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INPLASY

Efficacy and safety of erector spinae plane block for postoperative analgesia in minimally invasive urologic surgery: A systematic review and meta-analysis

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Han, LX; Zhang,SY; Liu, XL; Fu,Q.

Corresponding author:
Linxuan Han

linxuan_han@126.com

Author Affiliation:
Department of Anesthesiology, The Third People's Hospital of Chengdu, Sichuan Province, 610074, China.

ADMINISTRATIVE INFORMATION

Support - No support.

Review stage at the time of initial registration - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 9 November 2026 and was last updated on 9 November 2026.

INTRODUCTION

Review question / Objective Minimally invasive urologic surgery (MIUS) has become the standard of care for radical prostatectomy and nephrectomy, yet patients still experience significant postoperative pain. Erector spinae plane block (ESPB) has emerged as a promising regional technique, but lack of meta-analysis has focused exclusively on its efficacy in MIUS.

Condition being studied Minimally invasive urologic surgery (MIUS), encompassing laparoscopic and robot-assisted approaches, which has become the standard of care for major oncologic procedures including radical prostatectomy and nephrectomy. Compared with open surgery, laparoscopic and robot-assisted techniques reduce incisional trauma, bloods loss, and recovery time; however, patients still experience significant postoperative pain arising from multi-quadrant trocar sites, peritoneal irritation due to pneumoperitoneum, and particularly in nephrectomy, diaphragmatic and viscera nociception referred to the shoulde. In the context of enhanced recovery after surgery (ERAS) pathways, effective multimodal opioid-sparing analgesia is essential to promote early ambulation, reduce postoperative nausea and vomiting (PONV), and shorten hospital stays]. Regional anesthesia techniques have therefore assumed a central role in perioperative care for these procedures, with the transversus abdominis plane block (TAPB), quadratus lumborum block (QLB), and wound infiltration serving as traditional mainstays.

The erector spinae plane block (ESPB), first described by Forero et al. in 2016, has emerged as a promising alternative for thoracoabdominal analgesia. By depositing local anesthetic in the fascial plane between the erector spinae muscle and the transverse processes of the thoracic or lumbar vertebrae, ESPB produces analgesia via diffusion to the paravertebral space, the intercostal neurovascular bundle, and potentially the ventral and dorsal rami of the spinal nerves. In the specific context of minimally invasive urologic surgery, ESPB offers several theoretical advantages: it is

technically straightforward to perform with ultrasound guidance, carries a favorable hemodynamic profile with minimal risk of sympathetic blockade, and provides broad somatic coverage that may encompass both the flank and lower abdominal dermatomes relevant to nephrectomy and prostatectomy. Recent systematic reviews suggest ESPB was effective, offering a favorable balance of analgesia and safety following robot-assisted prostatectomy[16]. Notably, recent controlled randomized trials (RCT) head-to-head comparisons between ESPB and other fascial plane blocks, such as QLB and TAPB, which have yielded inconsistent results, and no previous meta-analysis has focused exclusively on ESPB in MIUS.

The absence of focused, procedure-specific synthesis limits the ability of clinicians to make evidence-based decisions regarding the optimal regional technique for laparoscopic and robot-assisted urologic procedures. Existing meta-analyses have either pooled heterogeneous surgical cohorts or examined ESPB across broad surgical categories, obscuring procedure-specific effect estimates. Furthermore, the rapid accumulation of new RCT data, including trials directly comparing ESPB with QLB, TAPB, and systemic analgesia, necessitates an updated quantitative synthesis. We therefore conducted this systematic review and meta-analysis to consolidate contemporary evidence on the analgesic efficacy and safety of ESPB specifically in adults undergoing MIUS, with predefined subgroup analyses by comparator type.

METHODS

Participant or population Adult patients (aged≥18 years) scheduled for MIUS.

Intervention Ultrasound-guided ESPB.

Comparator Control (no block, placebo, or alternative regional block).

Study designs to be included Only original, full-text, peer-reviewed RCT published in English were considered.

Eligibility criteria Inclusion was restricted to RCT comparing ESPB with a control arm (no block, placebo, or alternative regional technique) in adults undergoing MIUS with general anesthesia.

Information sources The literature search on 22 October 2026 via Web of science, PubMed, and the Cochrane Library.

Main outcome(s) The primary outcome was 24h postoperative opioid consumption (oral morphine equivalent).

Additional outcome(s) Secondary outcomes included postoperative pain scores at rest and during movement at 24h and 48h; intraoperative opioids consumption; surgical and anesthesia duration; time to ambulation; postoperative nausea and vomiting (PONV); and Quality of Recovery-15 (QoR-15) scores.

Quality assessment / Risk of bias analysis Two independent reviewers evaluated the risk of bias for each outcome in each included study using the Cochrane Risk of Bias 2 (RoB-2) tool, which estimated the following five domains.The certainty of evidence for each outcome was graded using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach.

Strategy of data synthesis Data were analyzed using Review Manager (RevMan) version 5.4.1 (The Cochrane Collaboration). For continues outcomes, we pooled standardized mean difference (SMD) with 95% confidence interval (CI) using the inverse variance method; for studies reporting medians with interquartile range (IQR), we converted to means and standard deviation (SD) using the method. For dichotomous outcomes, we calculated relative risk (RR) with 95% CI using the Mantel-Haenszel method. All analyses were performed using a random-effects model with the DerSimonian-Laird estimator. Statistical significance was set at P 50%).

Subgroup analysis Prespecified subgroup analyses were performed to identify whether the analgesic efficacy of ESPB versus control was modified by type of comparator (alternative regional blocks). Funnel plots were generated to assess publication bias and small-study effects for outcomes with data from at least 10 included studies.

Sensitivity analysis When substantial heterogeneity (I2>50%) was observed for an outcome, leave-one-out sensitivity analyses were conducted to identify potential sources.

Country(ies) involved China.

Keywords Erector spinae plane block, ESPB, Postoperative analgesia, Minimally invasive urologic surgery, Meta-Analysis.

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Contributions of each author

Author 1 - Linxuan Han
Email: linxuan_han@126.com
Author 2 - Siyu Zhang
Email: zsyujk@163.com
Author 3 - Xiaolan Liu
Email: lxldi1geyx@163.com
Author 4 - Qiang Fu
Email: fuqiang1878@outlook.com

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