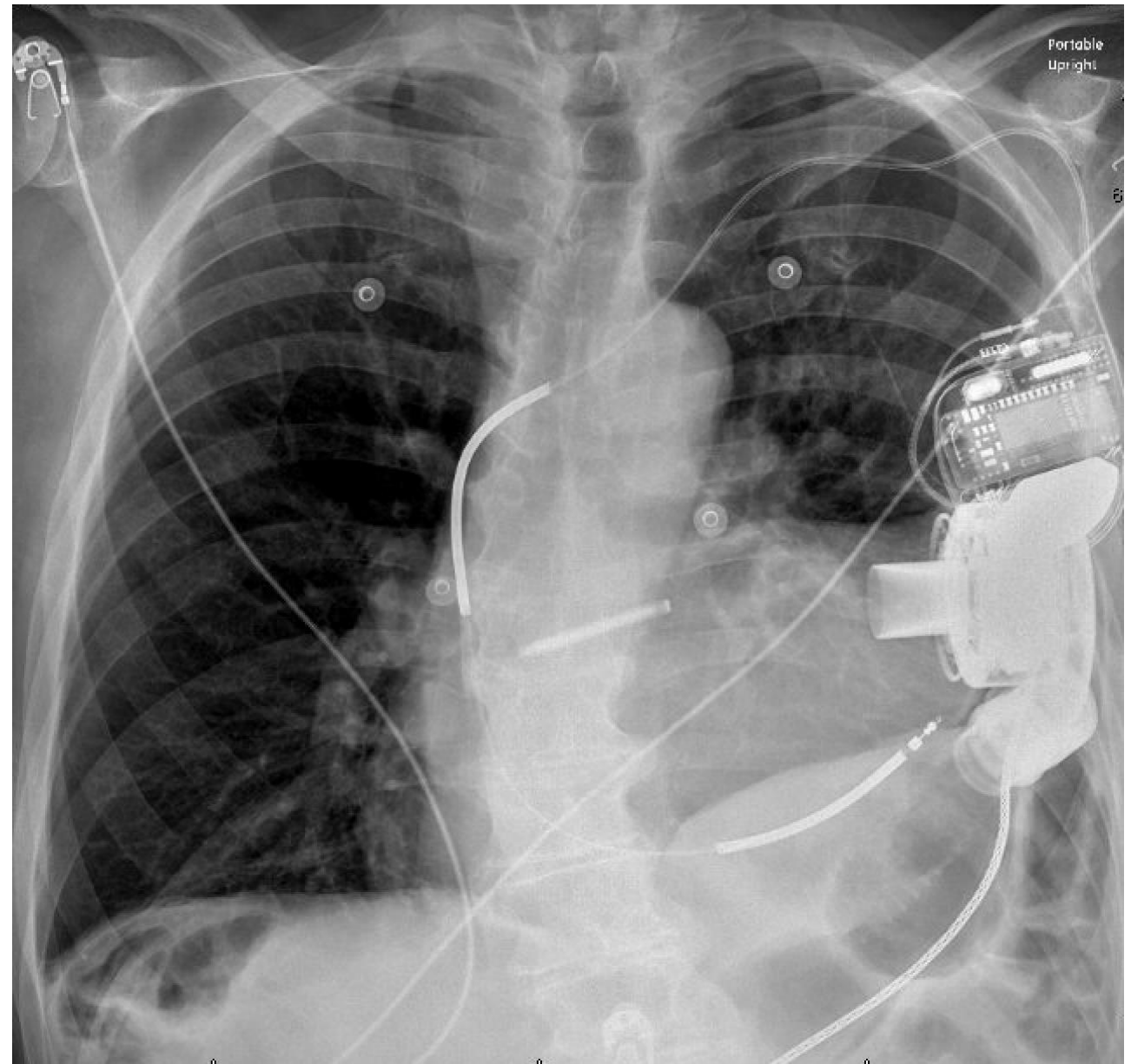


Figure 2: Chest X- ray showing LVAD and ICD

Case Description

Patient Is a 71-year-old male with PMH of viral nonischemic dilated cardiomyopathy status post HeartMate 3 LVAD implantation, single chamber ICD, paroxysmal atrial fibrillation on dofetilide, and mild aortic insufficiency presenting for elective right total hip arthroplasty (anterior approach).

Preoperative management:

- Pre- admission night prior for cardiac clearance, LVAD evaluation, transition from warfarin 7 days ago to lovenox bridge to heparin
- Arterial access was obtained preoperatively with placement of ultrasound-guided (USG) brachial arterial line
- Venous access included two large bore (16g) peripheral intravenous catheters
- Patient received an L4 erector spinae (ESP) block under USG for post operative pain

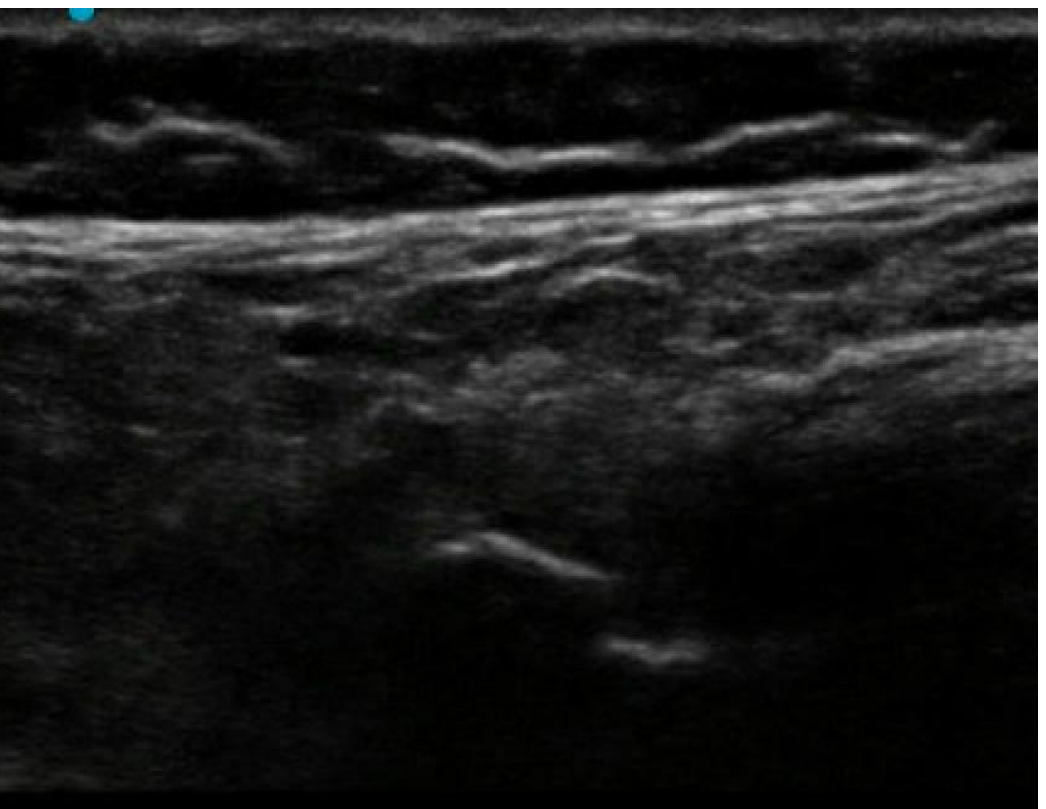


Figure 3: US guided ESP block at L4

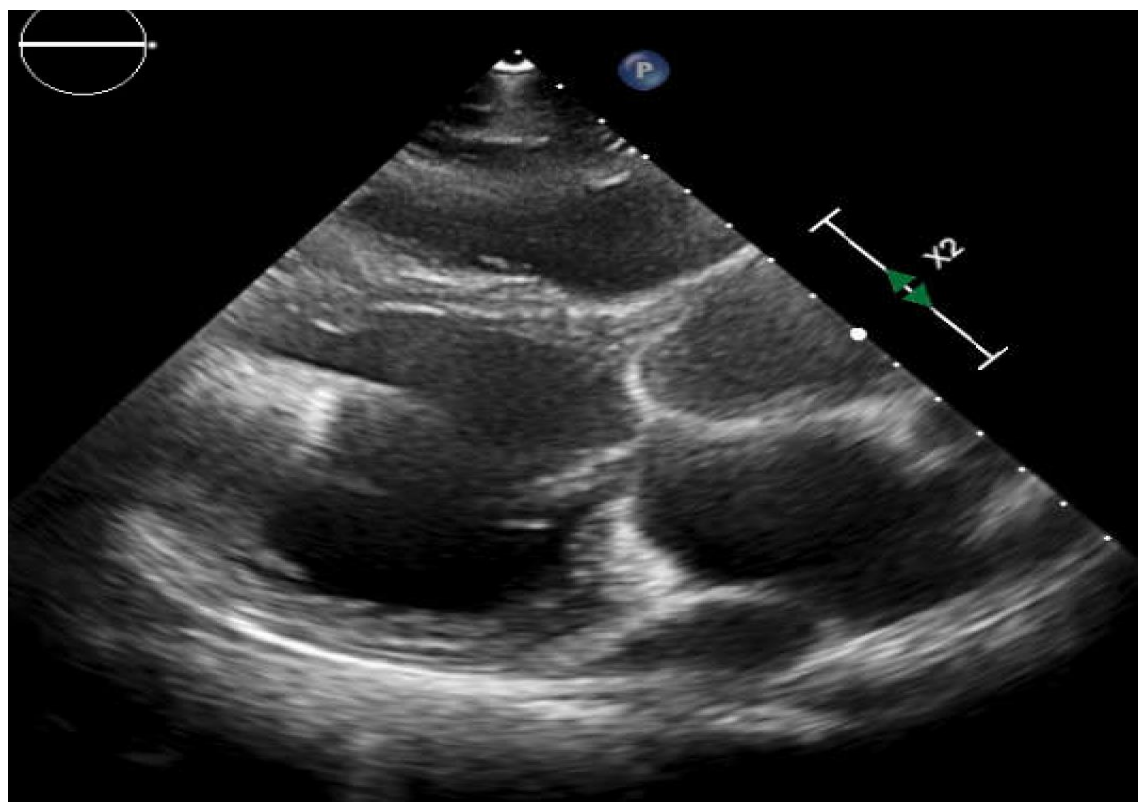


Figure 4: Intra-operative Transthoracic echo of parasternal long axis view showing LVAD inflow cannula.

Intraoperative management:

- Cardiac induction of general anesthesia with pressor support dopamine 2mcg/kg/min, Levophed .05 mcg/kg/min throughout duration of case.
- Consistent monitoring of LVAD throughout induction and the operation by an LVAD specialist
- The patient remained hemodynamically stable throughout the procedure and the operation was uneventful with EBL 200cc. Subsequently extubated and transferred to ICU.

Post-operative management:

- Concerns for post-op bleeding, heparin held, received two units of packed red blood cells (PRBCs) on post-op day 2 after 4 point drop in hemoglobin and intramuscular hematoma formation.
- Responded appropriately, transitioned back to warfarin.

Case Discussion

Total joint arthroplasty (TJA) in patients with left ventricular assist devices (LVADs) present unique challenges for anesthetic management due to the complex interplay between cardiovascular, hematologic, and respiratory systems.

Key considerations include:

- Preoperative assessment to evaluate LVAD function
- Assessment of coagulation status
- Optimization of volume status

Intraoperatively, meticulous attention is paid to:

- Hemodynamic stability
- Avoiding hypovolemia
- Minimizing the risk of bleeding complications

Postoperatively, close monitoring in a specialized unit with expertise in managing LVAD patients is crucial for early detection and management of potential complications.

Collaboration between anesthesiologists, surgeons, cardiologists, and LVAD specialists is essential for successful perioperative care in patients undergoing TJA with an LVAD.

Conclusion

This case demonstrates how the anesthetic management of LVAD patients undergoing elective total hip arthroplasty requires a multidisciplinary approach and meticulous attention to detail.

Strategies aimed at maintaining hemodynamic stability, optimizing coagulation status, and minimizing surgical and anesthetic risks are key to achieving successful perioperative outcomes in this complex patient population.

Sources

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