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RESEARCH

Posterior quadratus lumborum block or lumbar erector spinae plane block for postoperative analgesia management after lumbar spinal surgery: a randomized controlled trial

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Abstract

Purpose Postoperative pain after lumbar microdiscectomy (MD) can be significant. While both the lumbar erector spinae plane block (L-ESPB) and the posterior quadratus lumborum block (P-QLB) are used for analgesia, they have not been directly compared. We hypothesized that L-ESPB and P-QLB would provide different levels of analgesia after MD.

Methods This single-center, prospective, randomized controlled trial included 60 adult patients (ASA I-II) undergoing unilateral single-level lumbar MD. Patients were randomized to receive a bilateral, postoperative L-ESPB ($n=30$) or P-QLB ($n=30$) with 30 mL of 0.25% bupivacaine per side. The primary outcome was the Numerical Rating Scale (NRS) pain score at 2 h postoperatively. Secondary outcomes included NRS pain scores over 24 h, rescue analgesia requirements, and adverse events.

Results Patients in the L-ESPB group had statistically lower static and dynamic NRS pain scores at all measured time points (1, 2, 4, 8, 16, and 24 h) compared to the P-QLB group ($p=0.001$). The number of patients requiring rescue analgesia was lower in the L-ESPB group (1 vs. 9 patients, $p=0.012$), and the total tramadol consumption was also lower ($p=0.005$). The incidence of nausea and itching was significantly lower in the L-ESPB group. One patient in the L-ESPB group experienced a temporary motor block.

Conclusion In patients undergoing lumbar MD, L-ESPB provided superior analgesia and resulted in lower opioid consumption and fewer opioid-related side effects compared to P-QLB over the first 24 postoperative hours.

Keywords Lumbar erector spinae plane block · Posterior quadratus lumborum block · Postoperative analgesia management · Microdiscectomy · Lumbar spine surgery

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Introduction

Lumbar disc herniation (LDH), a common degenerative process of the intervertebral discs, is a primary cause of low back pain, which affects up to 80% of people at some point in their lives. While conservative treatments are the first line of therapy, surgical intervention is necessary for patients with refractory symptoms or progressive neurological deficits [1, 2]. Patients who do not respond to conservative treatment or who have a progressive neurological deficit undergo surgical treatment. Minimally invasive techniques like microdiscectomy (MD) are used for LDH surgery due to their superior postoperative results [1, 2]. Patients may endure moderate-to-severe pain during the postoperative phase. The source of this pain is the laminectomy, the surgical incision of the paravertebral muscles, and the retractors used during surgery [3]. Effective analgesia management in the postoperative period improves patient comfort and reduces the length of hospital stay by providing early mobilization and rapid recovery [3, 4]. Regional anesthesia techniques are prominent for analgesia management after lumbar surgery. Interfascial plane blocks are easy to perform and safe because they are applied under ultrasound guidance.

The erector spinae plane block (ESPB) is an interfascial plane block to the deep fascia of the erector spinae muscle (ESM) [5]. Since its description in 2016, a large number and variety of articles have been reported on its analgesic efficacy. ESPB provides thoracic, abdominal, lumbar, and hip analgesia depending on the localization of application. Lumbar ESPB (L-ESPB) was described by Tulgar et al. [6]. Its effectiveness for providing analgesia after various lumbar surgeries has been reported in multiple studies [7]. Another technique that can be preferred for analgesia management after lumbar surgery is the quadratus lumborum plan block (QLB), which is performed around the quadratus lumborum muscle (QLM). QLB has three different techniques [8], and there are studies reporting that anterior and posterior QLB (P-QLB) provide effective analgesia after lumbar surgery [3, 4]. L-ESPB targets both the dorsal and ventral ramus and has a risk of motor block due to paravertebral/epidural spread. QLB acts through the thoracolumbar fascia, targets only the dorsal ramus, and there is no information in the literature about motor block. In this respect, QLB may be an alternative to L-ESPB. Since no study has compared these two techniques in the literature, we aimed to compare L-ESPB and P-QLB. Based on the different anatomical targets of the two blocks, we hypothesized that L-ESPB would provide superior analgesia compared to P-QLB in the postoperative period in patients undergoing MD.

Methods

Study design and patients

The Ethics and Research Committee of Istanbul Medipol University granted approval for this prospective, randomized-controlled trial on July 18, 2024 (approval number: 692). Following approval, the study was listed as NCT06477198 on ClinicalTrials.gov. The Medipol Mega University Hospital Complex served as the site of this single-center study from August 2024 to February 2025. Every patient provided written informed consent.

The inclusion criteria were:

· Patients between 18 and 70 years of age.

· American Society of Anesthesiologists (ASA) classification I-II.

· Scheduled for unilateral single-level lumbar disc surgery with the microdiscectomy technique under general anesthesia.

The exclusion criteria were:

· History of bleeding diathesis,

· Receiving anticoagulant treatment,

· Known local anesthetics and opioid allergy,

· Infection of the skin at the site of the needle puncture,

· Pregnancy or lactation,

· Patients who do not accept the procedure.

· Change in surgical technique in the intraoperative period.

Randomization, blinding, and grouping

Patients were randomly assigned to one of two groups prior to surgery: Group ESPB ($n=30$) or Group QLB ($n=30$). Patients in Group QLB received P-QLB, whereas those in Group ESPB received L-ESPB. The Research Randomizer software was used to perform grouping and randomization using a randomization table. Each patient was given a random identifying number by a researcher who was not involved in the study. Grouping was invisible to the patients. The pain nurse anesthetist assessing outcomes was blind to grouping.

General anesthesia, intraoperative analgesia management, and surgical technique

Noninvasive blood pressure monitoring, pulse oximetry, and electrocardiography were monitored in the operating room. The same combination of intravenous (IV) propofol (2–3 mg/kg), fentanyl (1.5 mcg/kg), and rocuronium bromide (0.6 mg/kg) was used to induce general anesthesia in each group. The patients were put in the prone position for surgery following orotracheal intubation. Desflurane in an

air-oxygen mixture and remifentanil infusion (0.05–2 µg/kg/minute) were employed by the anesthesia staff to maintain anesthesia. When necessary, a 0.5 mcg/kg intravenous bolus dose of remifentanil was given. The same surgical team used the same procedure to perform single-level unilateral (right or left) MD for lumbar disc surgery on all patients. Using a 3 cm incision, the surgical procedure involved an inferior and superior partial hemilaminectomy + flavectomy + foraminotomy + MD. To treat postoperative nausea and vomiting and pain, all patients received intravenous ondansetron (4 mg), ibuprofen (400 mg), and tramadol (100 mg) 30 min before the end of surgery. If the patients exhibited adequate spontaneous respiration following block administration, they were extubated while supine. They were taken to the post-anesthesia care unit following extubation.

Block procedures

At the end of the surgery, before extubation, when the patient was in a prone posture, all block procedures were carried out under general anesthesia. During the application, a sheath was placed over the low-frequency convex transducer to maintain sterility.

US-guided ESPB

The transducer was positioned at the level of the L3 vertebrae in the parasagittal plane in the L-ESPB group. The transducer was positioned 4 cm laterally from the midline in order to visualize the transverse process. Over the transverse process, the ESM was visible. The in-plane approach was used to pierce the needle in the craniocaudal direction. Figure 1 shows the sonographic anatomy of L-ESPB. To verify the correct injection location, isotonic saline solution 5 mL was then injected into the deep fascia of ESM. Following needle placement, 30 milliliters of 0.25% bupivacaine were injected. On the opposite side, the same L-ESPB process was carried out. 60 milliliters of 0.25% bupivacaine were injected in total.

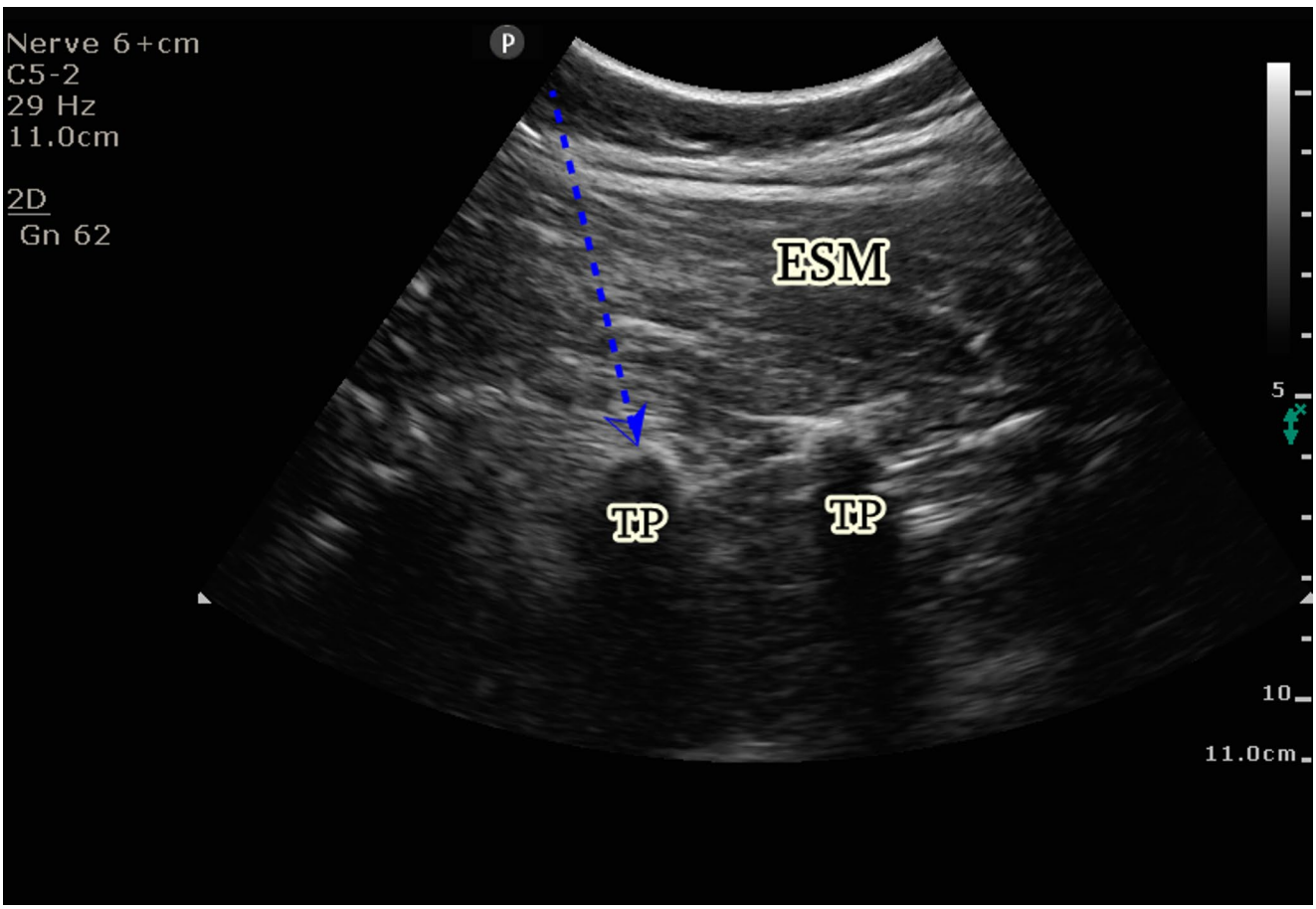


Fig. 1 Sonographic anatomy of the L-ESPB with parasagittal approach at the level of L3/L4 vertebrae. ESM; erector spinae muscle, TP; transverse process. White arrow indicates the needle direction

US-guided P-QLB

We selected the posterior approach for the QLB. Although an anterior approach has also been described, we chose the posterior technique as it is more superficial and technically less demanding to perform compared to the deeper anterior approach.

For imaging optimization, the side of the procedure (right or left) was slightly elevated by placing a pillow, and the table was slightly tilted and maneuvered upwards on the same side. Above the iliac crest, the transducer was positioned vertically. To view the QLM, the probe was shifted cranially. After determining the posterior side of the QLM, the needle tip was put there using an in-plane technique. After verifying the block area with an injection of isotonic saline (5 ml), 30 ml of 0.25% bupivacaine was administered to the posterior side of the QLM. Figure 2 shows the sonographic anatomy of P-QLB. On the opposite side, the same P-QLB process was carried out. 60 milliliters of 0.25% bupivacaine were injected in total.

Postoperative analgesia management protocol and outcomes

As part of our routine analgesic protocol, the patients were routinely given 1 g of paracetamol intravenously every 8 h. The 11-point Numerical Rating Scale (NRS), with 0 representing no pain and 10 representing the highest pain, was used to assess postoperative pain. We assessed pain during both static rest and dynamic movement. At postoperative 1, 2, 4, 8, 16, and 24 h, the patients' pain levels were noted. For rescue analgesia, intravenous (IV) tramadol (1 mg/kg) was administered to patients reporting an NRS score $\geq$4. This could be repeated as needed, with a minimum interval of 6 h between doses, not to exceed a total of 400 mg in a 24-hour period, per our institutional standard of care.

The primary outcome of the study was to compare NRS pain scores at 2 h postoperatively.

The secondary outcomes included postoperative NRS pain scores (assessed at rest [static] and during movement [dynamic]) at 1, 2, 4, 8, 16, and 24 h, the total consumption and frequency of rescue analgesia, and the incidence of adverse events (nausea, vomiting, itching, and motor block).

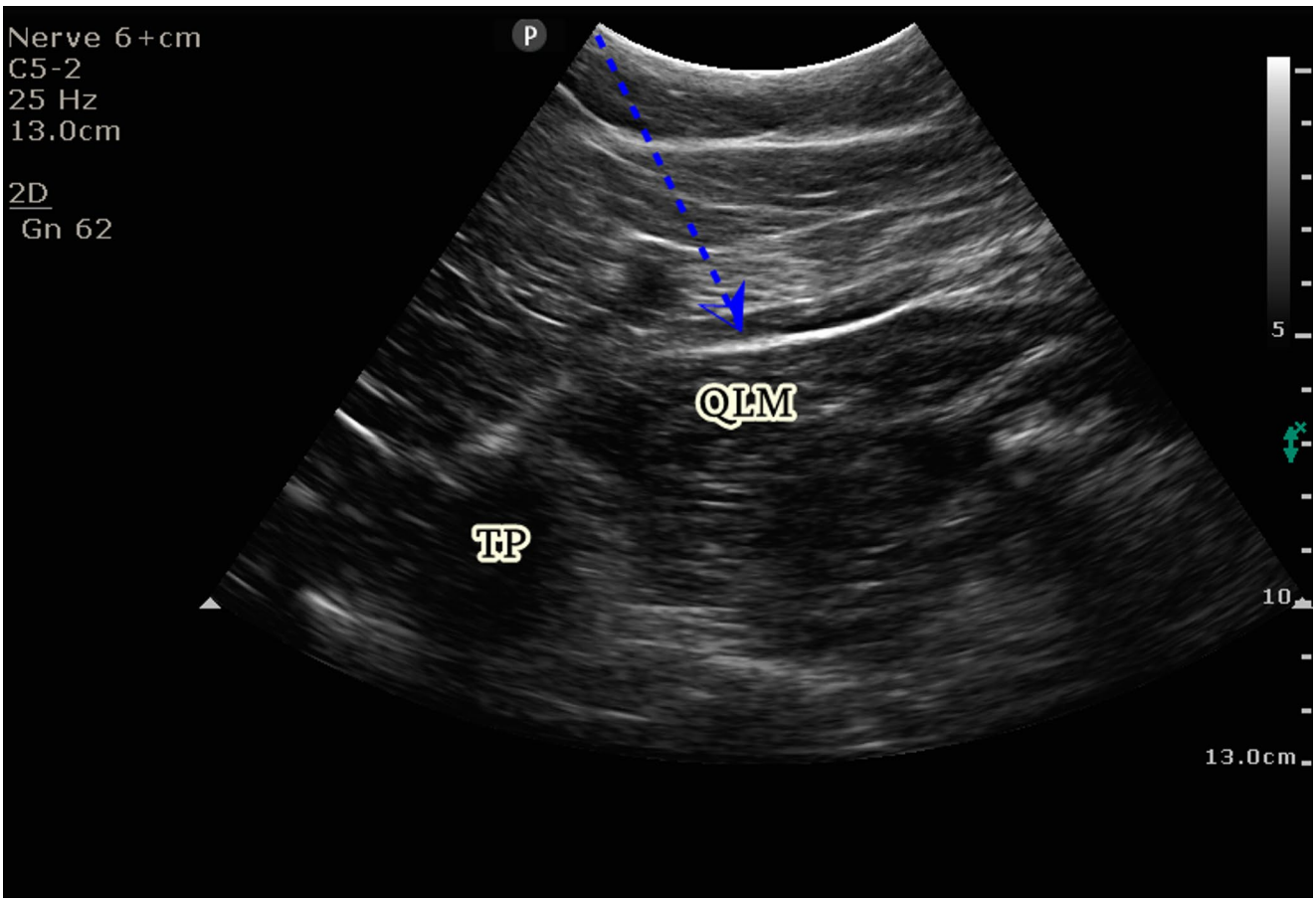


Fig. 2 Sonographic anatomy of the P-QLB. QLM; quadratus lumborum muscle, TP; transverse process. White arrow indicates the needle direction

The postoperative NRS ratings, the requirement for rescue analgesia, and adverse events were assessed by a pain nurse anesthetist who was blind to the grouping.

The blinded nurse anesthetist explicitly asked the patients to distinguish between actual surgical pain and general postoperative discomfort or pressure during each assessment.

Sample size and statistical analyses

The sample size was determined using G*Power software (V.3.1.9) based on the primary outcome of the NRS score at 2 h postoperatively. Based on a preliminary trial with eight patients per group, the mean NRS pain scores were 1 (SD 2.26) in the L-ESPB group and 3 (SD 0.54) in the P-QLB group. With 99% power, to detect a significant difference with an effect size (Cohen's d) of 1.22, a minimum of 26 patients per group was required in each group after taking an alpha (α) level of 0.05, beta (β) error 0.01, and a two-tailed test (effect size: 1,217251). To account for potential dropouts, we enrolled 30 patients in each group.

The Shapiro-Wilk test was used to determine if the observations in this study were skewed or normal based on the morphologies of the variable distributions. Data were detailed with mean ± SD and analyzed using an independent samples t-test to examine group-wise differences on the outcome parameters in cases where the test results showed that the data were normally distributed. The median and IQR were examined in depth and the groupwise differences were observed using the Mann-Whitney U test for the continuous data, which produced the non-parametric dispersion. We calculated the 95% CI of the median differences in NRS pain scores using the Hodges-Lehmann estimator. The threshold for statistical significance in our investigation was $p < 0.05$. SPSS V.25 (SPSS, Chicago, Illinois, USA) and R statistical software package (V 4.0.2, R Foundation for Statistical Computing, Vienna, Austria) were used for statistical analysis.

We acknowledge that performing multiple comparisons across six time points for the NRS data increases the risk of a Type I error. However, given the consistent and highly significant difference observed at every time point ($p = 0.001$), we did not apply a statistical correction (e.g., Bonferroni), but this should be considered a limitation of the analysis.

Results

The flow diagram for patient enrollment in our trial using the Consolidated Standards of Reporting Trials is displayed in Fig. 3. Throughout the study period, 81 patients had MD surgery. Of them, 60 patients ($n = 30$ each group) were assigned to the research groups. The two groups' baseline characteristics, anesthetic durations, surgical level and surgery durations did not differ (Table 1).

Table 2 shows the NRS pain scores. The static and dynamic NRS pain scores at 1st, 2nd, 4th, 8th, 16th, and 24th postoperative hours were statistically lower in the L-ESPB group compared to the P-QLB group ($p = 0.001$), with a large effect size. Table 3 shows the number of patients who needed rescue analgesia (tramadol) and the dose of rescue analgesia used. The number of patients requiring rescue analgesia was statistically lower in the L-ESPB group ($p = 0.012$). One patient in the L-ESPB group and 9 patients in the P-QLB group needed rescue analgesia. The dose of tramadol used was statistically lower in the L-ESPB group than in the P-QLB group ($p = 0.005$).

The incidence of side effects (nausea, vomiting, and itching) related to opioid use and the incidence of motor block are shown in Table 4. The incidence of nausea was statistically lower in the L-ESPB group than in the P-QLB group (1 patient and 8 patients, respectively, $p = 0.026$). The incidence of itching was statistically less in the L-ESPB group than in the P-QLB group (0 patients and 6 patients, respectively, $p = 0.024$). There was no difference in the incidence of vomiting between the groups ($p = 0.150$). All patients in the QLB group who experienced nausea or pruritus were those who required and received rescue tramadol. Although there was no statistical difference between the groups in the incidence of motor block ($p = 1$), motor block occurred in one patient in the L-ESPB group.

Additionally, the detailed frequency distribution of NRS pain scores for both groups at each postoperative time point is presented in Table 5.

Discussion

This is the first randomized, prospective study that compares L-ESPB vs. P-QLB for postoperative analgesia management in patients who underwent lumbar MD surgery. According to the results of our study, L-ESPB provided superior analgesia compared to P-QLB. In the postoperative 24-hour period, NRS pain scores at all hours, the number of patients requiring rescue analgesia, and the amount of opioids used were lower in the L-ESPB group. The incidence of nausea and pruritus was higher in the P-QLB group. Although not statistically significant, as an important point, one patient in the L-ESPB group developed a motor block in the postoperative period. The superior analgesic effect of L-ESPB observed in our study is likely attributable to its mechanism of action. The L-ESPB involves a larger volume of local anesthetic injected into a plane that allows for wide craniocaudal and medial-lateral spread, targeting both the dorsal and ventral rami of spinal nerves through potential

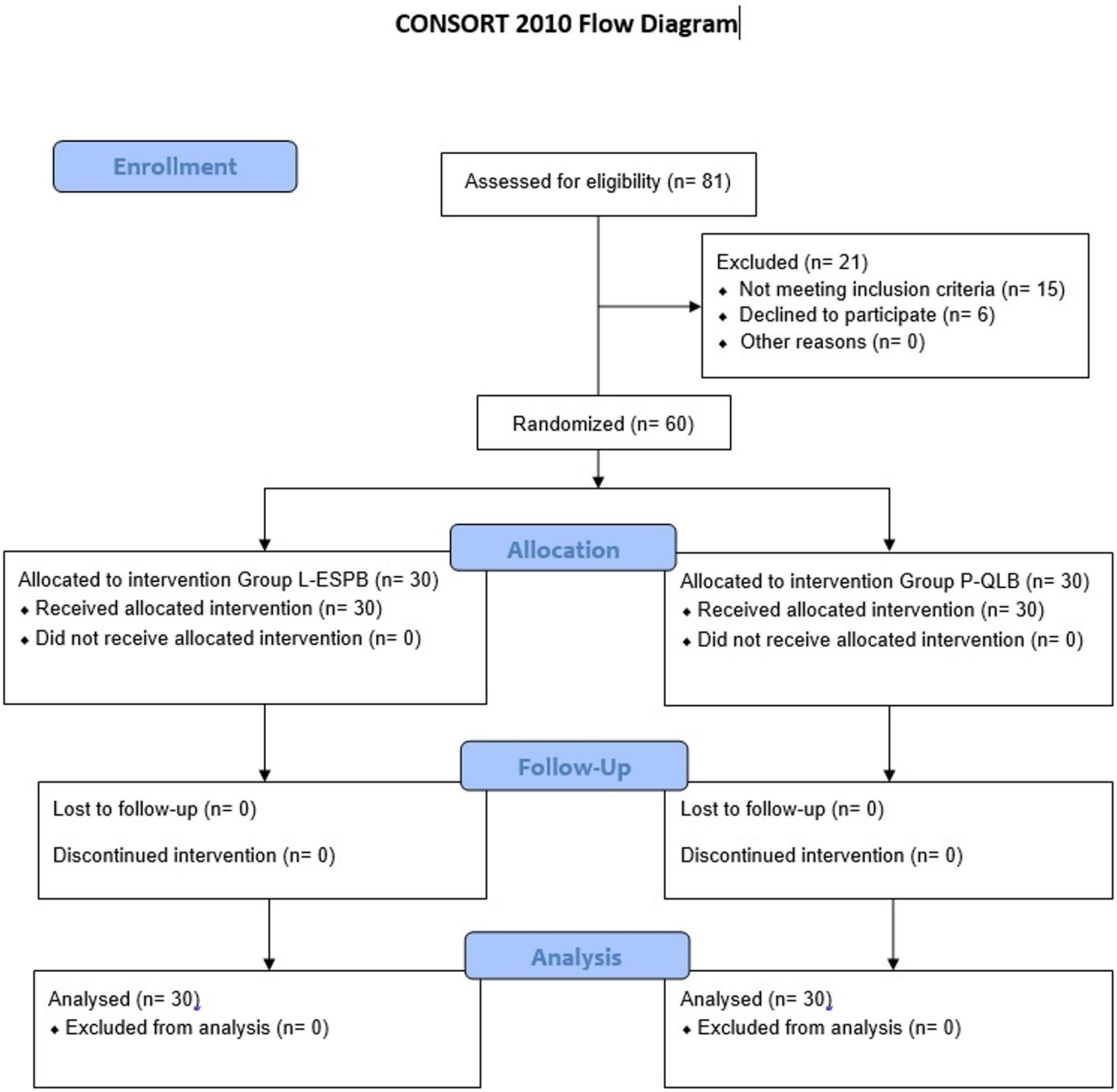


Fig. 3 CONSORT flow diagram of the study

paravertebral and epidural extension. This provides broader somatic and visceral coverage. In contrast, the P-QLB targets the thoracolumbar fascia, primarily affecting the dorsal ramus, which may result in a more localized and less comprehensive sensory blockade. While this focused action of P-QLB makes motor block less likely, the broader coverage of L-ESPB likely explains the significantly lower pain scores. However, this wider spread is also the probable cause of the transient motor block observed in one patient in the L-ESPB group, a known risk of the procedure.

Patients undergoing lumbar spine surgery experience severe pain in the postoperative period due to the dissection and removal of bony and paraspinal tissues and skin incisions [9]. Strategies used for analgesia management in these patients include oral or intramuscular/intravenous opioids, patient-controlled analgesia, and epidural analgesia. However, opioid agents are mostly used in these applications, and opioids have undesirable side effects such as nausea, vomiting, constipation, and urinary retention [10]. Therefore, regional anesthesia techniques emerge for rapid recovery and effective postoperative analgesia management [11].

Table 1 Comparison of demographic data, surgery levels and duration times of surgery and anesthesia

	Group L-ESPB ($n=30$)	Group P-QLB ($n=30$)	p
Age	42 (38–53)	43 (37–57)	0.8*
Gender (F/M)	14/16	14/16	*1*†
ASA (I/II)	9/21	10/20	*0.7**
Height (cm)	170 (160–176)	169 (160–176)	*0.8**
Weight (kg)	78 (66–90)	81 (70–94)	*0.2**
Duration of Surgery (min)	89 (80–105)	85 (80–92)	*0.5**
Duration of Anesthesia (min)	111 (97–127)	101 (96–109)	*0.1**
Level of surgery			
L2-L3	0	2	*0.1*†
L3-L4	5	2	
L4-L5	10	20	
L5-S1	15	6	

Values are expressed median (percentiles 25–75) or number

*P value is obtained with Mann-Whitney U test

†P value is obtained with Pearson's $\chi 2$ test (n)

p values were italicized and values that are written in bold represent statistical significance

ASA: American Society of Anesthesiologist, m: male, f: female, cm: centimeter, kg: kilogram, min: minutes

Table 2 The static and dynamic NRS during postoperative 24 h

	Group L-ESPB ($n=30$)	Group P-QLB ($n=30$)	Median Difference‡	95%CI‡	p
NRS Static					
1st hour	0 (0–0)	1 (1–2)	1.5	-2 to -1	***0.001***
2nd hour	0 (0–0)	2 (1–2)	2	-2 to -1	***0.001***
4th hour	0 (0–0)	1 (0–2)	1	-1 to 0	***0.001***
8th hour	0 (0–0)	1 (0–2)	1	-1 to 0	***0.001***
16th hour	0 (0–0)	1 (0–2)	1	-1 to 0	***0.001***
24th hour	0 (0–0)	0 (0–1)	0	-1 to 0	***0.001***
NRS Dynamic					
1st hour	0 (0–0)	3 (2–3)	3	-3 to -2	***0.001***
2nd hour	0 (1–2)	3 (2–3)	3	-3 to -1	***0.001***
4th hour	0 (0–0)	2 (2–3)	2	-2 to -2	***0.001***
8th hour	0 (0–0)	2 (1–3)	2	-2 to -1	***0.001***
16th hour	0 (0–0)	1 (1–2)	1	-2 to -1	***0.001***
24th hour	0 (0–0)	1 (0–1)	1	-2 to -1	***0.001***

Data are expressed as median (percentiles 25–75)

P value is obtained with Mann-Whitney U test median (percentiles 25–75)

p values were italicized and values that are written in bold represent statistical significance

Wilcoxon rank-sumtest used to compare medians between the groups

‡Hodges–Lehman estimator used to calculate 95% CI of the median differences

NRS: Numeric rating pain scale,

Table 3 The comparison of need of rescue analgesia (tramadol)

	Group L-ESPB ($n=30$)	Group P-QLB ($n=30$)	p
Rescue Analgesia (Y/N)	1/29	9/21	***0.012***
Rescue dose (mg)	0 (0–0)	0 (0-100)	***0.005***

P value is obtained with Pearson's $\chi 2$ test (n)

Data are expressed as median

*P value is obtained with Mann-Whitney U test median (percentiles 25–75)

p values were italicized and values that are written in bold represent statistical significance

Y: yes (indicates the number of the patients that used rescue analgesia), N: No., N/A: Not Applicable

Table 4 Comparison of the incidence of adverse effects between groups

	Group ESPB ($n=30$)	Group QLB ($n=30$)	p
Nausea (Y/N)	1/29	8/28	***0.026***
Vomiting (Y/N)	0/30	2/28	*0.150*
Itching (Y/N)	0/30	6/24	***0.024***
Motor Block (Y/N)	1/29	0/30	*1*

P value is obtained with Pearson's $\chi 2$ test (n)

Data are expressed as median

p values were italicized and values that are written in bold represent statistical significance

Y: yes, N: No

The use of interfascial plane blocks has grown in favor since ultrasound technology was incorporated into regional anesthetic and pain management procedures. ESPB was first described in 2016 for chronic pain of the thorax [12]. Since then, it has been used for many indications in acute and chronic pain from the cervical to the sacral region, and many articles have been published. ESM is a muscle that extends from the cervical to the sacral region and may show anatomical differences at each level. In the lumbar region, the ESM includes the multifidus, longissimus, and iliocostalis muscles, and the transverse process is deeper in this region [7, 13]. Therefore, L-ESPB is slightly more difficult to perform than thoracic ESPB, and LA distribution is more limited [7]. The first description of L-ESPB dates back to 2018 [6]. We can perform L-ESPB using a variety of different techniques. In our study, we performed L-ESPB with the classical parasagittal approach. During L-ESPB, LA spreads in the craniocaudal and medial-lateral directions and targets the dorsal ramus, providing multidermatomal sensory blockade [7, 14–16]. Another mechanism of action of L-ESPB is paravertebral spread [17]. Paravertebral spread may cause motor block in the lower extremities [18–20]. In our study, a motor block was observed in one patient in the L-ESPB group. The patient's motor block resolved in the 24-hour postoperative period, and the patient was discharged without any complications. There are studies in the

Table 5 Frequency distribution of NRS Static scores (Number of patients)

NRS Score	1 h (ESPB/QLB)	2 h (ESPB/QLB)	4 h (ESPB/QLB)	8 h (ESPB/QLB)	16 h (ESPB/QLB)	24 h (ESPB/QLB)
0	30 / 12	30 / 8	30 / 15	30 / 18	30 / 20	30 / 25
1	0 / 10	0 / 12	0 / 8	0 / 7	0 / 6	0 / 4
2	0 / 5	0 / 6	0 / 4	0 / 3	0 / 3	0 / 1
3+	0 / 3	0 / 4	0 / 3	0 / 2	0 / 1	0 / 0

literature about the effectiveness of L-ESPB for lumbar MD surgery. Yörükoğlu et al. compared preoperative L-ESPB vs. sham block, performed L-ESPB with 20 ml (total 40 ml) LA, and reported that L-ESPB provided effective analgesia [21]. Ciftci et al. compared L-ESPB vs. modified thoracolumbar interfascial plane block (m-TLIP) vs. control group [22]. They performed the blocks with 20 ml (total 40 ml) and reported that the L-ESPB and m-TLIP blocks provided effective analgesia. Unlike these studies, we used a 30 ml volume and performed L-ESPB postoperatively. QLB is a posterior abdominal wall fascial plane block. It is performed by injecting LA around the QLM. The thoracolumbar fascia (TLF) wraps around the QLM; the injected local anesthetic spreads through the TLF and targets the dorsal ramus [8, 23]. The QLM is enveloped by the layers of the thoracolumbar fascia (TLF), which serves as a conduit for local anesthetic. When injected posteriorly, the anesthetic spreads within this fascial plane medially toward the paravertebral space, where it can block the dorsal rami of the spinal nerves as they emerge. This mechanism explains its analgesic effect on the posterior lumbar region, despite the block also being known for providing somatic analgesia to the anterolateral abdominal wall. It has been reported that QLB covers the dorsal ramus in cadaveric examinations [8].

There are 3 techniques of QLB: anterior, posterior, and lateral approaches [8]. Clinical studies have reported that anterior QLB and P-QLB provide effective analgesia after lumbar surgery [3, 4, 24]. Alver et al. compared anterior QLB with the control group in lumbar surgery, performed 15 ml LA for QLB, and concluded that anterior QLB provided effective postoperative analgesia [24]. Contrary to this study, since anterior QLB is deeper and relatively more difficult to perform, we preferred P-QLB in our study and used a volume of 30 ml. Adigüzel et al. compared P-QLB and classical TLIP, utilized a volume of 20 ml, and reported that the two techniques provided a similar level of analgesia [4]. In a study comparing P-QLB and m-TLIP, the investigators performed a 30 ml volume and stated that m-TLIP provided superior analgesia to P-QLB [3]. Unlike these studies, we compared P-QLB with L-ESPB in our study, which is a first in the literature.

Although L-ESPB provided statistically superior analgesia, pain scores in the P-QLB group were not high enough to be clinically significant. Therefore, P-QLB may also be preferred in patients undergoing lumbar surgery. P-QLB may have some advantages over L-ESPB. There is a risk of motor block with L-ESPB, but there are no reported cases of motor block with P-QLB in the literature. Since L-ESPB is deeper, it is more difficult to visualize the linear spread of LA, whereas P-QLB is more superficial; it is easier to visualize the sonographic target, and the area of LA distribution is wider. However, although this is an advantage for P-QLB, it may result in a reduced area of sensory blockade [4].

The overall low NRS pain scores and minimal rescue analgesia requirements observed in both study groups might appear remarkably low for lumbar spine surgery. However, we believe this clinical outcome is a direct result of the synergistic effect between the minimally invasive nature of the microdiscectomy technique and our proactive multimodal analgesia protocol. Unlike more invasive spinal procedures, microdiscectomy involves limited tissue trauma, which inherently results in a lower baseline pain load. Furthermore, the intraoperative administration of regional blocks (L-ESPB or P-QLB) combined with the pre-extubation intravenous loading of paracetamol, ibuprofen, and tramadol allowed us to target pain pathways at multiple levels—peripheral, spinal, and supraspinal—simultaneously. This comprehensive approach effectively prevented the 'wind-up' phenomenon and preempted acute pain, explaining the frequent NRS pain scores of zero. These results underscore that when integrated into a robust multimodal regimen, both blocks are highly effective adjuncts that can elevate postoperative recovery to an excellent, near pain-free level.

In our study, we performed the blocks postoperatively for several reasons. First, it avoids delaying the start of surgery. Second, it ensures the block is performed only after the exact surgical levels are confirmed and the procedure is completed without changes to the surgical plan. Finally, it prevents the block's sensory and motor effects from potentially interfering with any intraoperative neuromonitoring. In addition, we preferred to perform the blocks after surgery in order to utilize the most effective hours of the block for postoperative analgesia management. We recognize that performing the block after surgical dissection could alter fascial planes and potentially affect local anesthetic spread; this represents a limitation of our study. However, our results demonstrate that both blocks still provided effective analgesia when administered postoperatively.

Our study has some limitations. We used a 30 ml volume in our study; different results may be obtained with different

volumes. We could not evaluate dermatome analysis, and sensory blockade assessment is important to evaluate the success of fascial plane blocks. We did not record block performance times, but according to our experience, sonographic evaluation of P-QLB was quicker than L-ESPB. We performed the blocks postoperatively; if we had performed them preoperatively, different results may have been achieved. We did not perform a postoperative quality of recovery evaluation; it may be valuable to perform this evaluation in future research. We selected the 2-hour postoperative time point as our primary outcome to assess the peak analgesic efficacy of the blocks. While we acknowledge the potential confounding effect of intraoperatively administered multimodal analgesics, this early time point is critical for determining the immediate success of the regional technique in providing patient comfort in the postanesthesia care unit and clinical ward. The sustained lower pain scores over 24 h in the L-ESPB group suggest the benefit extends well beyond the initial analgesic overlap. Finally, we did not use neuromonitoring techniques for motor response evaluation. Future studies aiming at determining the possible influence of the L-ESPB and P-QLB procedures on the requirement of monitoring techniques in lumbar spinal surgery should be taken into consideration. Furthermore, we did not record the time to first rescue analgesia request, which would have provided a more direct measure of the duration of analgesic efficacy for each block. Future studies should include this outcome to better characterize the pharmacodynamic profiles of these techniques.

Conclusion

In conclusion, L-ESPB provided superior analgesia compared to P-QLB. The pain scores and opioid consumption in the L-ESPB group were lower than those in the P-QLB group 24 h post-surgery.

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Data availability The datasets of the study are available from the corresponding author on reasonable request.

Declarations

Competing interests The authors declare no competing interests.

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