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Serratus posterior superior intercostal plane block for postoperative analgesia: a systematic review and meta-analysis of randomized controlled trials

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ADMINISTRATIVE INFORMATION

Support - No support.

Review Stage at time of this submission - Risk of bias assessment.

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 12 August 2026 and was last updated on 12 August 2026.

INTRODUCTION

Review question / Objective The aim of this systematic review and meta-analysis is to evaluate the efficacy of ultrasound-guided serratus posterior superior intercostal plane block (SPSIPB) for postoperative analgesia in adult patients undergoing surgery under general anesthesia.
(i) population: adult patients undergoing surgical procedures under general anesthesia.
(ii) intervention: ultrasound-guided serratus posterior superior intercostal plane block.
(iii) comparator: systemic analgesia, no regional block, local infiltration analgesia or alternative regional analgesic techniques.
(iv) outcomes: cumulative postoperative opioid consumption during the first 24 hours after surgery, postoperative pain intensity at rest and during movement assessed using NRS or VAS, rescue analgesia requirement, postoperative nausea and vomiting, recovery quality scores and block-related complications.
(v) study design: randomized controlled trials (RCT).

Rationale Thoracic epidural analgesia remains the gold standard for postoperative pain management following thoracic surgery. Although it provides excellent analgesia, its use is associated with sympathetic blockade leading to hemodynamic instability, technical complexity and the risk of serious complications, including epidural or subdural hematoma with spinal cord compression, as well as spinal canal infections. These limitations have stimulated the search for safer and more accessible regional analgesic techniques. Ultrasound-guided fascial plane blocks have emerged as a promising alternative because they are performed at a distance from major blood vessels and the central nervous system, thereby reducing the risk of severe complications. Among these techniques, the erector spinae plane block (ESPB) has been the most extensively investigated. However, accumulating evidence has raised concerns regarding the extent and reproducibility of its sensory blockade. Similar limitations have

been reported for several recently introduced fascial plane blocks, which, despite favorable anatomical and cadaveric findings, have not always demonstrated the expected clinical analgesic effects.

To improve postoperative analgesia, additional interfascial techniques, including the serratus anterior plane block (SAPB) and rhomboid intercostal block (RIB), have been introduced. Although these blocks have safety profiles comparable to that of the serratus posterior superior intercostal plane block (SPSIPB), they generally provide a more limited spread of local anesthetic. Particular interest has recently focused on the SPSIPB. Even when used as a single regional technique, SPSIPB has been shown to provide effective sensory blockade of the neck, shoulder and the entire ipsilateral hemithorax. Its extensive anesthetic spread, consistent analgesic profile and favorable safety characteristics make SPSIPB a potentially valuable regional analgesic technique for thoracic surgery and support its potential for broader clinical adoption. Despite encouraging findings from individual randomized controlled trials, the overall clinical evidence regarding SPSIPB remains limited. The absence of a comprehensive evidence synthesis hampers an objective assessment of its true analgesic efficacy, safety profile and comparative effectiveness relative to other regional analgesic techniques. Therefore, a systematic review and meta-analysis is warranted to evaluate the analgesic efficacy, postoperative opioid-sparing effect, duration of sensory blockade and safety of SPSIPB compared with existing regional anesthesia techniques. Such evidence will help define the role of SPSIPB in contemporary perioperative analgesia and determine whether its routine use in thoracic surgery is justified.

Condition being studied Postoperative pain following surgical procedures performed under general anesthesia.

METHODS

Search strategy Systematic literature searches of studies published from 2023 onwards were conducted independently by five researchers in MEDLINE, PubMed and the Cochrane Library. Additionally, forward and backward snowballing methods were used to identify potentially eligible studies. To avoid duplication of research efforts, the protocol registries INPLASY and PROSPERO were searched for ongoing or previously registered systematic reviews addressing the same research question. Furthermore, ClinicalTrials.gov was searched to identify ongoing or unpublished clinical trials.

Participant or population Adult patients undergoing surgical procedures under general anesthesia.

Intervention Ultrasound-guided single-shot serratus posterior superior intercostal plane block (SPSIPB) performed using local anesthetic.

Comparator Any comparator was eligible, including conventional analgesia, local infiltration analgesia, no regional block or other regional anesthesia techniques.

Study designs to be included Only randomized controlled trials were included.

Eligibility criteria Inclusion criteria: randomized controlled trials evaluating ultrasound-guided serratus posterior superior intercostal plane block and involving adult patients undergoing surgery under general anesthesia.

Studies were excluded if they met one of the following criteria: 1) non-randomized studies, observational studies, case reports, case series, reviews, editorials, letters, animal studies or studies of non-surgical/chronic pain populations; 2) pediatric-only studies, preprints, duplicate reports, protocols, trial registry records, or conference abstracts.

Information sources PubMed, MEDLINE, Cochrane Library, INPLASY, PROSPERO, ClinicalTrials.

Main outcome(s) Main outcome will be total cumulative postoperative opioid consumption during the first 24 hours after surgery.

Additional outcome(s) Additional outcomes will include VAS/NRS postoperative pain scores at rest and during movement, rescue analgesia requirement for postoperative period, postoperative nausea and vomiting, antiemetic use, recovery quality scores, itching/pruritus appearance and block-related complications.

Quality assessment / Risk of bias analysis The internal validity and risk of bias will be assessed using the Cochrane Risk-of-bias tool 2.0 (RoB2) for randomized trials. The certainty of evidence will be assessed with GRADE methodology.

Strategy of data synthesis Data extraction was performed by five independent authors. Extracted data included study identification and registration

details, funding, study setting and design, sample size, surgical procedure, randomization and blinding procedures, comparator characteristics, local anesthetics, patient characteristics, anesthesia and surgery duration, timing and position of SPSIPB performance, perioperative anesthesia and analgesia protocols, and study outcomes.

Data analysis will be performed using Stata 18.0 (StataCorp LLC, College Station, TX, USA). Continuous outcomes will primarily be pooled using mean differences (MDs) with 95% confidence intervals (CIs). Studies with zero variance in either treatment arm will not be included in analyses using the standardized mean difference. Where clinically appropriate, these data will be analysed using the mean difference. Studies reporting a mean and standard deviation (SD) of zero in both treatment arms will be excluded from the corresponding quantitative synthesis.

Binary outcomes will primarily be summarized as risk ratios (RRs) with 95% CIs. Studies with zero events in one treatment arm will be retained using a continuity correction where required for effect estimation, whereas studies with zero events in both treatment arms will be excluded from RR and OR meta-analyses.

To ensure comparability across studies, outcome data will be standardized before pooling. All postoperative opioid doses will be converted to intravenous morphine equivalents (IME) using established opioid conversion factors. Pain scores reported using VAS or NRS will be standardized to a 0-10 scale; values reported on a 0-100 scale will be divided by 10. When outcomes are reported as medians with ranges or interquartile ranges, means and SDs will be estimated using established conversion formulas based on the sample size. Where an outcome is reported separately for consecutive time intervals that together correspond to the prespecified analysis period, interval-specific means will be summed and the corresponding SD will be calculated as the square root of the sum of squared SDs.

For multi-arm trials contributing more than one eligible comparison to the same meta-analysis, the shared SPSIPB group will be split to avoid double-counting and inflation of study weight. For continuous outcomes, the sample size of the shared group will be divided proportionally across comparisons while retaining the reported means and standard deviations. For binary outcomes, both the sample size and the number of events in the shared group will be divided proportionally across comparisons.

Statistical heterogeneity will be assessed using Cochran's Q test and the I2 statistic. A fixed-effect model will be applied when $I2 < 50\%$ and the heterogeneity test yields $P \geq 0.05$; otherwise, a random-effects model with restricted maximum likelihood (REML) estimation will be used. Effect estimates will be reported with 95% CIs, and two-sided $P < 0.05$ will be considered statistically significant.

Subgroup analysis Subgroup analyses will be performed according to the type of comparator and type of surgery, where sufficient data are available. For each applicable outcome, analyses will be performed separately for breast surgery and video-assisted thoracoscopic surgery (VATS), with studies further stratified according to comparator type.

Comparator-based analyses will also be performed across all eligible surgery categories without restriction by type of surgery.

Analyses will include SPSIPB versus any eligible comparator, stratified by comparator category, as well as separate pairwise comparisons of SPSIPB versus ESPB.

Where sufficient data are available, these analyses will be conducted both within individual surgical categories and across all surgery categories.

Sensitivity analysis Sensitivity analyses will be performed by recalculating pooled effect estimates using alternative effect measures (standardized mean differences (SMDs) instead of mean differences (MDs) for continuous outcomes and odds ratios (ORs) instead of risk ratios (RRs) for binary outcomes) and by evaluating the results of only low/medium risk of bias studies bias.

Language restriction No language limitation.

Country(ies) involved Russian Federation.

Keywords Serratus posterior superior intercostal plane block; SPSIPB; postoperative analgesia; regional anesthesia; opioids.

Contributions of each author

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