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RESEARCH

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Comparison of erector spinae plane block and transverse abdominis plane block in postoperative recovery after laparoscopic colorectal surgery: a randomized, double-blind, controlled trial

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Abstract

Background Patients experience significant postoperative pain after laparoscopic resection of colorectal cancer. Transversus abdominis plane block (TAPB) provides effective analgesia, and recent studies have also shown that erector spinae plane block (ESPB) can be used for postoperative analgesia in abdominal surgery. However, there is a lack of comparison between the two methods regarding recovery quality following laparoscopic colorectal surgery.

Methods Sixty patients scheduled for laparoscopic radical resection of colorectal cancer were randomly assigned to receive either a ESPB with TAPB ($n = 30$). Both groups received a single injection of 20 mL of 0.25% ropivacaine bilaterally. The primary outcome was the quality of recovery (QoR) at 24 h postoperatively, using the quality of recovery-15 (QoR-15) scale. Secondary outcomes included the QoR at 48 h postoperatively, visual analogue scale (VAS) pain scores during the first 48 h postoperatively in both resting and active states, requirements for rescue analgesia, cumulative postoperative opioid consumption, patient satisfaction, incidence of postoperative nausea and vomiting (PONV), time to first flatus and ambulation, the Comprehensive Complication Index (CCI) score, and postoperative hospital stay.

Results At 24 h postoperatively, the QoR-15 score (mean ± standard deviation) was significantly higher in the ESPB group (109.2 ± 8.7) compared to the TAPB group (101 ± 10.1) ($p = 0.001$). Similarly, at 48 h postoperatively, the QoR-15 score remained higher in the ESPB group (118.5 ± 8.8) than in the TAPB group (113.8 ± 8.1) ($p = 0.035$). Patients in the ESPB group reported lower visual analog scale (VAS) pain scores during the first 24 h postoperatively (all $p < 0.05$) compared to those in the TAPB group. The sufentanil consumption median (interquartile range) in the ESPB group at 24 h postoperatively was lower (62, 61–65 μg) compared to the TAPB group (66, 63–70 μg) ($p < 0.001$). Hospital stay median was 7 (6–9) days for the ESPB group and 8 (7–10) days for the TAPB group ($p = 0.037$).

Conclusions Patients who received ESPB showed better recovery quality, improved analgesic effects, and higher postoperative satisfaction compared to those who underwent preoperative TAPB.

Trial registration https://www.chictr.org.cn (ChiCTR2400081157); date of registration: February 24, 2024. The first participant was enrolled on February 27, 2024.

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Keywords Erector spinae plane block, Quality of recovery, Regional anesthesia, Transversus abdominis plane block, Laparoscopic colorectal operation

Introduction

Colorectal cancer ranks among the top three most prevalent cancers globally (Fakih 2015; Ferlay et al. 2015). Over the past two decades, there has been a significant rise in the adoption of laparoscopic colorectal surgeries, encompassing techniques such as conventional, assisted, robotic, and single-incision laparoscopy (Wu et al. 2016; Chan et al. 2014; Keller et al. 2014). Laparoscopic methods, compared to traditional open surgeries, provide numerous benefits including reduced surgical trauma, enhanced safety, decreased postoperative pain, and expedited recovery (Tevis and Kennedy 2016). Despite advancements, notably in younger patients, a substantial number still suffer from moderate to severe postoperative pain following laparoscopic rectal surgeries (Lindberg et al. 2020). Inadequate management of early postoperative pain not only heightens the likelihood of chronic pain development but also increases the risk of postoperative pulmonary complications, thereby adversely impacting recovery quality (Tsai et al. 2017; Larsen et al. 2021; Teo et al. 2021). Consequently, optimizing acute postoperative pain management is crucial.

Thoracic epidural analgesia (TEA), traditionally used as a regional blockade method for abdominal surgeries, offers effective pain relief but has been met with skepticism regarding its application in colorectal cancer surgery due to procedural complexity, challenging postoperative management, and the potential for severe complications (Zhu et al. 2017). In contrast, various regional anesthesia and analgesia techniques under ultrasound guidance, such as the ultrasound-guided transversus abdominis plane block (TAPB), which targets abdominal wall sensory nerves (T6-L1) to alleviate pain, are now widely employed for postoperative pain control in abdominal surgery patients(Baeriswyl et al. 2016; El-Boghdadly et al. 2016). Another innovation in ultrasound technology is the erector spinae plane block (ESPB), introduced by Forero and colleagues in 2016 specifically for thoracic neuralgia (Forero et al. 2016). This technique involves the ultrasound-guided injection of local anesthetics between the deep fascia of the erector spinae muscle and the transverse processes, effectively providing postoperative analgesia for thoracic, abdominal, and spinal surgeries (Li et al. 2023; Bang et al. 2024; Oh et al. 2022). Compared to TEA, fascial plane blocks offer a simpler procedure, more defined effects, and fewer complications, establishing them as a favorable alternative for laparoscopic colorectal surgery.

ESPB may provide superior analgesia. Kwon and colleagues highlighted that ESPB not only mitigates somatic pain but also provides visceral analgesia(Kwon et al. 2020), whereas TAPB primarily targets the somatic pain associated with the abdominal wall and is confined to superficial nerves (Dina et al. 2020). Although both methods can provide analgesia in laparoscopic colorectal surgery (Shen et al. 2021), it is regrettable that there is currently a lack of comparison between the two in terms of using recovery quality as a patient-centered outcome measure.

Thus, our randomized controlled trial tested the hypothesis that ESPB, under ultrasound guidance, provides superior early recovery quality and postoperative analgesia following laparoscopic radical resection of rectal cancer compared to TAPB.

Methods

This randomized, controlled, single-center study received ethical approval from the Ethics Committee of North Sichuan Medical College Affiliated Hospital on January 12, 2024 (approval no. 2024ER12-1) and was registered on https://www.chictr.org.cn on February 24 (registration no. ChiCTR2400081157). Informed consent was obtained from all participants after they were fully informed of the study's risks. The first participant was enrolled on February 27, 2024. The study adheres to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for reporting clinical trials (Sk et al. 2010).

We enrolled patients aged 18–65 years, classified as ASA grades I–III, who were undergoing laparoscopic radical surgery for rectal cancer under general anesthesia. Exclusion criteria were comprehensive: site infection at the puncture site, history of blood disorders or coagulation dysfunction, chronic pain management, mental disorders or central nervous system diseases, recent opioid usage, and sensory impairments preventing cooperation with scale assessments.

A total of 60 eligible patients were included and randomly assigned in a 1:1 ratio to either the TAPB group or the ESPB group. Randomization was facilitated through a computer-generated randomization sequence and managed by an anesthesiologist uninvolved with the study's execution. Group assignments were recorded on separate pages and concealed in sequentially numbered, opaque, sealed envelopes. On surgery day, a different anesthesiologist, also not involved in the trial, opened the envelope and administered the regional blockade in the anesthesia preparation room. Consequently, the patients, attending anesthesiologists, surgeons, postanesthesia care unit (PACU) staff, data collectors, and the individual responsible for conducting the statistical analysis were blinded to group assignment throughout the observation period, including all postoperative follow-up periods.

Standard general anesthesia and postoperative analgesia protocol

Patients were not premedicated prior to surgery. Anesthesia was induced using standardized techniques, which included administration of sufentanil (0.4 μg/kg), etomidate (0.3 mg/kg), cisatracurium (0.2 mg/kg), and propofol (1 mg/kg). During the surgery, anesthesia was maintained with a balanced mixture of 2% sevoflurane in an oxygen/air blend (1:1 ratio) and a continuous infusion of remifentanil, dosed at 0.05–0.2 μg/kg/min. Muscle relaxation was achieved by administering intermittent injections of rocuronium as needed. The bispectral index (BIS) was monitored and maintained within a range of 40–60 to ensure adequate depth of anesthesia, while hemodynamic parameters were closely monitored and kept within 20% of baseline values. Upon completion of the surgery, tracheal extubation was performed once adequate muscle strength returned, and patients were subsequently transferred to the PACU. For postoperative analgesia, each patient was equipped with a patient-controlled intravenous analgesia (PCIA) device. The PCIA contained sufentanil at a concentration of 1 μg/ml, with a background infusion rate set at 2.5 ml/h, delivering a dose of 2.5 μg of sufentanil. Should the patient's VAS score exceed 5 during activity or 3 at rest, pressing the analgesic pump delivered a rescue dose of 1 μg of sufentanil. The device was programmed with a lockout interval of 15 min to prevent overdose.

Regional anesthesia blocks

All blocks were administered by an experienced attending anesthesiologist. Patients allocated to the ESPB group underwent an ESPB block as follows: The patient was positioned in the lateral decubitus posture, and the skin puncture site was sterilized. A linear ultrasound probe (UMT-400 Plus, Mindray, China) was longitudinally placed 2–3 cm lateral to the T9 spinous process to delineate the transverse process and erector spinae muscles. Employing an in-plane approach, an 80-mm-long, 22-gauge nerve block needle (Stimuplex D, Braun, Germany) was advanced through the muscles to the T9 transverse process. Subsequently, 2 ml of normal saline was administered to separate the erector spinae from the transverse process. After confirming the accurate placement of the needle tip, 20 ml of a 0.25% ropivacaine solution diluted with normal saline was injected. Ultrasound imaging confirmed a linear spread between the transverse process and the erector spinae muscle group, indicating a successful injection. The procedure was then repeated on the opposite side.

Patients in the TAPB group received a similar procedure in the following manner: The patient was placed in a supine position, and the skin was sterilized. A linear ultrasound probe (UMT-400 Plus, Mindray, China) was placed on the abdominal wall below the costal edge to visualize the three muscular layers—external oblique, internal oblique, and transversus abdominis. Using the in-plane method, an 80-mm-long, 22-gauge nerve block needle (Stimuplex D, Braun, Germany) was inserted between the internal oblique and transversus abdominis muscles. After injecting 2 ml of normal saline to separate these muscles, the correct needle tip placement was verified, and 20 ml of a 0.25% ropivacaine solution mixed with normal saline was injected. Ultrasound confirmed the separation of the internal oblique and transversus abdominis muscles, validating the successful injection. This procedure was similarly replicated on the contralateral side.

Outcome measures

This study primarily outcome the quality of recovery 24 h after surgery using the Chinese version of the QoR-15 questionnaire. The QoR-15, a validated multidimensional patient-reported outcome tool for the perioperative period (Erica et al. 2022), consists of 15 questions spanning 5 health domains: emotional state, physical comfort, psychological support, physical independence, and pain, allowing for a comprehensive assessment of the patient's overall recovery experience. The QoR-15 questionnaire has a scoring range from 0 to 150, where a higher score indicates a better quality of postoperative recovery. The secondary outcomes encompassed QoR-15 scores at 48 h, postoperative pain scores at rest and during movement, requirements for rescue analgesia, time to first flatus and ambulation, cumulative opioid consumption, incidence of postoperative nausea and vomiting (PONV), PACU duration, length of hospital stay, adverse events related to nerve blocks, patient satisfaction, and the Comprehensive Complication Index (CCI) score. The CCI score was determined using an online calculator to evaluate complications within 30 days post-surgery graded. Hospital stay was delineated as the duration from the day of surgery until discharge. Pain intensity at rest and during coughing was assessed using the VAS at 2, 6, 12, 24, and 48 h postoperatively. The CCI score was determined through an online calculator accessible at https://cci-calculator.com/cciCalculator. We continuously monitored the patients' conditions throughout their entire hospital stay. For patients discharged before the 30-day mark, we followed their progress remotely through our electronic medical record system to track outpatient appointments and readmissions. Patient satisfaction was assessed at postoperative day 2 by using an 11-point Likert scale (0 = entirely unsatisfied; 10 = fully satisfied).

Sample size and statistical analyses

The sample size for our study was determined based on the QoR-15 score, 24 h postoperatively. The minimum clinically important difference for the QoR-15 score was identified as 8 points, based on previous literature (Myles et al. 2016). Preliminary studies indicated a mean QoR-15 score of 105 ± 10.2 at this time point. We posited that an 8-point difference between groups would be clinically meaningful, setting significance levels at $\alpha = 0.05$ and a power of 80% ($\beta = 0.2$). This calculation yielded a necessary sample size of 27 patients per group. To accommodate a potential 10% dropout rate, we enrolled 30 participants per group in this study.

Statistical analyses were conducted using SPSS 27.0 (IBM Corporation, NY, USA). The Shapiro–Wilk test and Q-Q plots assessed the normality of quantitative variables. Normally distributed data were reported as mean ± standard deviation (SD) and analyzed using the independent samples *t*-test. Non-normally distributed variables were reported as median and interquartile range (IQR) and analyzed with the Mann–Whitney *U*-test. Categorical variables were presented as frequencies (percentages) and analyzed using Fisher's exact test or the chi-square test, as appropriate. Multiple repeated measurements between groups were evaluated using repeated measures analysis of variance, with Bonferroni corrections applied for multiple comparisons. A two-tailed *p*-value of less than 0.05 was considered statistically significant.

Results

Figure 1 illustrates the CONSORT flow diagram of the trial. Out of the initial 72 patients enrolled, 7 refused to participate, and 5 did not meet the inclusion criteria. Consequently, a total of 60 patients were analyzed in the study. All enrolled patients were successfully followed up, and there were no dropouts. Demographic and surgical

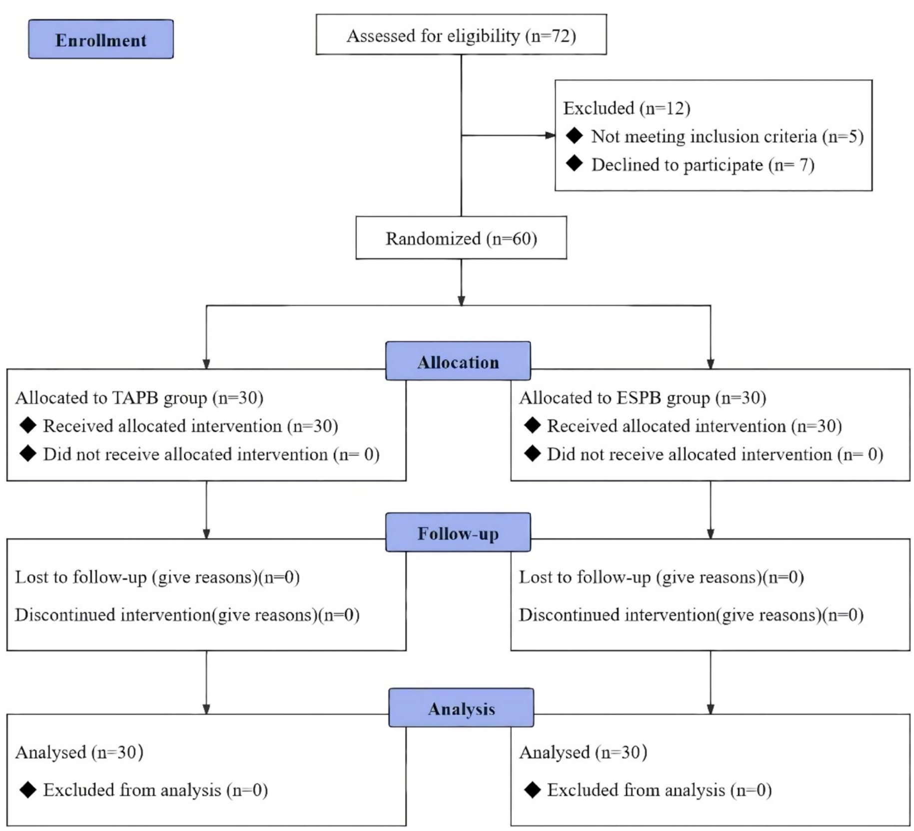

Fig. 1 CONSORT flowchart. Note: CONSORT, Consolidated Standards of Reporting Trials; ESPB, erector spinae plane block; TAPB, transverse abdominis plane block

Table 1 Demographic data and baseline characteristics

Variables	ESPB group (*n* = 30)	TAPB group (*n* = 30)	*p*-value
Age, years	58.1 ± 4.5	59.1 ± 4.1	0.407
Height, cm	164.1 ± 9.3	164.8 ± 7.8	0.730
Weight, kg	60.0 ± 9.3	62.7 ± 8.5	0.247
Gender, *n* (%)			0.793
Male	18 (60)	17 (56.7)	
Female	12 (40)	13 (43.3)	
ASA physical status, *n* (%)			0.737
I	4 (13.3)	3 (10)	
II	20 (66.7)	18 (60)	
III	6 (20)	9 (30)	
Duration of surgery, min	177.2 ± (45.6)	172.2 ± (35.9)	0.637
Duration of anesthesia, min	214.9 ± (41.2)	208.3 ± (34.3)	0.503
Remifentanil dose, μg	0.7 (0.6–0.9)	0.8 (0.7–1.2)	0.064
Preoperative global QoR-15 score	143.1 ± 5.0	141.6 ± 4.7	0.244

Dates are reported as mean ± SD, median (IQR) or number (percentage) where appropriate

ESPB Erector spinae plane block, *TAPB* Transverse abdominis plane block, *ASA* American Society of Anesthesiologists, *QoR-15* 15-item quality of recovery questionnaire

characteristics, including preoperative overall QoR-15 scores, were similar between the groups (Table 1).

The QoR-15 scores are presented in Fig. 2. At 24 h postoperatively, the overall QoR-15 score in the ESPB group was higher than in the TAPB group, with scores of 109.2 ± 8.7 and 101 ± 10.1, respectively (a difference of 8.2 [95% CI 3.3–13.0]; $p = 0.001$). At 48 h postoperatively, the ESPB group again had higher overall QoR-15 scores compared to the TAPB group, with scores of 118.5 ± 8.8 and 113.8 ± 8.1, respectively (a difference of 4.7 [95% CI 0.4–9.1]; $p = 0.035$).

Postoperative VAS pain scores are shown in Table 2. In summary, patients in the ESPB group had lower VAS pain scores at both rest and during activity within the first

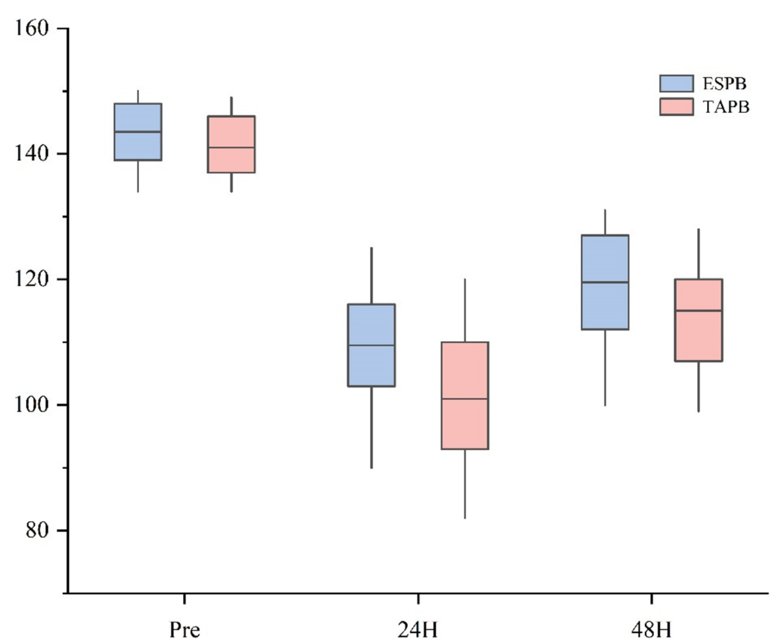

Fig. 2 Postoperatively at 24 and 48 h, patients in the erector spinae plane block (ESPB) group had higher overall recovery quality QoR-15 scores compared to the control group. Note: The boxplot shows the median QoR-15 scores (blue boxplot for the ESPB group, red boxplot for the TAPB group; Pre, preoperative). Lines represent medians, box edges represent the first and third quartiles, and whiskers indicate the most extreme values within 1.5 times the interquartile range

Table 2 Postoperative visual analogue scale (VAS) pain scores

	ESPB group (*n* = 30)	TAPB group (*n* = 30)	*p*-value
VAS at rest			
2 h	1 (1–2)	2.5 (2–3)	0.002
6 h	2.5 (2–3)	3 (3–4)	0.004
12 h	2 (2–3)	3 (2–3)	0.026
24 h	2 (1–2)	2 (2–3)	0.02
48 h	1 (1–1)	1 (1–2)	0.767
VAS at activity			
2 h	3 (3–4)	4 (3–5)	0.009
6 h	3 (3–4)	4 (4–5)	0.004
12 h	3 (3–4)	4 (3–4)	0.013
24 h	3 (3–3)	3 (3–4)	0.017
48 h	2 (2–3)	2 (2–3)	0.817

Data are presented as median (interquartile range). Mann–Whitney *U*-test was used to compare medians between the two groups

ESPB group Erector spinae plane block group, *TAPB* group Transversus abdominis plane block group

24 h postoperatively compared to the TAPB group (all $p < 0.05$). However, at 48 h postoperatively, there was no significant difference in VAS pain scores between the two groups at rest ($p = 0.767$) or during activity ($p = 0.788$). Additionally, the cumulative dose of sufentanil within the first 24-h post-surgery was lower in the ESPB group (median of 62 μg, *IQR* 61–64) compared to the TAPB group (median of 66 μg, *IQR* 63–70; $p < 0.001$).

Table 3 demonstrates that patients in the ESPB group reported significantly higher satisfaction scores at 48 h compared to those in the TAPB group, with medians of 9 (*IQR* 8–9) versus 8 (*IQR* 7–9) respectively ($p = 0.001$). Furthermore, the ESPB group experienced a shorter median hospital stay of 7 days (*IQR* 6–9) compared to 8 days (*IQR* 7–10) for the TAPB group ($p = 0.037$). There were no significant differences observed between the groups regarding PACU duration, intraoperative opioid use, time to first flatus, need for rescue analgesia, incidences of PONV, or total CCI scores. Additionally, no complications associated with the nerve block, such as bleeding, infection, local anesthetic toxicity, pneumothorax, or intestinal perforation, were reported in any of the patients.

Discussion

In this randomized controlled trial, we compared the efficacy of ESPB and TAPB using the patient-centered QoR-15 measure in patients undergoing laparoscopic rectal cancer surgery. We found that patients receiving ESPB reported higher QoR-15 scores at both 24 and 48 h postoperatively compared to those who received TAPB preoperatively, suggesting a superior overall recovery quality. In addition, ESPB was associated with enhanced pain relief within the first 24-h post-surgery and a reduction in the cumulative consumption of opioid analgesics. Furthermore, our results indicated shorter postoperative hospital stays and greater satisfaction with pain management in the ESPB group. These findings further support the value of ESPB in laparoscopic colorectal surgery.

A previous randomized controlled trial compared ESPB and TAPB in elderly patients undergoing laparoscopic rectal cancer surgery, focusing primarily on pain scores and opioid consumption (Shen et al. 2021). However, improvements in postoperative analgesia and reduced opioid intake only hold clinical significance if they contribute to better recovery quality(Jones and Aldwinckle 2020). Recovery after surgery and anesthesia is a complex, multidimensional process(Lee et al. 2014).

Table 3 Secondary outcomes during the study period

	ESPB group (*n* = 30)	TAPB group (*n* = 30)	*p*-value
PACU duration, min	65.8 ± 7.3	68.3 ± 10.6	0.293
Cumulative sufentanil consumption, μg			
0–24 h	62 (61–65)	66 (63–70)	< 0.001
24–48 h	61 (60–61.2)	61 (60–62)	0.46
Time to ambulation, days	4 (3–4)	4 (3–5)	0.056
Hospital stay, days	7 (6–9)	8 (7–10)	0.037
Patient satisfaction score	9 (8 ~ 9)	8 (7–9)	0.001
Time to first flatus, h	41 (32.8–48)	43.5 (34.8–56.3)	0.2
Required rescue analgesic, n (%)	3 (10)	5 (16.7)	0.706
PONV, n (%)	9 (30)	5 (16.7)	0.222
Comprehensive Complication Index	0 (0–8.7)	8.7 (0–14.4)	0.216
Reported block complications	0	0	0.99

Dates are reported as mean ± SD, median (IQR), or number (percentage) where appropriate

PONV Postoperative nausea and vomiting, *ESPB* Erector spinae plane block, *TAPB* Transverse abdominis plane block, *PACU* Postanesthesia care unit

Research suggests that assessing the effectiveness of anesthesia interventions should prioritize patient-centered outcomes. The QoR-15 is an internationally recognized and widely accepted multidimensional assessment tool for evaluating overall recovery quality after various surgeries(Myles et al. 2018). Therefore, we adopted QoR-15 as the primary outcome measure in our study.

Recent updates by Myles and colleagues have revised the minimum clinically important difference (MCID) for postoperative recovery quality to 6 points(Mp and Md 2021). In our study, we observed that the QoR-15 scores of patients in the preoperative ESPB group were 8.2 points higher than those in the TAPB group 24-h post-surgery. These results indicate that preoperative ESPB significantly enhances the clinical health status of patients undergoing laparoscopic rectal cancer surgery on the first day post-operation, surpassing the MCID and affirming the superiority of ESPB over TAPB in early postoperative recovery.

Pain following laparoscopic rectal surgery primarily stems from various sources: abdominal incisions, visceral traction, tissue damage, shoulder pain from intraoperative pneumoperitoneum, and diaphragmatic nerve stimulation(Perla et al. 2006). This means that patients will experience pain in their body and internal organs. This diverse pain profile highlights the importance of effective analgesic strategies. Our study demonstrates that preoperative ESPB offers superior opioid-sparing and analgesic effects compared to TAPB, which may be attributed to its mechanism of action. Both ESPB and TAPB are fascial blocks designed to alleviate abdominal pain. However, ESPB involves injecting local anesthetics between the erector spinae muscles and transverse processes. This placement allows the anesthetic to diffuse into the paravertebral space, affecting 3–5 vertebral bodies above and below(Chin and El-Boghdadly 2021). The blockage of both dorsal and ventral branches of the spinal nerves, along with a partial sympathetic blockade (Forero et al. 2016), facilitates comprehensive analgesia for both body and internal organs. In contrast, TAPB specifically targets the sensory nerves of the anterior lateral abdominal wall(Baeriswyl et al. 2015), primarily addressing somatic pain. Therefore, the broader analgesic reach of ESPB likely contributes to its enhanced effectiveness in managing pain, leading to higher patient satisfaction in pain management post-surgery.

Although the ESPB has gained popularity as a novel analgesic technique, its exact mechanism remains a topic of debate(Aponte et al. 2019; Yang et al. 2018). A recent anatomical study by Harbell and colleagues provided insight into the method of administration, showing that an ESP injection administered between the transverse processes (TP) results in more extensive anesthetic spread compared to a medial TP injection in a human cadaveric model(Harbell et al. 2023). This finding suggests variability in analgesic distribution based on the site of injection, underscoring the need for additional clinical research. Further studies are essential to explore the potential differences in clinical outcomes associated with various ESPB injection sites, potentially guiding more effective and tailored analgesic strategies in clinical practice.

The excessive use of opioids is linked to prolonged hospital stays and higher rates of readmission(Gustafsson et al. 2012). This study demonstrates that preoperative ESPB significantly reduces immediate postoperative opioid consumption compared to TAPB. The reduced opioid use in the ESPB group may correlate with shorter hospital stays. Therefore, minimizing opioid use during the perioperative period is crucial for enhancing postoperative recovery. Implementing effective alternative analgesic techniques can play a vital role in improving patient outcomes and reducing the dependency on opioids.

Traditionally, the management of postoperative abdominal pain predominantly utilized epidural analgesia, a technique commonly recommended for its regional blockade effectiveness(Jinn and G MJ, Brendan C, Aidan S, Amit P, Jeffrey G. 2017). However, due to challenges such as difficulties in catheter placement, relatively high rates of blockade failure, and risks including hypotension, infection, and hematoma, the favorability of this method has seen a decline (Ct and D C, W WJA. 2009). Moreover, with the advancement and widespread adoption of minimally invasive surgical methods, the appropriateness of epidural analgesia continues to be debated, particularly because of its high risk–benefit ratio (Jg and F B, H K. 2013).Consequently, this has led to the increasing recommendation of alternative, less invasive analgesic methods, such as the ESPB. Akhtar et al.'s meta-analysis revealed that in laparoscopic rectal cancer surgery, ESPB significantly reduces both intraoperative and postoperative opioid consumption, improves pain scores, and diminishes the need for rescue analgesia (Akhtar et al. 2024). Notable advantages of ESPB include its simplicity, convenience, and safety profile. It is favored over TEA and paravertebral blocks because the injection target area is superficial and distanced from critical organs and blood vessels, which significantly lowers the risk of block-related complications (Hamilton and Manickam 2017). These findings align with our research. However, as ESPB is a relatively new technique in regional anesthesia, it is crucial to gather more clinical evidence to further substantiate its safety profile.

There are limitations to this study. First, we did not evaluate the distribution of skin sensation following the administration of nerve blocks, potentially leading to inaccuracies in our assessment due to ineffective blocks. Despite this, due to the rapid turnover of surgeries, the practice of administering these and other peripheral nerve blocks under ultrasound guidance aligns with routine clinical practices; thus, our findings should be relevant to broad clinical setting. Second, the small sample size and the nature of this being a single-center study limit the generalizability of our results. Therefore, further multicenter studies are needed to confirm our findings. Variations in demographic characteristics and anesthetic practices across different centers could influence the outcomes. Third, the study population was aged 18–65 years. Although the high-risk population for colorectal cancer is people over 55 years old, there is an obviously increasing trend of younger onset rates (Dehal et al. 2018). Future studies should assess the effectiveness and safety of these two nerve block techniques across a broader age spectrum.

Conclusion

In conclusion, among patients undergoing laparoscopic radical surgery for colorectal cancer, ESPB offers more effective analgesic efficacy compared to TAPB. Moreover, higher QoR-15 scores at 24 and 48 h postoperatively indicate better overall recovery quality. We support ESPB as a viable alternative to TAPB.

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Authors' contributions
Pengfei Hou has made significant contributions to the study design, project administration, manuscript writing, data collection, and analysis. Wanxin Liu and Rongman Chen contributed to project administration and data analysis. Haiqi Mi contributed to manuscript writing and data analysis. Shuaiying Jia contributed to manuscript writing. Jingyan Lin contributed to study design, manuscript writing, editing, and review.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This randomized, controlled, single-center study received ethical approval from the Ethics Committee of North Sichuan Medical College Affiliated Hospital on January 12, 2024 (Approval No. 2024ER12-1). The study has been conducted in accordance with the principles set forth in the Helsinki Declaration, and patients have given their informed consent for participation in the research study.

Consent for publication
By submitting my article, I agree to pay the APC in full if my article is accepted for publication (unless it is covered by an institutional agreement or journal partner or a full waiver has been granted).

Competing interests
The authors declare no competing interests.

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