Original Article

DOI: 10.7860/JCDR/2025/81219.21990

Anaesthesia Section

Erector Spinae Plane Block versus Local Infiltration for Postoperative Pain Control in Percutaneous Nephrolithotomy: A Randomised Controlled Trial

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ABSTRACT

Introduction: Percutaneous Nephrolithotomy (PCNL) is standard for large/complex renal stones, yet remains painful postoperatively. The Erector Spinae Plane Block (ESPB) may offer superior analgesia compared to conventional Local Anaesthetic Infiltration (LAI).

Aim: To compare the efficacy of landmark-guided ESPB and LAI for postoperative analgesia following PCNL.

Materials and Methods: This single-blind, randomised controlled trial was conducted at the Department of Anaesthesiology, Krishna Institute of Medical Sciences (KMISDU), Krishna Vishwa Vidyapeeth, Malkapur, Karad, Maharashtra, India, from March 2023 to August 2024. Sixty adults undergoing elective PCNL were randomly allocated (computer sequence, sealed envelopes) into two groups (n=30 each): Group A received landmark-guided ESPB with 20 mL 0.2% ropivacaine, and Group B received LAI with 20 mL 0.2% ropivacaine. The primary endpoints were time to first rescue analgesia, 24-hour tramadol consumption, and the number of rescue doses. Secondary endpoints were Postoperative Nausea and Vomiting (PONV), time to mobilisation, time to oral intake, patient satisfaction (0-10), and complications including local anaesthetic systemic toxicity. Analysis used Statistical Package for Social Sciences (SPSS) version 25.0; p-value <0.05 was significant.

Results: All 60 patients were analysed (30 per group). Groups were comparable at baseline: age (42.3±9.6 vs 41.7±10.2 years), gender (male 60.0% vs 56.7%), weight (65.4±7.8 vs 64.7±8.1 kg), ASA I/II (66.7%/33.3% vs 73.3%/26.7%), and surgery duration (88.5±12.1 vs 89.3±13.4 min). ESPB significantly prolonged time to first rescue analgesia (8.10±1.41 vs 2.48±0.75 h; p-value <0.0001), reduced tramadol use (123.33±27.79 vs 205.00±39.86 mg; p-value <0.0001), and lowered rescue doses (1.67±0.66 vs 3.70±0.70; p-value <0.0001). Secondary outcomes favoured ESPB including lower PONV (10.0% vs 43.3%), earlier mobilisation (10.5±2.1 vs 18.7±3.3 h; p-value <0.01), faster oral intake (6.2±1.4 vs 12.3±2.5 h; p<0.01), and higher patient satisfaction (8.6±1.0 vs 6.3±1.4; p-value <0.001). No complications occurred in either group.

Conclusion: Landmark-guided ESPB provided superior postoperative analgesia compared to LAI following PCNL, with delayed rescue need, lower opioid consumption, fewer rescue doses, faster recovery milestones, and greater satisfaction, without added complications. ESPB is a safe, opioid-sparing technique suitable for inclusion in multimodal analgesia protocols for PCNL.

Keywords: Enhanced recovery, Multimodal analgesia, Patient satisfaction, Postoperative pain relief, Tramadol consumption, Ultrasound-guided nerve blocks

INTRODUCTION

Percutaneous Nephrolithotomy (PCNL) remains the treatment of choice for large or complex renal calculi, combining a minimally invasive approach with high efficacy in stone clearance. However, despite its minimally invasive nature, the procedure frequently leads to significant postoperative pain attributed to renal tract dilation, parenchymal injury, and capsular distension [1,2]. Optimising pain control is critical—not only for improving patient well-being but also for enabling early ambulation, reducing reliance on opioids, and preventing associated adverse effects like nausea and respiratory complications [3].

Conventional postoperative analgesia methods for PCNL primarily include systemic opioids and Local Anaesthetic Infiltration (LAI) at the surgical site. While LAI is simple to perform, its analgesic effect is limited in duration and insufficient for managing visceral pain [2]. Opioids, although effective, frequently lead to complications such as nausea, vomiting, pruritus, and respiratory depression, which may hinder recovery [3].

The Erector Spinae Plane Block (ESPB), introduced by Forero M et al., in 2016, has emerged as an innovative regional anaesthetic technique within multimodal analgesia protocols [4]. This technique involves injecting local anaesthetic deep to the erector spinae muscle, allowing for multidermatomal spread and potential blockade of both somatic and visceral afferents [5]. ESPB has demonstrated promising outcomes across a range of surgeries, including those involving the thoracic cavity, abdomen, and renal system, by significantly lowering postoperative opioid needs [6].

Recent trials have suggested that ESPB may surpass LAI in effectiveness, especially in renal procedures [6-8]. However, limited research exists on landmark-based ESPB techniques [7]. Therefore, the present study aimed to compare the efficacy of landmark-guided ESPB with local anaesthetic infiltration in patients undergoing PCNL, with primary outcomes including time to first rescue analgesia, cumulative tramadol consumption, and number of rescue doses, and secondary outcomes comprising incidence of PONV, time to mobilisation, time to oral intake, patient satisfaction, and complications.

MATERIALS AND METHODS

This was a single-blind, randomised controlled trial conducted in the Department of Anaesthesiology, KIMSDU, Karad, Maharashtra,

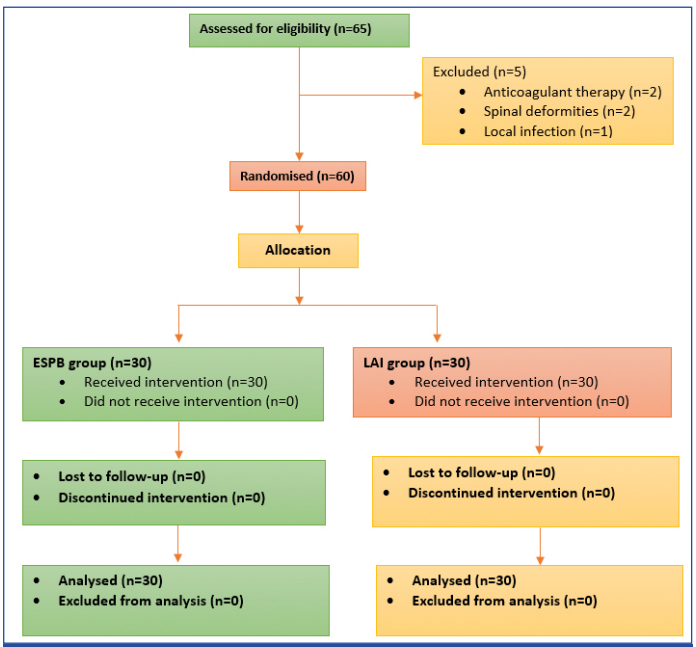
India from March 2023 to August 2024 (18 months). Ethical approval was obtained from the Institutional Ethics Committee (IEC No: KIMSDU/IEC/03/2023, dated 05/04/2023 and Clinical Trails No: CTRI/2024/08/073029). Written informed consent was taken from all participants. The LAI arm served as the control group, reflecting the routinely used postoperative analgesic strategy for PCNL at current study centre, while the ESPB arm served as the intervention.

Sample size calculation: The required sample size was calculated a priori using G*Power version 3.1.9.7. Based on the randomised study by Ramachandran S et al., (2021) [9] comparing ESPB with LAI after PCNL, which showed a markedly longer time to first rescue analgesia (median 12-h with ESPB vs 30 min with LAI) and a significant reduction in 24-h tramadol requirement, assumed a 30% reduction in 24-h tramadol consumption with ESPB versus LAI for the present trial. With two-sided α=0.05, power (1-β)=0.80 and equal allocation, 26 patients per group were required; allowing for attrition/protocol deviations, authors enrolled 30 per group (total N=60).

Inclusion criteria: Adults aged 18–65 years with American Society of Anaesthesiologists (ASA) physical status I or II scheduled for elective PCNL under General Anaesthesia (GA) were included.

Exclusion criteria: Patients with known allergy to local anaesthetic agents, infection at the intended injection site, coagulopathy or bleeding disorders, anatomical spinal abnormalities, or current use of anticoagulant therapy were excluded.

Randomisation, allocation, and blinding: Patients were randomly allocated into two groups (n=30 each) using a computer-generated random number table [Table/Fig-1], with assignments placed in sequentially numbered, sealed, opaque envelopes.



[Table/Fig-1]: Consolidated ONSORT Flow Diagram.

Group A (ESPB group) received a landmark-guided ESPB at the T8 level with 20 mL of 0.2% ropivacaine, while

Group B (LAI group) received 20 mL of 0.2% ropivacaine infiltrated around the surgical site.

Study Procedure

The choice of ropivacaine 0.2%, 20 mL for both ESPB and LAI was based on prior PCNL studies that used 20 mL ropivacaine for ESPB and for local wound infiltration (e.g., 20 mL of 0.375% ropivacaine in both arms) and on published guidance describing typical ESPB concentrations (0.25-0.375%) at similar volumes; 0.2% was used to maintain plane spread while minimising the risk of Local Anaesthetic Systemic Toxicity (LAST) [10,11]. The randomisation sequence was generated by an independent statistician, and participants were enrolled by a senior anaesthesiologist not involved in data collection.

Blinding: The study followed a single-blind design. The patients were blinded to allocation, though the anaesthesiologist administering the block was necessarily unblinded. To minimise bias, outcome assessment and statistical analysis were performed by investigators blinded to allocation, with standardised anaesthetic protocols and postoperative regimens applied across both groups.

Out of 65 screened patients, 60 met the eligibility criteria and were included; 5 were excluded (2 due to anticoagulant therapy, 2 with spinal deformities, and 1 with local infection at the injection site).

The primary outcomes were time to first rescue analgesia, total tramadol consumption in 24 hours, and number of rescue doses. The secondary outcomes included incidence of PONV, time to mobilisation, time to oral intake, patient satisfaction score {10-point Visual Analogue Scale (VAS)], and complications such as LAST.

STATISTICAL ANALYSIS

Data were analysed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean±standard deviation and compared using the independent samples t-test. Categorical variables were presented as frequencies and percentages and analysed with the Chi-square test or Fisher's exact test as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Baseline characteristics such as age, gender distribution, weight, ASA physical status, and duration of surgery were comparable between the two groups (p-value >0.05), as shown in [Table/Fig-2]. Similarly, intraoperative parameters, including the type of anaesthesia and the number of puncture attempts, did not differ significantly. The mean block duration in the ESPB group was 22±3 minutes, with a sensory onset time of 8.5±1.2 minutes [Table/Fig-3].

Variables	Group A (ESPB) (n=30) (Mean±SD)	Group B (LAI) (n=30) (Mean±SD)	p-value
Mean age (years)	42.3±9.6	41.7±10.2	0.81
Gender (Male/Female)	18/12	17/13	1.00
Weight (kg)	65.4±7.8	64.7±8.1	0.73
ASA grade (I/II)	20/10	22/8	0.77
Duration of surgery (min)	88.5±12.1	89.3±13.4	0.80

[Table/Fig-2]: Demographic characteristics of study participants.
Values are expressed as mean±standard deviation or number of patients. p-values were calculated using the unpaired Student's t-test for continuous variables (age, weight, duration of surgery) and the Chi-square test or Fisher's exact test (where appropriate) for categorical variables (sex, ASA grade)

Parameters	Group A (ESPB) (Mean±SD) (n=30)	Group B (LAI) (Mean±SD) (n=30)	p-value
Type of anaesthesia	GA	GA	NS
Mean duration of block (min)	22±3	Not applicable	-
Mean onset of sensory block	8.5±1.2	Not applicable	-
Number of puncture attempts	1.1±0.3	1.0±0.2	0.41

[Table/Fig-3]: Intraoperative parameters.
Values are presented as mean±standard deviation. Both groups received general anaesthesia as the primary anaesthetic technique. Duration and onset of block were applicable only to Group A (ESPB). p-values were calculated using the unpaired Student's t-test for continuous variables (block duration, onset time, puncture attempts) and descriptive comparison for categorical variables (type of anaesthesia).

Primary postoperative analgesic outcomes: The ESPB group demonstrated significantly better analgesic efficacy across all primary outcomes [Table/Fig-4]. The mean time to first rescue analgesia

was notably longer in group A (8.10±1.41 hours) than in group B (2.48±0.75 hours; p-value <0.0001). Additionally, group A required significantly lower total tramadol over 24 hours (123.33±27.79 mg) compared to group B (205.00±39.86 mg; p-value <0.0001). The average number of rescue analgesic doses was also fewer in group A (1.67±0.66) than in group B (3.70±0.70; p-value <0.0001).

Outcome measures	Group A (ESPB) (Mean±SD) (n=30)	Group B (LAI) (Mean±SD) (n=30)	p-value
Time to first rescue analgesia (hrs)	8.10±1.41	2.48±0.75	<0.0001
Total tramadol consumption (mg/24 hrs)	123.33±27.79	205.00±39.86	<0.0001
Number of rescue doses (in 24 hrs)	1.67±0.66	3.70±0.70	<0.0001

[Table/Fig-4]: Primary postoperative analgesic outcomes.
Values are mean±standard deviation. p-values were calculated using the unpaired Student's t-test. Time to first rescue analgesia is the interval (in hours) from the end of surgery to the first postoperative rescue analgesic. Total tramadol consumption is the cumulative dose (mg) administered in the first 24 hours. Number of rescue doses is the count of protocol-defined rescue administrations given within 24 hours.

Secondary outcomes: PONV occurred less frequently in the ESPB group (3 patients; 10%) compared to the LAI group (13 patients; 43.3%), which was statistically significant (p-value=0.0024). Moreover, patients in group A mobilised earlier (10.5±2.1 hours) than those in group B (18.7±3.3 hours; p-value <0.01). Time to oral intake was also earlier in group A (6.2±1.4 hours) compared to group B (12.3±2.5 hours; p-value <0.01). Patient satisfaction scores (VAS 1-10) were higher in the ESPB group (8.6±1.0) than in the LAI group (6.3±1.4; p<0.001), as detailed in [Table/Fig-5].

Outcome measures	Group A (ESPB) (Mean±SD) (n=30)	Group B (LAI) (Mean±SD) (n=30)	p-value
Patients with PONV (%)	3 (10%)	13 (43.3%)	0.0024
Time to mobilisation (hrs)	10.5±2.1	18.7±3.3	<0.01
Time to oral intake (hrs)	6.2±1.4	12.3±2.5	<0.01
Patient satisfaction score (VAS 1-10)	8.6±1.0	6.3±1.4	<0.001

[Table/Fig-5]: Secondary outcomes.
Values are mean±standard deviation or number of patients (%). p-values were calculated using the unpaired Student's t-test for continuous outcomes (time to mobilisation, time to oral intake, patient satisfaction score) and the Chi-square test (or Fisher's exact test, as appropriate) for categorical outcomes (incidence of PONV). Times are reported in hours (h) and were measured from the end of surgery to first mobilisation and to first tolerated oral intake. Patient satisfaction was assessed at 24 hours on a 0-10 VAS (higher scores indicate greater satisfaction).

Complications and safety profile: No major complications were observed in either group. There were no reported cases of LAST, pneumothorax, surgical site infection, or haemodynamic instability. No block failures occurred in the ESPB group.

DISCUSSION

The present study demonstrates that landmark-guided ESPB provides superior postoperative analgesia compared with LAI in patients undergoing PCNL. Patients in the ESPB group had a significantly longer duration before requiring rescue analgesia, lower tramadol consumption, and fewer rescue doses, confirming its opioid-sparing potential. These findings are consistent with previous clinical reports describing the multilevel somatic and visceral analgesia achieved through ESPB via spread into the paravertebral and epidural spaces [8,11].

In current randomised trial of patients undergoing percutaneous nephrolithotomy, the ESPB demonstrated a clear opioid-sparing effect compared with local anaesthetic infiltration: 24-hour tramadol consumption and the number of rescue doses were lower, the time to first rescue analgesia was longer, and the incidence of postoperative nausea and vomiting was significantly reduced, with earlier recovery milestones. These findings are concordant with prior reports in abdominal and colorectal surgery, where ESPB was associated with reduced perioperative opioid requirements and improved postoperative comfort [12,13], and they also align with evidence in PCNL showing fewer opioid-related adverse effects when ESPB is used instead of wound infiltration [9]. The agreement across studies likely reflects the multisegmental paravertebral spread achieved by ESPB, which provides both somatic and visceral analgesia relevant to pain after renal tract instrumentation.

Functional recovery outcomes in the ESPB group, including earlier mobilisation and resumption of oral intake, were in line with the findings of Pandey SP et al., and Mandal AK et al., who highlighted the role of ESPB in accelerating recovery in both renal and laparoscopic procedures [14,15]. This study further demonstrated that patient satisfaction scores were higher with ESPB, reflecting the clinical relevance of effective pain control in perioperative care. Recent higher-level evidence corroborates these observations. Singh A et al., conducted a systematic review and meta-analysis of randomised controlled trials and confirmed that ESPB significantly prolongs analgesia and reduces opioid requirements following PCNL [16]. Similarly, Long K et al., performed a network meta-analysis comparing multiple regional anaesthesia techniques for PCNL and concluded that ESPB, paravertebral block, and quadratus lumborum block significantly reduced postoperative opioid consumption, whereas local infiltration offered no advantage over placebo [17]. Moreover, Turkan H et al., reported comparable opioid consumption between ESPB and anterior quadratus lumborum block, both markedly superior to no block, further reinforcing the role of ESPB as an effective component of multimodal analgesia in PCNL [18].

The safety profile in this study was favourable, with no block-related complications observed. These results are consistent with earlier studies by Tulgar S et al., and Gultekin MH et al., who demonstrated a low complication rate and high feasibility of ESPB in urological and abdominal procedures [11,19]. Although ultrasound guidance is often advocated, findings of this study support the clinical utility of landmark-guided ESPB in resource-limited settings, in agreement with the conclusions of Sia CJY et al., [20].

Taken together, current evidence indicates that ESPB offers reliable postoperative analgesia, reduces opioid requirements, and facilitates enhanced recovery after PCNL. The present study adds to this growing body of literature by demonstrating that even a landmark-guided technique can achieve these outcomes effectively when performed under standardised protocols.

Limitation(s)

This single-centre, single-blind randomised trial was a priori powered only for the primary analgesic endpoint; therefore, estimates for secondary outcomes and complications should be interpreted as exploratory, and the study was not powered to detect uncommon adverse events or to support subgroup analyses. Follow-up was limited to the first 24 hours, so longer-term outcomes (e.g., persistent pain, readmissions, functional recovery) were not assessed. The ESPB was delivered by a landmark technique; while effective in this setting, reproducibility may vary with operator and may not fully mirror ultrasound-guided practice elsewhere. The comparator LAI regimen used a single concentration and volume of ropivacaine, which may limit generalisability to other infiltration protocols. Finally, although patients and outcome assessors were blinded, the proceduralist could not be, introducing a possibility of performance bias inherent to block studies.

CONCLUSION(S)

The present study demonstrates that landmark-guided ESPB provides significantly superior postoperative analgesia compared to LAI in patients undergoing PCNL. ESPB resulted in prolonged time

to first analgesic request, reduced tramadol consumption, fewer rescue doses, and improved patient satisfaction, with fewer opioid-related side-effects such as nausea and vomiting. Additionally, earlier mobilisation and oral intake were noted in the ESPB group, supporting its role in enhanced recovery protocols. The technique was safe, effective, and feasible using anatomical landmarks. ESPB may thus be considered a valuable component of multimodal analgesia in PCNL, particularly in resource-limited settings.

REFERENCES

[1] Akpayak IC, Ikeh CD. Percutaneous Nephrolithotomy in the Management of Renal Stone: An Audit of Outcomes and Complications. Ann Afr Med. 2025;24:461-67. Doi: 10.4103/aam.aam_5_25.

[2] Paneque T, Richey J, Abdelrazek A, Morgan K, Fitz-Gerald J, Swinney S, et al. Current advances in pain regimens for percutaneous nephrolithotomy A comprehensive review. Can Urol Assoc J. 2023;17(11):E388-E394. Doi: 10.5489/cuaj.8333.

[3] Ramsay MA. Acute postoperative pain management. Proc (Bayl Univ Med Cent). 2000; 13(3):244-47. Doi: 10.1080/08998280.2000.11927683.

[4] Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: A novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med. 2016;41:621-27. Doi:10.1097/AAP.0000000000000451.

[5] Adhikary SD, Pruett A, Forero M, Thiruvenkatarajan V. Erector spinae plane block as an alternative to epidural analgesia for post-operative analgesia following video-assisted thoracoscopic surgery: A case study and a literature review on the spread of local anaesthetic in the erector spinae plane. Indian J Anaesth. 2018;62:75-78. Doi: 10.4103/ija.IJA_693_17.

[6] Gürkan Y, Aksu C, Kuğ A, Yörükoğlu UH, Kılıç CT. Ultrasound guided erector spinae plane block reduces postoperative opioid consumption following breast surgery: A randomized controlled study. J Clin Anesth. 2018;50:65-68. Doi: 10.1016/j.jclinane.2018.06.033.

[7] Dey S, Mistry T, Mittapalli J, Neema PK. Landmark guided continuous erector spinae plane block: An adjunct for perioperative analgesia in a patient with difficult back operated for total hip arthroplasty. Saudi J Anaesth. 2020;14:276-77. Doi: 10.4103/sja.SJA_46_20.

[8] Kim E, Kwon W, Oh S, Bang S. The erector spinae plane block for postoperative analgesia after percutaneous nephrolithotomy. Chin Med J (Engl). 2018, 131:1877-78. Doi: 10.4103/0366-6999.237408.

[9] Ramachandran S, Ramaraj KP, Velayudhan S, Shanmugam B, Kuppusamy S, Lazarus SP. Comparison of erector spinae plane block and local anaesthetic infiltration of the incision site for postoperative analgesia in percutaneous nephrolithotomy - A randomised parallel-group study. Indian J Anaesth. 2021;65:398-403. Doi: 10.4103/ija.IJA_1450_20.

[10] Renganathan S, Prabhu SG, Raj N. Comparison of postoperative analgesic effect of ultrasound-guided erector spinae plane block and local anaesthetic infiltration with 0.375% ropivacaine in percutaneous nephrolithotomy patients: A randomised clinical study. J Clin Diagn Res. 2023;17(12):UC24-UC28. Published Online First: 2023. Doi: 10.7860/JCDR/2023/66373.18812.

[11] Tulgar S, Aydin ME, Ahiskalioglu A, De Cassai A, Gurkan Y. Anesthetic techniques: Focus on lumbar erector spinae plane block. Local Reg Anesth. 2020;13:121-33. Doi: 10.2147/LRA.S233274.

[12] Choi JJ, Chang YJ, Lee D, Kim HW, Kwak HJ. Effect of erector spinae plane block on postoperative pain after laparoscopic colorectal surgery: A randomized controlled study. J Pers Med. 2022;12:1717. Doi: 10.3390/jpm12101717.

[13] Muneeb Akhtar SM, Fareed A, Afzal U, Asghar MS, Mumtaz M, Faraz F, et al. Effectiveness of erector spinae plane block in reducing opioid consumption after colorectal surgery: A comprehensive meta-analysis. Am J Surg. 2024;232:31-44. Doi: 10.1016/j.amjsurg.2024.01.032.

[14] Pandey SP, Yadav U, Khan MMA, Singh AK, Verma S, Nigam S. Efficacy of ultrasound-guided erector spinae plane block in percutaneous nephrolithotomy. Cureus. 2023;15:e40186. Doi: 10.7759/cureus.40186.

[15] Mandal AK, Shrestha B, Yadav KK, Dahal S, Yadav P, Yadav P, Deo S. Ultrasound-guided bilateral Erector Spinae Plane Block (ESPB) for postoperative analgesia in laparoscopic cholecystectomy: A randomized controlled trial. Ann Med Surg (Lond). 2025;87:1307-17. Doi: 10.1097/MS9.0000000000002988.

[16] Singh A, Sharma AP, Ganesh V, Gupta R, Sharma G, Naik NB, et al. Efficacy of erector spinae plane block for postoperative analgesia after percutaneous nephrolithotomy: A systematic review and meta-analysis of randomized controlled trials. J Anaesthesiol Clin Pharmacol. 2025;41:62-72. Doi: 10.4103/joacp.joacp_403_23

[17] Long K, Zhou C, Liang J, Tang X, Li Z, Chen Q. Effect of different regional anaesthesia techniques on postoperative analgesia following percutaneous nephrolithotomy: A systematic review and network meta-analysis. Indian J Anaesth. 2025;69:12-22. Doi: 10.4103/ija.ija_679_24.

[18] Turkan H, Kaya C, Turunc E, Dost B, Ustun YB. Effects of anterior quadratus lumborum block versus erector spinae plane block on postoperative acute pain in percutaneous phrolithotomy: A prospective, observational study. BMC Anesthesiol. 2024;24:322. Doi: 10.1186/s12871-024-02691-7

[19] Gultekin MH, Erdogan A, Akyol F. Evaluation of the efficacy of the erector spinae plane block for postoperative pain in patients undergoing percutaneous nephrolithotomy: A randomized controlled trial. J Endourol. 2020;34:267-72. Doi: 10.1089/end.2019.0777.

[20] Sia CJY, Wee S, Au-Yong APS, Lie SA, Tan WJ, Foo FJ, et al. Analgesia efficacy of erector spinae plane block in laparoscopic abdominal surgeries: A systemic review and meta-analysis. Int J Surg. 2024, 110:4393-401. Doi: 10.1097/JS9.0000000000001421.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jun 18, 2025
- Manual Googling: Sep 14, 2025
- iThenticate Software: Sep 16, 2025 (14%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jun 11, 2025**
Date of Peer Review: **Aug 29, 2025**
Date of Acceptance: **Sep 18, 2025**
Date of Publishing: **Nov 01, 2025**