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A CASE OF L5–S1 DISC PROLAPSE UNDERGOING BILATERAL ENDOSCOPIC DISCECTOMY WITH CONTINUOUS SPINAL ANAESTHESIA

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ABSTRACT
Background: Continuous spinal anaesthesia (CSA) allows titrated intrathecal administration of local anaesthetic via an indwelling catheter, offering precise control over block height and duration. Although well suited to prolonged minimally invasive spine surgery, it remains underutilised owing to concerns over technical complexity and catheter-related complications.
Case Presentation: A 43-year-old male with L5–S1 disc prolapse underwent uniportal bilateral endoscopic discectomy under CSA. Anaesthesia was instituted via a catheter placed at the L2–L3 interspace, with an initial bolus of hyperbaric bupivacaine and fentanyl achieving a T8 sensory level, followed by hourly incremental top-ups. The procedure, lasting approximately three hours, was completed with stable haemodynamics, adequate analgesia, and no neurological or catheter-related complications.
Conclusion: This case illustrates that CSA, with careful incremental titration, provides a safe, stable, and flexible anaesthetic option for prolonged minimally invasive lumbar spine surgery, avoiding the risks of general anaesthesia and the rigidity of single-shot spinal techniques.

KEYWORDS: Continuous spinal anaesthesia; Endoscopic discectomy; Lumbar disc prolapse; Minimally invasive spine surgery; Spinal catheter; Regional anaesthesia

1. INTRODUCTION

Lumbar disc herniation is one of the most common causes of radiculopathy and low back pain, with the L5–S1 intervertebral level being the most frequently affected owing to its high biomechanical stress and mobility [1]. Patients typically present with nerve root compression manifesting as radiating leg pain, sensory disturbances, and motor deficits. When conservative management fails, surgical intervention becomes necessary.
Minimally invasive spine surgery, particularly endoscopic lumbar discectomy, has gained popularity over the past decade owing to its advantages of reduced tissue trauma, minimal blood loss, shorter hospital stays, and faster postoperative recovery compared with conventional open or microscopic techniques [2-3]. The endoscopic approach is especially advantageous at the L5–S1 level, though it may present anatomical challenges such as a high iliac crest and a narrow interlaminar window.
Anaesthetic management plays a crucial role in optimising surgical conditions and patient outcomes. Traditionally, such procedures have been performed under general anaesthesia (GA) or single-shot spinal anaesthesia [4]. Continuous spinal anaesthesia (CSA), however, is emerging as a valuable alternative, particularly for minimally invasive spine procedures. CSA involves the placement of an intrathecal catheter, allowing titrated administration of local anaesthetic and thereby providing precise control over the level and duration of blockade [5]. Compared with single-shot spinal anaesthesia, CSA offers several advantages:

- Better haemodynamic stability owing to gradual dosing
- Ability to extend the duration of anaesthesia as required
- Reduced risk of high spinal block
- Improved intraoperative analgesia with preserved patient cooperation

In endoscopic spine surgery, CSA also enables real-time neurological feedback from the awake patient, potentially reducing the risk of nerve injury. It additionally avoids airway manipulation and the systemic effects associated with general anaesthesia, which is particularly beneficial in patients with comorbidities [6]. Despite these advantages, CSA remains underutilised owing to concerns regarding technical difficulty and the risk of post-dural puncture headache, infection, and catheter-related complications. With proper technique and monitoring, however, it can be a safe and effective anaesthetic modality [7]. This case report highlights the successful use of continuous spinal anaesthesia for L5–S1 endoscopic discectomy, emphasising its feasibility, advantages, and perioperative considerations in modern minimally invasive spine surgery.

2. CASE PRESENTATION

A 43-year-old male (80 kg), with no known comorbidities, presented with a six-month history of progressive low back pain radiating to the left lower limb along the buttock, posterior thigh, leg, and dorsum of the foot, associated with numbness. There was no history of motor weakness or bowel/bladder dysfunction. Clinical examination revealed preserved motor power (5/5) with reduced sensation in the L5 and S1 dermatomes. He was diagnosed with L5–S1 intervertebral disc prolapse and planned for uniportal bilateral endoscopic discectomy.

Table 1 summarizes the patient's preoperative clinical profile.

Parameter	Finding
Age / Sex	43 years / Male
Weight	80 kg
Comorbidities	None
Heart Rate	89 beats/min
Blood Pressure	120/80 mmHg
SpO_2	98% on room air
Motor Power	5/5, bilaterally preserved
Sensory Deficit	Reduced sensation in L5 and S1 dermatomes (left side)
Bowel/Bladder Function	Normal

Table 1. Preoperative clinical profile.

Preoperative evaluation showed stable vital parameters with no systemic abnormalities. In the operating room, standard monitoring (ECG, non-invasive blood pressure, and pulse oximetry) was instituted. Under strict aseptic precautions, continuous spinal anaesthesia was performed with the patient in the sitting position using a paramedian approach at the L2–L3 interspace [8-9]. A 21G Tuohy needle was used to identify the subarachnoid space at a depth of 9 cm, and a spinal catheter was advanced and secured at 15 cm.

An initial intrathecal dose of 0.5% hyperbaric bupivacaine 2 mL with fentanyl 25 µg was administered, achieving a sensory block up to the T8 dermatome. Surgery commenced at 9:45 AM. The block level was reassessed hourly, and supplemental doses of 0.5% bupivacaine 1 mL were administered at 11:00 AM and 12:00 PM via the catheter to maintain adequate anaesthesia. The procedure was completed at 12:30 PM, and the spinal catheter was removed with discontinuation of anaesthesia at 12:40 PM.

Table 2 Outlines the perioperative anaesthetic timeline.

Time	Event
09:00 AM	Patient positioned sitting; aseptic precautions taken; CSA performed at L2–L3 paramedian approach; 21G Tuohy needle; subarachnoid space identified at 9 cm; catheter advanced and fixed at 15 cm
09:00 AM	Intrathecal bolus: 0.5% hyperbaric bupivacaine 2 mL + fentanyl 25 µg; sensory block achieved up to T8
09:45 AM	Surgery commenced (uniportal bilateral endoscopic discectomy, L5–S1)
11:00 AM	Supplemental dose: 0.5% bupivacaine 1 mL via catheter to maintain block level
12:00 PM	Supplemental dose: 0.5% bupivacaine 1 mL via catheter to maintain block level
12:30 PM	Surgery completed

Time	Event
12:40 PM	Spinal catheter removed; anaesthesia discontinued

Table 2. Perioperative anaesthetic timeline.

The intraoperative period remained haemodynamically stable throughout, without complications or need for conversion to general anaesthesia [11]. Postoperative recovery was uneventful, with effective analgesia and no neurological deficits or complications related to the technique. The patient was mobilised early and discharged in satisfactory condition [12].

3. DISCUSSION

Continuous spinal anaesthesia (CSA) is an underutilised but highly effective regional anaesthesia technique that allows precise titration of intrathecal drugs through an indwelling catheter. In this case, CSA provided stable and adequate anaesthesia for a prolonged minimally invasive spine procedure without the need for airway manipulation or conversion to general anaesthesia [10].

One of the principal advantages of CSA over single-shot spinal anaesthesia is the ability to titrate block height and duration. In this patient, the initial intrathecal dose achieved a T8 sensory level, and incremental doses of bupivacaine were administered hourly to maintain the required level. This approach avoided excessive sympathetic blockade, thereby ensuring haemodynamic stability—a consideration of particular importance in prone spine surgery. Compared with general anaesthesia, CSA offers several benefits in endoscopic spine surgery [1-12]. Avoidance of airway instrumentation reduces risks such as difficult intubation, airway trauma, and postoperative respiratory complications. Maintaining the patient in an awake or lightly sedated state also allows early neurological assessment, which is advantageous in spine procedures where nerve root integrity is critical [16-17].

The use of CSA further contributes to reduced intraoperative blood loss owing to sympathetic blockade and lower venous pressures, and it provides excellent postoperative analgesia, decreasing opioid requirements and facilitating early mobilisation—outcomes that align well with enhanced recovery after surgery (ERAS) protocols. However, CSA is not without limitations [12-13]. Technical expertise is required for catheter placement, and there remains a risk of complications such as post-dural puncture headache (PDPH), infection, catheter-related issues, or high spinal block if dosing is not carefully titrated. In this case, a controlled, incremental dosing strategy minimised these risks and resulted in an uneventful perioperative course [17]. In the context of uniportal bilateral endoscopic discectomy—a minimally invasive procedure characterised by shorter operative times and reduced tissue trauma—CSA appears particularly well suited. It allows adequate anaesthesia with minimal physiological disturbance, making it an attractive alternative to both general anaesthesia and single-shot spinal techniques [18].

4.CONCLUSION

This case demonstrates the successful and uneventful use of continuous spinal anaesthesia (CSA) for a uniportal bilateral endoscopic discectomy at the L5–S1 level, a procedure that, owing to its anatomical constraints and variable operative duration, places particular demands on the anaesthetic technique chosen. By permitting incremental, demand-based titration of intrathecal local anaesthetic through an indwelling catheter, CSA allowed the block to be matched precisely to the evolving needs of a three-hour endoscopic procedure, something neither a fixed single-shot spinal dose nor a rigid general anaesthetic protocol could have achieved with comparable haemodynamic stability.

Three clinical advantages were particularly evident in this case. First, the ability to extend block duration on demand removed the time pressure that often constrains single-shot spinal techniques in prolonged endoscopic procedures, while avoiding the larger upfront local anaesthetic doses that predispose to high or total spinal block. Second, haemodynamic stability was preserved throughout surgery, consistent with the gradual onset of sympathetic blockade achieved through incremental dosing rather than a single large bolus. Third, because the patient remained awake throughout, continuous neurological feedback was available to the surgical team, a feature considered valuable in endoscopic discectomy given the proximity of working instruments to exiting nerve roots. Equally relevant to the technique's broader applicability, this case avoided the recognised drawbacks of CSA when appropriate technique is followed: no evidence of post-dural puncture headache, catheter-related infection, or neurological complication was observed, and the catheter was removed promptly at the end of the procedure. This is consistent with reported experience that, while CSA carries a theoretical risk profile distinct from single-shot spinal or epidural techniques, careful patient selection, strict asepsis, and conservative incremental dosing make these complications uncommon in practice. Taken together, this case adds to a small but growing body of literature supporting continuous spinal anaesthesia as a feasible, titratable, and haemodynamically stable anaesthetic option for minimally invasive spine surgery. It avoids the systemic burden and airway-related risks of general anaesthesia while overcoming the principal limitation of single-shot spinal techniques — a fixed, non-extendable duration of action. For endoscopic procedures at anatomically challenging levels such as L5–S1, where operative time can be unpredictable, CSA merits wider consideration as a primary anaesthetic strategy. Larger comparative series and prospective trials are warranted to better define patient selection criteria, optimal catheter techniques, and long-term safety outcomes for CSA in minimally invasive spine surgery.

5. PATIENT CONSENT

Written informed consent was secured from the patient to document the clinical evaluation and to include any relevant images in this case report.

6. CONFLICT OF INTEREST

The authors declare no conflict of interest. No funding was received for the preparation of this case report.

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