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Case Report

Novel Use of Combined Spinal and Erector Spinae Plane Block for Long Segment Thoracolumbar Fusion: A First in Malaysia

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Abstract

Since its introduction in 2016, the Erector Spinae Plane Block (ESPB) has gained recognition as a promising regional anesthesia technique. However, its efficacy and safety in lumbar spine surgery remain debated due to limited clinical evidence. Conversely, Spinal Anesthesia (SA) has been increasingly acknowledged as a safe and effective alternative to General Anesthesia (GA) for elective lumbar procedures. Despite its advantages, the unfamiliarity with SA management has limited its widespread adoption in awake spine surgery.

We report the first documented case in Malaysia of successful long-segment spinal fusion and decompression under combined SA and ESPB anesthesia in a 24-year-old male with L1-L2 vertebral metastases secondary to testicular cancer. The patient presented with mechanical instability, severe spinal canal stenosis and conus medullaris compression, alongside significant tracheal deviation from carinal tumor involvement, rendering GA contraindicated. Following detailed preoperative counseling, the procedure posterior instrumentation from T10 to L5 with L1-L2 laminectomy was performed uneventfully under combined SA and ESPB with sedation, utilizing a dual-surgeon approach.

This case highlights the viability of combined SA and ESPB as an alternative anesthetic strategy for urgent lumbar spine surgery when GA is not feasible, demonstrating favorable perioperative outcomes.

Keywords: Spinal Anesthesia; General Anesthesia; Erector Spinae Plane Block

Introduction

Spinal Anesthesia (SA) represents a safe and efficacious anesthetic modality for lumbar spine surgery. The existing literature on its application in lumbar decompression procedures is predominantly supportive, indicating that spinal anesthesia demonstrates comparable safety and efficacy to general anesthesia, with potential advantages in certain clinical outcomes [1]. Randomized Controlled Trials (RCTs) have shown that SA, in comparison to General Anesthesia (GA), is associated with more stable hemodynamics, reduced intraoperative blood loss and decreased postoperative analgesic requirements [1]. Although SA is well-established in other surgical disciplines, such as lower extremity procedures and cesarean deliveries, its adoption for elective lumbar spine surgery has remained limited. GA remains the preferred and most utilized technique for such procedures. This preference may be attributed to higher patient acceptance, the flexibility to prolong surgical duration with GA or anesthesiologists' inclination toward GA due to the more secure airway management it affords in the prone position.

Postoperative pain following lumbar spine surgery is frequently severe, often discouraging early mobilization and impeding recovery. Current analgesic strategies, such as Patient-Controlled Analgesia (PCA) or epidural injections, carry significant

limitations. While PCA provides effective pain control, it is associated with opioid-related adverse effects. Epidural analgesia, though useful, poses risks including infection and hematoma formation. Conventional oral analgesics often offer insufficient relief for acute postoperative pain. Inadequate pain management may predispose patients to chronic pain, significantly compromising long-term quality of life. The Erector Spinae Plane Block (ESPB), introduced in 2016 as a novel fascial plane block technique, has yet to have its clinical benefits definitively established [2]. Its precise mechanism of action remains controversial, though many experts hypothesize that local anesthetic spread within the fascial plane may partially block the dorsal rami of spinal nerves, thereby producing a paraspinal analgesic effect [3]. Notably, two Randomized Controlled Trials (RCTs) have demonstrated that ESPB may reduce both postoperative opioid requirements and pain scores following lumbar spine surgery [3]. However, the existing evidence remains limited, as most studies fail to incorporate appropriate comparator groups. Consequently, the efficacy and safety of ESPB in this surgical context continues to be debated. There is a pressing need for well-designed, large-scale RCTs to provide definitive evidence [3].

Case Report

A 24-year-old male with metastatic (stage IV) testicular carcinoma presented with severe lumbosacral pain following minor trauma due to a seated fall. The pain was associated with bilateral lower limb radiculopathy, significantly impairing his functional capacity and restricting prolonged sitting or standing. Notably, he denied any bladder or bowel dysfunction, with no clinical evidence of conus medullaris syndrome. Radiographic and MRI evaluation demonstrated L1 and L2 vertebral metastatic lesions with associated pathological fractures, resulting in disruption of sagittal and coronal spinal alignment. These fractures contributed to severe spinal canal stenosis, with evident compression of the conus medullaris and adjacent nerve roots. The surgical plan involved long-segment Posterior Spinal Instrumentation and Fusion (PSIF) from T10 to L5, along with laminectomy at L1 and L2. However, due to severe tracheal deviation and carinal compression (minimal luminal diameter: 4.75 mm) secondary to pulmonary metastatic disease, safe endotracheal intubation could not be achieved. Consequently, general anesthesia was deemed contraindicated owing to the inability to establish a secure airway for mechanical ventilation. Given these constraints, we proceeded with a combined Spinal Anesthesia (SA) and Erector Spinae Plane Block (ESPB), supplemented with sedation. Following an extensive preoperative family conference and detailed counseling which highlighted the risks of intraoperative anesthetic failure and potential abortion of the procedure, the patient demonstrated full comprehension, accepted the associated risks and expressed strong motivation to proceed with this palliative surgery (Fig. 1-4).

In the operating room, bilateral ESPB was performed with ultrasound guidance at T12. 20cc ropivacaine 0.3% with dexamethasone 4mg given on each side respectively. Subsequently, ultrasound guided spinal anesthesia was carried out in sitting position at L1 (just above the tumor compression L2), total 4 cc hyperbaric 0.5% bupivacaine and 20 mcg fentanyl dissolved in dextrose was given. The patient was then placed supine to allow the anesthetic to migrate rostrally. Level of blockade from T6-L5 was checked and confirmed with loss pin prick and temperature sensation before placing the patient in prone position. Patient was prep and invasive monitoring applied (arterial line and ETCO2). He was given IV paracetamol 1 gm, IV parecoxib 40 mg, and for mild sedation with IV midazolam 2 mg and IVI dexmedetomidine prior to surgical incision. Approximately 120 minutes into the surgery, patient started to experience pain sensation, TCI remifentanyl was started at 0.5-1ug/kg/min until the end of the surgery. The surgery completed without complications in its usual manner in 180 minutes, with the full operative time from the start of anesthesia to transfer to Intensive Care Unit (ICU) taking total of 240 minutes. In ICU, patient was fully conscious, alert and obeyed command. He was kept overnight in ICU for close observation and started on Patient Control Analgesia (PCA) oxynorm 8 hour later. PCA was continued for 2 days before switching to oral analgesic.

The procedure was completed efficiently using a coordinated two-surgeon technique, achieving immediate stability and postoperative radicular symptom relief. Postoperatively, he demonstrated significant clinical improvement, with resolution of spinal instability and radiculopathy, resulting in enhanced functional capacity and quality of life.

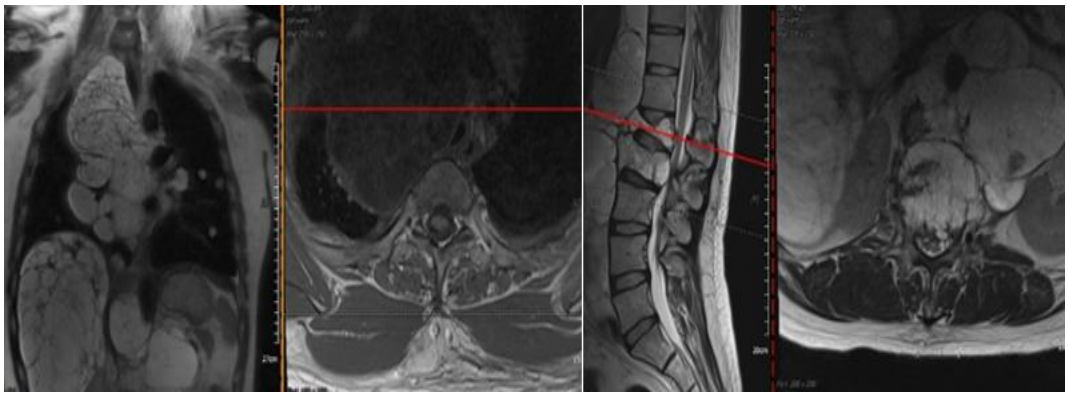

Figure 1: Left Image-MRI Thoracic (coronal and axial view) demonstrated severe carina compression by intrathoracic tumor. Right Image-MRI thoracolumbar (Sagittal and axial view) showed L1 and L2 pathological fracture with sever spinal canal stenosis and conus medullaris compression.

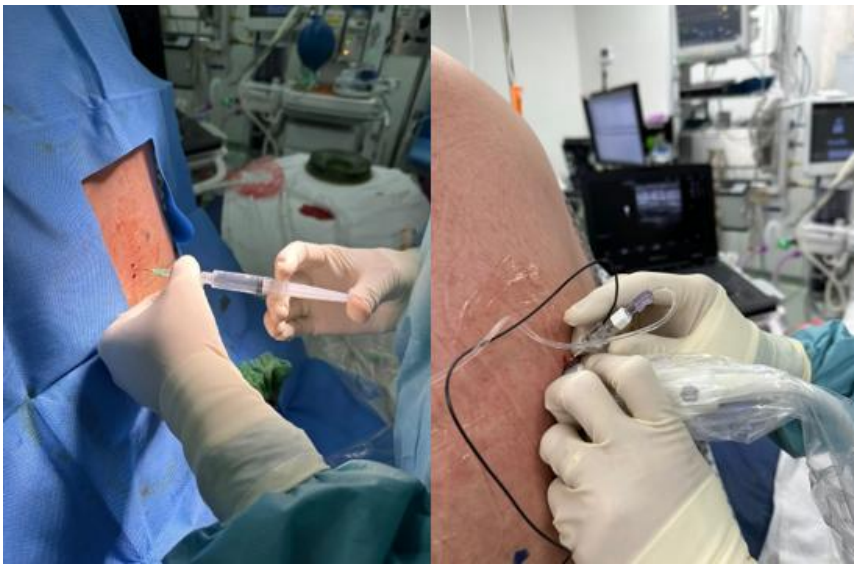

Figure 2: Left picture shows spinal anesthesia. Right picture shows ultrasound guided Erector Spinae Plane Block (ESPB).

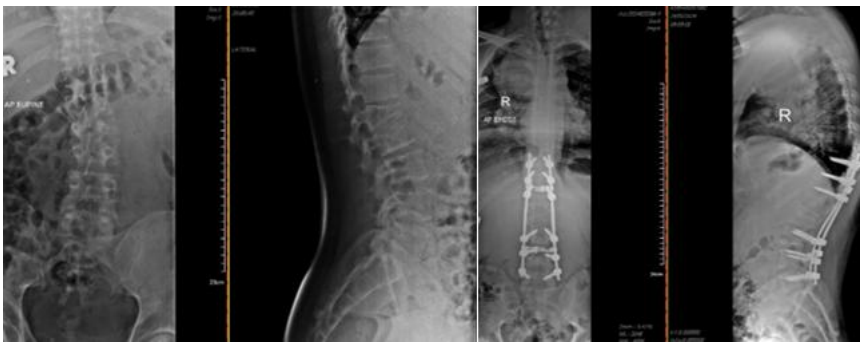

Figure 3: Left radiograph demonstrated L1 and L2 pathological fracture with loss of coronal and sagittal alignment. Right radiograph depicted restored alignment post Posterior Spinal Instrumented Fusion surgery (PSIF) from T10 till L5.

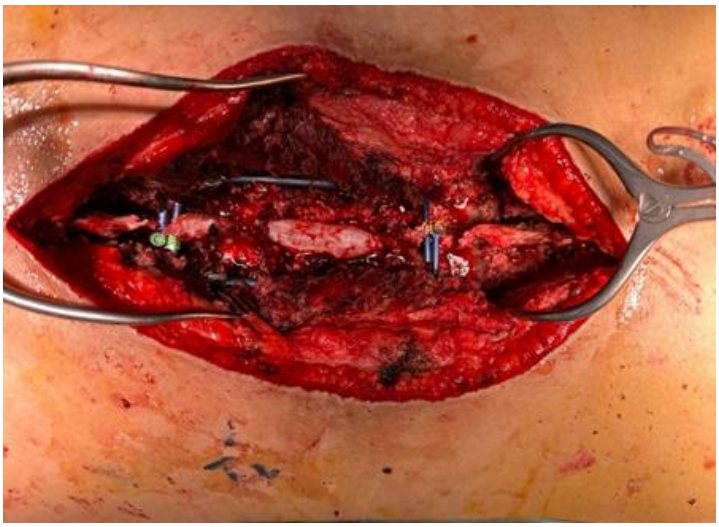

Figure 4: Intraoperative picture of surgical wound post two level laminectomy and long segment posterior fusion surgery.

Discussion

Spinal metastases often lead to debilitating sequelae such as pain, spinal instability and neurological deficits. In cases of metastatic spinal cord compression, progressive myelopathy can result in irreversible loss of motor, sensory and autonomic function. Current evidence supports the role of palliative surgery in improving Performance Status (PS), Activities of Daily Living (ADL) and neurological outcomes compared to nonsurgical management [4]. Despite this patient's poor prognosis (modified Tokuhashi score predicting <6 months survival), we proceeded with surgical intervention given its potential benefits in quality of life. The patient, fully informed of his limited life expectancy, strongly desired surgery for even marginal functional improvement. Postoperatively, he reported significant satisfaction and experienced a meaningful enhancement in his quality of life until his demise.

Spinal Anesthesia (SA) is a safe, feasible and cost-effective alternative to General Anesthesia (GA) for lumbar spine surgery, with growing evidence supporting its advantages [5]. Systematic reviews and randomized trials confirm that SA reduces perioperative complications (blood loss, postoperative nausea and delirium), shortens hospital stays and accelerates recovery times, particularly in procedures like discectomy, decompression and instrumentation [6]. Importantly, SA avoids airway manipulation, making it safer for high-risk patients (e.g., severe pulmonary disease, elderly or those with difficult airways). In this case, the patient presented with pulmonary metastases causing severe tracheal deviation and carinal compression, rendering endotracheal intubation unsafe and precluding the use of general anesthesia. Although spinal anesthesia offers significant advantages in spine surgery, its adoption remains limited due to clinician inexperience, concerns regarding intraoperative positioning and perceived technical difficulties. To our knowledge, this represents the first documented case of spinal anesthesia being successfully utilized for spine surgery in Malaysia.

Surgeons remain cautious about adopting SA for spine surgery due to multiple practical and perceived challenges. Key concerns include intraoperative patient movement compromising surgical precision and incomplete analgesia risking urgent conversion to GA [7]. In this case, the patient received supplemental Erector Spinae Plane Block (ESPB) and sedation, which effectively prevented intraoperative pain and unnecessary movement, thereby maintaining optimal surgical conditions. The duration of spinal anesthesia with bupivacaine rarely exceeds 4 hours, but adjuvants like epinephrine can extend this to 5-6 hours [8]. To mitigate the risks associated with prolonged operative duration, the procedure was performed by experienced spine surgeons working concurrently. Two surgeons reduces complications, operating room time, and length of stay compared with a single-surgeon approach [9]. Additionally, we opted for direct decompression via L1 and L2 laminectomy instead of a more extensive corpectomy with reconstruction. This strategic approach ensured the surgery could be completed within the critical four-hour window, further enhancing patient safety and procedural efficiency.

An additional consideration is whether intraoperative durotomy compromises the efficacy of SA or if SA increases the incidence of durotomy. However, comparative studies indicate no significant difference in durotomy rates between SA and General Anesthesia (GA). Furthermore, even in cases where durotomy occurs, there is no documented evidence of SA failure, suggesting

that dural breach does not adversely affect anesthetic outcomes [10]. However, SA limited the use of Intraoperative Neurophysiological Monitoring (IONM) in this case, as signal monitoring of the conus medullaris following decompression and pedicle screw insertion extended proximally to the T10 level. Nevertheless, triggered electromyography a widely utilized modality remained feasible and effective for assessing pedicle screw placement in patients under SA [2].

A published case report demonstrated that ESPB effectively reduced intraoperative analgesic and muscle relaxant requirements during spondylolisthesis correction surgery [11]. In our case, we employed ultrasound-guided ESPB as an adjunct to Spinal Anesthesia (SA) to achieve paraspinal muscle blockade and optimize surgical conditions. Furthermore, the analgesic effect of Spinal Anesthesia (SA) in spine surgery is typically limited to the T10 dermatomal level due to the risk of respiratory compromise and thoracic sympathetic blockade, which may result in severe bradycardia or intraoperative hypotension if the anesthetic level extends above T10 [1]. To address this limitation, the addition of an ESPB can help ensure adequate analgesia for surgical levels proximal to T10, particularly given that our most cephalad pedicle screw placement was at the T10 level. While existing literature primarily focuses on ESPB's role in postoperative pain management, current evidence does not support its use as a standalone anesthetic technique for spine surgery [12]. Therefore, we do not recommend ESPB as a sole anesthetic method for such procedures.

Conclusion

This case highlights the successful use of combined Spinal Anesthesia (SA) and Erector Spinae Plane Block (ESPB) in a high-risk patient undergoing long-segment lumbar fusion and decompression for metastatic spinal cord compression. ESPB and strategic surgical planning (e.g., dual-surgeon approach, limited laminectomy) can mitigate concerns over anesthesia duration and incomplete analgesia. This case demonstrates that, in carefully selected patients, combined SA and ESPB offers a viable anesthetic strategy for complex spine surgery when GA is contraindicated. Further studies are warranted to validate its efficacy, refine technical protocols and expand its adoption in spine surgical practice.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement

Not applicable.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore, was exempt.

Informed Consent Statement

Informed consent was taken for this study.

Authors' Contributions

All authors contributed equally to this paper.

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