

## Anesthetic management of an adult patient with hypertrophic obstructive cardiomyopathy and chronic kidney disease for minimally invasive video-assisted thoracoscopic surgery

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### ABSTRACT

It is not an uncommon situation to encounter a patient with anesthesia having multiple co-morbidities. Here, we report the successful anesthetic management of an immunosuppressed 53-year-old female patient with hypertrophic obstructive cardiomyopathy, stage IV chronic kidney disease, and chronic lung infection who was posted for minimally invasive video-assisted thoracoscopy requiring one lung ventilation. Intraoperative hemodynamic stability was maintained with etomidate, fentanyl, cisatracurium, desflurane, and dexmedetomidine with accurate bispectral depth for sedation and precise fluid guidance with transesophageal echocardiography. The entire anesthetic conduct was planned to avoid the left ventricular outflow tract obstruction and maintain a steady-state hemodynamic balance. This case report is a learning experience of how close vigilance with appropriate use of monitoring and knowledge about disease *per se* resulted in an uneventful perioperative period.

**Key words:** Hypertrophic obstructive cardiomyopathy, One lung ventilation, Video-assisted thoracoscopic surgery

A patient with hypertrophic obstructive cardiomyopathy (HOCM) undergoing video-assisted thoracoscopic surgery (VATS) is a very high-risk surgical procedure with very few literature reviews to guide it. The anesthesiologist has to be highly vigilant perioperatively to maintain stable hemodynamics and pulmonary function without worsening the underlying condition. The incidence of morbidity and mortality is high as it can lead to sudden death during any stage of the procedure [1]. The key challenges for an anaesthesiologist are to prevent left ventricular outflow tract (LVOT) obstruction, diastolic dysfunction, myocardial ischemia, arrhythmias, and also to provide accurate lung isolation while maintaining adequate oxygenation [2]. Additional considerations regarding intra and post-operative pain management should be given in the likelihood of proceeding on to thoracotomy.

This case report will give us an idea of why it is important to know the pathophysiology of the patient's co-morbid conditions and how we should plan for anesthesia.


### CASE REPORT

A 53-year-old female, a known case of HOCM, diabetic, hypertensive, and stage IV chronic kidney disease (CKD)

presented to our outpatient department with breathing difficulty for 6 months. She gave a history of recurrent left pleural effusions which was aspirated multiple times. Hence, she was referred to us for further management. She had a Covid infection in June 2019 which was managed conservatively. She had undergone a right renal transplant in March 2010, which got rejected immediately. Hence, the left renal transplant was done again in March 2010 but currently, she is in allograft failure on twice weekly hemodialysis, erythropoietin injections, and steroid immunosuppression. A non-functional AV Fistula present on the left antecubital fossa leading to the left breast lymphedema was noted. She had also undergone venoplasty for the same in April 2021. Her computed tomography chest showed a large loculated left pleural effusion, near total atelectasis of the lingula and left lower lobe. Hence, she was posted for left lung decortication with pleurodesis.

On examination, she had stable hemodynamics with a pulse rate of 88/min and a BP of 170/70 mm Hg, diminished left side air entry from mid to basal areas of the lung. Laboratory investigations were normal except for serum creatinine 5.59 mg/dl and potassium 5.39 meq/L.

An electrocardiogram (ECG) showed the left ventricular hypertrophy with normal sinus rhythm. Two-dimensional echo findings as follows: Hypertrophied left ventricle, asymmetrical septal hypertrophy, presence of systolic anterior motion of mitral leaflet; Septal: Posterior wall ratio >1.5; with mild pulmonary

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arterial hypertension; EF 68%; and dilated left atrium measuring 68 mm × 47 mm with no clot formation. Informed high-risk consent was obtained in view of underlying heart disease and the complexity of the procedure.

For systemic hypertension, she was on Amlodipine, Metoprolol, and Prazosin. We continued all cardiac medications till the day of surgery and hemodialysis was done on the day of surgery. In the operation theatre, all standard monitoring like 5 lead ECG with ST segment analysis, pulse oximetry, and temperature probe was instituted along with an arterial line for invasive BP, Bispectral index, transesophageal echo monitoring, and 16G peripheral line. After adequate preoxygenation, general anesthesia was induced with Etomidate 0.4 mg/kg body weight, Fentanyl 5 mcg/kg, and Succinylcholine 100 mg. Intubation was done with 37 F left-sided double lumen endotracheal intubation; the position was confirmed with fiberoptic bronchoscopy. Anesthesia was maintained with 50% nitrous oxide in oxygen; desflurane 3%; dexmedetomidine infusion at 0.3 mcg/kg/h; and cisatracurium infusion at 2 mcg/kg/min along with intermittent positive pressure ventilation. After placing the patient in the right lateral position, the position of the DLT was re-confirmed with fiber optic bronchoscopy. Adequate precautions were taken to avoid position-related injuries.

All the hemodynamic parameters were monitored continuously. The procedure lasted for 1½ h, during which 1.0 L balanced salt solution (BSS) was given. Intraoperative transesophageal echo (TEE) was used continuously to monitor cardiac function and volume status. Cisatracurium and dexmedetomidine infusion was stopped 20 min before surgery. At the end of the surgery, the neuromuscular block was reversed with standard doses of neostigmine and glycopyrrolate and the trachea was extubated. Hemodynamics during the whole intraoperative period was uneventful. The patient was observed overnight in the post anesthetic care unit and discharged on the third postoperative day without any complications. Analgesia was maintained with IV Paracetamol 1gm Q6H and IV Tramadol (SOS).

## DISCUSSION

Hypertrophic cardiomyopathy with or without LVOT obstruction posted for any kind of surgery is a nightmare for any anesthesiologist. One should be prepared to avoid dynamic obstruction to left ventricular outflow, diastolic dysfunction, impaired coronary vasodilator reserve, myocardial ischemia, and supraventricular or ventricular tachyarrhythmias [3]. Knowledge about drugs to avoid or to be used in moderation in the perioperative period is also important. The goals of anesthetic management are to avoid tachycardia, hypotension, sympathetic stimulation, increased myocardial contractility, and a decrease in preload and afterload [4].

VATS surgeries in these patients can further amplify anesthetic concerns. VATS is known to cause less postoperative pain, early mobilization, lower overall morbidity, a shortened hospital stay with reduced cost, and a cosmetic incision [5]. However, it also adds to the challenge intraoperatively by inducing hemodynamic

and physiological changes while providing adequate lung isolation. One lung ventilation (OLV) physiology is connected intimately to its effects on ventilation and perfusion matching [6]. It leads to atelectasis of non-ventilated lung, hypoxemia, activation of hypoxic pulmonary vasoconstriction, and decreased blood flow to the non-dependent lung [7]. Furthermore, the increased pulmonary vascular resistance induced by hypoxic pulmonary vasoconstriction, increased ventilation pressures, hypoxemia, or hypercarbia can cause hemodynamic changes, which can potentially lead to circulatory instability [8]. This delicate interplay between cardiac and pulmonary status along with renal impairment was complex and required accurate monitoring, precise fluid and drug dosing along with heightened vigilance for complications.

Our management was tailored according to the current status of the patient. Minimal preloading with BSS before induction because insufficient diastolic filling pressure is said to contribute to LVOT obstruction [9]. Of course, the fluid balance was a challenge because HOCM needs adequate preload and afterload versus CKD which needs fluid restriction. Induction was done with an ultra-short acting hypnotic, cardio-stable agent like Etomidate to prevent hypotension, afterload reduction, and less histamine release. Wahab *et al.* [10] have proved in their study that etomidate provides more stable hemodynamic parameters (Systolic BP, diastolic BP, and mean arterial pressure) when used for induction of anesthesia, whereas, propofol produced a significant fall in blood pressure after induction. Blessberger *et al.* [11] in their study, mention that beta-blockers may be beneficial for people who are undergoing cardiac surgery because they may reduce the number of people who experience atrial fibrillation and ventricular arrhythmias. Bradycardia-inducing drugs such as fentanyl and dexmedetomidine were used to maintain adequate surgical depth of anesthesia with a Bispectral index of 40–60, mainly to avoid sympathetic stimulation. Adequate intraoperative volume status was maintained using TEE as guidance. Desflurane was used as a volatile agent due to its minimal effects on heart rate and systemic vascular resistance. Desflurane due to its hemodynamic stability minimal cardiovascular depression and low solubility (lower partition coefficient) may offer better outcomes in a variety of cardiac surgeries as reviewed by Mandke *et al.* [12]. Cisatracurium infusion was the muscle relaxant of choice as it is cardio-stable with less histamine release [13]. It was used as an infusion to maintain steady-state plasma levels. Successful OLV with double-lumen tube along with ventilator strategies of Tidal volume 6–8 mL/kg. In our patient, a respiratory rate of 20/min; FiO<sub>2</sub> to maintain adequate oxygenation with a minimal PEEP of 5 cmH<sub>2</sub>O to avoid hemodynamic compromise was maintained. Intraoperative serial arterial blood gas monitoring was done for measuring oxygenation, lactates, acidosis, and electrolyte levels. Optimal analgesia with intraoperative intercostal nerve block helped to prevent tachycardia.

## CONCLUSION

Patients with multiple co-morbidities such as HOCM, CKD, and immunocompromised are posted for OLV procedures like VATS

pose risk for sudden death. Managing such a patient requires knowledge about the underlying pathology and skillset to manage an emergent situation. Appropriate perioperative planning, vigilant watch on hemodynamics, and use of necessary monitors, especially TEE in the intraoperative period can reduce deleterious events and ensure a successful perioperative outcome.

## REFERENCES

1. Kankal PA, Tandale SR, Naik SV, Khade SM. Anesthesia concerns in patients with hypertrophic obstructive cardiomyopathy posted for orthopedic surgery. *Med J DY Patil Vidyapeeth* 2021;14:452-4.
2. Nama RK, Parikh GP, Patel HR. Anesthetic management of a patient with hypertrophic cardiomyopathy with atrial flutter posted for percutaneous nephrolithotomy. *Anesth Essays Res* 2015;9:284-6.
3. Sahoo RK, Dash SK, Raut PS, Badole UR, Upasani CB. Perioperative anesthetic management of patients with hypertrophic cardiomyopathy for noncardiac surgery: A case series. *Ann Card Anaesth* 2010;13:253-6.
4. Haering JM, Comunale ME, Parker RA, Lowenstein E, Douglas PS, Krumholz HM, *et al.* Cardiac risk of noncardiac surgery in patients with asymmetric septal hypertrophy. *Anesthesiology* 1996;85:254-9.
5. Sedrakyan A, van der Meulen J, Lewsey J, Treasure T. Video assisted thoracic surgery for treatment of pneumothorax and lung resections: Systematic review of randomised clinical trials. *BMJ* 2004;329:1008.
6. Lohser J. Evidence-based management of one-lung ventilation. *Anesthesiol Clin* 2008;26:241-72.
7. Ferreira HC, Zin WA, Rocco PR. Physiopathology and clinical management of one-lung ventilation. *J Bras Pneumol* 2004;30:566-73.
8. Trepte C, Haas C, Meyer N, Gebhardt M, Goepfert MS, Goetz AE, *et al.* Effects of one-lung ventilation on thermodilution-derived assessment of cardiac output. *Br J Anesth* 2012;108:922-8.
9. Fifer MA, Vlahakes GJ. Management of symptoms in hypertrophic cardiomyopathy. *Circulation* 2008;117:429-39.
10. Wahab Z, Heisnam I, Nushrat M. A comparative study of the effect of etomidate and propofol induction on haemodynamic response and serum cortisol levels in patients undergoing laparoscopic cholecystectomy. *J Evid Based Med Healthc* 2020;7:186-90.
11. Blessberger H, Lewis SR, Pritchard MW, Fawcett LJ, Domanovits H, Schlager O, *et al.* Perioperative beta-blockers for preventing surgery-related mortality and morbidity in adults undergoing cardiac surgery. *Cochrane Database Syst Rev* 2019;9:CD013435.
12. Mandke A, Sarkar M, Deshpande C, Maheshwari A, Kumar B, Bhavani M, *et al.* Newer volatile anesthetic agents in cardiac anesthesia: Review of literature. *J Card Crit Care* 2021;5:54-9.
13. Shaikh SA, Jadhav AV, Patil AR, Sahasrabudhe AD. Efficacy of different doses of cisatracurium for intubation for surgeries under general anesthesia-A randomised clinical study. *J Clin Diagn Res* 2022;16:UC01-4.

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