

Effect Of Intraoperative Erector Spinae Block For Faster Recovery And Reduced Post-Operative Pain In Patients Undergoing Discectomies & Spinal Decompression

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Abstract

Objective: To evaluate the efficacy of intraoperative Erector Spinae Block (ESB) in reducing postoperative pain and facilitating recovery in patients undergoing spinal surgeries.

Methods: A prospective cohort study was conducted at the Orthopedic Department of Dr. Ziauddin Hospital Karachi, Pakistan from 15th June 2022 to March 31st, 2023. Patients aged 30 to 50 years undergoing spinal surgeries such as discectomies and spinal decompressions with ASA status I or II were included in the study. Participants were divided into two groups: those receiving ESB (n=33) and a control group receiving standard pain management (n=33). The primary outcome measured was the intensity of postoperative pain, assessed using the Visual Analog Scale (VAS) at 6 hours, 12 hours, and 24 hours post-surgery. Secondary outcomes were the length of hospital stay and the presence of nausea and vomiting.

Results: Significant reductions in pain scores were observed in the ESB group compared to the control group at 6 hours (median scores: 5 vs. 7, $p=0.003$), 12 hours (5 vs. 6, $p=0.028$), and 24 hours (3 vs. 4, $p=0.038$) post-intervention. The ESB group had a shorter median hospital stay (2 days) compared to the control group (3 days), with this difference being statistically significant ($p=0.001$).

Conclusion: ESB is an effective and safe technique for managing postoperative pain in spinal surgery patients. It offers significant benefits over traditional pain management approaches, including reduced pain scores, lower opioid consumption, and shorter hospital stays.

MeSH Keywords: postoperative pain, surgery, opioids, recovery.

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1. Introduction

Spine decompressions and discectomies rank among the most frequent surgical interventions aimed at relieving pressure on spinal nerves caused by herniated discs or spinal stenosis.¹ Despite their effectiveness, these surgeries resulted in significant postoperative pain and prolonged recovery periods.^{2,3} Research indicates that approximately one-third of patients with spinal stenosis and 14% of patients with herniated discs experience poorly controlled pain within the 1st post-operative day.⁴ This highlights the importance of effective postoperative pain management in spine surgery, as uncontrolled pain can lead to prolonged hospital stays, delayed mobilization, increased risk of complications, and chronic pain syndromes.^{2,5}

Historically, the management of postoperative pain following spinal fusion surgery has predominantly relied on the use of opioids.⁶ Opioids are efficacious but pose a risk for addiction, respiratory depression, constipation, hyperalgesia, nausea, vomiting and ileus.⁶ Consequently, there has been a notable shift towards exploring multimodal and opioid-sparing analgesic techniques aimed at improving recovery and reducing the side effects.⁷ For this purpose, several local anaesthesia (LA) techniques, including intravenous, infiltration at the wound site, and regional methods such as paravertebral, epidural, and spinal anesthesia, have been examined.⁷

In recent years, lumbar erector spinae blocks (ESB) have emerged as a safe, simple, promising, and well-performing alternative technique to other regional techniques.⁸ First described in 2016, the ESB targets the dorsal rami of the spinal nerves, providing a wide



band of analgesia over several dermatomes. The mechanism behind the ESB involves spreading the local anesthetic to reach the ventral and dorsal rami of the spinal nerves, which in turn, addresses the complex network of innervation of the spine and its adjacent structures, thereby providing extensive pain relief.⁹ Recent case reports have highlighted the positive effect of an ESB on pain for multiple indications including lumbar transverse process fractures, and post-operative pain following lumbar spine fusion, vertebral metastases, and scoliosis surgeries.^{6,9} Moreover, the ESB technique offers a lower risk of severe complications such as direct spinal cord injury, epidural hematoma, and central nervous system infections, positioning it as a promising and safer alternative in the field of postoperative pain management for spinal surgery.^{9,10} There is a lack of local data available regarding postoperative pain management in patients undergoing posterior spinal decompression and discectomy. Hence, this study aimed to determine whether local anaesthetic applied to the paraspinal muscles intraoperatively would be effective in patients undergoing discectomies & spinal decompression or not. This study would help in addressing an essential gap in current surgical practices by exploring a potentially safer, more effective method of pain management that could set a new standard for care in spinal surgery.

2. Materials & Methods

This was a prospective cohort study conducted at the Orthopedic Department of Dr. Ziauddin Hospital Karachi, Pakistan from 15th June 2022 to March 31st, 2023. This study was approved ethical review committee of Dr. Ziauddin Hospital (ERC# 07-06/22). The sample size calculation was performed by using OpenEpi software. The estimated sample size was 66 i.e. 33 participants in each group at 95% confidence interval and 80% power. The anticipated mean and standard deviation were taken from previous literature in patients with ESB as 5.7 ± 2.0 and patients without ESB as 4.2 ± 2.3 ¹¹. Patients aged 30 to 50 years undergoing spinal surgeries such as discectomies and spinal decompressions with ASA status I or II were included in the study. Patients with a history of mental illness, local

infection, carcinoma, uncontrolled seizures, severe coagulation disorders, need for mechanical ventilation, and psychosomatic disorders were excluded from the study. Patients with any revision spinal decompression or discectomy, patients with pregnancy, and no other than Opioid Sparing Analgesia were also excluded. Convenience sampling technique was used for sample selection.

The eligible patients were enrolled in the study after taking informed consent. Patients were divided into two groups i.e. exposed (ESB group) and unexposed (control group). The general anaesthesia regime was similar in both groups. Patients in the exposed group, after securing intravenous access and establishing standard monitoring, patients were positioned sitting. Under the guidance of an ultrasound using a curved probe (2 to 5 MHz), the transverse processes near the area of surgery on the lumbar vertebrae were located. A dose of 20 ml of 0.25% bupivacaine was administered adjacent to the transverse process using a 22-gauge spinal needle in a longitudinal approach, ensuring contact was made. The same method was repeated on the opposite side. While in the control group, patients did not receive the ESB.

Baseline data, including age, gender and BMI were collected from all the patients. The primary outcome measured was the intensity of postoperative pain, assessed using the Visual Analog Scale (VAS) at 6 hours, 12 hours, and 24 hours post-surgery. Secondary outcomes were the length of hospital stay and the presence of nausea and vomiting.

Data was analyzed using SPSS version 23. Mean and SD/Median (Q1 to Q3) were reported for numeric variables like age, BMI, length of hospital stay and VAS. Frequency and percentage were reported for categorical variables like gender, and presence of nausea and vomiting. Mann-Whitney U test was applied to assess the difference in VAS and length of hospital stay between both groups. The Fisher Exact test was applied to assess the difference in the presence of nausea and vomiting. The level of significance was set at 5%.

3. Results

The ESB and control groups presented similar age (38.24 ± 9.42 years vs. 39.74 ± 9.47 years) and BMI distribution (39.74 ± 7.16 kg/m² for ESB vs. 38.52 ± 6.95

kg/m²). The gender distribution showed a slightly higher percentage of males in the control group (63.6%) compared to the ESB group (54.5%). (Table 1)

Table 1: Baseline characteristics among both groups

Variables	ESB (n=33)	Control (n=33)
Age (years)	38.24±9.42	39.74±9.47
BMI (kg/m ²)	39.74±7.16	38.52±6.95
Gender		
Male	18 (54.5%)	21 (63.6%)
Female	15 (45.5%)	12 (36.4%)

Data presented as Mean±SD or n (%)

Significant reductions in pain scores were observed in the ESB group compared to the control group at 6 hours (median scores: 5 vs. 7, $p=0.003$), 12 hours (5 vs. 6, $p=0.028$), and 24 hours (3 vs. 4, $p=0.038$) post-intervention. The ESB group had a shorter median hospital stay (2 days) compared to the control group (3 days), with this difference being statistically significant ($p=0.001$). Although there was a difference in the occurrence of PONV between the two groups (3 cases in ESB vs. 4 cases in the control group), this difference was not statistically significant ($p=0.355$). (Table 2)

Table 2: Comparison of outcomes among both groups

Outcomes	ESB (n=33)	Control (n=33)	p-value
Pain at 6 hours	5 (4-7)	7 (5-8)	0.003
Pain at 12 hours	5 (4-6)	6 (5-7)	0.028
Pain at 24 hours	3 (3-5)	4 (3-5)	0.038
Hospital stay	2 (2-3)	3 (3-4)	0.001
PONV	1 (3)	4 (12.1)	0.355

Data presented as Median (Q1-Q3) or n (%)

4. Discussion

The necessity to enhance postoperative recovery and minimize pain following spinal surgeries, such as discectomies and spinal decompressions, has driven the pursuit of effective pain management strategies.^{2, 12, 13} This study was conducted to assess the efficacy of intraoperative ESB in achieving these outcomes. Our findings reveal that ESB significantly reduces postoperative pain and accelerates recovery, which aligns with the growing body of evidence suggesting the benefits of regional anaesthesia techniques in spinal surgery.^{6, 14-17}

Our results demonstrated significant reductions in postoperative pain scores at 6, 12, and 24 hours in the ESB group compared to the control group, alongside a significant decrease in the length of hospital stay. These findings are consistent with previous research, such as the study by Akhlagh et al., which highlighted the

analgesic efficacy of bilateral lumbar ESB following lumbar laminectomy.⁶ Similarly, van den Broek et al. observed improved postoperative recovery after laminectomy and discectomy surgery with the use of ESB.¹¹ Three more RCTs showed that ESB significantly reduced postoperative pain scores, reduced hospital stay and reduced opioid use who underwent lumbar decompression surgery and laminectomy or surgery for prolapsed intervertebral disc.¹⁸⁻²⁰ Moreover, a study by Daniele et al. on the use of ESB in thoracic surgery presented similar conclusions regarding pain management. They found a significant reduction in the need for postoperative opioids in the ESP block group compared to the control group.²¹ A meta-analysis conducted by Huda et al. reviewed five randomized controlled trials and concluded that ESB significantly decreases postoperative pain scores ($p<0.05$) and opioid consumption ($p=0.02$) in the first 24 hours following hip surgery.²² Similarly, another systematic review by Liu et al. also revealed similar results that ESB significantly reduced postoperative pain scores, PONV and opioid consumption in patients undergoing lumbar spinal surgery.²³ The consistency of these results across different types of surgeries, including lumbar laminectomy and thoracic procedures, highlights ESB's broad applicability as a potent pain management strategy.

Comparatively, the utilization of ESB as an opioid-sparing technique addresses the limitations associated with traditional opioid-based pain management, such as the risk of addiction and side effects like respiratory depression and constipation.^{12, 21, 24} The shift towards multimodal analgesia, as discussed by Kaye et al., emphasizes the importance of integrating techniques like ESB to enhance patient outcomes and recovery processes.⁷

The strengths of this study lie in its focus on a locally underexplored area of postoperative pain management and its contribution to the existing literature on the benefits of ESB in spinal surgeries. Furthermore, the study's methodology and statistical analysis provide robust evidence supporting the use of ESB as a safe and effective pain management technique. However, there are limitations to consider, including the study's observational design and the potential for selection bias due to the convenience sampling technique. Future research should aim to replicate these findings in larger, randomized controlled trials to strengthen the evidence base. Additionally, exploring the long-term outcomes of

ESB on postoperative recovery and pain management could provide valuable insights into its sustained effects.

5. Conclusion

This study highlights the significant effect of ESB in improving postoperative recovery and reducing pain following spinal surgeries. The evidence suggests that ESB is a versatile and effective pain management technique that offers a valuable alternative to traditional opioid-based approaches, aligning with the shift towards multimodal analgesia.

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Contributions:

A.A, A.M.S, N.M - Conception of study

- Experimentation/Study Conduction

N.M, M.S.M, Z.S - Analysis/Interpretation/Discussion

N.M, Z.S - Manuscript Writing

A.A, A.M.S, M.S.M, Z.S - Critical Review

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