



## TO INVESTIGATE THE PERIOPERATIVE ANALGESIC EFFECTIVENESS OF ULTRASOUND-GUIDED ERECTOR SPINAE PLANE BLOCK IN LUMBAR SPINE SURGERIES.

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**ABSTRACT** **Objective :** The goal is to determine the efficacy of ultrasound-guided Erector Spinae Plane block (ESPB) on perioperative opioid analgesic use, hemodynamics, and duration of postoperative analgesia in patients posted for lumbar spine surgeries. **Material and methods:** In this case series, 30 patients whose ages ranged from 18 to 65 years and belonging to ASA grade I and II were assessed for the perioperative effects of ESPB, who were posted for elective Lumbar spine surgery at the Dr. D. Y. Patil Hospital and Research Institute in Kolhapur, Maharashtra, between January 2022 and November 2022. Following a preliminary assessment and inquiry, patients were posted for elective surgery. **Results:** In our study, 80% of the patients did not need opioid analgesics during the procedure and there was a very low frequency of hemodynamic alterations. 90% of the patients had a Visual Analogue Scale (VAS) score of less than 3 in the postoperative period, which added 5 hours to the average duration before receiving the very first analgesic (provided if the VAS was more than 4). **Conclusion:** We concluded that there was reduced perioperative opioid use with hemodynamic stability and reduced postoperative pain when ESPB was supplemented as an analgesic regimen for lumbar spine surgery. ESPB can be thought of as a reliable and efficient perioperative analgesic treatment that helps in Enhanced recovery after surgery (ERAS).

**KEYWORDS :** lumbar spine surgery, erector spinae plane block, Enhanced recovery after surgery, Visual Analogue Scale

### Introduction :

Patients may feel excruciating pain in the postoperative period after lumbar spine surgery, which leads to an increase in the usage of opioid analgesics, which have a number of negative side effects such as respiratory depression, drowsiness, nausea, and constipation that can exacerbate a patient's health and lengthen their stay in the hospital.

Regional anesthetic methods are currently considered standard practice in Enhanced recovery after surgery (ERAS) protocols because of the growing importance of multimodal analgesic approaches to prevent the aforementioned problems. [1]

In 2016, Ferero et al. invented the Ultrasound-guided erector spinae plane block (ESPB), an interfascial nerve block in which local anesthetic is delivered beneath the erector spinae muscle group (m spinalis, m longissimus thoracis, iliocostalis) [2]. It blocks the anterior and posterior rami of spinal nerves causing sensory blockade over the antero- and posterolateral thorax [3,5]. ESPB is linked to a decreased likelihood of complications, with no significant structures nearby, simple sono-anatomy, and preservation of spinal cord functions. [3] Imaging studies suggest that, when local anesthetic is injected into the ESP, it spreads cranially and caudally as the plane maintains continuity along the spine. [4] To study the effectiveness of pre-operative ESPB as an addition to the multimodal analgesic protocol in posterior lumbar surgeries, this research is aimed to evaluate perioperative hemodynamics, analgesic consumption, pain scores during the post-operative period, and rescue analgesic consumption. Any complications during the procedure were noted.

### Methodology:

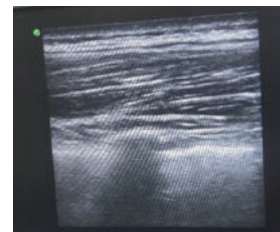
This study is a prospective case series in which we performed the ESPB on thirty patients undergoing elective lumbar spine surgeries, between ages 18 to 65 years, belonging to ASA physical status I- II from January 2022 to November 2022. During the pre-anesthetic checkups and after proper counseling, informed consent was obtained. These blocks were performed by skilled anesthesiologists with training in ultrasound guided regional anesthesia. Patients with BMI >30 or <18, coagulation disorder, surgical site skin infections, allergy to local anesthetic, or gross spine deformity were excluded from the study. All patients included in this study underwent thorough pre-anesthetic assessment, detailed medical and surgical history was obtained, a complete physical examination was done with airway and spine examination, and all routine laboratory investigations were done.

### Procedure:

After shifting the patients in the operating room, an 18G intravenous line was secured, monitor was attached with continuous ECG monitoring, heart rate, non-invasive BP monitoring, oxygen saturation (SPO<sub>2</sub>), temperature, end-tidal CO<sub>2</sub>, and anesthetic gas analysis. Injection Glycopyrrolate 0.2mg IV, Injection midazolam 1mg IV, IV

Ondansetron 4mg, IV ranitidine 75mg and injection fentanyl 1mcg/kg IV was given as premedication. Induction was done with injection propofol 1.5-2mg/kg and injection succinylcholine 2mg/kg. After induction of anesthesia and placement of the patient in prone position, the ESP block was performed. Under ultrasound guidance with high frequency curved array probe placed longitudinally, 3cm lateral to the vertebral column at the level of transverse process (TP) of T12, 2 muscles erector spinae and trapezius muscle were identified. A 10cm, 20-G echoplex block needle, was introduced in a cephalo-caudal orientation. The needle is advanced until it hits the TP with the deposition of local anesthetic (LA) drug injection bupivacaine 0.5% 20cc. Hydro dissection with 1–2 mL of normal saline to visualize and confirm the plane, and then, deposition of LA was done. The spread of LA fluid was visualized as seen in figure 2. The right location of the needle tip is confirmed by fluid spread (LA) under erector spinae muscle, separating it from the TP. Rhomboid major is absent at this level. The same procedure was repeated on the contralateral side. Anaesthesia was maintained with sevoflurane in a 50:50 air: oxygen mixture and vecuronium for muscle relaxation. Fentanyl boluses of 25mcg were administered if heart rate and mean arterial pressure (MAP) raised by 15% of baseline vitals after induction. The total dose administered throughout was documented.

The duration of the surgery was noted and warmer was used to maintain a normal body temperature and prevent hypothermia. After extubating the patients were shifted to the recovery room and were monitored for 24 hours postoperatively. Injection tramadol 100mg IV in 100 ml Normal saline was given over 20 minutes as a postoperative rescue analgesic if VAS >4.



**Figure 1:** USG image of ESPB at the level of T12 transverse process.



**Figure 2: USG image showing the local anesthetic spread**

**Data collection and outcomes:**

This study includes 30 patients posted for lumbar spine surgery between January 2022 to November 2022 in our institute.

The patient's demography, ASA status, duration of the surgery, and baseline vitals were noted. The intraoperative vitals like Heart Rate (HR) and Mean Arterial Pressure (MAP) were noted every 15 mins until the surgery lasted. The total dosage of fentanyl used intraoperatively was also noted.

After extubation, acute postoperative pain was assessed using the Visual Analogue scale (VAS), if >4 patient was given injection Tramadol 100mg IV. Postoperatively the pain was assessed at 12 hours and 24 hours using VAS scoring and the total analgesic used was recorded. Any adverse event like nausea, vomiting, mental status alteration, and any other complication was also noted.

**Table 1: Age Distribution of patients studied**

AGE GROUP	FREQUENCY	PERCENTAGE
Below 30	3	10%
31-40	8	26.66%
41-50	10	33.33%
51-65	9	30%

**Table 2: Weight Distribution of patients studied**

Weight in kgs	FREQUENCY	PERCENTAGE
Below 50	2	0.6%
51-60	10	33.33%
61-70	14	46.66%
71-75	4	13.33%

**Table 3: Gender Distribution of patients studied**

GENDER	FREQUENCY	PERCENTAGE
MALE	11	36.66%
FEMALE	19	63.66%

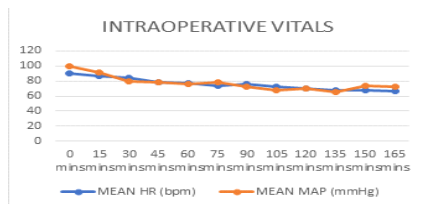
**Table 4: ASA GRADE Distribution of patients studied**

ASA grade	FREQUENCY	PERCENTAGE
I	9	30%
II	21	70%

**Table 5: Surgical duration**

Time duration (in mins)	FREQUENCY	PERCENTAGE
120 – 150	8	26.66%
151 – 180	15	30%
181 – 210	7	23.33%

Mean duration of surgeries was 165 minutes.



**Figure 3: Line diagram showing intraoperative vitals**

Hemodynamic parameters (HR and BP) remained stable throughout the surgical duration and the mean total dosage of injection fentanyl top-up in 30 patients was 14.16 ± 20.08 mcg.

**TABLE 5- VAS SCORE IN IMMEDIATE POST OPERATIVE PERIOD**

VAS SCORE	FREQUENCY (in percentage)
1	23.33%
2	50%
3	23.33%
4	1%

In the immediate postoperative period, the VAS score was <3 in most patients. The VAS score at 12 hours postop was 2 in 10 % of the patients, 3 to 4 in 80 % of the patients, and >4 in the remaining 10%. 24 hours postop the VAS was >4 in 73.33% of the patients and were given

analgesics, <4 in 26.67% of patients. The mean duration of postoperative analgesia was found to be 13 ± 2.50 hours. No complications or adverse events were noted in the intraoperative or postoperative period.

**Discussion:**

This prospective study was done on 30 patients to show the advantages of adding preoperative erector spinae plane block in the multimodal analgesic protocol for lumbar spine surgeries. We were able to conclude that ESPB reduced the intraoperative and postoperative consumption of analgesics, provide stable intraoperative hemodynamics and increase the duration of postoperative analgesics with no complications.

Patients may experience severe pain after spine surgery, therefore, a multidisciplinary analgesic regimen is required which includes conducting interventional methods and using multimodal systemic analgesics. Regional anaesthesia techniques have gained a lot of popularity due to their safety profile and prolonged analgesia duration. The ultrasound-guided ESP block is a straight forward procedure that involves injecting local anaesthetic into a paraspinal tissue plane under erector spinae muscle far from the pleura and neuroaxis, thus, reducing the chance of complications. Iliocostalis, longissimus, and spinalis are the muscles that make up the erector spinae and runs from the skull to the pelvis and sacrum.<sup>[2,5]</sup> The local anesthetic acts by blocking the dorsal and ventral rami of spinal nerves at levels located above and below the injection site.<sup>[2,5]</sup> The degree of the dermatomal blockage is increased by multi-level distribution and diffusion into the paravertebral and intercostal regions. Various studies<sup>[2,7,8,9]</sup> have been carried out to evaluate the utility of ESPB on multiple surgeries such as thoracic, breast, spine surgeries, using varying volumes and doses of ropivacaine or bupivacaine at the midpoint of the incision or at T10, T12, and L4, nevertheless, its efficacy and safety are still debatable. The consequences of a lumbar ESP block have not been subjected to a thorough investigation.

The primary outcome of this study is the reduced intraoperative dosage of opioid analgesics and stable intraoperative hemodynamics. Opioids are linked with several side effects, such as bradycardia, nausea, vomiting, pruritus, and respiratory depression.<sup>[6]</sup> This opioid sparing effect was also observed in previous studies by Zhang et al, where they conducted a systematic review and meta-analysis that evaluated the “effectiveness of ESPB in spinal surgery.”<sup>[7]</sup> Similar observations were made in a study conducted by Amit et al, where “they assessed the effects of ESPB on 7 patients undergoing cervical and thoracic spine surgery”. They concluded that “for cervical and thoracic spine procedures, the ESP block produces effective intraoperative and postoperative analgesia as well as hemodynamic stability and an opioid-sparing effect.”<sup>[8]</sup>

Our research shows that ESPB significantly decreased postoperative pain in individuals having spine surgery, thus reducing the dose of postoperative analgesic requirement. Early mobilization was also made possible by the absence of substantial pain following surgery. These findings were similar to the “systematic review and meta-analysis” performed by Liang X et al, where they concluded that it decreased the number of patients who needed rescue analgesia and prolonged postoperative analgesia.<sup>[9]</sup>

**Conclusion:**

In conclusion, for perioperative analgesia during lumbar spine surgery, the Erector Spinae plane block is useful and efficient with no side effects. It provides several advantages like minimizing analgesic usage in the perioperative period with stable hemodynamics. It prolongs postoperative analgesic usage while reducing the requirement for rescue analgesics.

**Conflict of interest**

Authors do not have any conflict of interest.

**Ethics statement**

This research is reviewed and approved by the Ethical Committee of D Y Patil Hospital. The patients/participants provided their written informed consent to participate in this study.

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