

Epidural Anesthesia in Ureterolithiasis Patient with Cardiovascular Diseases: A Case Report

Praisys Gladys Intan Pardede^{1,*}, I Putu Kurniyanta¹, Tjokorda G.A. Senapathi¹

¹Anesthesia and Intensive Care Department of Medical Faculty, Udayana University, Ngoerah General Hospital, Denpasar, Indonesia

*Corresponding Author. Email: praisygladys@gmail.com, Telp: +6281259598585

ABSTRACT

The number of surgical procedures in patients with cardiovascular comorbidities has increased in recent decades. Regional anesthetic procedures, either unaccompanied or combined with general anesthesia, are useful perioperatively for reducing the stress response and cardiac sympathetic activity, enabling earlier extubation, shortening hospital stay, and providing good postoperative analgesia. This case report aims to provide insight into the appropriate selection of anesthesia in a patient with comorbid heart failure and chronic renal failure. Anesthetic techniques in patients with cardiovascular disorders require a good understanding of physiology and pharmacology. In this case, a regional anesthetic technique was chosen because it offers several advantages for patients with cardiovascular comorbidities. A 69-year-old man was diagnosed with right ureterolithiasis with severe right hydronephrosis and end stage chronic kidney disease (CKD), as well as chronic heart failure (CHF) functional class II and mild mitral regurgitation (MR). He underwent ureterolithotomy in the supine position. Epidural anesthesia (bupivacaine 0.375%) was associated with hemodynamic fluctuations, with blood pressure of 92–131/57–80 mmHg, heart rate of 62–88 beats/min, respiratory rate of 16–18 breaths/min, and SpO₂ of 98–99% with oxygen via nasal cannula. During the operation, the patient was quite comfortable, and no additional pain medication was administered. Postoperatively, epidural bupivacaine 0.0625% with morphine 0.5 mg was administered for analgesia. In conclusion, epidural anesthesia is suggested in selected patient with chronic renal failure and heart disease, which provided favorable results, without major perioperative complications, and reduced postoperative pain.

Keywords: Cardiovascular disease, epidural anesthesia, geriatric, renal failure



Published by:
Universitas Negeri Gorontalo

Mobile number:
+62852 3321 5280

Address:
Jend. Sudirman St. No.6, Gorontalo
City, Gorontalo, Indonesia

Email:
jmhsj@ung.ac.id

Article History:
Received 14 September 2026
Accepted 2 October 2026
Published 18 October 2026

DOI:
<https://doi.org/10.37905/jmhsj.v6i1.41521>

Introduction

Recently, there is an increasing trend of ureterolithotomy procedures. The selection of an appropriate anesthetic technique must be considered, especially in cases with cardiovascular comorbidities.¹ Heart failure is a prominent cardiovascular comorbidity that is frequently encountered.² The prevalence of heart failure in Southeast Asia is higher than in other countries, reaching 4.5–6.7% of the total population.³

In patients with cardiovascular disease, regional anesthetic techniques are beneficial perioperatively in reducing stress response and cardiac sympathetic activity, facilitating earlier extubation, shortening hospital stay, and providing good postoperative analgesia.⁴ In contrast, heart failure can complicate these procedures because it can increase postoperative mortality. The use of regional anesthetic techniques in patients with heart failure with low ejection fraction, including those with mitral regurgitation, can cause substantial hemodynamic effects, including a significant reduction in peripheral volume. Therefore, regional anesthetic techniques are commonly avoided in such cases. However, in this case report, we demonstrate that in a patient with comorbid heart failure and chronic renal failure due to ureteral stones, low-dose epidural anesthesia remains relatively hemodynamically safe and still provides an optimal anesthetic effect.

Case

A 69-year-old man diagnosed with right distal ureteral stones and severe right hydronephrosis presented with complaints of colic pain in the right flank region since one year prior and difficulty urinating. The patient had previously been examined at S Hospital and was told he had kidney stones in both the right and left kidneys. He had also been diagnosed with chronic renal failure (CRF) and had been undergoing dialysis since six months prior. He often complained of dyspnea on exertion. He had a prior hemodialysis session three days before procedure and did not receive any anticoagulation drug. He had no history of myocardial infarct, ischemic heart disease, or coronary evaluation before. He had a 10-year history of hypertension and had been taking amlodipine 10 mg once daily, ramipril 5 mg once daily, and bisoprolol 2.5 mg once daily for the past two years.

Initial physical examination during preoperative stage revealed blood pressure (BP) 130/90 mmHg, pulse 63 beats per minute, regular, body mass index of 22.04 kg/m², and axillary temperature 36.3°C. The auscultated heart sounds were within normal limits, with no additional heart sounds. The extremities were warm, no edema was found, and the interspinous space was palpable without any signs of infection. The patient had adequate preoperative volume status through parenteral replacement of fluid requirements eight hours preoperatively.

Laboratory examination showed a mild anemia (hemoglobin 9.2 g/dL), a hyperuremic state (blood urea nitrogen, BUN 35.3 mg/dL), and impaired kidney function (creatinine 5.7 mg/dL). His electrolyte levels were within normal limits (potassium 4.7 mmol/L, sodium 139 mmol/L). The preoperative electrocardiography (ECG) showed sinus rhythm without ST segment changes. The results of hemostatic function tests (PT/aPTT) were within normal limits. Echocardiography revealed left ventricular hypertrophy, reduced ejection fraction of 46%, hypokinesis of the anterior, anteroseptal, inferoseptal, and inferior segments, and minimal pericardial effusion. A collection measuring 0.8 cm inferior to the left ventricle was observed, along with mild mitral regurgitation.

Preoperative problems identified were geriatric status with impaired kidney function (CRF stage 5), cardiac abnormalities (congestive heart failure, CHF functional class II and mild mitral regurgitation), and anemia. Potential problems that could occur included hemodynamic instability, cardiac rhythm disturbances, and cardiac arrest.

The patient, with ASA physical status III, received pre-anesthesia preparation including insertion of an 18 G intravenous line with a three-way stopcock connected to Ringer's lactate at 20 dpm. The epidural anesthesia technique was initiated with administration of fentanyl 25 mcg and ondansetron 4 mg through intravenous as premedication. For anesthesia, plain bupivacaine 0.375% 12 mL as a single bolus was injected via an epidural catheter placed at L3-4. The total block height reached the T4 level, and no additional anesthetic drugs were administered during the surgery. The incision was made at the T12 level 16 minutes after anesthesia.

During surgery, hemodynamic fluctuations were observed, with BP 92–131/57–80 mmHg, pulse 62–88 bpm, respiratory rate 16–18 tpm, and SpO₂ 98–99% with oxygen via nasal cannula at 3 L/min. A period of hypotension occurred during the first 15–30 minutes of the ureterolithotomy procedure, but was adequately managed with intravenous administration of 200 mL crystalloid solution, considering that the mean arterial pressure (MAP) was still adequate. The operation lasted 70 minutes, with an estimated blood loss of 50 mL.

Postoperatively, epidural bupivacaine 0.0625% in combination with morphine 0.5 mg and oral paracetamol 500 mg every six hours were administered for analgesia. There were no intraoperative or postoperative complications. He was then moved to the intermediate care room. The aforementioned analgesic was maintained and no complaints were reported during treatment. The patient was discharged after three days of care.

Discussion

Chronic renal failure is characterized by a reduction in glomerular filtration rate to below 60 mL/min/1.73 m², albuminuria over 30 mg/24 hours, or persisting indicators of kidney impairment lasting for three months. Early detection at first-level health facilities is needed because advanced CRF can cause end-stage renal disease, heart problems, and even death. Management of CRF includes reducing the risk of heart problems, treating albuminuria, reducing the potential risk of nephrotoxins, and adjusting other medications the patient is taking. Patients require surveillance for consequences associated with CRF, including hyperkalemia, metabolic acidosis, anemia, and various metabolic abnormalities.⁵

Heart failure refers to a deviation in cardiac structure or function that leads to the heart's inability to deliver oxygen to the body. Standard indicators of heart failure consist of breathlessness at rest or during exertion, fatigue, and edema in the lower extremities. The clinical evaluation shows tachycardia, tachypnea, unintentional lung sounds, pleural effusion, heightened jugular venous pressure, peripheral swelling, and hepatomegaly.⁶

Identifying heart failure in its initial phases is slightly difficult due to the subtle and unusual symptoms, necessitating additional examinations. Examinations that may be conducted include ECG, chest radiography, and echocardiography. Irregularities detected on an ECG involve arrhythmias, ischemic conditions, and left ventricular hypertrophy. Chest X-rays can identify cardiomegaly, pulmonary congestion, pleural effusion, and parenchymal lung diseases or infections that cause or exacerbate dyspnea. Echocardiography is crucial for diagnosing heart failure with preserved ejection fraction. The diagnosis requires fulfillment of three criteria: the manifestation of signs and/or symptoms indicative of heart failure, normal or marginally compromised left ventricular systolic function (ejection fraction >45–50%), evidence of diastolic dysfunction (abnormal left ventricular relaxation or diastolic stiffness), and increased levels of natriuretic peptides.^{6,7}

From the anamnesis, the patient was also diagnosed with CRF on hemodialysis. Patients with CRF are susceptible to acid–base disturbances, electrolyte disturbances, and homeostatic disturbances. Surgery and anesthesia have a major influence on kidney function. Fluid overload, hypovolemia, and the occurrence of renal failure post-surgery are significant contributors to postoperative complications and mortality.⁸

Optimal fluid regulation is crucial in the treatment of individuals with chronic renal insufficiency, regardless of hemodialysis status. To optimize patients who will undergo major surgery, dialysis should be performed on the day of surgery. The longer the interval between dialysis and surgery, the greater the risk of fluid overload, acidemia, and hyperkalemia.

Dialysis is usually scheduled 12–24 hours before surgery. If major surgery is scheduled on the same day as dialysis, a minimum gap of four hours should be allowed between the end of dialysis and surgery to allow the anticoagulation effect to dissipate.⁹

Perioperative assessment of patients with heart failure aims to assess disease severity and myocardial contractility. Indicators of the severity of heart failure can be assessed from limitations in activity, orthopnea, and paroxysmal nocturnal dyspnea. As in this case, patients with mild to moderate heart failure usually take beta-blocker drugs that function to control the pulse but can block sympathetic nerve activity, thereby reducing cardiac contractility.¹⁰

In this case, the surgical procedure performed was open ureterolithotomy. Indications for this procedure are complex stone composition and location, failure of extracorporeal shock wave lithotripsy (ESWL) or ureterorenoscopy (URS) therapy, intrarenal anatomic abnormalities (infundibular stenosis, strictures, obstruction at the ureteropelvic junction), morbid obesity, and skeletal deformities.¹

In ureterolithotomy surgery, general anesthesia is recommended over regional anesthesia because the patient's position can cause discomfort and pain due to diaphragmatic stimulation. However, in this case, because the patient has heart failure, regional anesthesia is preferred because hemodynamics are more stable and postoperative pain is lower.^{1,11}

The choice of epidural anesthetic technique in heart failure patients must consider several side effects, namely hypotension resulting from uncontrolled sympathetic blockade and the need for volume loading, which can cause ischemia. This can be controlled by administering low doses of epidural anesthesia because large doses can cause toxicity and myocardial depression.¹²

Regional anesthesia is usually the choice for geriatric patients because it has several advantages, such as faster postoperative mobilization and intraoperative hemodynamic stabilization. Epidural anesthesia is a neuraxial anesthetic with a segmental block, in which a decrease in systemic venous resistance occurs gradually, thereby maintaining hemodynamic stability.¹³

In this case, an epidural catheter was placed at the level of T11–T12 with a catheter length in the epidural space of 4 cm; the target dermatome was T11–L2, viscerotome T11–L2, with a regimen of plain bupivacaine 0.375%, volume 12 mL. Bupivacaine is a local anesthetic drug that is widely used and has a long duration of action. Bupivacaine is toxic to the heart when given in large doses. When given at therapeutic doses, only minimal cardiac changes occur. Nevertheless, elevated hazardous levels in the bloodstream might impair cardiac conduction and excitability, potentially resulting in atrioventricular block, ventricular

arrhythmias, and cardiac arrest. Moreover, there may be a reduction in myocardial contractility and peripheral vasodilation, leading to diminished cardiac output and arterial blood pressure.¹⁴

During the surgical procedure, hemodynamic variations were observed while oxygen was administered through a nasal cannula at a rate of 3 L/min. Such hypotensive and bradycardic episodes often result from extensive sympathetic blockade, which reduces cardiac preload. Bradycardia can be managed with atropine, whereas hypotension can be treated with a fluid bolus of 10–20 mL/kg of body weight (BW) in patients without underlying cardiac dysfunction. However, rapid, high-volume fluid resuscitation must be avoided in patients with heart failure; instead, restricted crystalloid administration at a slower rate is preferable. In these cases, fluid challenges can be given in increments of up to 250 mL, guided by continuous hemodynamic monitoring and clinical response assessment after each bolus.^{15,16}

Vasopressors are often needed to return blood pressure to levels close to baseline. Significant hypotension can be corrected rapidly by giving an alpha-receptor agonist, namely phenylephrine 40 to 100 mcg, or a sympathomimetic beta- and alpha-agonist, namely ephedrine 5 to 10 mg in repeated doses as needed.¹⁷

After surgery, epidural bupivacaine 0.0625% with morphine 0.5 mg and oral paracetamol 500 mg every six hours were administered for analgesia. Various supplementary medications have been utilized for the epidural administration of local anesthetic solutions, primarily to enhance the efficacy and longevity of the epidural blockade and for postoperative pain relief, or to decrease the volume of local anesthetic injected to mitigate the scope and impact of the sympathetic block.¹⁶

The influence of epidural anesthesia on heart performance is contingent upon the degree of sympathetic blocking. The stronger the blockade level, the more significant the impact. The hemodynamic alterations associated with a low block are negligible; thus, this method can be executed in most individuals with cardiac conditions. Frequently, the sympathetic blockade manifests at levels substantially superior to the sensory and motor levels. Notwithstanding comprehensive sympathectomy resulting from local anesthetic, hemodynamic alterations emerge at a more gradual and regulated pace.¹⁸

The main goal perioperatively in patients with cardiac disorders is to prevent ischemia by maintaining the distribution and consumption of oxygen throughout the body. Epidural anesthesia can reduce pain, reduce the stress response during surgery, dilate coronary arteries, and allow the use of low doses of anesthetics and analgesics, thereby reducing myocardial damage.^{12,16,19} This case report has main limitations. Strict blood pressure monitoring via intra-arterial blood pressure measurement was not performed, which ideally should have been done

in this case.

Conclusion

Anesthetic management in patients with cardiovascular comorbidities requires a solid understanding of physiology and pharmacology. In this case of CRF secondary to complicated ureterolithiasis, an epidural anesthetic technique was selected because it offered several advantages for this patient population. In this selected case, the technique yielded favorable results without major perioperative complications and mitigated postoperative pain.

Conflict of interest

The authors had no competing interest to declare.

Informed consent

Written informed consent was obtained from the patient for publication of this case report.

Funding source

The authors had no received any financial source during reporting following case.

Acknowledgments

Nothing to declare.

References

1. Glazer K, Vaitla P, Brea JJ. Ureterolithiasis. StatPearls Publishing; 2021.
2. Inamdar AA, Inamdar AC. Heart Failure: Diagnosis, Management and Utilization. *J Clin Med*. 2016; 5(7):62.
3. Lam C. Heart failure in Southeast Asia: facts and numbers: HF in Southeast Asia. *ESC Heart Fail*. 2015; 2(2):46-9.
4. Koyyalamudi Veerandra, Asgarian CD, Kraus M, Tran L. Regional Anesthesia and Cardiovascular Disease. In: *Essentials of Regional Anesthesia*; 2018. p. 529–40.
5. Chen TK, Knicely DH, Grams ME. Chronic Kidney Disease Diagnosis and Management. *JAMA*. 2019;322(13):1294–304.
6. Perhimpunan Dokter Spesialis Kardiovaskular Indonesia. *Pedoman Tatalaksana Gagal Jantung*. 2nd ed. PP PERKI; 2020.
7. Kenyon CR, Van Wyk L, Flom A, Ibrahim R, Pham HN, Lakhdar S, et al. Advances in Diagnosis and Treatment of Acute and Chronic Heart Failure: A Comprehensive Review. *J Clin Med*. 2026;15(2):618.
8. Saran S, Kharat A, Reddy GHV, Madhavan B, Bhattacharjee A, Thomas MP. Anaesthesia Challenges in Patients With Chronic Kidney Disease: A Clinical Approach From Internal Medicine. *Cureus*. 2025;17(9):e91694.

9. Perioperative Management of the Patient With Chronic Renal Failure: Overview, Preparation, Post-Procedure. 2021 [cited 2022 Jan 16]; Available from: <https://emedicine.medscape.com/article/284555-overview>
10. Bill KM. Anaesthesia for patients with cardiac disease undergoing non-cardiac surgery. *Anaesth Intensive Care Med.* 2018;19(6):292–7.
11. Kwon O, Lee J-M, Park J, Cho MC, Son H, Jeong H, et al. Influence of anesthesia methods on surgical outcomes and renal function in retrograde intrarenal stone surgery: a prospective, randomized controlled study. *BMC Anesthesiol.* 2019;19(1):239.
12. Dias RSG, Soares JHN, Castro DdSe, Gress MAKdA, Machado ML, Otero PE, et al. Cardiovascular and respiratory effects of lumbosacral epidural bupivacaine in isoflurane-anesthetized dogs: The effects of two volumes of 0.25% solution. *PLoS ONE.* 2018;13(4):e0195867.
13. Elfeky MA, Stohy ASM, Sabra MM, Mahareak AA, Alkumity AA. Randomized comparison of continuous spinal anesthesia versus continuous epidural anesthesia in high-risk elderly patients undergoing major orthopedic lower limb surgeries. *Res Opin Anesth Intensive Care.* 2019;6:72–9.
14. Qadri F, Stephenson K, Akula RS. Bupivacaine Induced Cardiac Toxicity Mimicking An Acute Non-ST Segment Elevation Myocardial. *Ann Cardiol Vasc Med.* 2022;5(2):1064.
15. Wink J, Veering BT, Aarts LPHJ, Wouters PF. Effects of Thoracic Epidural Anesthesia on Neuronal Cardiac Regulation and Cardiac Function. *Anesthesiology.* 2019;130(3):472–91.
16. Shaheen M, Sardar K, Chowdhury A. Ejection Fraction <35% - Anaesthetic Experience of 236 Cases: A Retrospective Study. *Anwer Khan Mod Med Coll J.* 2018;9(2):114–20.
17. Nurcahyo WI. Anestesi Regional pada Pasien dengan Penyakit Jantung/Hemodinamik Tidak Stabil. *J Anesthesiol Indones.* 2019;11(1):48–57.
18. Amin SM, Sadek SF. Continuous spinal anesthesia for elderly patients with cardiomyopathy undergoing lower abdominal surgeries. *Egypt J Anaesth.* 2016;32(4):535–40.
19. Landoni G, Isella F, Greco M, Zangrillo A, Royse CF. Benefits and risks of epidural analgesia in cardiac surgery. *BJA Br J Anaesth.* 2015;115(1):25–32.