

Case Report

Laminectomy Under Spinal Anesthesia in a Patient with Chronic Obstructive Pulmonary Disease: A Case Report

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Article history:

Received: April 19, 2025

Revised: July 27, 2025

Accepted: August 3, 2025

ePublished: September 25, 2025

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Abstract

Background: Lumbar laminectomy is frequently performed to alleviate spinal cord compression caused by herniated lumbar discs. Selecting the most appropriate anesthetic technique is vital, particularly in patients with coexisting conditions, including chronic obstructive pulmonary disease (COPD). For individuals at elevated risk of pulmonary complications, spinal anesthesia (SA) may offer advantages over general anesthesia (GA). This report explored the outcomes and safety of SA in a patient diagnosed with COPD undergoing lumbar decompression surgery.

Case Presentation: A 32-year-old male with a body mass index of 23 kg/m² underwent L4-L5 laminectomy due to persistent, severe radicular pain in his left leg unresponsive to conservative treatment. His medical history included significant tobacco use and a diagnosis of COPD, raising concerns about potential respiratory complications associated with GA. Consequently, SA was selected. The procedure was performed successfully with no intraoperative complications, and the patient was discharged 48 hours post-surgery with stable respiratory function. At a two-week follow-up, he reported complete resolution of pain and improvement in neurological function.

Conclusion: In patients with COPD, SA during laminectomy can maintain spontaneous respiration, lower the risk of pulmonary issues, and promote faster postoperative recovery. Nevertheless, vigilant intraoperative monitoring of hemodynamics and oxygenation remains essential. While this case supports the use of SA in such scenarios, broader studies are necessary to validate these findings.

Keywords: Laminectomy, Lumbar disc herniation, Spinal anesthesia, General anesthesia, Chronic obstructive pulmonary disease, Case report

Please cite this article as follows: Mousavi N, Hajilo P, Imani B. Laminectomy under spinal anesthesia in a patient with chronic obstructive pulmonary disease: a case report. *Avicenna J Care Health Oper Room*. 2025;3(2):80-84. doi:[10.34172/ajchor.95](https://doi.org/10.34172/ajchor.95)

Introduction

Laminectomy is a frequently performed surgical intervention aimed at alleviating pressure on the spinal cord and nerves in the lumbar area. Traditionally, the procedure entails excising the lamina and spinous process up to the medial edge of the facet joint at the affected spinal level. The first documented lumbar laminectomy was performed in 1814 by Henry Klein via an open approach, marking a key milestone in spinal decompression surgery (1). Today, laminectomy continues to be one of the primary surgical treatments for lumbar spinal stenosis (2). Lumbar spine surgeries may be conducted under either general anesthesia (GA) or spinal anesthesia (SA), each presenting distinct benefits and drawbacks. GA is often the default choice due to its longer anesthetic duration, secured airway in prone positioning, and broader patient acceptance. However, modern anesthetic protocols increasingly acknowledge the efficacy of SA as

a valid alternative (3). SA has been linked with shorter operative times, reduced anesthetic requirements, faster recovery, minimal blood loss, and a lower frequency of postoperative nausea and vomiting. Nonetheless, limited case series have explored the use of SA in more complex lumbar procedures, such as spine fusion surgeries. These studies primarily evaluated intraoperative metrics, complication rates, recovery duration, postoperative discomfort, hospital stay, and overall costs (4). Chronic obstructive pulmonary disease (COPD) is a progressive, inflammatory disorder characterized by persistent airflow limitation that is only partially reversible (5). As the third leading cause of death globally, COPD is a significant contributor to morbidity and mortality and poses growing concerns in global health (6).

Although the theoretical benefits of SA in COPD patients undergoing lumbar spine surgeries are recognized, there is a notable gap in the literature regarding its application



specifically in laminectomy procedures for this high-risk group. Limited data exist on the safety and efficacy of SA in COPD patients undergoing laminectomy, with most studies focusing on less complex surgeries or broader spine interventions (7).

This case report aims to address this gap by presenting the successful use of SA in a young COPD patient with severe radicular symptoms undergoing laminectomy. To the best of our knowledge, this is among the first reports highlighting the feasibility and benefits of SA in such a clinical context.

In the context of spinal surgery, SA offers multiple advantages for COPD patients. It allows for spontaneous respiration, minimizes intraoperative blood loss, lowers the risk of thromboembolism and pulmonary issues, and reduces the chances of postoperative cognitive decline. Additionally, SA helps avoid pressure-related injuries, such as brachial plexus damage and facial pressure ulcers, often associated with the prone position (8). In elderly COPD patients, perioperative respiratory challenges are amplified by diminished pulmonary reserves, surgical stress, and residual anesthetics, increasing the risk of complications like bronchospasm, hypoxemia, extubation difficulties, and cardiovascular instability (9). For those with significant cardiovascular risks, SA is often considered a safer option, promoting greater hemodynamic stability during procedures (3). Moreover, various meta-analyses and preclinical studies have supported the use of regional anesthesia (epidural or spinal) over GA in COPD patients to minimize the incidence of postoperative respiratory complications and reduce dependence on extended mechanical ventilation (10).

Case Presentation

A 32-year-old man with a body mass index of 23 kg/m² presented with radiating pain localized to the left lower limb. He reported no prior lumbar surgeries but noted a history of chronic lower back discomfort over the preceding year, which had been manageable through conservative therapies, such as medication and physiotherapy. Nonetheless, earlier this year, the pain re-emerged suddenly following physical exertion and persisted thereafter. After enduring two weeks of severe pain, he sought clinical evaluation. Physical examination revealed a positive straight leg raise (Lasegue) test, accompanied by newly developed neurological signs, including right-sided muscle weakness graded at 4/5. The Lasegue test elicited symptoms at a 30-degree angle, and passive stretching of the left leg resulted in an approximate 40% decrease in strength. The patient also rated his pain intensity as 9 out of 10 on the visual analog scale, indicative of severe and disabling discomfort.

Magnetic resonance imaging scans confirmed a left-sided herniated disc at the L4–L5 level with moderate-to-severe herniation grade and significant compression of the left nerve root, consistent with the patient's symptoms of nerve root irritation and radiculopathy. These findings

justified the urgency of surgical intervention.

Despite the initial recommendation for surgery, the patient opted to delay operative intervention and underwent a six-week course of non-surgical management. This included a regimen of anti-inflammatory drugs, physical therapy, and localized injection treatments. During this time, he participated in ten physiotherapy sessions involving therapeutic exercises, electrotherapy, ultrasound, and massage therapy. Pharmacological management included agents such as methylprednisolone, ketorolac, gabapentin, and meloxicam.

Despite these interventions, his symptoms showed minimal improvement, and the pain continued to significantly hinder his daily life. As a result, the decision was made to proceed with surgical decompression.

Preoperative evaluations, including pulmonary function tests, revealed a forced expiratory volume in 1 second/forced vital capacity ratio of 60%, indicating moderate COPD. The patient also had a history of heavy smoking, which increased his risk profile for GA. To mitigate respiratory risks, SA was selected for the procedure. The SA protocol involved the administration of 3 mL of 0.5% bupivacaine using a 27G Whitacre spinal needle. Intraoperative monitoring included continuous measurement of oxygen saturation, blood pressure, heart rate, and level of consciousness.

On the day of surgery, the patient was placed in the prone position on the operating table with only the lumbar section adjusted to optimize surgical access, without using any bolsters. Intraoperative sedation was provided to keep the patient relaxed. A 5 cm midline lumbar incision was made, and unilateral paraspinal muscle retraction was performed using a self-retaining retractor. A left-sided discectomy was then performed, with the removal of herniated disc fragments. The surgical site was closed in layers, including muscle and skin.

The postoperative course was uneventful. The patient remained under observation for 48 hours and was subsequently discharged. Two weeks later, he returned for follow-up and suture removal. At that time, his visual analog scale pain score had fallen to zero, and the Lasegue test was negative, indicating full symptom resolution and functional recovery. These outcomes were especially notable given the severity of his preoperative condition and his underlying pulmonary disease.

Discussion

This case report focused on a 32-year-old male diagnosed with an L4–L5 disc herniation who underwent a left-sided unilateral discectomy due to severe radicular pain in his left lower limb. The case underscores the critical role of accurate diagnosis—as emphasized by Bydon et al—and timely intervention in managing lumbar disc herniation in patients presenting with radicular symptoms (2). A substantial body of literature supports the use of SA across various surgical disciplines. According to Abderazek and Gardener, SA is particularly beneficial

for patients with high surgical risk profiles. Advances in regional anesthesia techniques have notably improved intraoperative precision and postoperative outcomes (11). For example, Torabi et al demonstrated that SA can significantly reduce intraoperative blood loss and limit the need for transfusion benefits, especially valuable for patients with clotting disorders (12). Similarly, research by Sung et al in orthopedic contexts showed that SA contributes to lower postoperative pain scores, shorter hospital stays, and accelerated recovery timelines (13). Additionally, a study by Graetz et al reported that the use of SA in abdominal surgeries correlates with decreased postoperative opioid requirements, which in turn reduces complications such as respiratory depression and constipation (14). Federico et al concluded that patients undergoing urological surgeries under SA experienced better pain relief and fewer adverse effects compared to those receiving GA (15). From a safety perspective, Shokouhi et al found that SA is associated with a lower incidence of postoperative cardiovascular complications, making it a more favorable option for elderly patients and those with underlying cardiac conditions (16). The use of SA has considerably increased in recent years and is now commonly employed in various surgical fields, including obstetrics, orthopedics, vascular surgery, general surgery, and urology. Among its many benefits, SA has been linked to improved physiological outcomes, including enhanced cardiac, pulmonary, and gastrointestinal functions (17). It also reduces the risk of surgical site infections and the need for intensive postoperative monitoring (18). Notably, the sympathetic blockade associated with SA contributes to decreased gastrointestinal inhibition and increased intestinal perfusion, an important consideration in surgeries such as colonic anastomosis (19).

In a comparative analysis of this case's findings with those of studies performed by Muzien and Dos Santos, SA shows significant advantages in spinal surgeries, including reduced risks associated with GA and improved postoperative pain control (3, 20). However, according to these studies, SA may not be suitable for all COPD patients, due to the potential for hemodynamic instability, which poses increased risks for this population (21). In this particular case, SA was chosen considering the patient's COPD history and a careful risk-benefit assessment; fortunately, SA was administered without serious hemodynamic complications. Nonetheless, it is important to emphasize that in COPD patients with more advanced disease or severe cardiovascular comorbidities, this technique may carry greater risks due to blood pressure fluctuations and may require more intensive management (22).

However, some literature offers contrasting perspectives. Shahzadi et al noted that SA can sometimes increase the risk of hypotension and post-dural puncture headaches, both of which may necessitate additional interventions (23). Hypotension often results from vasodilation caused by sympathetic blockade, which can impair perfusion

to vital organs; in severe cases, treatment may require intravenous fluids and vasopressor support. Furthermore, spinal headaches, typically caused by cerebrospinal fluid leakage at the puncture site, can significantly affect patient comfort during recovery (24). Azar also warned that in patients with advanced cardiac disease, SA could trigger significant hemodynamic fluctuations, potentially posing more risk than GA in select high-risk populations (25). The hypotensive effects of SA primarily result from its impact on the sympathetic nervous system, reducing the body's ability to compensate for blood pressure drops by limiting increases in cardiac output and vascular resistance (26). In patients with preexisting cardiac conditions, these physiological changes may compromise coronary perfusion and increase the risk of myocardial ischemia. In comparison, GA often allows better controlled management of hemodynamic parameters, but it carries its own risks, including respiratory depression and the need for endotracheal intubation (27).

Conversely, Hajilo et al observed that SA may enhance the overall postoperative recovery experience. However, their findings also indicated that the return of motor function might be delayed in elderly patients. Such delays can prolong hospitalization, limit early mobility, and increase the likelihood of postoperative complications such as pressure ulcers and deep vein thrombosis (28).

Variability in reported outcomes across studies may be explained by multiple factors, including differences in SA protocols, such as types of anesthetic agents used, their dosages, and administration techniques, as well as patient-related characteristics, such as age and comorbidities (e.g., diabetes, hypertension, or cardiac disease) (20). The type and duration of surgery also play a role; longer or more complex surgeries sometimes require hybrid anesthesia approaches. Other influencing factors include anesthesia management strategies, the use of adjunctive methods such as peripheral nerve blocks for postoperative analgesia, institutional variations, and the skill and experience of the anesthesia team.

Limitations of the Study

This report covered only a single case, which inherently limits the generalizability of the findings. Additionally, the lack of long-term follow-up, including monitoring for the risk of COPD exacerbation post-discharge, represents a significant limitation. To better understand the effects of SA and the long-term surgical outcomes in patients with underlying pulmonary conditions, future studies should consider a larger sample size and extended follow-up periods.

Conclusion

This case report explored the use of SA as an alternative anesthetic strategy in a patient with COPD undergoing lumbar laminectomy. Due to the elevated risk of respiratory complications in individuals with COPD, GA can pose significant hazards—including hypercapnia,

bronchospasm, atelectasis, and prolonged dependency on mechanical ventilation. In contrast, SA enabled the maintenance of spontaneous breathing, minimized the need for ventilatory support, and helped reduce the likelihood of postoperative pulmonary complications. Nevertheless, the procedure required meticulous intraoperative management, particularly with regard to maintaining hemodynamic stability, preventing hypotensive episodes, and ensuring continuous oxygen saturation monitoring. The favorable outcome in this case suggests that, when appropriately selected and closely monitored, patients with COPD may noticeably benefit from SA. This approach can offer a safer anesthetic alternative, particularly in high-risk respiratory cases. However, broader clinical studies are needed to more clearly define its advantages, limitations, and appropriate clinical indications in patients with compromised pulmonary function.

Authors' Contribution

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Competing Interests

The authors declare that they have no conflict of interest.

Ethical Approval

This human study received approval from the Ethics Committee of Hamedan University of Medical Sciences (IR.UMSHA. REC.1404.592).

Funding

The study was funded by Vice-chancellor for Research and Technology, Hamadan University of Medical Sciences.

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