

Perioperative Anaesthetic Management of Severe Aortic Stenosis with Anticipated Difficult Airway in Geriatric Hip Fracture Surgery: A Case Report

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ABSTRACT

Aortic Stenosis (AS) is a high-risk valvular condition associated with significant perioperative morbidity during non-cardiac surgery, especially in elderly patients. Anaesthetic management is quite difficult due to fixed cardiac output, dependence on preload, and intolerance to tachycardia or hypotension. The presence of multiple comorbidities and difficult airway further increases perioperative risk. We report the anaesthetic management of a 73-year-old male with severe AS (aortic valve area 0.8 cm², mean gradient 40 mmHg), diabetes mellitus, hypertension, and anticipated difficult airway, who underwent elective proximal femoral nailing for intertrochanteric fracture. Preoperative evaluation revealed preserved left ventricular systolic function with electrocardiographic ischaemic changes. A properly planned general anaesthesia technique was adopted using etomidate-based induction, invasive haemodynamic monitoring, controlled airway management using video laryngoscopy, and regional analgesia via ultrasound-guided fascia iliaca block. Intraoperative haemodynamics were maintained within normal limits with judicious fluid therapy, opioid supplementation, and beta-blocker titration. The postoperative period presented with transient delirium, which was managed successfully with dexmedetomidine infusion. The patient had an uneventful recovery and was discharged on postoperative day five. This case study underlines the significance of meticulous anaesthetic planning after thorough assessment and perioperative cardiovascular monitoring for elderly individuals with multiple comorbidities undergoing non-cardiac procedures, especially when complicated by difficult airway.

Keywords: Aged, Echocardiography, Haemodynamic monitoring, Video laryngoscopy

CASE REPORT

A 73-year-old male patient, who suffered a slip and fall injury at home, went to the orthopaedic clinic three days later. He sustained injury to the left hip and elbow. He reported no history of head injury or loss of consciousness. On inspection, his left leg was shortened and externally rotated. An X-ray of his hip revealed that he had an intertrochanteric fracture in his left femur, and elective proximal femoral nailing was recommended. The patient was diagnosed with type 2 diabetes mellitus and systemic hypertension 10 years back. He was prescribed oral hypoglycaemic agent (metformin 500 mg with sitagliptin 50 mg) and antihypertensive medication (amlodipine 10 mg) but was not compliant with treatment for the past eight years. He denied history of chest pain, breathlessness, palpitation or syncope.

Intraoperative haemodynamics were accurately monitored. Heart rate ranged between 62-78 beats/min, invasive mean arterial pressure was maintained between 75-90 mmHg, and central venous pressure ranged from 8-10 cm H₂O. Urine output averaged 0.7-1 mL/kg/hr. The total volume of the intraoperative crystalloid injection was 1.2 L, resulting in an estimated blood loss of 300 mL. His effort tolerance, as assessed by Metabolic Equivalents (METs), was greater than four. Airway assessment revealed retrognathic jaw [Table/Fig-1] with thyromental distance of less than 4 cm, indicating difficult airway. Mouth opening and neck movement was adequate and modified Mallampati grade 4 was assigned.

Electrocardiography (ECG) showed ST segment depression and T wave changes in V1-V5. Two-dimensional echocardiography showed eccentric left ventricular hypertrophy with good left ventricular ejection fraction (64%). There was severe Aortic Stenosis (AS) with a peak gradient of 64 mmHg across the valve and a mean gradient of 40 mmHg. The cross-sectional area of the valve was



[Table/Fig-1]: Retrognathic jaw line indicating an anticipated difficult airway in an elderly gentleman.

0.8 cm². Mild tricuspid regurgitation with tricuspid regurgitation pressure gradient of 35 mmHg and mild pulmonary hypertension was present.

Low molecular weight heparin (Enoxaparin) 0.6 mL was administered subcutaneously on admission for deep vein thrombosis prophylaxis. Risk of major adverse cardiac events was explained and informed consent for the procedure was obtained under the American Society of Anaesthesiology (ASA) class 3.

Anaesthetic goals in managing a patient with AS for non-cardiac surgery include avoiding tachycardia, maintaining sinus rhythm, optimising preload, afterload and contractility. The patient was premedicated with oral alprazolam 0.25 mg on the night before

and the morning of surgery, along with intravenous pantoprazole 40 mg one hour before surgery. The right internal jugular vein was cannulated with a 7Fr triple lumen catheter and left radial artery was cannulated using a 22G cannula for invasive blood pressure monitoring. Anti-sialagogues were avoided to prevent increase in heart rate. Fiberoptic bronchoscope was kept on standby in view of anticipated difficult intubation. Anaesthesia was induced with intravenous etomidate 12 mg and fentanyl 160 µg. After confirming adequate bag-mask ventilation, neuromuscular blockade was achieved with succinylcholine 100 mg. Succinylcholine was chosen to facilitate rapid airway control due to the anticipated difficult airway and normal serum potassium levels. The trachea was intubated orally using a C-MAC video laryngoscope with an 8.0 mm internal diameter endotracheal tube; the laryngoscopic view was Cormack-Lehane grade III.

An ultrasound-guided fascia iliaca compartment block was administered using 30 mL of 0.5% ropivacaine with 8 mg dexamethasone for postoperative analgesia. The haemodynamic parameters were maintained within normal limits throughout the procedure. Crystalloids were given only to replace the blood loss till calculated allowable blood loss. Intra-operative tachycardia was managed with adequate opioids, maintenance of depth of anaesthesia and a titrated dose of intravenous metoprolol 1 mg was administered as a slow bolus over 1–2 minutes. The patient was extubated after ensuring complete reversal of neuromuscular blockade. Intravenous lignocaine 60 mg was administered prior to extubation to attenuate the haemodynamic response. Postoperatively, the patient developed delirium for a few hours, which was managed with a slow intravenous infusion of dexmedetomidine 25 µg.

The patient was shifted to the post-anaesthesia care unit for haemodynamic monitoring. Postoperative analgesia was managed with transdermal fentanyl patch and injection paracetamol. Postoperative stay was uneventful and he was discharged on the fifth postoperative day.

DISCUSSION

The AS is a progressive valvular disorder in which obstruction to the left ventricular outflow results in a fixed cardiac output and poses considerable risk during the perioperative period of a patient [1]. In healthy individuals, the transvalvular flow across the aortic valve occurs at velocities below 2 m/s. As valvular narrowing progresses, these velocities increase and it is accompanied by rising pressure gradients and a reduction in effective valve area. These are all features that define severe disease [2].

For a protracted period, many patients remain asymptomatic, and during this phase the incidence of perioperative cardiac complications is comparatively low. The onset of symptoms such as exertional dyspnoea, angina, syncope, or heart failure reflects critical obstruction and marks a significant increase in perioperative risk. Without effective treatment or intervention, the prognosis is dire once symptoms appear; within a few years, death rates have been recorded to reach 90% [3,4].

The prevalence of AS in patients aged 65 years and below is 1–2%, while it increases to 29% in those above the age of 65. About 4–9% of patients with AS have severe stenosis [4]. The aetiology varies with geography- calcification of the valve is more common in the Western world and infective causes are common in the developing world. With increasing age of patients undergoing surgery, these valvular lesions are expected to constitute a bigger disease burden [5]. In younger and middle-aged patients, congenital abnormalities- most commonly bicuspid aortic valves- quickly progress to clinically significant stenosis due to superimposed calcification of the valve [5]. On the other hand, progressive calcific disease is the most common cause in the developed world, but rheumatic valvular cardiac disease and infective endocarditis still play a significant role in poorer nations [6]. When evaluating perioperative risk in

elderly patients, these underlying variations have an impact on valve anatomy, disease development, and the existence of related comorbidities [7].

The haemodynamic sequelae of AS have important implications for anaesthetic management. Progressive valvular obstruction increases left ventricular ejection time, elevates left ventricular end-diastolic pressure, and reduces effective aortic pressure [1,4]. Chronic pressure overload leads to concentric left ventricular hypertrophy, increased myocardial oxygen demand, impaired coronary perfusion, and diastolic dysfunction. With progression of disease, systolic dysfunction and overt heart failure may occur. Therefore, patients with severe AS are highly dependent on adequate preload, maintenance of sinus rhythm, and preservation of systemic vascular resistance, making them particularly vulnerable to haemodynamic disturbances during the anaesthetic period [8].

Numerous case studies suggest that satisfactory results from non-cardiac surgery in elderly individuals with moderate to severe persistent asthma are attainable if anaesthetic administration is appropriately matched with these specific biologic limits [9]. Milojevic M et al., described successful perioperative management in elderly patients undergoing urgent non-cardiac procedures, underlining the role of invasive arterial blood pressure monitoring, careful induction, and early initiation of vasopressor support if needed [10]. Similarly, Armanous M et al., highlighted the importance of comprehensive preoperative echocardiographic evaluation and multidisciplinary planning, proving that functional impairment is underestimated more often than not in the geriatric population [11]. In situations where surgery cannot be deferred, clear communication regarding major adverse cardiac events and meticulous haemodynamic preparation were considered essential.

Both general and regional anaesthetic techniques have been reported in literature, with the choice guided by surgical requirements and patient-specific factors. In an 86-year-old individual with serious pulmonary disease undergoing major abdominal surgery, Kim SH et al., reported the use of general anaesthesia with Remimazolam, maintaining stable hemodynamics during induction and maintenance [12]. Alternatively, Scurrah A et al., effectively applied blocking peripheral nerves for fractured hip treatment, hence preventing the cardiovascular consequences related to general anaesthesia and neuraxial sympathetic suppression [13]. Berg KB et al., described a graded neuraxial technique combined with invasive monitoring and vasopressor support at an early point, underscoring the need to prevent sudden reductions in systemic vascular resistance in this population [14].

All the reported cases commonly used invasive hemodynamic monitoring as a key factor in the association with successful outcomes [9]. Placement of an arterial catheter prior to induction allowed prompt recognition and management of hypotension, as described by Naylor AJ et al., [15]. Central venous access promoted early and proactive administration of vasoactive agents, the common ones being phenylephrine and norepinephrine. Strict control of heart rate and maintenance of sinus rhythm were repeatedly emphasised to preserve diastolic filling and coronary perfusion.

Several authors labelled the postoperative period as a particularly vulnerable phase. Kim SH and Fechner J and Scurrah A et al., recommended postoperative observation in a high dependency or intensive care setting for at least 24–48 hours postoperatively, given the risk of delayed haemodynamic instability, arrhythmias, and potential myocardial ischaemia [12,13]. Adequate postoperative analgesia by incorporating regional techniques was considered essential to minimise sympathetic activation and maintain cardiovascular stability, while providing effective postoperative analgesia [16].

From a therapeutic standpoint, medical therapy does not halt disease progression and remains largely supportive [17]. Balloon aortic valvuloplasty offers only a transient symptomatic benefit and is

limited only by high rates of restenosis, whereas definitive treatment involves surgical or transcatheter aortic valve replacement [16,17]. Several reports articulate that valve intervention should precede elective non-cardiac surgery whenever feasible in symptomatic patients. However, when urgent or emergency surgery is inevitable, optimised anaesthetic and perioperative management remains the principle determinant of outcome [18-20].

CONCLUSION(S)

To conclude, currently available case-based evidence suggests that non-cardiac surgery in geriatric patients with severe AS can be undertaken with favourable outcomes when guided by a thorough understanding of disease pathophysiology, detailed preoperative assessment, individualised anaesthetic planning, invasive haemodynamic monitoring, and vigilant postoperative care. Maintenance of preload, sinus rhythm, and systemic vascular resistance continues to form the key of perioperative management in this high-risk group.

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