

Available online on 15.09.2026 at <http://jddtonline.info>

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

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Case Report

Awake Bipolar Hemiarthroplasty Under Combined Posterior Lumbar Plexus and Subgluteal Sciatic Nerve Blocks in a Patient with True Severe Low-Flow Low-Gradient Aortic Stenosis and End-Stage Ischemic Cardiomyopathy: A Case Report

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Article Info:

Abstract



Article History:

Received 25 June 2026

Reviewed 02 Aug 2026

Accepted 26 Aug 2026

Published 15 Sep 2026

Cite this article as:

Ali ME, ALakkad A, Awake Bipolar Hemiarthroplasty Under Combined Posterior Lumbar Plexus and Subgluteal Sciatic Nerve Blocks in a Patient with True Severe Low-Flow Low-Gradient Aortic Stenosis and End-Stage Ischemic Cardiomyopathy: A Case Report, Journal of Drug Delivery and Therapeutics. 2026; 16(9):1-7 DOI: <https://doi.org/10.22270/jddt.v16i9.7985>

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Background: Hip fracture surgery in patients with severe aortic stenosis and advanced heart failure presents a major anesthetic challenge. General anesthesia may cause myocardial depression and hemodynamic instability, while neuraxial anesthesia carries the risk of sympathectomy-induced hypotension. Peripheral nerve blocks may offer a safer alternative in selected high-risk patients.

Case Presentation: A 74-year-old man with severe ischemic cardiomyopathy (ejection fraction 21%), true severe low-flow low-gradient aortic stenosis, moderate pulmonary hypertension, chronic atrial fibrillation with CRT-D, chronic kidney disease, and recent urosepsis required urgent bipolar hemiarthroplasty. After multidisciplinary optimization, surgery was performed under combined posterior lumbar plexus and subgluteal sciatic nerve blocks. The patient remained fully awake without sedation. Invasive monitoring was established, and a low-dose norepinephrine infusion (80-240 µg/h) maintained hemodynamic stability. The procedure lasted approximately four hours with blood loss <700 mL. Blood pressure remained stable around 100/60 mmHg and heart rate between 60-85 beats/min under CRT-D pacing.

Conclusion: Combined posterior lumbar plexus and sciatic nerve blocks may provide a valuable anesthetic option for selected patients with severe low-flow low-gradient aortic stenosis and advanced heart failure undergoing urgent hip fracture surgery, allowing avoidance of both general anesthesia and neuraxial sympathectomy while preserving hemodynamic stability.

Keywords: aortic valve stenosis, hemiarthroplasty, high risk surgical patients, hip fractures, ischemic cardiomyopathy, low flow low gradient aortic stenosis, lumbar plexus block, regional anesthesia, sciatic nerve block, systolic heart failure

Introduction

Hip fractures carry substantial morbidity and mortality in elderly patients with advanced cardiovascular disease. The anesthetic management of patients with severe aortic stenosis is particularly challenging because maintaining preload, afterload, coronary perfusion pressure, and stable rhythm is essential for hemodynamic stability ^{1,2}. Patients with true severe low-flow low-gradient aortic stenosis and markedly reduced left ventricular ejection fraction represent an especially high-risk subgroup in whom even modest reductions in systemic vascular resistance may precipitate myocardial ischemia or circulatory collapse ^{1,2}.

Both general anesthesia and neuraxial

anesthesia pose significant risks in this population. General anesthesia may induce myocardial depression, vasodilation, and the need for positive-pressure ventilation, all of which can compromise cardiac output ^{1,2}. Neuraxial anesthesia may trigger abrupt sympathectomy and profound hypotension, making it unsuitable for many patients with critical valvular disease ³.

Regional anesthesia techniques that avoid sympathectomy and minimize myocardial depression have therefore gained interest as safer alternatives in selected high-risk cardiac patients ^{4,5,6}. Lumbar plexus block provides reliable anesthesia for hip surgery by targeting the femoral, obturator, and lateral femoral cutaneous nerves ^{7,8}, while the sciatic nerve

block supplements posterior hip innervation and improves surgical conditions⁹. When combined with vigilant hemodynamic monitoring and proactive vasopressor support, these techniques may allow urgent hip fracture surgery to proceed safely in patients who are otherwise poor candidates for general or neuraxial anesthesia^{5,10}.

We report the successful use of combined posterior lumbar plexus and subgluteal sciatic nerve blocks as the sole anesthetic technique for urgent bipolar hemiarthroplasty in a patient with true severe low-flow low-gradient aortic stenosis, severe ischemic cardiomyopathy, chronic atrial fibrillation, and recent sepsis.

Case Presentation

A 74-year-old Palestinian male weighing 100 kg (BMI 34 kg/m²) was admitted with a displaced femoral neck fracture requiring urgent bipolar hemiarthroplasty. His medical history included hypertension, type 2 diabetes mellitus, chronic kidney disease, ischemic heart disease, coronary artery bypass grafting in 2006, chronic atrial fibrillation, cardiac resynchronization therapy-defibrillator (CRT-D), chronic suprapubic catheter, recurrent urinary tract infections, and

recent urosepsis.

He required intensive care unit admission for three days due to sepsis-related deterioration and atrial fibrillation with rapid ventricular response requiring rate control with amiodarone infusion. Laboratory investigations showed hemoglobin 11.1 g/dL, platelet count $213 \times 10^3/\mu\text{L}$, INR 0.93, and creatinine 155 $\mu\text{mol/L}$.

Preoperative transthoracic echocardiography demonstrated a dilated left ventricle with severe global systolic dysfunction and an ejection fraction of 21%. Findings were consistent with severe ischemic cardiomyopathy and true severe low-flow low-gradient aortic stenosis, with an aortic valve area of 0.78 cm², dimensionless index of 0.22, and mean gradient of 36 mmHg. Additional findings included moderate pulmonary hypertension (PASP 51 mmHg), moderate mitral regurgitation, moderate tricuspid regurgitation, and preserved right ventricular systolic function (Figures 1-6). The preoperative electrocardiogram showed sinus rhythm with nonspecific intraventricular conduction delay and anterior ST-segment depression (Figure 7). Given the high anesthetic risk, peripheral nerve blocks were selected as the primary anesthetic technique.

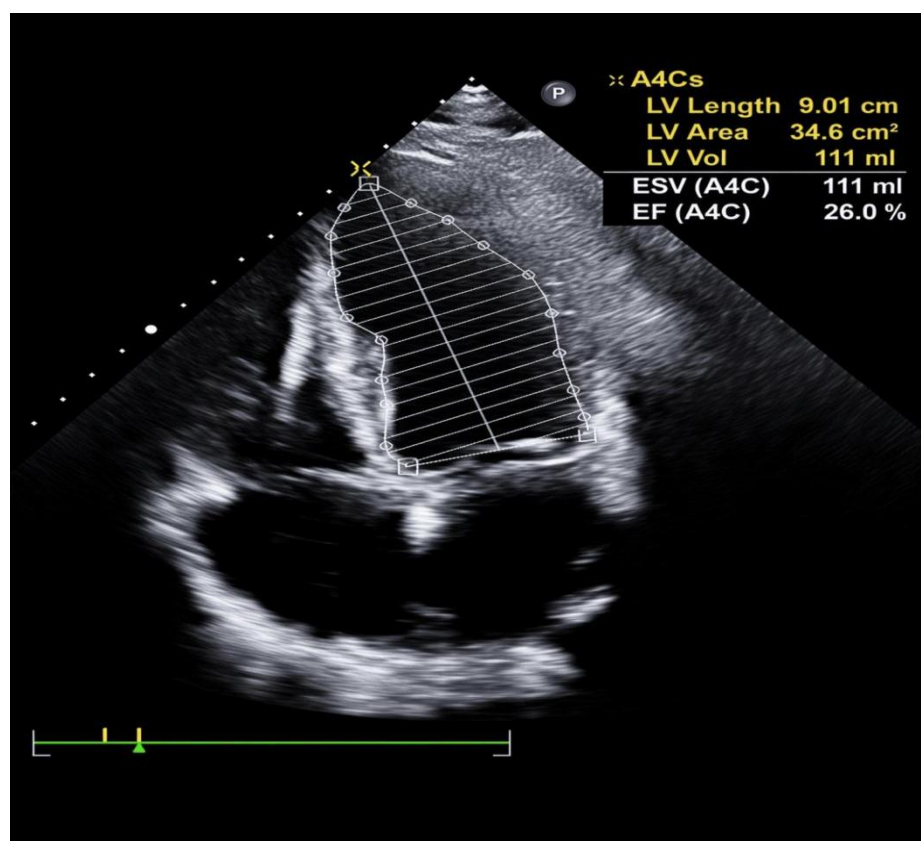


FIGURE 1: Apical 4-chamber view (end-systole) with LV endocardial tracing.

LV length 9.01 cm, LV area 34.6 cm², end-systolic volume 111 ml, ejection fraction 26%. Demonstrates dilated left ventricle with severely reduced systolic function.



FIGURE 3: Zoomed view of the aortic valve.

Heavily calcified aortic valve leaflets with reduced opening, consistent with severe calcific aortic stenosis.

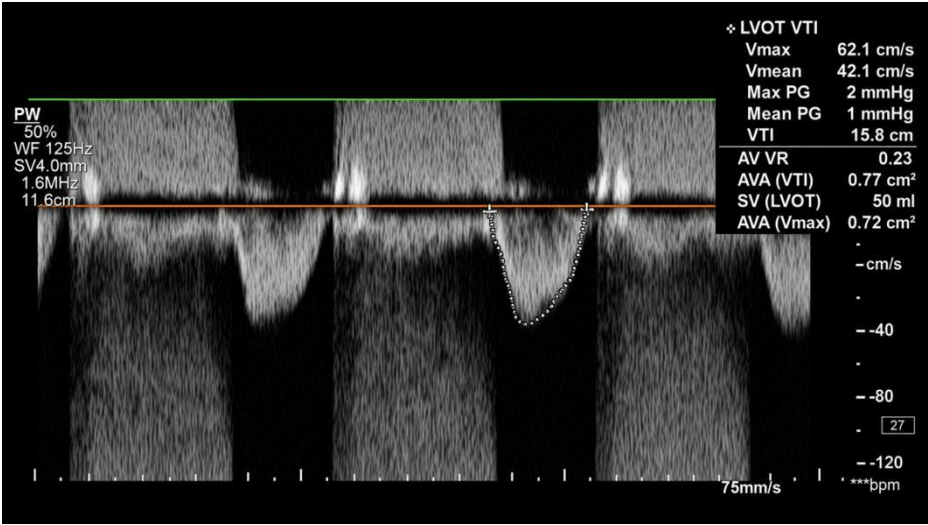


FIGURE 4: Pulsed-wave Doppler of the left ventricular outflow tract (LVOT VTI).

Vmax 62.1 cm/s, Vmean 42.1 cm/s, Max PG 2 mmHg, Mean PG 1 mmHg, VTI 15.8 cm, stroke volume (LVOT) 50 ml, AV velocity ratio 0.23, AVA (VTI) 0.77 cm², AVA (Vmax) 0.72 cm². Used for calculation of stroke volume and aortic valve area.

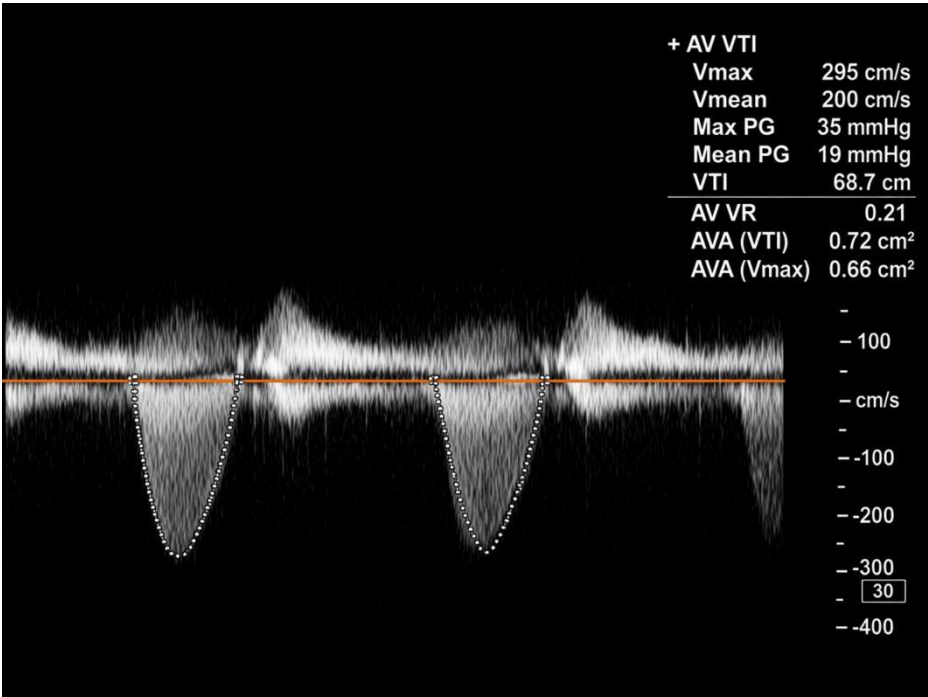


FIGURE 5: Continuous-wave Doppler across the aortic valve (AV VTI).

Vmax 295 cm/s, Vmean 200 cm/s, Max PG 35 mmHg, Mean PG 19 mmHg, VTI 68.7 cm, AV velocity ratio 0.21, AVA (VTI) 0.72 cm², AVA (Vmax) 0.66 cm². Consistent with low-flow, low-gradient severe aortic stenosis.

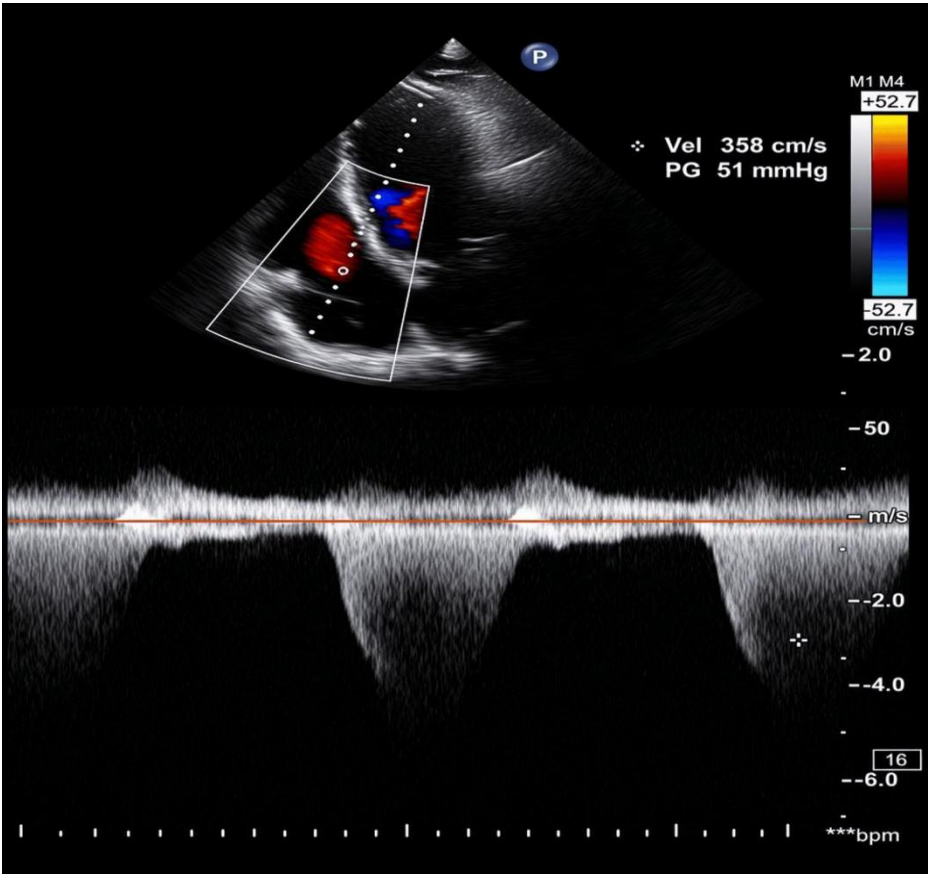


FIGURE 6: Color-flow and continuous-wave Doppler of the aortic valve.

. Peak velocity 358 cm/s, peak gradient 51 mmHg. Demonstrates high-velocity turbulent jet across the stenotic aortic valve.

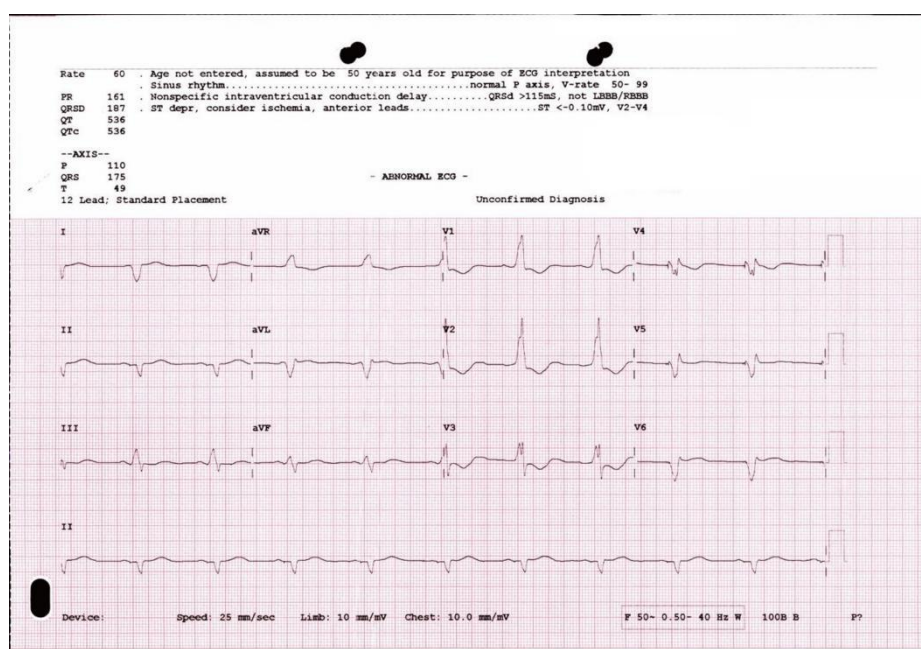


FIGURE 7: . Preoperative 12-lead electrocardiogram.

Sinus rhythm at 60 bpm, PR 161 ms, QRS duration 187 ms (nonspecific intraventricular conduction delay), QTc 536 ms. ST-segment depression in anterior leads (V2–V4).

Before block placement, a radial arterial catheter and central venous catheter were inserted under local anesthesia. Blood products were crossmatched and immediately available. A posterior lumbar plexus block was performed using combined ultrasound and nerve stimulator guidance, with 30 mL of 0.3% bupivacaine administered after confirming correct needle placement. A subgluteal sciatic nerve block was subsequently performed using ultrasound and nerve stimulator guidance with 10 mL of 2% lidocaine containing epinephrine.

The patient remained fully awake and cooperative without sedation. Bipolar hemiarthroplasty was completed successfully over approximately four hours, with estimated blood loss <700 mL. A norepinephrine infusion (80–240 µg/h) was used to maintain systemic vascular resistance and coronary perfusion.

Hemodynamic parameters remained stable throughout the procedure, with arterial blood pressure maintained around 100/60 mmHg and heart rate between 60–85 beats/min under CRT-D pacing.

Postoperatively, the patient was transferred to the intensive care unit, where he remained awake, pain-free, and hemodynamically stable. His postoperative course was uneventful, and he stayed in the ICU for two days before further recovery.

Discussion

Patients with true severe low-flow low-gradient aortic stenosis and markedly reduced left ventricular ejection fraction represent one of the highest-risk groups undergoing noncardiac surgery. Their hemodynamic stability depends on preserved preload, adequate systemic vascular resistance, and maintenance of coronary perfusion pressure. Even modest reductions in afterload or myocardial depression may precipitate ischemia, ventricular failure, or circulatory collapse ^{1,2}. Hip fracture surgery further increases risk because it is urgent, physiologically stressful, and often performed in elderly patients with multiple comorbidities.

General anesthesia is frequently avoided in such patients because induction agents, volatile anesthetics, and positive-pressure ventilation can reduce myocardial contractility and systemic vascular resistance ^{1,2}.

Neuraxial anesthesia, although commonly used for hip fracture surgery, may produce abrupt sympathectomy and profound hypotension, making it unsuitable for patients with critical aortic stenosis ⁸. These limitations have led to increasing interest in regional anesthesia techniques that preserve sympathetic tone and minimize myocardial depression ^{3,7,9}.

The combined posterior lumbar plexus and subgluteal sciatic nerve block used in this case provided complete surgical anesthesia while

avoiding the hemodynamic consequences associated with both general and neuraxial anesthesia. The lumbar plexus block reliably anesthetizes the femoral, obturator, and lateral femoral cutaneous nerves, offering effective coverage for hip surgery ^{4,5}. The sciatic nerve block supplements posterior hip innervation and improves surgical conditions, particularly for hemiarthroplasty ⁶. Together, these blocks can provide dense anesthesia without compromising sympathetic tone.

A key component of the anesthetic strategy was proactive hemodynamic management. Invasive arterial pressure monitoring and central venous access allowed continuous assessment of perfusion and volume status. Low-dose norepinephrine infusion maintained systemic vascular resistance and coronary perfusion, preventing hypotension and myocardial ischemia. This approach aligns with evidence showing that regional anesthesia combined with vigilant hemodynamic support can improve perioperative outcomes in high-risk cardiac patients undergoing orthopedic surgery [7,9,10].

The successful completion of a four-hour bipolar hemiarthroplasty without sedation, hemodynamic instability, or postoperative cardiovascular complications demonstrates the feasibility of this technique in carefully selected patients. Although this approach is not appropriate for all individuals with severe aortic stenosis, it may be considered when general and neuraxial anesthesia pose prohibitive risks and when expertise in advanced regional anesthesia is available.

Conclusions

Combined posterior lumbar plexus and subgluteal sciatic nerve blocks can provide a safe and effective anesthetic option for selected patients with true severe low-flow low-gradient aortic stenosis and advanced systolic heart failure undergoing urgent hip fracture surgery. By avoiding the myocardial depression associated with general anesthesia and the profound sympathectomy of neuraxial techniques, this regional approach preserves systemic vascular resistance and coronary perfusion. When combined with meticulous preoperative optimization, invasive monitoring, and proactive vasopressor support, it may allow high-risk cardiac patients to undergo major orthopedic procedures with greater hemodynamic stability and a more favorable perioperative course.

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Ashraf ALakkad

Acquisition, analysis, or interpretation of data: Ashraf ALakkad, Mohammad Eid Ali

Drafting of the manuscript: Ashraf ALakkad, Mohammad Eid Ali

Critical review of the manuscript for important intellectual content: Ashraf ALakkad, Mohammad Eid Ali

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form.

Funding: All authors have declared that no financial support was received from any organization for the submitted work.

Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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