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# Analgesic efficacy of erector spinae plane block versus intrathecal morphine in cesarean section: randomized clinical trial

## Eficácia analgésica do bloqueio do plano eretor da espinha versus morfina intratecal em cesariana: ensaio clínico randomizado

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## ABSTRACT

**BACKGROUND AND OBJECTIVES:** While intrathecal opioids are effective in managing post-cesarean pain, their use is often associated with adverse effects such as nausea, pruritus, and delayed return of bowel function. The erector spinae plane block (ESPB) has emerged as a promising alternative, offering effective analgesia with a more favorable side effect profile. Thus, in this study, the aim was to compare the analgesic efficacy and adverse effects of bilateral parasagittal ESPB with intrathecal morphine (ITM) in patients undergoing elective cesarean sections.

**METHODS:** A randomized, controlled clinical trial was conducted with 54 pregnant women undergoing elective cesarean sections, allocated into two groups: ITM (n = 27) and ESPB (n = 27). The ITM group received hyperbaric bupivacaine combined with morphine, while the ESPB group received hyperbaric bupivacaine and a bilateral ultrasound-guided 0.25% levobupivacaine block at the T9 level. Pain at rest was assessed using a verbal numerical rating scale (vNRS) at 2, 6, 12, and 24 h postoperatively. Adverse effects, use of supplementary analgesia, time to first bowel movement, and length of hospital stay were also recorded.

**RESULTS:** There was no significant difference in pain intensity between the groups at any of the assessed time points. However, the ITM group had a significantly higher incidence of pruritus (74.1%), nausea (44.4%), and emesis (22.2%), whereas none of the patients in the ESPB group experienced these adverse effects ($p<0.05$). The use of supplementary analgesia was higher in the ESPB group, though not statistically significant (25.9% vs. 3.7%). Elimination of flatus occurred earlier in the ESPB group ($p=0.001$), although the length of stay was similar between groups.

**CONCLUSION:** ESPB achieved effective analgesia with fewer adverse effects than ITM. These findings support ESPB as a safe, effective, and well-tolerated alternative for post-cesarean analgesia, particularly within multimodal analgesia protocols.

**KEYWORDS:** Opioid analgesics, Anesthesia and analgesia, Nerve block, Cesarean section, Pain measurement.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS:** Embora os opioides intratecais sejam eficazes no controle da dor pós-cesariana, seu uso é comumente associado a efeitos adversos, como náusea, prurido e atraso no retorno da função intestinal. O bloqueio do plano eretor da espinha (ESPB) surgiu como uma alternativa promissora, oferecendo analgesia eficaz com um perfil de efeitos adversos mais favorável. Assim, neste estudo, o objetivo foi comparar a eficácia analgésica e os efeitos adversos do ESPB parassagital bilateral com a morfina intratecal (ITM) em pacientes submetidas a cesarianas eletivas.

**MÉTODOS:** Foi realizado um ensaio clínico randomizado e controlado com 54 gestantes submetidas a cesarianas eletivas, alocadas em dois grupos: ITM (n = 27) e ESPB (n = 27). O grupo ITM recebeu bupivacaína hiperbárica combinada com morfina, enquanto o grupo ESPB recebeu bupivacaína hiperbárica e um bloqueio bilateral de levobupivacaína a 0,25% guiado por ultrassom no nível T9. A dor durante o repouso foi avaliada por meio de uma escala de classificação numérica verbal (ENV) às 2, 6, 12 e 24 horas de pós-operatório. Além disso, foram registrados os efeitos adversos, o uso de analgesia suplementar, o tempo para a primeira evacuação e o tempo de permanência no hospital.

**RESULTADOS:** Não houve diferença significativa na intensidade da dor entre os grupos em nenhum dos momentos avaliados. No entanto, o grupo ITM apresentou incidência significativamente maior de prurido (74,1%), náusea (44,4%) e vômito (22,2%), enquanto nenhuma das pacientes do grupo ESPB apresentou esses efeitos adversos ($p<0,05$). O uso de analgesia suplementar foi maior no grupo ESPB, embora não tenha sido estatisticamente significativo (25,9% vs. 3,7%). A eliminação de flatos ocorreu mais cedo no grupo ESPB ($p=0,001$), embora o tempo de internação tenha sido semelhante entre os grupos.

**CONCLUSÃO:** O ESPB resultou em analgesia eficaz com menos efeitos adversos do que a ITM. Esses achados apoiam o ESPB como uma alternativa segura, eficaz e bem tolerada para analgesia pós-cesariana, particularmente dentro de protocolos de analgesia multimodal.

**DESCRITORES:** Analgésicos opioides, Anestesia e analgesia, Bloqueio nervoso, Cesariana, Medição da dor.

## HIGHLIGHTS

- Although intrathecal opioids are effective in controlling post-cesarean pain, they can be associated with some adverse effects. In this sense, the erector spinae muscle plane block (ESPB) has emerged as a promising analgesic alternative in cesarean sections
- The present study aimed to compare the analgesic efficacy and adverse effects of bilateral ESPB with intrathecal morphine (ITM) in patients undergoing elective cesarean sections

- ESPB provided effective analgesia, with no statistically significant differences in pain scores or patient satisfaction compared to ITM, and resulted in fewer adverse effects - such as nausea, vomiting, pruritus and delayed bowel function, and did not increase the length of hospital stay

## INTRODUCTION

Cesarean section is one of the most commonly performed surgeries worldwide, with rising rates in recent decades. In Brazil, approximately 1.6 million cesarean sections are performed annually, accounting for around 57% of births, one of the highest proportions globally[1]. This scenario underscores the importance of effective strategies for managing postoperative pain to enhance maternal recovery and reduce associated complications.

Acute pain following cesarean section is a major concern. Studies show that 50-70% of women experience moderate-to-severe pain after the procedure, with chronic pain developing in up to 20% of cases, often linked to inadequate analgesia in the immediate postoperative period[2]. Moreover, intense postpartum pain is estimated to increase the risk of postpartum depression threefold[3]. These conditions can negatively impact maternal functioning, bonding with the newborn, and the duration of hospital stay[4].

Postoperative pain management often includes the use of opioids such as morphine, which, although effective, are associated with undesirable side effects, including nausea, vomiting, sedation, constipation, and respiratory depression[5]. These adverse effects can impair recovery, prolong hospitalization, and reduce quality of life[6,7].

In the search for effective analgesic strategies with fewer adverse effects, the erector spinae plane block (ESPB) has gained growing attention. First described in 2016[8], ESPB is a regional anesthesia technique involving the injection of local anesthetic into the fascial plane deep to the erector spinae muscle. This approach provides analgesia across multiple thoracic and abdominal dermatomes. Emerging evidence indicates that ESPB offers effective pain relief while reducing opioid requirements and minimizing the incidence of side effects[8].

In this context, the present randomized clinical trial aimed to evaluate the analgesic efficacy of intrathecal morphine (ITM) versus ESPB in patients undergoing elective cesarean sections. The hypothesis is that both techniques provide comparable analgesia within the first 24 h postoperatively, with fewer adverse effects in the ESPB group. Specifically, the study analyzes postoperative pain intensity, the incidence of nausea and vomiting, and opioid consumption. By addressing these outcomes, the study aimed to contribute to optimizing post-cesarean pain management and accelerating maternal recovery.

## METHODS

### Study design

This randomized controlled clinical trial was approved by the institutional ethics committee (CAEE: 36219520.9.0000.5505). All procedures were conducted in accordance with the Declaration of Helsinki and Brazil's National Health Resolution No.466/12. Informed consent was obtained from all the participants before enrollment. The study followed the CONSORT guidelines to ensure standardized and transparent reporting. The trial was registered in the Brazilian Registry of Clinical Trials – ReBEC (registration number: RBR-5grcjzt), accessible at: https://ensaiosclinicos.gov.br.

### Participants

The study was conducted at Ary Pinheiro Base Hospital, Porto Velho, Rondônia, Brazil. A total of 54 participants were enrolled, and their anthropometric data, including gender, age, weight, height, and body mass index (BMI), were recorded (Table 1).

Inclusion criteria were women aged between 18 and 36 years, BMI between 18 and 30 kg/m$^2$, functional status classified as grade II by the American Society of Anesthesiologists (ASA) and scheduled for a non-emergency cesarean section. Exclusion criteria included: diabetes mellitus, hypertension, infection at the puncture site, cognitive impairment (inability to understand the assessment), psychiatric illness, coagulopathy or use of anticoagulants, history of illicit drug use, recent use of analgesics (within 2 weeks prior to surgery) or known allergy to any drug used in the study.

### Randomization

Randomization was performed using the Randomizer® software. Women scheduled for cesarean section were informed about the study and invited to participate. Those who consented were randomly assigned to one of the two treatment groups before anesthesia was administered.

### Groups and interventions

Participants were randomly allocated into two groups of 27 patients each (Figure 1). Standard monitoring was applied, including pulse oximetry, non-invasive blood pressure, and continuous electrocardiography. All patients underwent subarachnoid block at the L3-L4 interspace using a 26-G Quincke needle.

Group 1

ESPB Group: participants in Group 1 received subarachnoid anesthesia with 12 mg of 0.5% hyperbaric bupivacaine before surgery. At the end of the procedure, a bilateral ESPB was performed using a craniocaudal approach in the right lateral decubitus position. A Procare® Quincke 22G x 3.5-inch needle was used under direct ultrasound guidance (Terason t3000cv) with a linear probe (Terason

**Table 1.** Comparisons between the ITM and ESPB groups in terms of age, weight, height, and body mass index (BMI).

| | ITM (n=27) | ESPB (n=27) | p-value* |
|---|---|---|---|
| Age (years) | | | 0.857 |
| Mean (SD) | 24.15 (±5.08) | 24.41 (±5.44) | |
| Median (IQR) | 23 (20-28) | 23 (20-28) | |
| Range | 18-36 | 18-36 | |
| Weight (kg) | | | 0.871 |
| Mean (SD) | 67.54 (±9.12) | 67.17 (±7.52) | |
| Median (IQR) | 70 (62-74) | 67 (61.5-72) | |
| Range | 50-82 | 52-79 | |
| Height (m) | | | 0.011 |
| Mean (SD) | 1.61 (±0.06) | 1.57 (±0.06) | |
| Median (IQR) | 1.63 (1.56-1.68) | 1.56 (1.50-1.64) | |
| Range | 1.49-1.70 | 1.49-1.69 | |
| BMI (kg/m$^2$) | | | 0.029 |
| Mean (SD) | 25.76 (±2.47) | 27.20 (±2.24) | |
| Median (IQR) | 25.95 (24.2-27.5) | 27.64 (26.1-28.9) | |
| Range | 20.82-29.64 | 21.10-29.97 | |

Data are presented as mean ± standard deviation (SD), median with interquartile range (IQR 25-75%), and minimum-maximum values. *p-values refer to Student's *t*-test for independent samples with equal variances

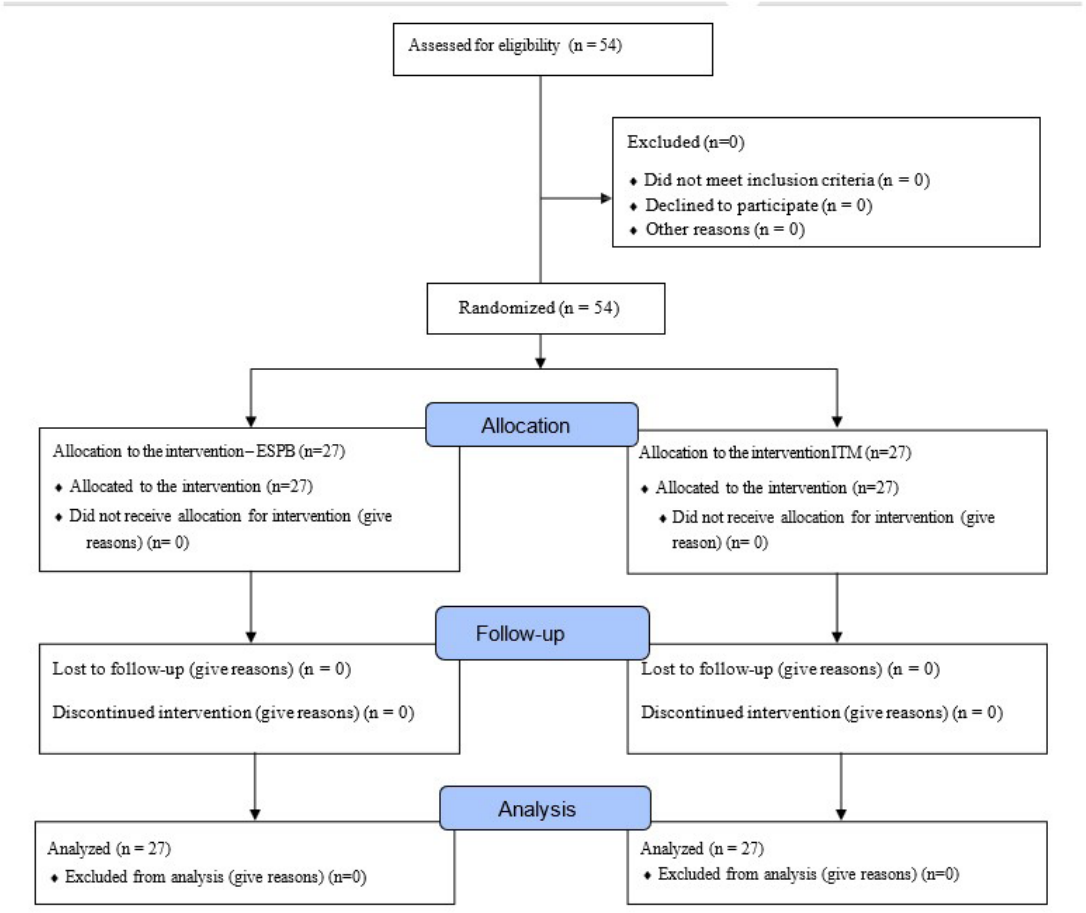


**Figure 1.** CONSORT study flowchart. ESPB = Erector spinae plane block; ITM = Intrathecal morphine.

12L, 5-12 MHz), targeting the transverse process of the ninth thoracic vertebra (T9). Correct needle positioning was confirmed by visualizing the tip over the transverse process and by hydrodissection of the interfascial plane between the transverse process and the erector spinae muscle following a 1 mL test injection. Subsequently, 20 mL of 0.25% levobupivacaine was administered bilaterally (Figure 2).

Group 2

ITM Group: participants in Group 2 received subarachnoid anesthesia with 12 mg of 0.5% hyperbaric bupivacaine combined with 0.1 mg of morphine before surgery.

### Standard postoperative analgesia protocol

All participants received intravenous dipyrone 2 g every 4 h and ketoprofen 100 mg every 12 h during the first 24 h postoperatively. If necessary, patients could request intravenous tramadol (100 mg), administered at intervals of at least 6 h, not exceeding 400 mg per day. Pain intensity was measured using a verbal numerical rating scale (vNRS) at each tramadol administration.

### Pain assessment and hospital discharge

Pain intensity at rest was assessed using the vNRS (0-10) at 2, 6, 12, and 24 h after surgery. Evaluations were conducted by an anesthesiologist not involved in the procedure. The number of patients requiring supplementary analgesia and the incidence of adverse effects during the first 24 h were recorded. The time to hospital discharge was also documented.

### Primary and secondary outcomes

The primary outcome was the comparison of postoperative pain intensity between the ESPB and ITM groups. Secondary outcomes included the frequency of side effects (nausea, vomiting, and pruritus), patient satisfaction with the analgesic technique, and length of hospital stay.

### Sample size and statistical analysis

The sample size was calculated to compare two groups across four time points. Assuming a significance level of 0.05, a statistical power of 80%, and an effect size of 30%, a minimum of 27 patients per group was required. The calculation was performed using G*Power software version 3.1.9.6 (University of Kiel, Germany).

Statistical analysis was conducted using SPSS software version 22.0. Statistical tests were selected based on the distribution of each variable. Normality of quantitative data was assessed using descriptive statistics, box plots, histograms, normal probability plots, and the Shapiro-Wilk test. Homogeneity of variance was evaluated using Levene's test. Student's *t*-test was used for

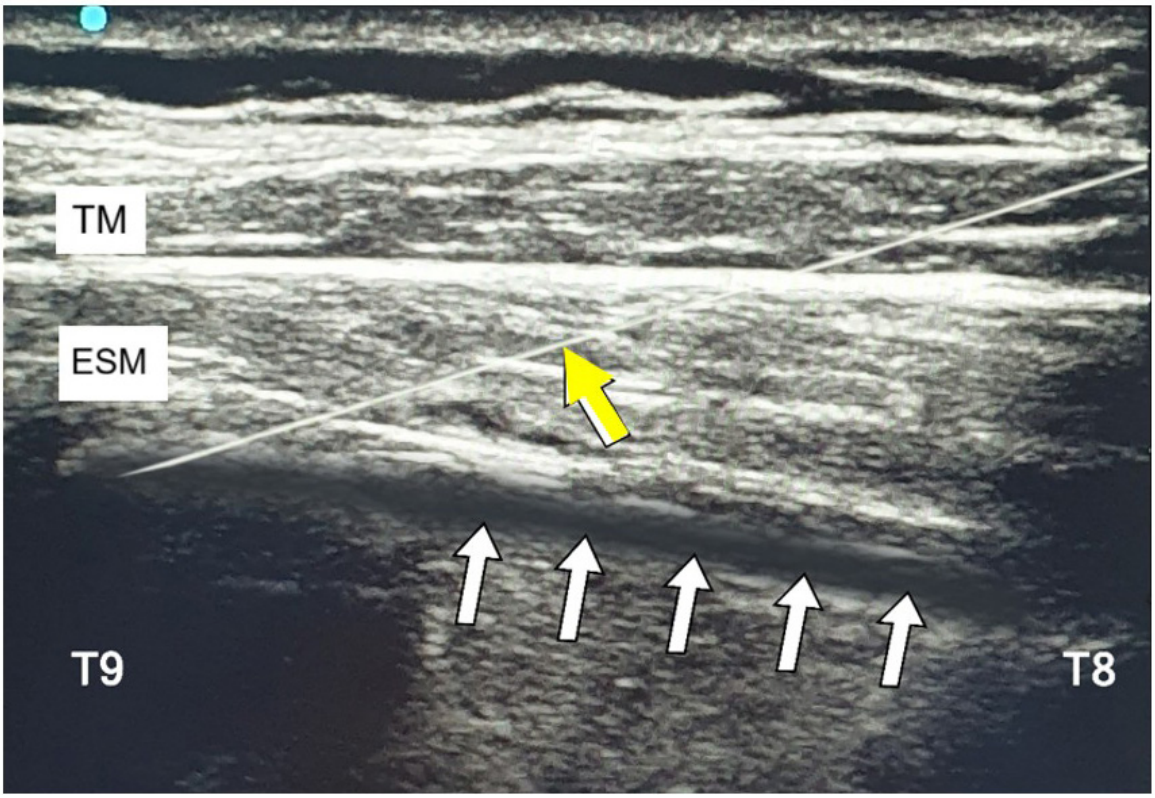


**Figure 2.** Ultrasound-guided erector spinae plane block. The yellow arrow indicates correct needle trajectory, with the tip positioned over the transverse process of T9. The white arrows show the dispersion of the local anesthetic. TM = Trapezius muscle; ESM = Erector spinae muscles.

comparisons of age, weight, height, and BMI; the Mann-Whitney U test was applied to pain intensity scores; and Chi-square or Fisher's Exact tests were used to assess adverse effects. A p-value ≤ 0.05 was considered statistically significant.

## RESULTS

A total of 54 patients were included in the study, with 27 receiving ITM and 27 undergoing ESPB. The mean age of the participants was 24.3 years (range: 18-36 years). The average BMI was 26.5 kg/m² (range: 20.82-29.97 kg/m²). No participants were classified as underweight (BMI < 18.5 kg/m²) or obese (BMI > 30 kg/m²). However, 75.9% (n = 41) were considered overweight, with a BMI between 25 and 29.99 kg/m².

Table 1 presents comparisons between the ITM and ESPB groups based on age, weight, height, and BMI. There were no statistically significant differences between the groups for age or weight. However, there were significant differences in height and BMI. The ITM group had a greater average height (1.61 m) than the ESPB group (1.57 m). Consequently, the ESPB group had a significantly higher average BMI compared to the ITM group (27.20 kg/m² vs. 25.76 kg/m²; p = 0.029).

Table 2 compares pain intensity at rest using the vNRS at 2, 6, 12, and 24 h postoperatively. Non-parametric repeated measures ANOVA yielded similar results. There was no interaction effects between group and time (p = 0.91), indicating no difference in pain progression between groups over time. Additionally, there was no group effect (p = 0.92), suggesting no overall difference in pain intensity between the ESPB and ITM groups. A significant time effect was observed (p = 0.05), reflecting slight variations in pain intensity in both groups across time points.

Table 3 presents the comparison of secondary outcomes, including the incidence of side effects (pruritus, nausea, and

**Table 2.** Comparison between the ITM and ESPB groups in terms of the numeric pain scale at rest (vNRS).

| Time point | ITM (n=27) | ESPB (n=27) | p-value* |
|---|---|---|---|
| Pain (2 h) | | | 0.683 |
| Mean (SD) | 0.52 (±0.85) | 0.48 (±0.9) | |
| Median (IQR) | 0 (0-1) | 0 (0-1) | |
| Range | 0-3 | 0-3 | |
| Pain (6 h) | | | 0.663 |
| Mean (SD) | 0.81 (±1.07) | 1.26 (±1.91) | |
| Median (IQR) | 0 (0-2) | 0 (0-2) | |
| Range | 0-3 | 0-7 | |
| Pain (12 h) | | | 0.906 |
| Mean (SD) | 0.67 (±1.04) | 0.74 (±1.13) | |
| Median (IQR) | 0 (0-1) | 0 (0-1) | |
| Range | 0-4 | 0-4 | |
| Pain (24 h) | | | 0.970 |
| Mean (SD) | 1.04 (±1.40) | 1.04 (±1.37) | |
| Median (IQR) | 0 (0-2) | 0 (0-2) | |
| Range | 0-4 | 0-4 | |

Data are presented as mean ± standard deviation (SD), median with interquartile range (IQR 25-75%), and minimum-maximum values. *p-values refer to the Mann-Whitney U test.

**Table 3.** Comparison of adverse effects, need for supplementary analgesia, time to evacuation/elimination of flatus, and patient-reported experience between ITM and ESPB groups.

| Parameter | Response | ITM (n = 27) | ESPB (n = 27) | p-value* |
|---|---|---|---|---|
| Itching | Yes | 20 (74.1%) | 0 (0%) | <0.001* |
| Nausea | Yes | 12 (44.4%) | 0 (0%) | < 0.001* |
| Emesis | Yes | 6 (22.2%) | 0 (0%) | 0.023** |
| Supplementary analgesia required | Yes | 1 (3.7%) | 7 (25.9%) | 0.050** |
| Satisfactory experience | Yes | 27 (100%) | 24 (88.9%) | 0.236** |
| Time to evacuation or elimination of flatus | < 12 h | 7 (25.9%) | 20 (74.1%) | 0.001** |
| | 12-24 h | 16 (59.3%) | 6 (22.2%) | |
| | > 24 h | 4 (14.8%) | 1 (3.7%) | |

*p-value refers to Chi-square test; **p-value refers to Fisher's Exact test, as appropriate.

emesis), the need for supplementary analgesia, time to first bowel movement or flatus elimination, and patient-reported experience. For analysis purposes, emesis was recorded as a binary (presence or absence), rather than by number of episodes.

A statistically significant difference was observed across all three adverse effect parameters. In the ESPB group, none of the patients experienced pruritus, nausea, or emesis. In contrast, in the ITM group, 20 patients (74.1%) experienced pruritus, 12 (44.4%) had nausea, and 6 (22.2%) had emesis. Regarding the number of emesis episodes in the ITM group, 21 patients (77.8%) had no episodes, five (18.5%) had one episode, and one patient (3.7%) experienced three episodes.

Regarding supplementary analgesia, the ESPB group required more additional pain management than the ITM group. In the ITM group, only one patient required supplementary analgesia, administered between 6 and 12 h post-procedure. In the ESPB group, seven patients required supplementary analgesia: three within the first 6 h, one between 6 and 12 h, and three between 12 and 18 h after the procedure.

Regarding the time to bowel evacuation or elimination of flatus, a delay was observed in the ITM group. Only seven patients (25.9%) in this group achieved evacuation or flatus within the first 12 h, compared to 20 patients (74.1%) in the ESPB group. Moreover, four patients (14.8%) in the ITM required more than 24 h, whereas only one patient (3.7%) in the ESPB group had such a delay. Despite these adverse effects, all patients in both groups were discharged within 48 h of the procedure.

## DISCUSSION

In this study, postoperative analgesic effectiveness, patient satisfaction, and time to hospital discharge were compared between the ESPB and ITM groups during the first 24 h. The ESPB group exhibited a lower incidence of side effects but a higher, though not statistically significant, consumption of tramadol.

These findings are consistent with previous studies[9,10], which demonstrated that ESPB can provide effective analgesia across multiple dermatomes, including the thoracoabdominal regions, with a favorable side effect profile. Thus, the present study adds to the growing body of evidence seeking alternatives to opioids, particularly given the known adverse events of opioids, such as nausea, emesis, pruritus, and delayed bowel function[11,12].

Some authors have reported increased postoperative opioid requirements when comparing multimodal anesthesia protocols with and without ESPB across various surgeries, including mastectomy[13], arthrodesis[14,15], and nephrectomy[16]. Others observed only reduced pain intensity, such as in prostatectomy[17]. The present study's findings align with studies supporting the effectiveness of ESPB as part of multimodal strategies for managing post-cesarean pain[18-22].

In this study, ESPB was performed postoperatively under spinal anesthesia, consistent with the approach of reference authors[19,23]. Similar methods have also been employed in studies using the quadratus lumborum block[24,25]. Performing ESPB after surgery aimed to reduce the discomfort associated with thoracic puncture.

The block was administered at the T9 level, in line with other studies targeting uterine analgesia[19,26-28]. However, there is no consensus regarding the cephalocaudal or ventral dispersion of local anesthetics in ESPB, particularly the extent of spread necessary to achieve visceral analgesia. Most available studies on ESPB dispersion are conducted on cadavers using different techniques[29-31], with inherent limitations such as the absence of respiratory dynamics.

A study evaluated the spread and sensitivity of unilateral ESPB at the T7 level in 10 healthy volunteers [32]. A 30 mL solution of 0.25% ropivacaine combined with 0.3 mg of gadolinium was administered, and imaging was performed using magnetic resonance imaging (MRI) 60 minutes after injection, while assessments of thermal (cold) and mechanical (pinprick) sensitivities were conducted between 30 and 50 minutes. The local anesthetic consistently spread to the intercostal space, paravertebral space, and neural foramina, with epidural spread observed in four participants. Sensitivity tests revealed highly variable results and generally underestimated the extent of spread visualized on MRI[32].

Bupivacaine and ropivacaine are the most commonly used local anesthetics for ESPB, typically administered at concentrations ranging from 0.25% to 0.5% in total volumes between 15 and 60 mL[33]. Most clinical studies report using 20 mL of 0.25% per side in adult patients[13-15]. In the present study, 20 mL of 0.25% levobupivacaine was used bilaterally. Levobupivacaine was selected due to its improved safety profile compared to racemic bupivacaine[34].

Patients were evaluated during the first 24 h postoperatively, the period when pain intensity is typically highest, consistent with findings from prior studies[13,16,17,28]. The primary objective of this study was to compare analgesic effectiveness between ESPB and ITM following cesarean section. Both techniques provided comparable analgesia during the 24 h. This equivalence was also reported by another work[19], although in their study, tramadol consumption was significantly higher in the ITM group.

ESPB is considered a safe and technically straightforward regional block. Another reference study[15] reported that experienced anesthesiologists could perform ESPB in approximately 6 min, as the target, the transverse process, is a superficial bony structure. Moreover, given its distance from the spinal cord and major vascular structures, ESPB may be a suitable option for patients with contraindications to neuraxial anesthesia[35].

A comprehensive review[10] analyzed 242 ESPB cases reported between 2016 and 2018. The majority of procedures involved a single injection technique (80.2%), followed by intermittent boluses (12.0%) and continuous infusion (7.9%). Multimodal analgesia was used in 90.9% of cases. Sensory changes were reported in 34.7% of procedures, and a reduction in opioid consumption was observed in the same proportion. Only one adverse event, pneumothorax, was reported.

Although ITM provided effective analgesia during the first 24 h after cesarean section, it was associated with a higher incidence of nausea, vomiting, and pruritus, as well as a longer time to first flatulence or bowel movement, compared to the ESPB group. In this study, these side effects did not prolong hospital stay. However, such adverse effects, along with postoperative pain, are known

contributors to patient dissatisfaction and should be carefully considered when designing postoperative analgesia protocols[36].

Similarly to the results presented herein, a 2025 systematic review and meta-analysis comparing novel fascial plane blocks with intrathecal morphine ITM after caesarean delivery reported that TAP block yielded higher early pain scores than ITM at 6-12 h, whereas QL and ESP blocks did not differ significantly from ITM on those early analgesic endpoints; importantly, both TAP and QL were associated with lower odds of postoperative nausea/vomiting, and the overall certainty of evidence was rated low[37]. These findings reinforce the interpretation that fascial plane blocks may mitigate opioid-related adverse effects without establishing analgesic equivalence to ITM.

Complementarily, a focused meta-analysis directly comparing ESPB with TAPB after caesarean section (7 RCTs; n=380) found that ESPB provided lower pain scores at rest and on movement up to 24 h, reduced opioid consumption, prolonged analgesia duration, and improved patient satisfaction, albeit with some heterogeneity and a call for larger, standardized trials. These results support prioritizing ESPB over TAPB within multimodal post-cesarean protocols when feasible, while the small, non-significant increase in rescue tramadol underscores the need to individualize dosing, timing, and technique (including consideration of continuous regimens) to optimize effectiveness and tolerability[38].

While the present study's findings are encouraging, the study has several limitations. First, it was a single-center study with a relatively small sample size, which may affect the generalizability of the results. Second, the presence of postoperative dressings and residual effects of intrathecal anesthesia limited accurate assessment of sensory loss, preventing definitive confirmation of ESPB success. Additionally, there was a statistically significant difference in patient height between groups, a random occurrence, which may have influenced anesthetic spread and effectiveness. This highlights the importance of further research into how body composition affects the distribution and efficacy of local anesthetics.

It is also important to recognize that all regional anesthesia techniques carry a risk for failure; for ESPB, the failure rate has been estimated at approximately 6.5%33. Finally, patients in the present study were not blinded to group allocation. Although ESPB is generally considered safe, the procedure can involve discomfort and minor complications[10], which influenced the authors' decision to prioritize patient awareness and informed consent.

Although ESPB demonstrated similar efficacy to ITM on the vNRS, its greater interindividual variability, smaller visceral coverage, and postoperative latency may have led to a greater demand for supplemental analgesia with tramadol. These hypotheses reinforce the importance of considering multimodality, block timing, dose and volume individualization, and possibly the use of continuous techniques when opting for ESPB as an alternative to ITM.

Therefore, further studies are needed in an attempt to answer questions that have not yet been elucidated, such as the volume and dose required for different body compositions, as well as the superiority of different infusion modalities - single or continuous dose (intermittent bolus vs. continuous infusion) and the possibility of associating adjuvants (alpha 2-agonists and corticosteroids, for example).

## CONCLUSION

This study demonstrated that, within the first 24 h following cesarean section, ESPB provided effective analgesia with no statistically significant differences in pain scores or patient satisfaction versus ITM, while resulting in fewer adverse effects-namely nausea, vomiting, pruritus, and delayed bowel function. Notably, ESPB did not increase the risk of complications or extend hospital stay. These findings support ESPB as a safe, effective, and promising alternative for postoperative analgesia in cesarean deliveries, particularly as part of a multimodal anesthetic strategy.

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