

# Anesthesia Concerns in Patients with Hypertrophic Obstructive Cardiomyopathy Posted for Orthopedic Surgery

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### ABSTRACT

Hypertrophic cardiomyopathy (HCM) is the most common genetic cardiovascular disorder, characterized by asymmetric hypertrophy of the interventricular septum that leads to intermittent obstruction of the left ventricular outflow tract (LVOT). Clinical presentation ranges from the absence of symptoms to sudden death at any age. Anesthesia and surgical stress can lead to exacerbation of the LVOT obstruction and may complicate the perioperative course. We hereby describe the perioperative management of two patients with HCM posted for orthopedic surgery.

**KEYWORDS:** Hypertrophic obstructive cardiomyopathy, left ventricular outflow tract obstruction, orthopedic surgery

## INTRODUCTION

Hypertrophic obstructive cardiomyopathy (HOCM) is a rare genetic disorder of the heart inherited as an autosomal dominant trait. It is characterized by asymmetric hypertrophy of interventricular septum causing intermittent obstruction of the left ventricular outflow tract (LVOT).<sup>[1]</sup> Sudden cardiac death can occur due to acute LVOT obstruction or fatal arrhythmia.<sup>[2]</sup> We report successful conduct of anesthesia in a patient with HOCM undergoing orthopedic procedure.

## CASE REPORTS

### Case 1

A 57-year-old male, weighing 72 kg, a diagnosed case of proximal tibia fracture due to road traffic accident, was planned for intramedullary nailing under epidural anesthesia. The patient is a known case of HOCM diagnosed 6 years ago in view of dyspnea and taking regular oral aspirin 150 mg and metoprolol 25 mg once daily for the same. General examination revealed a pulse rate of 68 bpm and blood pressure of 142/86 mmHg. Electrocardiogram (ECG) showed features of left ventricular hypertrophy (LVH). Two dimensional (2D) echo showed concentric LVH, asymmetric interventricular septal hypertrophy with gradient across the LVOT is 55 mmHg, diastolic dysfunction Grade II and left ventricular (LV) ejection fraction 60%. All

cardiac medications were continued till the day of surgery. Informed high-risk consent was obtained in view of heart disease. Standard anesthesia monitoring was done with ECG with ST-segment analysis, noninvasive blood pressure, pulse oximetry, temperature, and urine output. Preloading with 500 ml of Ringer's lactate was done. Epidural anesthesia was chosen due to less hemodynamic perturbations and to extend analgesia in postoperative period. Epidural catheter was inserted at L3–L4 level with loss of resistance technique and kept 4 cm inside the space. Epidural test dose of 3 cc 2% lignocaine with 15 mcg of adrenaline was given to rule out intrathecal or intravascular placement. Intravenous (IV) midazolam up to 2 mg was given for anxiolysis. Intermittent boluses of 0.5% bupivacaine up to 15 cc were given during the procedure for surgical anesthesia guided by sensory blockade. Intraoperatively, the patient developed a single episode of hypotension which responded to IV phenylephrine 100 mcg and narrow complex tachycardia with a ventricular rate of 170–180/min, suggestive of atrial fibrillation (AF) with normal blood pressure reading. It reverted back to sinus rhythm following IV diltiazem 25 mg administration. Rest of the intraoperative

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period was uneventful. The procedure lasted for 90 min with blood loss of 150 ml which was replaced with colloid. The patient was monitored in critical care unit, and analgesic doses of local anesthetic and opioid were continued postoperatively.

### Case 2

A 69-year-old female, weighing 78 kg, a diagnosed case of proximal humerus fracture, was planned for internal fixation under interscalene and supraclavicular peripheral nerve block. The patient was a known case of HOCM and hypertension diagnosed 3 years ago in view of dyspnea, fatigability, and syncopal attack and taking regular oral amlodipine 10 mg and enalapril 5 mg once daily. General examination revealed a pulse rate 76/min and blood pressure of 130/78 mmHg. ECG showed left axis deviation. 2 D echo revealed systolic anterior motion of mitral valve, mitral regurgitation, sclerotic aortic valve, HOCM with gradient across the LVOT is 70 mmHg, diastolic dysfunction Grade I and LV ejection fraction 70%. All cardiac medications were continued. All cardiac medications were continued till the day of surgery. Informed high-risk consent was obtained in view of heart disease. Standard anesthesia monitoring was done with ECG with ST-segment analysis, noninvasive blood pressure, pulse oximetry, temperature, and urine output. Preloading was done with 500 ml of Ringer's lactate. Peripheral nerve blocks were chosen as a sole surgical anesthesia procedure due to less hemodynamic perturbations. Right-sided interscalene and supraclavicular nerve blocks were given with 20 ml and 30 ml of 0.25% of bupivacaine mixed with 40 mcg of clonidine, respectively. Soon after the completion of block, the patient developed labored breathing with tachypnea and desaturation. Air entry was equal and clear on both sides on auscultation. The patient's airway was secured with cuffed endotracheal tube size 7 after IV fentanyl 100 mcg and thiopentone 250 mg. Anesthesia was maintained with oxygen and nitrous oxide along with sevoflurane through closed circle absorber. Hemodynamic stability was maintained intraoperatively except for one episode of hypotension which responded to 100 mcg of phenylephrine. The procedure lasted for 120 min with 300 ml blood loss, adequately replaced with colloid. The patient was extubated after the procedure and was kept in intensive care unit with high concentration FiO<sub>2</sub> mask with reservoir bag. Postoperative chest X-ray was within normal limits, and arterial blood gas was unremarkable except mild hypoxia (PaO<sub>2</sub> – 256). Breathing was normal on postoperative day 1. Both the patients were discharged on postoperative day 10 without any complication.

### DISCUSSION

The presence of LVOT obstruction is an independent risk factor for adverse outcome of HOCM.<sup>[3]</sup> The severity of LVOT is dependent on alterations in LV preload and afterload, LV cavity size, and heart rate. Stress echocardiography is an important diagnostic tool in HOCM patients without outflow gradient at rest as it helps in establishing the risk of exercise-induced obstruction necessitating change in treatment protocol, and it also predicts the risk of progressive heart failure. It was not advised in our patients in view of orthopedic trauma and the presence of LV gradient at rest.<sup>[4]</sup> High ejection fraction is generally due to concentric nature of hypertrophy, noticed in both the patients.

Sympathetic stimulation due to various noxious stimuli is bound to occur during anesthesia and surgery frequently which may worsen the dynamic outflow tract obstruction. Hence, anesthesia management should be focused at maintenance of the abovementioned parameters and treatment of specific complications such as arrhythmia, hypotension, and cardiac failure. Fluid bolus before anesthesia helps to maintain the stroke volume and minimize the adverse effect of positive pressure ventilation on preload.<sup>[5]</sup> Regional anesthesia is preferred over general anesthesia in view of excellent analgesia and anesthesia, minimum hemodynamic fluctuations, and prolonged postoperative analgesia.<sup>[6]</sup> Premedication with benzodiazepine prevents the sympathetic stimulation due to anxiety. Sevoflurane was a preferred inhalational agent in view of its cardiostability. Selective alpha-1 agonist, like phenylephrine, is preferred for intraoperative hypotension as it increases systemic vascular resistance without affecting myocardial contractility or heart rate.<sup>[7]</sup> Our first patient developed AF intraoperatively, managed effectively with diltiazem, and the second patient developed dyspnea probably due to phrenic nerve involvement which improved completely on postoperative day 1.

These patients are also prone to diastolic dysfunction, subendocardial ischemia, ventricular tachycardia, and fibrillation perioperatively.<sup>[8]</sup> AF is the most common arrhythmia and is associated with increased risk of thromboembolism and sudden death due to decreasing diastolic filling and cardiac output.<sup>[9]</sup> Preoperative beta blockers helps by decreasing the heart rate which results in prolongation of diastole and increased passive ventricular filling, thus it reduces the myocardial oxygen requirement.<sup>[10]</sup>

### CONCLUSION

Through understanding of Pathophysiology of hypertrophic cardiomyopathy, avoiding factors causing

an increase in LVOT obstruction perioperatively, vigilant intraoperative monitoring and judicious intravascular therapy results in successful perioperative outcome.

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### Conflicts of interest

There are no conflicts of interest.

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