DOI: 10.7860/JCDR/2025/80727.21867

Case Report

Anaesthesia Section

Anaesthetic Management of a Patient with Dilated Cardiomyopathy Undergoing Ureteroscopic Lithotripsy: A Case Report

SWETA GAJAPURE[1], VIVEK CHAKOLE[2]

ABSTRACT

Patients with severely compromised left ventricular systolic function undergoing non cardiac surgery present a significant anaesthetic challenge, particularly when the Ejection Fraction (EF) is critically low. Dilated Cardiomyopathy (DCM), characterised by progressive ventricular dilation and impaired myocardial contractility, increases the risk of perioperative instability, arrhythmias and postoperative decompensation. The present case involves a 65-year-old female with long-standing hypertension and Type 2 Diabetes Mellitus (T2DM), who was non compliant with her medications. She developed right flank pain, intermittent fever and vomiting. Imaging revealed a perinephric collection requiring drainage, after which she was scheduled for right ureteroscopic lithotripsy and Double J (DJ) stenting. The present case is notably complex due to her severely reduced EF of 15%, documented regional wall motion abnormalities and moderate valvular regurgitation. Anaesthetic management required careful preoperative planning, including echocardiographic assessment and nephrology consultation. Etomidate was chosen for induction because of its minimal cardiovascular depressant effects, while fentanyl provided analgesia and vecuronium was used for muscle relaxation. The present case underscores the importance of individualised anaesthetic strategies for patients with severe cardiac dysfunction. With appropriate drug selection and multidisciplinary coordination, high-risk cardiac patients can safely undergo non cardiac surgical interventions.

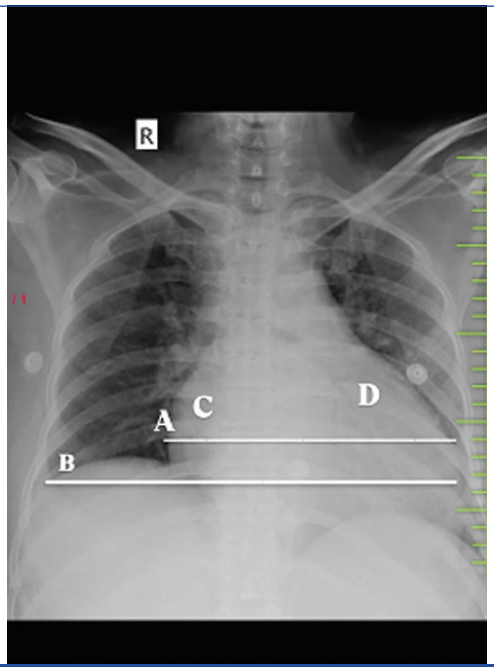
Keywords: Anaesthesia, Ejection fraction, Non cardiac surgery

CASE REPORT

A 65-year-old female presented with a sudden onset of progressively worsening abdominal pain localised to the flanks, accompanied by multiple episodes of non projectile vomiting with clear watery content {American Society of Anaesthesiologists (ASA) grade 3}. She reported intermittent, high-grade fever over the past 15 days, which was partially relieved by medications. Her medical history was significant for T2DM and hypertension, both of which had gone untreated for the last two weeks.

Initial laboratory investigations revealed severe anaemia with a haemoglobin level of 7.1 g/dL, a markedly elevated total leukocyte count of 22,000/mm^3 and a platelet count of 6.34×10^3/µL. Imaging suggested a perinephric collection and the patient underwent percutaneous nephrostomy with the placement of a 12 French pigtail catheter, which was later repositioned due to a residual collection. Renal function showed increased creatinine levels, prompting a nephrology consultation prior to Computed Tomography (CT) urography.

During this period, transthoracic echocardiography identified significant cardiac dysfunction, with an EF of 15%, regional wall motion abnormalities involving the anteroseptal and mid-inferior walls, moderate mitral and tricuspid regurgitation and a dilated left ventricle, consistent with DCM. The electrocardiogram revealed left bundle branch block. The patient was started on appropriate cardiac medications, including tablet Aldactone 25 mg once daily, tablet Furosemide 20 mg once daily and tablet Carvedilol 3.125 mg once daily. Given the diagnosis of obstructive uropathy with a proximal ureteric stone, the decision was made to proceed with right ureteroscopic lithotripsy and double J stenting under general anaesthesia. The radiological features of DCM is shown in [Table/Fig-1].



[Table/Fig-1]: Radiological features for Dilated Cardiomyopathy (DCM).
*A-Maximum horizontal diameter of the cardiac silhouette; B-Maximum horizontal diameter of thorax; C-Right atrium enlargement; D-Left ventricular enlargement.

Anaesthetic management: On the day of surgery, the patient was brought to the operating room with stable vital signs: blood pressure 130/85 mmHg, heart rate 70 beats per minute with sinus rhythm, respiratory rate 16 breaths per minute and oxygen saturation of 96% on room air. Standard ASA monitors were applied, along with invasive arterial blood pressure monitoring via the right radial artery. Central venous access was established through the right internal jugular vein under local anaesthesia.

Given the severely reduced EF and regional wall motion abnormalities, the anaesthetic plan focused on maintaining haemodynamic stability and avoiding myocardial depression. Anaesthesia induction was achieved cautiously using 20 mg of etomidate administered intravenously (i.v.), chosen for its minimal cardiovascular effects. Fentanyl was administered in incremental doses totaling 200 mcg i.v. to provide adequate analgesia while minimising sympathetic stimulation. Vecuronium 8 mg i.v. was used for neuromuscular blockade to facilitate intubation. Airway management was uneventful, with the placement of a 7.0 mm cuffed endotracheal tube under direct laryngoscopy.

Maintenance of anaesthesia was accomplished with low-dose sevoflurane supplemented by intermittent fentanyl boluses, aiming to avoid hypotension and tachycardia. Throughout the procedure, invasive blood pressure, Electrocardiogram (ECG), pulse oximetry, end-tidal Carbon Dioxide (CO_2) and central venous pressure were closely monitored. Vasopressor support was kept on standby; however, phenylephrine or norepinephrine were not required as the patient remained haemodynamically stable, with the mean arterial pressure maintained above 65 mmHg. Fluid administration was judiciously guided by urine output and central venous pressure to prevent volume overload.

Neuromuscular blockade was reversed at the end of surgery using 200 mg of sugammadex i.v. to allow rapid and complete recovery, reducing the risk of residual paralysis and respiratory complications. The surgery lasted approximately one hour and 55 minutes without intraoperative complications. The patient was extubated while awake after ensuring adequate spontaneous ventilation and neuromuscular recovery and was then transferred to the intensive care unit for postoperative monitoring. Haemodynamics remained stable postoperatively and the patient showed no signs of cardiac decompensation.

DISCUSSION

For anaesthesiologists treating patients with severely low EF, especially as low as 15%, managing anaesthesia presents great difficulty. These patients are particularly vulnerable to arrhythmias, postoperative cardiac decompensation and intraoperative hypotension. In the present case, careful preoperative assessment and planning were key. The authors chose etomidate for induction due to its minimal myocardial depressant effect. Preoperative assessment and careful planning are crucial in such situations.

The study by Wu YH et al., presents a case report detailing the successful anaesthetic management of a patient with DCM and poor EF undergoing laparoscopic surgery for rectal cancer. Continuous and intraoperative monitoring was highlighted as a vital component of anaesthetic management. Following preoxygenation, 50 µg of sufentanil, 10 mg of etomidate and 50 mg of rocuronium were administered intravenously to induce general anaesthesia. The findings highlight the importance of individualised anaesthetic approaches and comprehensive monitoring to enhance patient safety during surgical procedures [1].

In a study by Quing E et al., the analysis focused on a total of 140 patients who had heart diseases and were undergoing non cardiac surgeries. The study concludes that anaesthetic methods for patients with heart disease should be tailored to the individual needs of each patient. It emphasises the importance of comprehensive monitoring, particularly invasive monitoring and the necessity for proper and timely treatment based on the specific cardiac conditions of the patients [2].

Regional anaesthesia is often favoured in low EF patients. In a study by Bin Suhaym NA and Aamri E, epidural anaesthesia was used in pregnant women with 30% EF undergoing caesarean delivery; the slow onset and controlled block allowed for successful stability throughout [3]. In a study by Wang H et al., midazolam 2 mg, sufentanil 15 µg, cisatracurium 15 mg and etomidate 16 mg were administered for the induction of anaesthesia in a patient with DCM and purpura undergoing interventional thrombectomy of both femoral arteries. The present case suggests that maintaining haemodynamic stability, improving perioperative coagulation control, using anticoagulants judiciously and preventing thrombotic events are essential components of anaesthesia management for DCM patients [4].

Cardiovascular stability has been demonstrated in several clinical studies involving patients undergoing non cardiac surgery with low myocardial EF or DCM. According to Sumler ML et al., who presented a case for pulmonary resection, additional effects from positioning, one-lung ventilation, surgical procedures and contraction of the pulmonary vascular bed imposed physiological effects on cardiovascular function. They also reported general anaesthetic management of a patient with DCM undergoing pulmonary resection surgery [5,6].

Sugammadex was used in the present case to reverse neuromuscular blockade, which has proven to be safer and more effective for patients with high-risk cardiovascular diseases. Jones RK et al., presented a case series that established its role in preventing prolonged blockade and instability in cardiac-compromised individuals. Pervez MB and Naqvi SSUH demonstrated that non cardiac surgery can be performed even in extreme cases with the right support, highlighting the role of combined regional-general anaesthesia and invasive monitoring in a patient undergoing bowel surgery with an EF of less than 10% [7,8].

Alternative anaesthetic options in high-risk patients with reduced EF include the use of ketamine for its sympathomimetic properties, but it should be used cautiously in patients with cardiovascular diseases. A slow induction with fentanyl and midazolam or high-dose opioids is also employed to minimise haemodynamic fluctuations. Total Intravenous Anaesthesia (TIVA) is generally avoided due to the hypotensive effects of propofol, while low concentrations of volatile agents such as sevoflurane may be used cautiously. Regional anaesthesia, particularly graded epidural or combined spinal-epidural techniques, has demonstrated favourable outcomes in appropriate cases by reducing the myocardial depressant effects of general anaesthesia [9,10].

CONCLUSION(S)

The present case demonstrates the significance of customising anaesthetic management for patients with impaired heart function who require non cardiac surgery. The anaesthetic management was complicated by the patient's extremely low EF of 15%, resulting from DCM. Etomidate was selected for induction due to its favourable cardiac profile and minimal haemodynamic impact, making it particularly suitable for patients with severely compromised myocardial function. Neuromuscular blockade and reversal agents were carefully chosen to avoid exacerbating cardiovascular stress. Intraoperatively, the patient was monitored with close attention to haemodynamic parameters and anaesthetic management was dynamically tailored in coordination with the surgical and medical teams. Despite the high perioperative risk associated with her cardiac status, the procedure was completed uneventfully. This case highlights that, with better planning, appropriate pharmacological choices and effective interdisciplinary collaboration, even high-risk patients with significantly reduced EF can undergo general anaesthesia safely.

REFERENCES

[1] Wu YH, Hu L, Xia J, Hao QS, Feng L, Xiang HB. Anaesthetic management of laparoscopic surgery for rectal cancer in patients of dilated cardiomyopathy with poor ejection fraction: A case report. Int J Clin Exp Med. 2015;8(6):9555-59. PMID: 26309623; PMCID: PMC4538102.

[2] Qing E, Dong X, Lin D, Wu W. The anesthesia for patients with heart disease undergoing noncardiac surgery: A review of 140 cases [Internet]. 2007 [cited 2025 May 23]. Available from: https://doi.org/10.3969/j.issn.1007-5062.2007.02.005.

[3] Bin Suhaym NA, Aamri E. Anesthetic management of dilated cardiomyopathy for cesarean section: A case report. Saudi J Anaesth. 2020;14(1):120-22.
[4] Wang H, Zhu Y, Nan Y, Jin X. Anesthetic management of a patient with dilated cardiomyopathy and purpura for interventional thrombectomy of both femoral artery: Case report. Medicine (Baltimore). 2024;103(19):e37889. Doi: 10.1097/MD.0000000000037889.
[5] Sanatkar M, Sadeghi M, Esmaeili N, Sadrossadat H, Shoroughi M, Ghazizadeh S, et al. The hemodynamic effects of spinal block with low dose of bupivacaine and sufentanil in patients with low myocardial ejection fraction. Acta Med Iran. 2013;51(7):438-43. PMID: 23945886.
[6] Sumler ML, Andritsos MJ, Blank RS. Anesthetic management of the patient with dilated cardiomyopathy undergoing pulmonary resection surgery: A case-based discussion. Semin Cardiothorac Vasc Anesth. 2013;17(1):09-27. Doi: 10.1177/1089253212453620.
[7] Jones RK, Caldwell JE, Brull SJ, Soto RG. Reversal of profound rocuronium-induced blockade with sugammadex: A randomized comparison with neostigmine. Anesthesiology. 2008;109(5):816-24. Doi: 10.1097/ALN.0b013e31818a3fee.
[8] Pervez MB, Naqvi SSUH. Aggressive anesthetic management of a patient with severely dilated cardiomyopathy for non-cardiac surgery. J Anesth Crit Care Open Access. 2017;8(1):00304.
[9] Kurdi MS, Theerth KA, Deva RS. Ketamine: Current applications in anesthesia, pain, and critical care. Anesth Essays Res. 2014;8(3):p 283-90. Doi: 10.4103/0259-1162.143110.
[10] Kouroukli I, Zompolas V, Tsekoura V, Papazoglou I, Louizos A, Panaretou V. Comparison between lornoxicam quick-release and parecoxib for post-operative analgesia after laparoscopic cholecystectomy: A prospective randomized, placebo-controlled trial. J Anaesthesiol Clin Pharmacol. 2013;29(4):485-90. Doi: 10.4103/0970-9185.119144.

PARTICULARS OF CONTRIBUTORS:
1. Junior Resident, Department of Anaesthesiology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra, India.
2. Professor, Department of Anaesthesiology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sweta Gajapure,
Junior Resident, Department of Anaesthesiology, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha-442107, Maharashtra, India.
E-mail: shwetagajapure@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jun 06, 2025
- Manual Googling: Jul 14, 2025
- iThenticate Software: Jul 16, 2025 (7%)

ETYMOLOGY: Author Origin

EMENDATIONS: 5

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **May 23, 2025**
Date of Peer Review: **Jun 21, 2025**
Date of Acceptance: **Jul 18, 2025**
Date of Publishing: **Oct 01, 2025**