



ORIGINAL RESEARCH PAPER

Orthopaedics

EFFICACY OF ERECTOR SPINAE BLOCK FOR POST-OPERATIVE PAIN MANAGEMENT IN TRANSFORAMINAL LUMBAR INTERBODY FUSION: A CASE CONTROL STUDY

KEY WORDS: Erector spinae block/TLIF/regional block

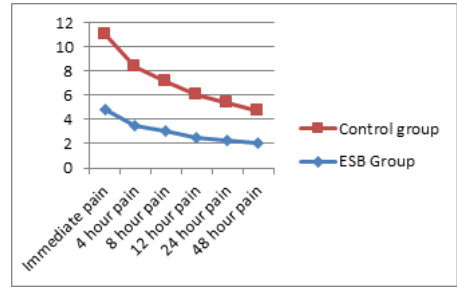
Dr. Naresh Kumar Eamani	Birrd(T) Hospital, Tirupathi Asst Professor
Dr. Deepak K	Birrd(T) hospital, Tirupathi Associate Professor
Dr. Katukota Vishal	Birrd(T) Hospital, Tirupathi Asst Professor
Dr. Sabarishwara n Arivazhagan*	Birrd(T) Hospital, Tirupathi Junior Resident *Corresponding Author

ABSTRACT	<p><b>Background:</b> Transforaminal lumbar interbody fusion (TLIF) is a common surgical procedure for lumbar spinal stenosis and spondylolisthesis. Post-operative pain management remains a significant challenge. The efficacy of regional anesthesia techniques in reducing postoperative pain following surgical procedures has been minimally explored in lumbar interbody fusions. This case-control study investigated the efficacy of erector spinae plane block in reducing post-operative pain after TLIF. We compared patients who received an ESP block (case group) with those who did not (control group) regarding pain Scores, analgesic requirements, ambulation time, and length of hospital stay. <b>Method:</b> A total of 120 patients scheduled for TLIF surgery at BIRRD(T) hospital ,Tirupathi were included in this case-control study. Patients were divided into two groups: those receiving the erector spinae block (ESB group, n=60) and those receiving standard analgesia (control group, n=60). Pain levels were assessed at multiple postoperative intervals (immediate, 4, 8, 12, 24, and 48 hours) using a numerical rating scale (NRS). Analgesic requirements, ambulation times, and length of hospital stays were also recorded. <b>Results:</b> The ESB group experienced significantly lower pain scores at all time points compared to the control group. Notably, patients who received ESB required less rescue analgesia during the first 24 hours postoperatively. Ambulation was initiated earlier in the ESB group (mean 20 hours) compared to the control group (mean 24 hours). The average length of hospital stay was shorter in the ESB group (4 days vs. 6 days). <b>Conclusions:</b> The use of erector spinae blocks in patients undergoing TLIF significantly enhances postoperative pain control, reduces analgesic consumption, and accelerates recovery. These findings support the incorporation of ESB as a standard adjunctive technique in lumbar spine surgery.</p>
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<p><b>INTRODUCTION</b></p> <p>Transforaminal lumbar interbody fusion (TLIF) is a common surgical intervention for various spinal pathologies, particularly lumbar disc herniation and degenerative disc disease. While effective for alleviating symptoms, postoperative pain management remains a crucial aspect of patient care and recovery(Mobbs et al., 2015). The use of regional anaesthesia had a favorable outcome in the postoperative period(Bai et al., n.d.; Kim et al., 2016). Opioid analgesia, although widely used, is associated with significant side effects, including nausea, vomiting, and delayed recovery times (Dunn et al., 2016; Pugely et al., 2014). Effective pain management is crucial for optimizing recovery and minimizing complications (Chang et al., 2020). Regional anesthesia techniques, such as the erector spinae block (ESB), have garnered attention as potential adjuncts to standard analgesic regimens (Aldebeyan,S.A, n.d.). The ESB involves the injection of local anesthetics into the erector spinae muscle group, providing targeted analgesia to the thoracic and lumbar regions . Several studies have demonstrated the effectiveness of ESP blocks in various surgical settings (Braxton et al., 2022;Yazicioglu &amp; Aydin, n.d.), including spine surgery (Wetmore et al., 2024), but evidence specifically regarding TLIF is limited .This study aims to analyze the efficacy of the ESB in patients undergoing TLIF by comparing postoperative pain levels, analgesic requirements, ambulation times, and lengths of hospital stay.</p> <p><b>Methods</b></p> <p><b>Study Design</b></p> <p>A case-control study design was implemented. Ethical approval was obtained from the institutional review board and informed consent was collected from all participants.</p> <p><b>Patients:</b></p> <p>A total of 120 patients (aged 21-73 years), who underwent</p>	<p>Single level TLIF from May 2023 to May 2024, were included. Participants were randomly assigned to an ESB group or a control group.</p> <p><b>Intervention:</b></p> <p><b>Erector Spinae Block:</b> The ESB was performed preoperatively, with 20 mL of 0.25% bupivacaine administered at the appropriate vertebral level with the help of ultrasound.</p> <p><b>Control Group:</b> Standard opioid-based analgesia was administered per the institution's protocol.</p> <p><b>Outcome Measures</b></p> <p>Pain scores assessed at immediate, 4, 8, 12, 24, and 48 hours postoperative using a numerical rating scale (0-10).The first analgesic requirement in hours and the number of analgesic doses required in 12 and 24 hours post-surgery.Ambulation time measured in hours post-surgery.Length of hospital stay measured in days.</p> <p><b>Statistical Analysis</b></p> <p>Data were analyzed using statistical software (SPSS). Continuous variables were compared using independent t-tests, while categorical variables were assessed with chi-square tests. A p-value of &lt;0.05 was considered statistically significant.</p> <p><b>RESULTS:</b></p> <p>The total sample size was 120 patients.The demographic data and surgical characteristics of the study population were assessed.The majority of the patients fell within the age group of 41- 50 years and 51-60 years accounting for 37.5% and 27.8 % of the sample respectively.The sample consisted 93 female patients and 27 male patients, representing 77.5 % and 22.5 % of the study population respectively. The mean duration of</p>
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surgery in both groups were compared although the difference was not statistically significant.

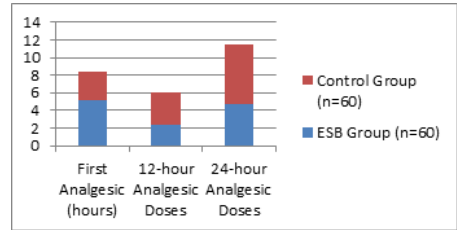
The mean pain scores ( $\pm$ SD) for the ESB group was significantly lower at all postoperative intervals compared to the control group as described in (Figure 1).



**Figure 1:** Line diagram showing comparison of pain scores using numerical rating scale

**Analgesic Requirements:**

The first analgesic requirement (figure 2) was delayed in the ESB group (ESB: 5.2 hours [ $\pm$ 2.1 ]; Control: 3.2 hours [ $\pm$ 1.5];  $p < 0.01$ ).



**Figure 2:** Graph showing comparison of requirement of analgesia in both groups

The total number of analgesic doses required within the first 12 hours was significantly lower in the ESB group (ESB: 2.3 [ $\pm$ 0.9]; Control: 3.7 [ $\pm$ 1.2];  $p < 0.01$ ). The total number of analgesic doses required within the first 24 hours was significantly lower in the ESB group with that of the ESB group (ESB: 4.7 [ $\pm$ 1.8]; Control: 6.8  $\pm$  2.3).

**Ambulation Time And Length Of Stay**

The average time to ambulate postoperatively was significantly shorter in the ESB group (ESB: 20 hours [ $\pm$ 4.8]; Control: 25.8 hours [ $\pm$ 5.3];  $p < 0.01$ ). Similarly, the length of hospital stay was reduced in the ESB group (ESB: 4 days [ $\pm$ 1]; Control: 6 days [ $\pm$ 2];  $p < 0.01$ ) (Table 1)

**Table 1: Comparison Of Post Operative Outcomes In ESB Group With The Control Group**

Outcome	ESB group (N=60)	Control group(N=60)	p-value
Ambulation time(Hours)	23.8 $\pm$ 3.5	26.2 $\pm$ 4.2	0.003
ICU Stay (hours)	20 $\pm$ 4.8	25.8 $\pm$ 5.3	0.001
Duration of stay(days)	4.3 $\pm$ 1.2	5.0 $\pm$ 1.5	0.021

**DISCUSSION**

The results of this study underscore the significant advantages of using the erector spinae block (ESB) as an adjunct to standard analgesic techniques in patients undergoing transforaminal lumbar interbody fusion (TLIF). The substantial reduction in pain scores across all postoperative time points indicates that the ESB effectively provides regional analgesia, resulting in improved patient comfort during recovery(Kot et al., 2019). Prior literature has established that effective pain control not only enhances patient satisfaction but also facilitates earlier mobilization, thereby potentially decreasing hospital stays reducing healthcare costs (Mobbs et al., 2015; Tadi,J. & Kaur,D., 2020).

Our findings corroborate this literature, patients receiving the ESB were able to mobilise sooner post-surgery and experienced shorter lengths of stay compared to controls.

The ESB targets the dorsal rami of the spinal nerves, providing sensory blockade to the thoracolumbar region (Aldebeyan,S.A, n.d.). Given the anatomy of the erector spinae muscle group and its proximity to these nerve roots, the ESB can provide significant pain relief in the regions affected by the surgical procedure. Previous studies have highlighted that regional blocks can reduce the need for opioids, thereby diminishing the common side effects such as postoperative nausea, constipation, and respiratory depression (Dunn et al., 2016; Nguyen et al., 2021). Our results align with these reports, revealing a lower overall requirement for rescue analgesics in the ESB group during the initial postoperative hours(Roh et al., 2020).

Furthermore, our study builds on existing research by highlighting the importance of multimodal analgesia strategies in spinal surgery(Yoo et al., 2019). The enhanced postoperative pain control provided by the ESB can lead to improved recovery trajectories, including expedited discharge from the hospital and decreased incidence of postoperative complications.

Our findings also provoke considerations for future research directions. Despite the promising outcomes observed in this study, the specific optimal dosages and techniques for administering the ESB remain to be established. Variability in block techniques, such as the volume and concentration of anesthetic used, challenges the generalizability of the techniques across different patient populations and surgical procedures (Bai et al., n.d.; Tadi,J. & Kaur,D., 2020). Future studies designed to compare varying approaches to the ESB and establish standardized protocols are crucial. Additionally, investigating the long-term impacts of ESB on chronic pain management, functional outcomes, and quality of life post-surgery can provide further evidence for its use in spine surgery.

**CONCLUSION:**

The integration of the erector spinae block into the multimodal analgesia regimen for transforaminal lumbar interbody fusion shows great promise. The ESB not only contributes to enhanced postoperative pain control and reduced opioid consumption but also facilitates quicker patient recovery, enabling faster ambulation and shorter hospital stays. Given the limitations of our study, including its single-center design and a relatively small sample size, additional research in multicenter settings is warranted. With ongoing advances in regional anesthesia techniques, the ESB may solidify its role in postoperative care strategies within spinal surgery, further enhancing patient outcomes and operational efficiencies in surgical practices.

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