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Fluoroscopy-Guided Erector Spinae Plane Block in Single-Level Lumbar Fusion Surgery: A Case Series of 10 Patients

Sumedha Shinde[1], Arvind J. Vatkar[2], Tanmay Athawale[3], Arpan Mittal[3], Riddhi Shah[3], Gaurav Gupta[4], Vishwapriya Kumar[3]

Abstract

Background: Erector spinae block which is fluoroscopy guided is a good option for pain relief post surgery in resource constrained operating theatre setups.

Objective: This case series aims to describe the procedural feasibility, perioperative analgesic profile, and early postoperative outcomes of fluoroscopy-guided bilateral Erector Spinae Plane Block (ESPB) in 10 patients undergoing single-level lumbar fusion surgery.

Methods: A retrospective case series examined 10 adult patients who underwent single-level open transforaminal lumbar interbody fusion (TLIF) for degenerative lumbar pathology using a fluoroscopy-guided erector spinae plane block (ESPB) technique. Following general anaesthesia and prone positioning, the surgical site was located via fluoroscopy, and a spinal needle was inserted for local anesthetic injection. Outcomes assessed included block performance time, postoperative visual analogue scale (VAS) pain scores, opioid use, ambulation time, hospital stay length, patient satisfaction, and complications within the first 48 hours.

Results: This retrospective case series examined 10 patients (50% female, mean age 55.3 ± 7.6 years) who underwent single-level TLIF with fluoroscopy-guided ESPB. The mean block time was 3.09 ± 0.26 minutes. Postoperative pain control was effective, indicated by median Visual Analogue Scale (VAS) scores: 2.5 at 2 hours, 2.0 at 6 hours, 3.0 at 12 and 24 hours. Friedman's test showed significant differences in VAS scores ($\chi^2(3) = 13.91$, $p = 0.003$). Early recovery included a mean ambulation time of 2.86 ± 0.31 hours and a hospital stay of 4.4 ± 0.5 days. Patient satisfaction was high (median 9.5, IQR 1), with a significant negative correlation between average 24-hour VAS scores and satisfaction ($\rho = -1.0$, $p < 0.001$). No significant correlations were found for age with ambulation time ($\rho = -0.382$, $p = 0.275$) or length of stay ($\rho = -0.170$, $p = 0.641$). No postoperative complications occurred.

Conclusion: This 10-patient case series supports fluoroscopy-guided bilateral ESPB as a practical and effective adjunct for perioperative analgesia in single-level lumbar fusion surgery. The technique is especially attractive because it can be performed by the spine surgeon during fluoroscopic level confirmation, potentially improving workflow while maintaining outcomes comparable to those reported in the literature.

Keywords: Erector spinae block, Fluoroscopy, Ultrasound, Spine surgery, TLIF, Post-operative pain

Introduction

Open lumbar fusion procedures are associated with substantial postoperative pain due to paraspinal muscle dissection and tissue manipulation, often leading to increased perioperative opioid use and delayed mobilization [1]. Contemporary perioperative pathways therefore increasingly rely on

[1]Department of Immuno Haematology and Blood Transfusion, Dr. D.Y. Patil School of Medicine, Navi Mumbai, Maharashtra, India.
2Department of Orthopaedics, MGM Medical College, Navi Mumbai, Maharashtra, India.
3Department of Orthopaedics, Dr. D.Y. Patil School of Medicine, Navi Mumbai, Maharashtra, India.
4Department of Orthopaedics, Central Institute of Orthopaedics, Safdarjung Hospital, New Delhi, India.

Address of Correspondence
Dr. Sumedha Shinde,
Department of Immuno Haematology and Blood Transfusion, Dr. D.Y. Patil School of Medicine, Navi Mumbai, Maharashtra, India.
E-mail: sumedhashinde@gmail.com

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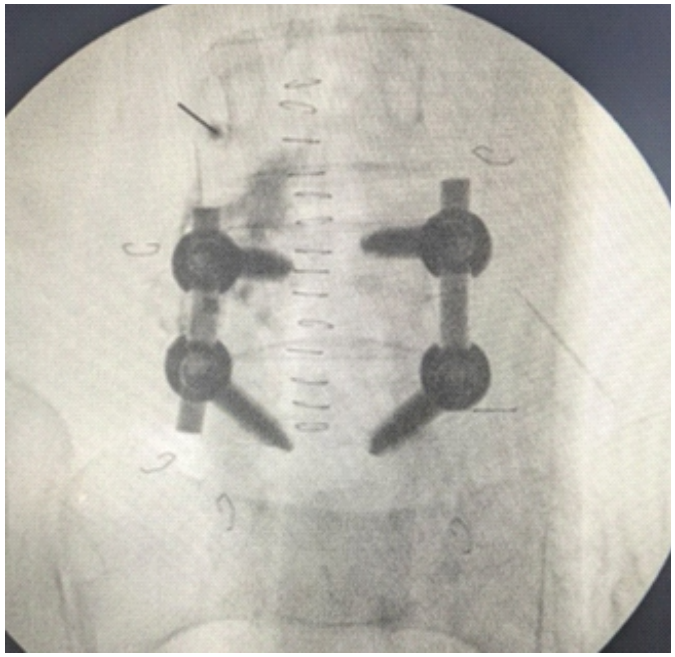

Figure 1: Needles hitting the L3 transverse process, in the surgery done at L45 level.

multimodal analgesia and regional anesthetic techniques to reduce opioid exposure and improve recovery [2].

The erector spinae plane block is one such interfascial plane block that has shown efficacy in spine surgery [3]. Although ultrasound guidance has traditionally been used, fluoroscopy-guided delivery has practical appeal in lumbar fusion because the operating surgeon already uses fluoroscopy for level localization and is familiar with the relevant posterior bony anatomy [4].

Materials and Methods

Study design

This article presents a descriptive case series of 10 consecutive adult patients who underwent single-level open TLIF for degenerative lumbar pathology and received bilateral fluoroscopy-guided ESPB as part of perioperative multimodal analgesia. The duration of study was 3 month from Jan 2026 to March 2026, at multiple hospitals in Navi Mumbai. The structure, terminology, procedural details, and outcome domains were aligned with the uploaded study so that the present series remains clinically comparable in design and interpretation.

Eligibility

Included patients were adults in age group of 20-80 years undergoing single-level lumbar fusion for conditions such as degenerative spondylolisthesis, lytic spondylolisthesis, or lumbar canal stenosis with instability, reflecting the eligibility framework of the source study. Patients with local infection, coagulopathy, poor skin condition at the site, previous lumbar surgery, systemic infection, malignancy, traumatic pathology, or refusal for regional analgesia were excluded in line with the parent study approach.

Perioperative protocol

All patients received standard general anesthesia and multimodal analgesia with acetaminophen and pregabalin, with fentanyl reserved for rescue analgesia, consistent with the uploaded protocol. Intraoperative and postoperative observations included pain scores, opioid requirement, ambulation time, postoperative alertness, hospital stay, nausea or vomiting, and patient satisfaction.

Fluoroscopy-guided ESPB technique

After induction of general anaesthesia, patients were positioned prone and the intended operative level was marked using fluoroscopy in the true anteroposterior view. A 22-gauge 90 mm Quincke spinal needle was introduced about 1 cm lateral to the target transverse process in a steep 10-20 degree medial trajectory until bony contact was achieved guided by fluoroscopy as shown in figure 1.

The target level for ESP block was 1 level above the surgery i.e if the level is L4L5 , the the target transverse process was of L3 vertebrae.The needle was then withdrawn approximately 2 mm to rest in the interfascial plane deep to the erector spinae muscle and contrast 0.5- 1 ml dye iohexol was injected to see the flow of dye in the inter-fascial plane as shown in figure 2.

On confirmation of the location 20 mL of 0.2% ropivaciane was injected after negative aspiration as seen in figure 3 ; the same technique was repeated contralaterally.

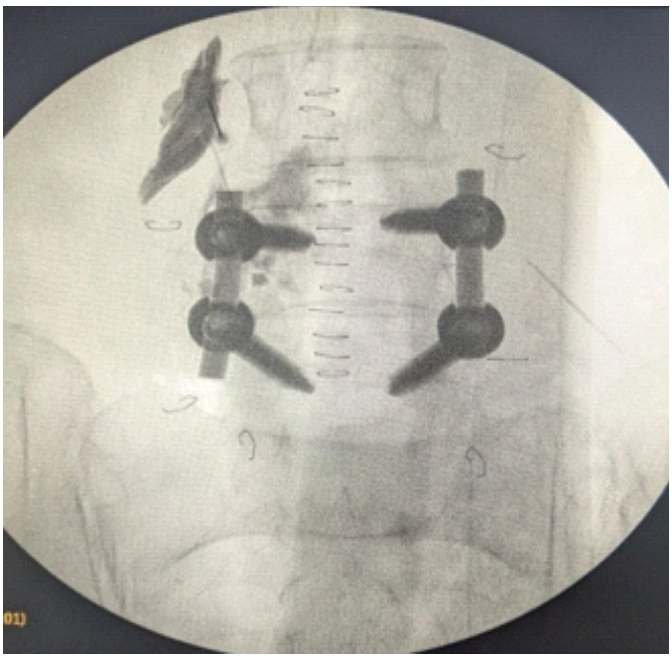

Figure 2: The injection of contrast dye to assess the flow in the inter-fascial plane of erector spinae region.

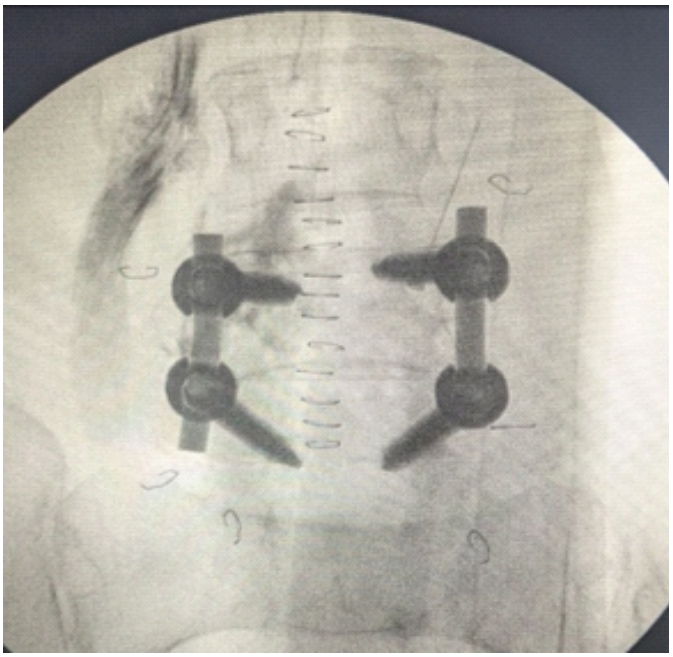

Figure 3: Showing flow of Ropivacaine in the erector spinae plane as seen by the dilution of contrast dye.

Outcome measures

The principal descriptive outcomes in this series were feasibility of block administration, postoperative pain control with VAS score recording at 2, 4, 6, 12, 24 hours after surgery, rescue opioid requirement, time to ambulation, duration of hospitalization, patient satisfaction, and adverse events.

Individual case summaries

All 10 cases demonstrated technically straightforward bilateral block placement after fluoroscopic identification of the transverse process, with no need to abandon or convert the technique as shown in table 1. The procedural workflow was efficient because the block was integrated into the same fluoroscopic setup used for surgical level marking, which reflects one of the main operational advantages emphasized by the uploaded study.

Results

Patient and surgical characteristics

Ten adult patients underwent single-level transforaminal lumbar interbody fusion (TLIF) using general anaesthesia and bilateral lumbar erector spinae plane block (ESPB). The average age was around 55 years (range 44-67), with 7 males and 3 females. The most common reason was lumbar canal stenosis (5/10), followed by degenerative spondylolisthesis (2/10), degenerative disc disease (2/10), and lytic spondylolisthesis (1/10). All patients underwent single-level TLIF with bilateral posterior instrumentation, with index levels of L4L5 in five, L3L4 in three, and L5S1 in two.

Block performance

All patients received bilateral ultrasound-guided ESPB at the one lumbar level superior to corresponding to the surgical segment prior to incision. The mean block performance time was 3.1 minutes (range 2.7–3.5 minutes), reflecting a consistently rapid technique across cases. No block-related technical difficulties or immediate adverse events were recorded.

Postoperative pain outcomes

Postoperative pain scores were low throughout the first 24 hours after surgery. Mean visual analogue scale (VAS, 0–10) scores were approximately 2.5 at 2 hours and 2.2 at 6 hours, rising slightly to 2.7 at 12 hours and 3.2 at 24 hours. Inter-individual variability was modest, with VAS values ranging between 2 and 3 for most time points and a maximum of 4 at 24 hours. No patient required urgent intervention for uncontrolled pain, and no rescue analgesia failures were documented in the dataset.

Functional recovery and length of stay

Table 1- THe demographics and findings of 10 patients studied.

Case	Age	Sex	Diagnosis	Surgery	Side	Level	Block time (min)	VAS 2h	VAS 6h	VAS 12h	VAS 24h	Time to ambulation (h)	Length of stay (days)	Satisfaction (0-10)	Complication
1	48	M	Degenerative spondylolisthesis	Single-level TLIF	Bilateral	L4L5	3.2	2	2	3	3	6.5	4	10	Nil
2	55	F	Lumbar canal stenosis	Single-level TLIF	Bilateral	L3L4	2.8	3	2	3	3	7	5	9	Nil
3	62	M	Lytic spondylolisthesis	Single-level TLIF	Bilateral	L4L5	3.1	2	2	2	3	10	4	10	Nil
4	46	F	Degenerative disc disease	Single-level TLIF	Bilateral	L5S1	3.5	3	3	3	4	6	5	9	Nil
5	59	M	Lumbar canal stenosis	Single-level TLIF	Bilateral	L4L5	2.9	2	2	2	3	8	4	10	Nil
6	51	m	Lumbar canal stenosis	Single-level TLIF	Bilateral	L3L4	3	3	2	3	3	10	4	9	Nil
7	67	M	Degenerative spondylolisthesis	Single-level TLIF	Bilateral	L4L5	2.7	2	2	2	3	6	4	10	Nil
8	44	F	Lumbar canal stenosis	Single-level TLIF	Bilateral	L5S1	3.4	3	3	3	4	12	5	9	Nil
9	58	M	Lumbar canal stenosis	Single-level TLIF	Bilateral	L4L5	3	2	2	3	3	8	4	10	Nil
10	63	m	Degenerative disc disease	Single-level TLIF	Bilateral	L3L4	3.3	3	2	3	3	9	5	9	Nil

Functional recovery was rapid. All patients were mobilised within a narrow window between approximately 6 hours to 12 hours after surgery, inspite of low pain scores mainly due to logistical issues of either patient operated over evening causing mobilization on next day or lack of varied times of physiotherapist attending the patient. Hospital length of stay was similarly homogeneous, ranging from 4 to 5 days, with a mean of about 4.4 days. There were no readmissions or delayed neurological or wound-related events recorded during the index admission.

Patient-reported satisfaction and complications

Patient-reported satisfaction with analgesia and overall perioperative experience was high in all cases. Satisfaction scores on a 0–10 numeric scale ranged from 9 to 10, with a mean of 9.5. No peri- or postoperative complications attributable to ESPB or the analgesic regimen were noted; all entries for "Complication" were recorded as "Nil".

Because of the small sample size and single-arm design, no formal hypothesis testing or between-group comparisons were performed; the analysis was limited to descriptive statistics.

Discussion

This retrospective case series demonstrates that bilateral lumbar ESPB as an adjunct to general anaesthesia for single-level TLIF is feasible, extremely quick to perform and associated with low early postoperative pain scores, very early ambulation, short and uniform length of stay and high patient satisfaction, without observed block-related complications. Although limited by sample size and the absence of a control group, the findings are consistent with, and in some respects at least as favourable as, the results reported in recent randomized controlled trials and meta-analyses of ESPB in lumbar spine surgery.

Comparison with published ESPB data in lumbar spine surgery

Multiple randomized trials and systematic reviews have established ESPB as an effective component of multimodal analgesia for spinal procedures, including lumbar fusion. These studies consistently show that ESPB reduces early postoperative pain scores and perioperative opioid requirements compared with no block or sham, while maintaining a favourable safety profile [5]. In lumbar surgery specifically, pooled analyses suggest that ESPB lowers both rest and movement pain in the first 24–48 hours and prolongs the time to first rescue analgesia, with associated improvements in patient satisfaction [6].

The absolute pain scores observed in the present series, predominantly 2–3/10 over the first 24 hours, lie within or slightly below the ranges typically reported for patients who received ESPB in randomized lumbar fusion trials, where mean VAS values often remain in the low-to-mid single digits despite significant reductions compared with controls. This suggests that, in this setting, ESPB provided clinically meaningful and, by published standards, excellent analgesia after TLIF.

Time to ambulation and length of stay are more variably reported in the literature, similar to our study more related to logistics than due to inability of the patient to mobilise according to the author. Some individual trials have shown earlier mobilisation and modest reductions in length of stay with ESPB, whereas larger meta-analyses across heterogeneous spinal procedures have not consistently demonstrated statistically significant changes in these endpoints. In the current cohort, variable ambulation within approximately 6-12 hours of surgery and a length of stay confined to 4–5 days compare favourably with published series of lumbar fusion. On comparing similar studies with Lumbar surgery plus ESP blocks, Zhang et al in 2020 saw a median of 72 hours for ambulation and 6 days for length of stay [7]. Van den Broek saw the median time of 2.74 days as length of stay [8]. While this cannot be attributed solely to ESPB—since institutional ERAS protocols and surgical factors also play major roles—it indicates that the analgesic strategy did not impede, and likely facilitated, early mobilisation.

Relation to other regional techniques

ESPB is one of several posterior trunk blocks used for lumbar spine surgery, alongside thoracolumbar interfascial plane (TLIP) blocks and various quadratus lumborum block approaches. Comparative trials generally show that ESPB and these alternative blocks all confer significant benefits over systemic analgesia alone, with modest differences between techniques in pain scores, opioid consumption and block duration that vary by study [9]. Recent meta-analyses have therefore concluded that ESPB is safe and effective but not unequivocally superior to other well-performed plane blocks for lumbar surgery [6].

In that context, the present data suggest that bilateral lumbar ESPB can deliver outcomes at least comparable to those reported for other regional strategies: low early pain, early ambulation, short hospital stay and high satisfaction without major complications. However, because only a single block technique was used and there was no contemporaneous comparator (such as TLIP or quadratus lumborum block), no inference can be made regarding the relative superiority of ESPB over other regional techniques in this cohort.

Feasibility, efficiency and safety

A practical advantage of ESPB highlighted by this series is the very short block performance time. The mean bilateral block time of just over 3 minutes underscores the procedural simplicity and efficiency of lumbar ESPB in experienced hands. Although most randomized studies do not report block performance time numerically, ESPB is frequently described as

technically straightforward and quick under ultrasound guidance. In a high-throughput operating schedule, such a short, reproducible procedure may be attractive, especially when balanced against its analgesic benefits.

No block-related complications were observed in this series, aligning with the low complication rates reported in larger clinical trials and systematic reviews. ESPB is performed in a relatively superficial fascial plane, distant from the neuraxis and major vascular structures, which likely contributes to its favourable safety profile when standard precautions and ultrasound guidance are used [10].

Clinical implications

The combination of rapid block placement, low early pain scores, very early ambulation and high satisfaction suggests that lumbar ESPB can be integrated effectively into a multimodal analgesic and enhanced recovery pathway for single-level TLIF. In particular, the narrow range of pain scores and recovery parameters across patients indicates that the technique may offer not only good average outcomes but also a high degree of consistency. For clinicians, these findings support the routine consideration of ESPB as an adjunct in appropriately selected lumbar fusion cases, especially where early mobilisation and short length of stay are key objectives.

Limitations and future directions

Several limitations must be acknowledged. First, the sample size is small (n=10), limiting the precision of estimates and precluding meaningful subgroup analyses by diagnosis, level or demographic factors. Second, the study uses a single-arm design without a control or comparator block, so improvements in pain and recovery cannot be definitively attributed to ESPB rather than to surgical technique, systemic analgesia or institutional ERAS elements. Third, opioid consumption and other quantitative analgesic endpoints were not captured in this dataset, restricting the ability to benchmark opioid-sparing effects against the existing ESPB literature.

Future research in this setting should include larger, prospective cohorts with standardized data collection and a contemporaneous comparator group, such as TLIF patients receiving alternative regional blocks or systemic analgesia alone. Randomized or well-matched observational designs would allow robust evaluation of ESPB's impact on pain, opioid use, ambulation, length of stay and complications, as well as exploration of potential predictors of response. Incorporating patient-reported outcome measures and longer-term follow-up could further clarify whether early analgesic benefits translate into sustained improvements in functional recovery and chronic pain after lumbar fusion.

Future research needs larger, prospective cohorts, standardized data, and a contemporaneous comparator (e.g., TLIF with alternative blocks or systemic analgesia) to robustly evaluate ESPB's impact on pain, opioid use, ambulation, length of stay, and complications. Randomized or well-matched observational designs are required, along with exploration of response predictors. Incorporating patient-reported outcomes and longer follow-up will clarify if early benefits lead to sustained functional recovery and less chronic pain post-lumbar fusion.

Conclusion

Our retrospective case series supports fluoroscopy-guided bilateral ESPB as a practical and effective adjunct for perioperative analgesia in single-level lumbar fusion surgery. The technique is especially attractive because it can be performed by the spine surgeon during fluoroscopic level confirmation, potentially improving workflow while maintaining outcomes comparable to those reported in the literature. It is also a very feasible tool for operating surgeons, as most of them have C-arms in their operation theaters but lack ultrasound machines, which are costly and have restriction in India due to strict rules of PNDCT [11].

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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