



## Graded Epidural Anaesthesia as a Sole Anaesthetic Technique for Lower Limb Surgeries in Patients with Low Ejection Fraction: A Case Series

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### Abstract

*In patients with a history of ischemic heart disease with low ejection fraction, it's always a challenge for the Anaesthesiologist to make a decision on whether to administer General Anaesthesia (GA), central neuraxial blockade, or both. When the Left ventricular ejection fraction (LVEF) percentage reduces to less than 35%, it indicates the presence of severe systolic dysfunction. Both general anaesthesia and regional anaesthesia carry potential risks due to these patients' low cardiac output status. Hemodynamic fluctuations associated with anaesthesia can be detrimental in these patients. A clear intraoperative plan should be designed to manage the hemodynamics of these patients. Here we report two cases of ischemic heart disease with low ejection fraction posted for orthopedic surgeries. Graded epidural anaesthesia was used as a sole anaesthetic technique. The patients were hemodynamically stable in the intraoperative as well as postoperative period.*

**Keywords:** Ischemic heart disease, Low Left Ventricular Ejection Fraction, Graded Epidural Anaesthesia, Cemented modular hemiarthroplasty, PFNA<sub>2</sub>.

### Introduction

Ischemic heart disease (IHD) is a leading cause of morbidity and mortality in the world. It is also one

of the leading causes of perioperative complications in cardiac patients.<sup>[1]</sup> It involves narrowing coronary vessels due to atherosclerosis,

in which patients may end up with heart failure.<sup>[2]</sup> In these patients, with low cardiac output status (Ejection Fraction <40%), maintaining the hemodynamics is a unique challenge to the anaesthesiologist. General anaesthesia (GA) can alter the hemodynamics either due to the effect of induction agents or due to the stress response during direct laryngoscopy and tracheal intubation. Neuraxial anaesthesia causes sympathetic blockade which can decrease cardiac preload resulting in hypotension.<sup>[2]</sup> Modified neuraxial anaesthetic techniques are reasonable options (low-dose combined spinal epidural or graded epidural anaesthesia) for these kinds of patients. Here we report two cases of geriatric patients with IHD with ejection fraction (EF) less than 40% posted for orthopedic surgeries under graded epidural anaesthesia uneventfully.

### Case Report -1

An 81-year-old female reported at Orthopaedic casualty with a history of fall and complains of pain over her right hip. She was unable to stand upright due to pain. She had a history of Hypertension and Type 2 Diabetes Mellitus for 20 years and was on regular medications. She underwent Coronary Artery Bypass Grafting 13 years back and 3 years back she had to undergo Percutaneous Transluminal Coronary Angioplasty for Acute Coronary Syndrome. She has been on dual antiplatelet drugs since then.

On examination, she was moderately built and nourished (body weight = 50 kg, Height = 145 cm). She had no pallor, icterus, cyanosis, clubbing, or lymphadenopathy. Her pulse rate was 70/ min, regular rhythm. Blood pressure was 150/90 mm Hg in the left upper limb, sitting posture. All systemic examinations were within normal limits. All blood investigations were within normal limits. X-ray of the right hip joint showed a Type 2 Garden neck of Femur fracture. She was posted for cemented modular hemiarthroplasty right femur.

On cardiology consultation, a 2D echocardiogram (ECHO) was taken and showed: EF 38%, Sclerosed aortic valve, Regional Wall Motion Abnormality (RWMA), Hypokinetic inferoposterior wall, moderate left ventricular systolic dysfunction, Moderate Pulmonary Artery Hypertension (PAH).

The patient was posted for surgery under high risk after stopping antiplatelet drugs for 5 days. The patient and bystanders were counselled and after their consent, planned to proceed with the surgery. Oral premedication with pantoprazole 40mg and alprazolam 0.25mg were given and adequate fasting guidelines were followed. The procedure was explained to the patient in detail, ensuring her full cooperation. IV access was taken with a 20G cannula in the right upper limb and also right external jugular vein was cannulated.

In the operating room, monitors were attached, including pulse oximetry, 5 lead Electrocardiogram (ECG), and Non Invasive Blood Pressure (NIBP). After local infiltration, the right radial artery was cannulated with a 20G arterial cannula. Arterial blood pressure was transduced to obtain a beat-to-beat variation in blood pressure. The patient was sedated with intravenous midazolam 1mg and intravenous fentanyl in an incremental dose up to 1 mcg/kg. The patient was positioned in the right lateral decubitus position and the left leg was slightly flexed. After strict aseptic precautions, an epidural catheter was placed in the L2-L3 space with a catheter length of 4cm in the epidural space. Correct placement of the epidural catheter was confirmed by a negative test dose of 3ml Lignocaine 2% with 15mcg of epinephrine.

After the test dose and the patient's hemodynamics were stable, the regimen of Bupivacaine 0.5% by volume 3 ml was given; after that, we waited for 10 minutes, and the hemodynamics of the patient remained stable. Therefore, we added lignocaine 2% 4 ml and waited for another 10 minutes. Noradrenaline infusion was kept ready to manage any

hypotension intraoperatively. After confirming the block height, surgery was started. The operation lasted for 90 minutes. The fluid replacement was done with IV crystalloids. The estimated blood loss was around 200 ml. There were no hemodynamic fluctuations or complications that occurred during and after surgery. After the surgery, epidural infusion was given with bupivacaine 0.125% with 1mcg/ml fentanyl at a rate of 5- 6 ml/hr for postoperative pain management. Patient hemodynamics remained stable throughout the postoperative period and she was discharged after 7 days of treatment in good condition.

### Case Report-2

Similarly, an 80-year-old male who is a known case of hypertension for 25 years, chronic obstructive pulmonary disease for 20 years, and coronary artery disease for 4 years, reported to the orthopaedic casualty with a history of fall at home and was diagnosed to have Intertrochanteric fracture of the left femur.

His general examination, vitals, and routine investigations were within normal limits. His preoperative ECG shows ST depression in lead V5 and V6 and ECHO showed left ventricular systolic dysfunction with an EF of 34% and features of ischemic dilated cardiomyopathy with multiple RWMA.

After preoperative optimization, he was taken up for Proximal Femoral Nail Antirotation 2 (PFN-A2) under high risk. He was managed in a similar fashion to the graded epidural technique described in the first case and was hemodynamically stable throughout the procedure. The operation lasted for 50 minutes and the estimated blood loss was around 150 ml. After the surgery, epidural infusion was given using 0.125% bupivacaine with 1mcg/ml fentanyl at a rate of 2-3 ml/hr for postoperative pain management. His postoperative stay was uneventful and was discharged after 5 days of treatment in good condition.

### Discussion

Patients with IHD undergoing noncardiac surgery are at an increased risk for perioperative cardiovascular events.<sup>[2]</sup> Maintaining the cardiovascular, renal, pulmonary, and central nervous system functions in aged patients is one of the important determinants of outcome from surgical procedures under general or regional anaesthesia.<sup>[2]</sup>

In this patient, the anaesthetic goals include avoiding myocardial depression, maintenance of normovolemia, preventing an increase in afterload, and sudden hypotension.<sup>[2]</sup> Subarachnoid block can result in considerable hemodynamic instability due to the inability to control the level of block.<sup>[2]</sup> General anaesthesia has been associated with hypotension due to intravenous induction agents, tachycardia, and hypertension because of sympathetic stimulation from direct laryngoscopy and endotracheal intubation, which can lead to myocardial ischemia, leading to cardiac morbidity.<sup>[3]</sup>

Due to these considerations, a modified neuraxial anaesthetic technique with the Graded Epidural method was chosen for this patient. The graded epidural anaesthetic technique produces very slow changes in the preload and afterload that mimic pharmacological goals in the treatment of this disease.<sup>[4]</sup> It also reduces stress response, coagulation response, coronary vasospasm, perioperative myocardial events, maintains myocardial oxygen supply, and reduces myocardial oxygen demand as well as harmful effects of general anaesthesia.<sup>[3]</sup> Graded epidural blockade causes better perioperative outcomes compared to GA in patients with cardiac illness undergoing noncardiac surgeries.<sup>[5]</sup> In this case, local anaesthetic was given at incremental doses slowly by monitoring hemodynamic parameters. Other potential benefits of using epidural anaesthesia include excellent pain control, decreased incidence of deep vein thrombosis, and better pulmonary outcome in the postoperative period.<sup>[3]</sup>

**Conclusion**

Patients with IHD with low EF coming for noncardiac surgery is quite challenging for anaesthetic personnel. Graded epidural anaesthesia with slow blockade of dermatomes may be used as a sole anaesthetic technique for patients with IHD and a low EF for noncardiac surgery.

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