



Liver Meets Left Ventricle: Anesthetic Considerations to Partial Hepatectomy in Hypertrophic Cardiomyopathy

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Introduction:

Hypertrophic cardiomyopathy presents significant perioperative challenges for anesthesiologists, including left ventricular outflow tract obstruction (LVOTO) and resulting sudden cardiac death. Intraoperative management relies on prevention through avoidance of exacerbating factors of LVOTO: significant tachycardia, hypovolemia, and afterload reduction. Further complicating the matter is the introduction of complex surgical cases that are often in direct conflict with the aforementioned principles. For example, the intraoperative management of a partial hepatectomy, where hypovolemia and permissive hypotension are often necessary to minimize significant intraoperative bleeding.

Case Presentation:

A 79-year-old female with HOCM and metastatic adenocarcinoma of the colon, with secondary malignant neoplasm of the liver, underwent a laparoscopic-assisted partial hepatectomy. Preoperative assessment was significant for 14 mm basal septal hypertrophy and left ventricular outflow tract flow acceleration. The patient was managed with beta blocker and presented as asymptomatic, denying dyspnea on exertion and syncopal episodes. Morphine spinal was administered prior to induction per institution-based ERAS protocol. Standard induction was performed with fentanyl, etomidate, and rocuronium, followed by tracheal intubation. Post-induction arterial and large-bore peripheral venous access were obtained, and a transesophageal echocardiography (TEE) probe was placed.

Intraoperative Findings:

Sixty minutes into surgery, TEE revealed left ventricular outflow tract obstruction coinciding with a significant hypotensive episode managed with phenylephrine, volume boluses, and beta blockade. TEE-guided preload and afterload management were vital to achieve hemodynamic stability. Estimated blood loss totaled 600 mL. The patient was successfully extubated and transitioned to the post-operative phase of care without complications.

Final ECHO Report:

- HOCM with intermittent obstruction
- Left ventricular hypertrophy
- Gradients of 135 mmHg across the LVOT
- Systolic anterior motion (SAM) of the mitral valve is present intermittently
- Mitral valve (MV) Bileaflet thickening with mild underlying MR that increases to moderate with LVOTO

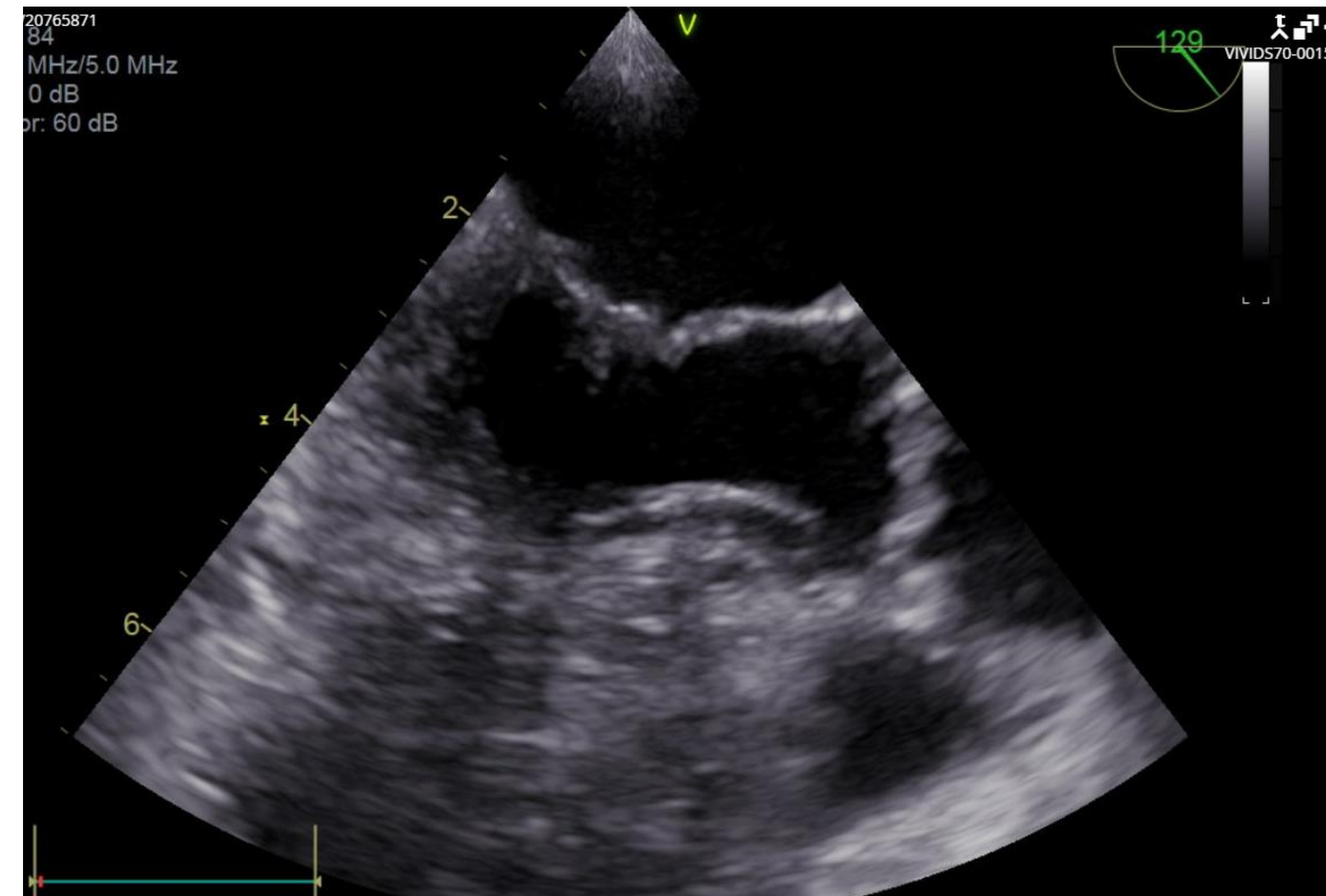


Figure 1: Intraoperative LVOT without obstruction on TEE

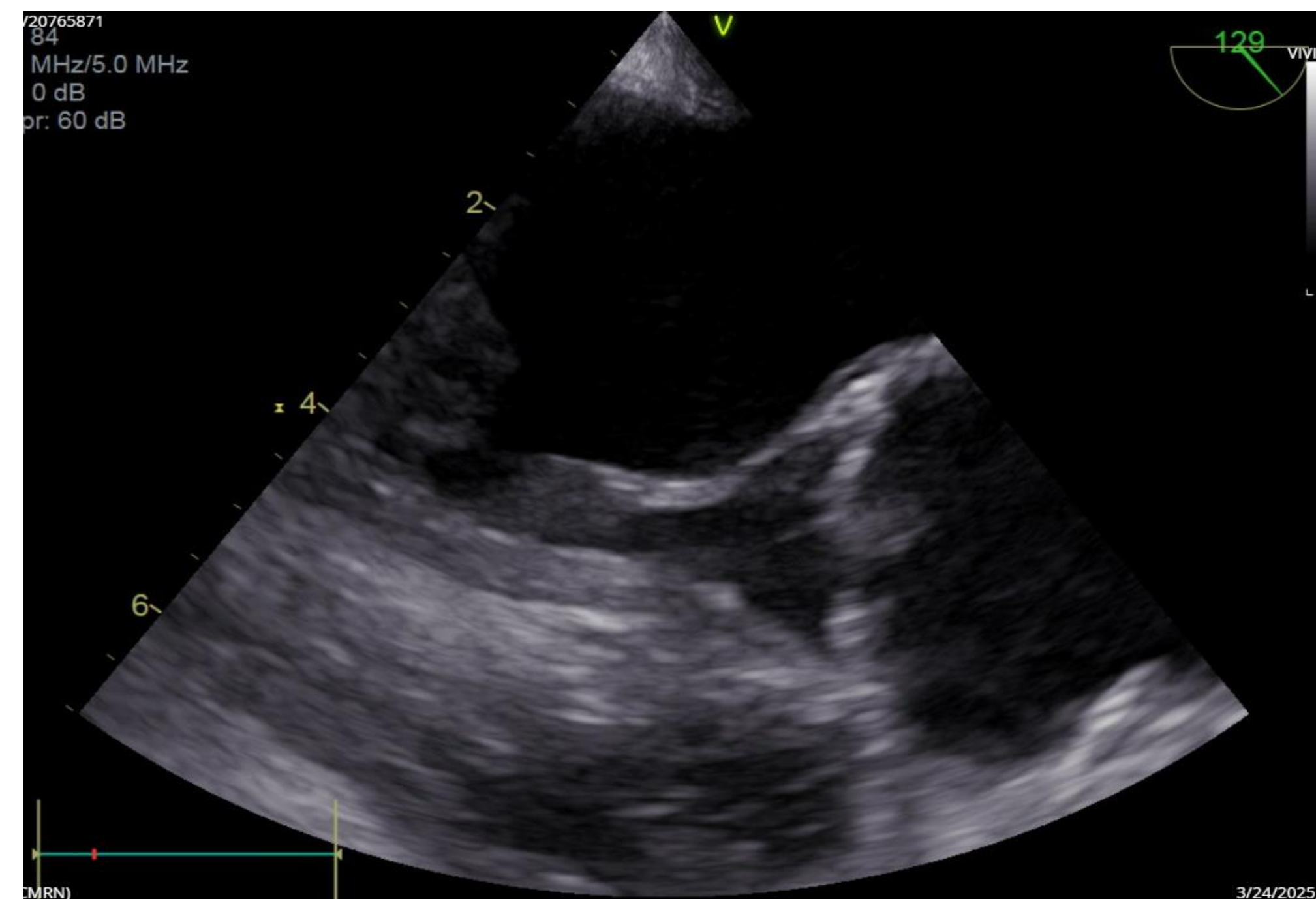


Figure 2: Intraoperative LVOTO demonstrated on TEE

Discussion:

- HOCM is a myocardial pathology characterized by ventricular septal hypertrophy with risk for potential LVOTO exacerbated by: decreases in preload, decreases in afterload, or increases in contractility and heart rate
- Hepatectomy typically requires a low CVP (below 5 cmH2O) achieved via fluid restriction to minimize hemorrhage, directly creating the hypovolemic state that risks precipitating dynamic LVOTO
- TEE placement proved essential for intraoperative assessment, allowing the team to directly observe the LVOT obstruction and use the findings to guide management
- Echocardiography (TTE/TEE) is crucial for determining LV morphology, assessing LVOT gradients, and identifying systolic anterior motion (SAM) of the mitral valve, which often accompanies HOCM. Evaluating the LVOT using Velocity Time Integral (VTI) variation can also assess volume responsiveness
- The immediate management of the hypotensive episode required intervention against the low-volume state (preload reduction) and afterload reduction that occurred during the case
- Volume boluses addressed the preload deficit from hypovolemia and insufflation while Phenylephrine increased systemic vascular resistance and decreased the pressure gradient across the LVOT
- Beta blockade helped prevent tachycardia and decrease contractility, both critical components of HOCM management

Anesthetic goals	Preload	Contractility	Afterload	Heart rate
HOCM	↑	↓	↑	↓

Table 1. Dynamic LVOTO in patients with HCM. Used with permission from Hensley N, et al. *Anesth Analg* 2015;120(3):554-69.¹

Figure 3: HOCM Anesthesia Management Goals

Conclusion:

Managing anesthesia for HOCM patients undergoing hepatectomy is inherently challenging due to the conflicting hemodynamic principles necessary for myocardial stability and reduced surgical blood loss. This case successfully demonstrates that prompt recognition of intraoperative LVOT obstruction using advanced monitoring, specifically TEE guidance, coupled with immediate interventions focusing on maintaining preload and afterload (volume boluses, phenylephrine, beta-blockade), is vital for achieving hemodynamic stability and optimizing patient outcomes.

References:

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3. Vives M, Roscoe A. Hypertrophic cardiomyopathy: implications for anesthesia. *Minerva Anesthesiol*. 2014;80(12):1310-9.

