

## Case Report

# Emergency open cholecystectomy in a patient with severe aortic stenosis under epidural anaesthesia

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### ABSTRACT

Goldman and colleagues identified severe aortic stenosis (AS) as a risk factor for perioperative cardiac complications in non-cardiac surgery. Although patients with aortic stenosis are at an increased risk of perioperative cardiac events, they can undergo non-cardiac surgery relatively safely provided that the condition is recognized and appropriate monitoring and management put in place. The early detection and treatment of hypotension and arrhythmias are essential. We present a case of severe aortic stenosis posted for emergency open cholecystectomy which was successfully managed under epidural anaesthesia and had an uneventful recovery.

**Keywords:** Emergency open cholecystectomy, Epidural anaesthesia, Non cardiac surgery, Severe aortic stenosis

### INTRODUCTION

Aortic stenosis (AS) is a progressive disease that may remain asymptomatic for decades. As severity progresses, there is increased left ventricular outflow obstruction and reduced left ventricular compliance leading to a reduction in myocardial function and reduced cardiac output. Severe AS is a known risk factor for perioperative cardiac complications in non-cardiac surgery. Haemodynamic goals for treating patients with aortic stenosis include maintaining myocardial oxygen delivery via adequate systemic pressure and diastolic time, maintenance of contractility, and optimized preload for a non-compliant left ventricle aided by sinus rhythm with an ideal rate of 60-80 beats per minute.

Traditionally, general anaesthesia was advocated for these patients, however it should be borne in mind that most anaesthetic agents cause vasodilatation and moreover general anaesthesia, muscle relaxation, positive pressure ventilation can interfere with venous return and

reduce vascular tone, further compromising the cardiac output. Therefore, it is the conduct of anaesthesia rather than the specific technique that is important.

Anaesthetic techniques that reduce systemic vascular resistance (e.g. regional neuraxial techniques) must be used with extreme caution although successful cases of carefully titrated epidural and spinal blocks using catheters have been reported.<sup>1</sup>

Considering hemodynamic stability, epidural anaesthesia is preferred to spinal anaesthesia due to gradual onset of peripheral sympathetic nervous system blockade in aortic stenosis patients.

### CASE REPORT

Authors reported a case of 75 years old female with no known comorbidities who came to the hospital with complaints of abdominal pain and fever for 3 days. The patient was not on any regular medications. On

examination, she was found to have expiratory wheeze and systolic murmur. On evaluation, patient was found to have acute calculous cholecystitis on USG abdomen. The patient was posted for laparoscopic cholecystectomy.

On further evaluation, the patient was incidentally found to have severe aortic stenosis with a gradient of 84/49 and mild AR with EF of 55% and mild PAH with PASP 40mmhg and ST changes were noted on ECG. After taking cardiologist opinion, surgery was cancelled in view of severe aortic stenosis and high risk of anaesthesia.

After 2 days, during the hospital stay, the patient developed increase in abdominal pain and repeat USG was suggestive of perforated gall bladder and the patient was posted for emergency open cholecystectomy. The patient and relatives were explained regarding the high risk of anaesthesia and written informed consent was taken for the same.

In view of severe aortic stenosis and expiratory wheeze, authors decided to go ahead with segmental epidural anaesthesia.

In the operating room, the baseline heart rate was noted to be 114 beats per minute and, the blood pressure was 146/92 mmhg and 96% spo<sub>2</sub>. A 22G intravenous cannula was present in situ on the left hand. The patient was coloaded with ringer lactate.

All emergency drugs including phenylephrine, adrenaline, antiarrhythmic drugs, noradrenaline infusion and defibrillator pads were kept ready. All necessary drugs and equipments for General anaesthesia were kept ready.

Right radial artery was cannulated under local anaesthesia for beat to beat blood pressure monitoring. Central line was secured in right internal jugular vein under USG guidance with local infiltration under all aseptic precautions. In sitting position, a 16G epidural catheter was inserted in T7-8 space under all aseptic precautions.

After giving test dose and excluding inadvertent intravascular or intrathecal migration of the catheter, 10ml of 0.5% bupivacaine and 5 ml of 2% lignocaine was diluted to 20 mls and titrated doses of 4 ml were given every 5 minutes till confirmation of sensory block from T4-T10 dermatomes, by eliciting loss of sensation to pin prick and cold temperature.

The goal was to maintain sinus rhythm, avoid any drop in systemic vascular resistance and maintain stroke volume. Any hypotension was avoided by starting noradrenaline infusion and mean arterial pressure was maintained more than 80 mm Hg. Intraoperatively, the patient maintained a heart rate of around 90/minute, Spo<sub>2</sub> of 100% with 6 L/min oxygen via Hudson mask and mean arterial

pressure above 80 mm Hg with noradrenaline support at 0.08-0.1 mcg/kg/min.

There was no significant blood loss or hemodynamic instability during the surgery. The patient was comfortable and did not complaint of any pain or discomfort. A top up of 5 ml 0.25% bupivacaine was given via epidural catheter after 1 hour. No further top ups were needed and the surgery lasted 70 minutes.

After the procedure the patient was shifted to ICU for further monitoring and management with noradrenaline support of 0.05 mcg/kg/min. The inotropes were tapered and stopped over the next few hours. The epidural catheter was removed next day. For post op pain management, she was given paracetamol round the clock.

On postoperative day 1, patient developed a brief episode of atrial fibrillation for which she was started on amiodarone infusion. Once the rate was controlled, she was switched to oral amiodarone.

The postoperative period was uneventful otherwise. Patient was discharged on post op day 8 and was continued on oral Amiodarone 200 mg and Aspirin 75 mg.

## DISCUSSION

Anaesthesia in severe AS can cause rapid clinical deterioration and patient mortality. The current American College of Cardiology (ACC) guidelines recommend aortic valve surgery before elective non cardiac surgery in symptomatic AS patients.<sup>2</sup> In some clinical circumstances, aortic valve surgery cannot be performed as in author's case patient had suspected gall bladder perforation because of which urgent cholecystectomy was planned. In such situation, it is important to determine which anaesthesia technique has the lowest risk for these patients for undergoing non cardiac surgery. Both regional and general anaesthesia carry a high risk in a patient with severe aortic stenosis.

Although the use of neuraxial anaesthesia is traditionally contraindicated in patients with severe aortic stenosis, there have been reports of safe administration of carefully titrated segmental epidural anaesthesia with gradual administration of local anaesthetics to minimize any hemodynamic changes and maintain cardiovascular stability in such cases.<sup>3-6</sup>

One may prefer regional anaesthesia in terms of perioperative events and in prolonged post-operative analgesia, as well as in terms of patient's and surgeon's satisfaction but since these patients have a fixed stroke volume, any major reduction in systemic vascular resistance is not tolerated and may result in severe hypotension, myocardial ischemia, reduced contractility and sudden fall in perfusion pressure; therefore, spinal anaesthesia in patient with AS should be avoided.<sup>7</sup>

Although various studies have advised and stressed on the use of graded epidural anaesthesia in severe AS patients.<sup>8</sup> In recent times successful graded epidural anaesthesia has been reported in short-statured patients of aortic stenosis for cesarean section, two cases have reported high levels of block.<sup>9,10</sup>

Administration of regional anaesthesia at INR >1.5 (The patient's INR was 1.23) has been associated with increased risk of vertebral canal hematoma.<sup>11</sup> Therefore, in patients with deranged coagulogram, decision for regional anaesthesia should be omitted.

In two studies comparing general and epidural anaesthesia for non-cardiac surgery in severe AS patients, authors have proven that severe AS patients can undergo emergent non cardiac surgery with acceptable risk and found that severity of AS and emergency surgery are most important predictors of major adverse cardiovascular events following non cardiac surgery.<sup>12,13</sup> Thus, we can safely say that the question whether to give general or epidural anaesthesia depends totally on anesthesiologist's discretion who takes into consideration patient's perioperative condition, severity of AS, type of surgery, and previous experience of such cases.

In this case, we did a detailed evaluation of patient's existing cardiac condition and functional capacity. On the basis of her medical history and the results of the echocardiography, her aortic stenosis was regarded as severe (peak/mean gradient across the wall 84/49 mmhg), but compensated, non-critical, and the patient was nearly asymptomatic.

Echocardiographic information was the key tool to form an assessment of the risk involved. This was discussed with the patient, family and general surgical team and an informed decision was taken to proceed with the surgery with risks and benefits explained.

Basically, the management revolves around the disease pathophysiology. Careful haemodynamic monitoring is the most vital part of the management. Monitoring should include an arterial line to detect beat to beat changes in the blood pressure. Central venous access provides a route for the administration of vasopressor therapy. (Pulmonary artery catheterization was avoided because of the risk of precipitating arrhythmias). Intraoperative transoesophageal echocardiography, if available, may be appropriate and it also allows assessment of left ventricular filling and contractility.

The hemodynamic goals consisted of -

- Maintaining low or normal heart rate and sinus rhythm
- Adequate volume loading
- Maintaining systemic vascular resistance

Drugs that maintain the systemic vascular tone such as norepinephrine, phenylephrine must be available. Hypotension should be treated aggressively with these drugs initially, followed by management of the underlying cause, e.g. haemorrhage. Administration of vasoconstrictors by infusion, rather than boluses, facilitates cardiovascular stability. In this case, infusion noradrenaline 0.08-0.1mcg/kg/min was started to avoid hypotension.

Maintenance of sinus rhythm and adequate intravascular volume is vital to ensure ventricular filling. Arrhythmias must be treated promptly. New onset atrial fibrillation may require cardioversion, particularly if the patient is haemodynamically unstable. Sinus tachycardia can also be detrimental as it reduces the diastolic time for myocardial perfusion. Plasma potassium concentrations should be monitored and maintained within the normal range. An intra-operative arterial blood gas was done which came out to be normal (ABG: pH - 7.4; pCO<sub>2</sub>- 36.1; pO<sub>2</sub>- 257; BE-2; Na -137; K- 3.4; HCT- 31; HB - 10.5).

In this case, the total duration of surgery was 70 minutes, and there was no major fluid shift expected. Also, the patient suffered no significant blood loss or intraoperative arrhythmias. As for all valve lesions, like this case appropriate antibiotic prophylaxis was given and strict aseptic precautions were taken. We administered inj Meropenem 1 gm and inj Metronidazole 500 mg intraoperatively. Non-steroidal anti-inflammatory drugs were avoided because such patients are at risk of postoperative renal dysfunction.

## CONCLUSION

In this conclusion, we strongly suggest that epidural anaesthesia may be performed safely and effectively by administration of small, gradual and incremental doses of local anaesthetics for patients with asymptomatic and compensated severe aortic stenosis undergoing open cholecystectomy. However, the use of regional anaesthesia remain controversial in other major and minor surgeries involving such patients. So, the choice of an ideal anaesthetic technique should be based on individual assessments, the present cardiac condition of the patient, type of surgery planned, patient positioning and functional capacity of the patient.

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