# Anesthetic nuances in a hypertrophic cardiomyopathy patient for laparoscopic abdominoperineal resection

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## ABSTRACT

Hypertrophic cardiomyopathy is a complex cardiac disease with unique pathophysiologic characteristics and a great diversity of morphologic, functional, and clinical features. It is characterized by a massive asymmetrical hypertrophy of the myocardium. Clinical features range from an absence of symptoms to sudden death. We report a rare case of a 57-year-old male presenting with a history of constipation for 3 months, weight loss and fatigue for 3 months, and blood in stools for 1 month. He was diagnosed with a carcinoma rectum. He was planned for abdominoperineal resection by laparoscopic approach. Aim of this case report is to discuss the challenging technical nuances of anesthetic management of a patient with hypertrophic cardiomyopathy posted for laparoscopic surgery.

**Keywords:** *General anesthesia, Hypertrophic cardiomyopathy, Laparoscopic abdominoperineal resection.*

Hypertrophic cardiomyopathy (HCM) is a complex cardiac disease with unique pathophysiologic characteristics. This relatively common heart disease has a great diversity of morphologic, functional and clinical features. It has an incidence of 1 in 500 [1]. It is an autosomal dominant condition and is the most common genetic cardiac disease [1]. It is characterized most commonly by the left ventricular hypertrophy with heart failure and sudden cardiac death. Physiologically, the systolic murmur of HCM is characteristically aggravated my decreasing the venous return to heart, which is usually done by asking the patient to stand up from the supine position or do the Valsalva maneuver [2]. Around 20% of HCM patients develop atrial fibrillation (AF), which exacerbates other accompanying clinical symptoms and carries a risk of embolic stroke [2].

These patients can experience anginal chest pain due to ischemia from a (blood) supply and demand (excess myocardium) mismatch [3]. HCM poses unique challenges for conducting an anesthetic intervention. In this report, we highlight the preoperative assessment, intraoperative and postoperative management of anesthesia in HCM patients providing and reviewing many learning points regarding its management.

## CASE REPORT

A 57-year-old male patient presented with the diagnosis of carcinoma rectum posted for laparoscopic abdominoperineal resection. On preoperative evaluation day before surgery, the patient had no significant history except a history of hemorrhoidectomy 23 years back under spinal anesthesia, which was uneventful. He had undergone 27 cycles of radiotherapy for carcinoma and the last cycle was one year back. He had no other co-morbidity. On examination, pulse rate was 77/min and blood pressure was 112/70 mmHg. The respiratory rate was 16/min. Clinically, the airway and all other systemic examinations were normal.

Routine blood investigations and chest X-ray were grossly within normal limits (Fig. 1). Electrocardiogram (ECG) showed ST depression with significant T wave inversion in anterolateral chest leads (Fig. 2). Two-dimensional echocardiography showed asymmetrical septal hypertrophy, features suggestive of HCM (non-obstructive), grade 2 left ventricle diastolic dysfunction, mild mitral regurgitation (MR) and normal left ventricle ejection fraction (LVEF 60%). Due to HCM, invasive monitoring was

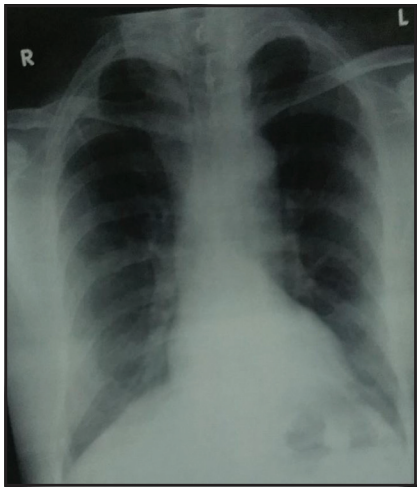


**Figure 1: Chest X-ray of the patient at the end of inspiration.**

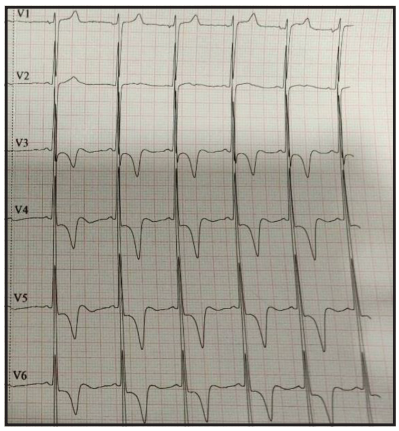


**Figure 2: Electrocardiogram (ECG) showing ST depression with significant T wave inversion in anterolateral chest leads.**

planned during surgery. The patient was kept nil per oral for eight hours before surgery. Tablet alprazolam 0.25mg was given at night and 6am on the day of surgery with a sip of water. Written, informed, and explained consent was obtained from the patient and his family.

On the day of surgery, the patient was shifted to the operation theatre. Monitors attached and vitals were recorded. Peripheral venous access was secured by using an 18G intravenous (I/V) cannula on the left forearm. Under all aseptic conditions, the epidural catheter was inserted at L1- L2 space and fixed at 10cm from the skin. The patient was sedated with injection midazolam (0.05mg/kg) and injection morphine (0.1 mg/kg). An arterial catheter was placed in the right radial artery under local anesthesia. The right-sided internal jugular vein was cannulated, and the central venous pressure (CVP) monitor was attached.

After premedication with injection glycopyrrolate (0.005mg/kg) and injection ondansetron (0.1 mg/kg), preoxygenation with 100% oxygen was done for 3 minutes. Induction was done with injection propofol (1mg/kg) given slowly in incremental doses and injection vecuronium (0.08 mg/kg). Injection esmolol (0.5 mg/kg) was administered to attenuate the laryngoscopic response. The patient was intubated with an 8mm ID endotracheal tube. Anesthesia was maintained using 50% nitrous oxide in oxygen, isoflurane (0.8-1%) and injection vecuronium boluses. The ventilator was adjusted to achieve Spo2>95% and end-tidal CO2 of 33-36 mmHg through tidal volumes of 6ml/kg, frequency of 10-14/min and I:E ratio 1:2. The patient was placed in the lithotomy position. Carbon dioxide insufflation was done slowly at the start of the surgery for creation of pneumoperitoneum to allow visualization of intraabdominal organs. The intraabdominal pressure was kept below 15 mmHg.Epidural top-up administered 1 hour after the start of surgery, and after every 1 hour, 6 ml of 0.25% ropivacaine administered.

The procedure lasted for 6.5 hours during which the patient remained hemodynamically stable except there were two episodes of hypotension which responded to 200ml bolus of normal saline and 100 microgram phenylephrine. CVP guided fluid was administered and CVP was kept between 12-13 cm H2O. Urine output was measured at regular intervals throughout the surgery. Intraoperative ECG showed ST depression and inverted T waves, but sinus rhythm was maintained throughout. At the end of the surgery, neuromuscular blockade was reversed with injection glycopyrrolate (0.008mg/kg), and injection neostigmine (0.05mg/kg) and the patient was extubated.

The patient was shifted and monitored in the Intensive Care Unit (ICU) during the postoperative period. Regular monitoring of heart rate, blood pressure, urine output, CVP, and temperature were done. Epidural analgesia was continued in the postoperative period for 48 hrs. All other factors like pain, shivering, anxiety, hypoxia, and hypercarbia, which can stimulate sympathetic activity were monitored and taken care accordingly. The patient did well after the surgery. On the last follow-up at 6 months, he was doing fine.

## DISCUSSION

Hypertrophic cardiomyopathy is the most common genetic cardiovascular disease caused by a multitude of mutations in genes encoding proteins of the cardiac sarcomere [4]. This case highlights many important physiological aspects with which an anesthesiologist must be versed so as to manage this condition effectively. As described earlier, decreasing the preload not only increases the murmur of HCM, but it also increases the sub-aortic stenosis leading to decreased stroke volume. So, an adequate CVP guided fluid is required to ensure adequate stroke volume and hence cardiac output in this condition [5].

Anesthetic implications of management of a case of HCM for non-cardiac surgery, therefore, include intensive cardiovascular monitoring and management of perioperative complications [6]. This can be achieved by maintaining adequate preload and afterload; avoiding vasodilators and agents that increase contractility [7]. Preloading before induction helps maintain stroke volume and minimizes adverse events of positive pressure ventilation. Premedication with midazolam helps in alleviating anxiety thus avoiding unnecessary sympathetic stimulation. In our patient, smooth induction with injection propofol and prior esmolol administration to blunt sympathetic response during intubation was done. Propofol is generally avoided in cardiac induction due to its cardio-depressant effect; however in HCM, we need mild cardiac depression, so propofol was used [6]. Preload reduction and severe hypotension may be encountered during the creation of pneumoperitoneum for laparoscopic surgery. Therefore, in our case, the surgeon was advised to insufflate the abdomen slowly and at a pressure not exceeding 15mmHg [8].

We maintained CVP at 12-13cm of $H_2O$, thus maintaining adequate preload to maintain optimal cardiac output. We inserted an epidural catheter for intraoperative analgesia and post-operative pain relief. Sahoo RK et al. [9], Ahmed A et al.[10] did similar studies but in contrast to their studies, our study was unique in that ours is the first study reporting the successful use of anesthesia along with laparoscopic technique in HCM patients.

## CONCLUSION

Management of hypertrophic cardiomyopathy includes a thorough understanding of the pathophysiology of the condition and maintaining specific hemodynamic goals to prevent perioperative complications associated with it.

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