Systematic Review and Meta-Analysis

Comparison of efficacy of ultrasound-guided erector spinae plane block versus thoracolumbar interfascial plane block in patients undergoing lumbar spine surgeries: A systematic review and trial sequential meta-analysis

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ABSTRACT

Background and Aims: Existing literature does not establish the superiority of the erector spinae plane (ESP) block or the thoracolumbar interfascial plane (TLIP) block in pain relief and reducing opioid consumption in lumbar spine surgeries. This systematic review and meta-analysis was aimed to discern their relative efficacy and safety. **Methods:** This meta-analysis included randomised controlled trials (RCTs) comparing ESP and TLIP blocks in lumbar spine surgeries. The primary outcome was 24-h opioid consumption, and secondary outcomes were visual analogue scale (VAS) scores at 1 h and 24 h and various complications. PubMed, Central Register of Controlled Trials, SCOPUS, EMBASE databases and cross-references were electronically searched. Two authors extracted data independently, cross-checked, and analysed them using RevMan 5.4. Binary outcomes were reported as odds ratios (OR), while continuous outcomes were presented as standardised mean differences (SMDs) accompanied by 95% confidence intervals (95% CIs). **Results:** Among 1107 articles, six RCTs (492 patients) were finally included. The ESP block demonstrated lower 24-h opioid consumption compared to TLIP [SMD −0.32 (95% CI: −0.50, −0.14); $P < 0.001$, $I^2 = 83\%$]. At 1 and 24 h, ESPB yielded significantly lower VAS scores compared to TLIP [1 h: SMD −0.38 (95% CI: −0.57, −0.18); $P < 0.001$, $I^2 = 83\%$; 24 h: SMD −0.57 (95% CI: −0.76, −0.37); $P < 0.001$, $I^2 = 73\%$]. No significant difference was noted in adverse events. **Conclusion:** In comparison to the TLIP block, the ESP block has significantly lower 24-h opioid consumption and VAS scores at 1 and 24 h in patients undergoing lumbar spine surgery.

Keywords: Erector spinae plane block, lumbar surgery, opioid-free analgesia, regional analgesia, spine surgery, thoracolumbar interfascial plane block, trial sequential meta-analysis, ultrasound-guided blocks

INTRODUCTION

Managing perioperative pain in the context of lumbar surgeries is complex and challenging. New regional techniques like the erector spinae plane (ESP) block and the thoracolumbar interfascial plane (TLIP) block have reduced the reliance on systemic opioids. They are recommended as part of enhanced recovery after surgery protocols. These blocks have gained popularity due to their ability to reduce the incidence

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of perioperative nausea and vomiting, provide effective perioperative analgesia and improve patient satisfaction.[1]

The ESP block, introduced by Forero *et al*.,[2] can manage analgesia in the thoracic, abdominal and lumbar regions. However, the TLIP block is described as a method for achieving adequate analgesia in lumbar spine surgeries. Initially, TLIP was described as a classical approach by Hand *et al*.[3] However, a modified approach was later introduced by Ahiskalioglu *et al*.,[4] which supposedly decreased the risk of neuraxial injury compared to the classical approach.

Randomised controlled trials (RCTs) comparing the ESP and TLIP blocks in lumbar spine surgeries have not definitively established the superiority of one technique over the other.[5-10] The recently published study by Peng *et al*.[11] addressed this issue through a meta-analysis of available studies. Despite the existing literature, we endeavour to conduct our meta-analysis for several reasons: we have access to newly published RCTs, our unique analysis method encompasses a larger patient cohort and we intend to undertake a trial sequential analysis (TSA) to determine the necessity for future studies in this field. We have initiated a systematic review and meta-analysis to address this knowledge gap and ascertain whether either block offers a more advantageous profile concerning pain relief and complications. Our primary objective was to look for the efficacy of the block in terms of 24-h opioid consumption, and secondary objectives included the visual analogue scale (VAS) score and safety profile.

METHODS

We followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses[12] statement for conducting and reporting the results of this meta-analysis. The meta-analysis was prospectively registered with the International Prospective Register of Systematic Reviews (ID: CRD42023470329).

Eligibility criteria

This meta-analysis included RCTs that compared ultrasound-guided ESP block and TLIP block in adult patients undergoing lumbar spine surgeries. We limited our selection to studies published in the English language. We included studies that compared TLIP (either classical or modified) with ESP using any volume of local anaesthetic or adjuvant for lumbar spine surgery. Studies that compared either of these blocks with other methods or controls were not part of this meta-analysis. The primary outcome of this meta-analysis was '24-h opioid consumption' in the included patients. Secondary outcomes were VAS score at 1 and 24 h and the incidence of complications (nausea, vomiting, pruritis, respiratory depression).

Information sources

PubMed, Cochrane Central Register of Controlled Trials, SCOPUS and EMBASE were searched for potentially eligible trials from inception to 29 February 2024. References of the previously published meta-analyses and randomised trials were also searched manually to identify eligible trials.

Search strategy

The following keywords were used to search the database: 'thoracolumbar interfascial plane block', 'erector spinae plane block', 'modified thoracolumbar interfascial plane block', 'spinal surgeries', 'lumbar surgeries'. The exact search strategy for each database is given in Supplementary Table 1.

Study selection

Two authors (CM and SM) independently searched the titles and abstracts of the potentially eligible trials. Potentially eligible articles were assessed for inclusion from the full text. Any disputes between the two authors were solved by discussion with the third author, PKD.

Data collection process

Study characteristics and outcome data, including information about the first author's name, publication year, sample size, patient characteristics, the drug used for the block, type and dosage of intraoperative analgesic agents, settings for patient-controlled analgesia (PCA), the rescue analgesic employed, primary and secondary outcomes and any reported complications, were recorded independently by two authors (RHR and SM). All data were cross-checked by the third author (MP). All required data from the eligible trials were tabulated in a Microsoft Excel™ (Microsoft Corp., Redmond, WA, USA) datasheet.

Summary measures and synthesis of results

Statistical analysis was done using Review Manager (RevMan Computer program, Version 5.4, The Cochrane Collaboration, 2020). Binary outcomes were reported in odds ratio (OR) with a 95% confidence

Table 1: Detailed characteristics of the individual studies

Study, year	Sample size TLIP/ESP	Block drug	Intraoperative analgesia	PCA	Analgesia apart from PCA	Rescue analgesia	Primary outcome(s)	Secondary outcomes
Ciftci *et al*., 2020[5]	Modified TLIP versus ESP 30/30	0.25% bupivacaine 20 ml each side	Remifentanil 0.01–0.1 μg/kg/min infusion	IV fentanyl, with a demand dose of 20 μg, a 20-min lockout time and a 4-h limit of 200μg	IV paracetamol 1 g sixth hourly	Meperidine 0.5 mg/kg	24-h fentanyl consumption	Postoperative pain scores
Wang *et al*., 2021[6]	Classical TLIP versus ESP 102/102	30 ml 0.375% ropivacaine	Remifentanil 0.15–0.3 μg/kg/min infusion	IV (sufentanil 4.5 μg/kg + flurbiprofen 100 mg + saline 200 ml), background dose 3 ml/h, demand dose of dose 3 ml, lockout interval 15 min	Nil	IV sufentanil 5 μg if NRS >5	Postoperative pain scores and perioperative 48-h opioid consumption	Incidence of side effects of opioids, frequency of PCA compressions, remedial analgesic administration and the life quality score during the 6 months after surgery
Kumar *et al*., 2023[7]	Modified TLIP versus ESP 30/30	0.2% Ropivacaine 20 ml each side	Boluses of fentanyl 0.5 μg/kg	IV fentanyl with a demand dose of 20 μg, lockout interval 10 min, maximum hourly fentanyl doses of 120 μg	IV paracetamol 1 g eighth hourly, IV diclofenac 0.1 mg/kg 12th hourly	0.5 μg/kg fentanyl	48-h fentanyl consumption	Intraoperative fentanyl requirements, postoperative pain scores and the incidence of nausea, vomiting and excessive sedation
Tantri *et al*., 2023[8]	Classical TLIP versus ESP 102/102	0.25% bupivacaine 20 ml each side	Boluses of fentanyl 50–75 μg	IV morphine, with a demand dose of 1 mg, lockout interval of 10 min and maximum dose of 10 mg/4 h	IV paracetamol 1 g eighth hourly	Not mentioned	Interleukin-6 and interleukin-10 levels	Postoperative pain scores and postoperative morphine consumption
Bilge *et al*., 2023[9]	Classic TLIP versus ESP	0.25% bupivacaine 20 ml each side	Remifentanil infusion 0.01–0.5 μg/kg/min and 25 μg fentanyl at the end	Not used	1 g IV paracetamol every 6 h and dexketoprofen 50 mg IV twice per 24 h	Fentanyl 25–50 μg in PACU and oral oxycodone 5–10 mg in the ward as per the NRS scores	Quality of Recovery-40 score in the postoperative 24th hour	Comprehensive Complication Index scores, postoperative pain scores, opioid consumption, first rescue analgesic administration time and complications
Dilsiz *et al*., 2024[10]	Classical TLIP versus ESP 34/34	0.25% bupivacaine 20 ml each side	Remifentanil 0.05 μg/kg/min infusion	IV tramadol bolus of 0.1 mg/kg	IV paracetamol 1 g eighth hourly	0.5 mg/kg meperidine immediate post-op if NRS >4, IM diclofenac 75 mg	24-h opioid consumption in morphine equivalents	Postoperative pain scores, incidents of side effects, mobilisation time, oral intake, post-op stay

ESP=Erector spinae plane, IV=intravenous, IM=intramuscular, NRS=Numeric rating Scale, PACU=postoperative anaesthesia care unit, PCA=patient-controlled analgesia, TLIP=thoracolumbar interfascial plane

interval (95% CI). For continuous variables, mean and standard deviation (SD) values were extracted for both groups of patients, a mean difference (MD) was computed at the study level and a standardised mean difference (SMD) was computed to pool the results across all studies. If the values were reported as median and an interquartile range or the total range of values, the mean value was estimated by a previously described method.[13] A fixed-effect model was used for the meta-analysis of data.[14] I^2 was used to test the heterogeneity. All results were reported as posterior median OR with 95% CI and SMD with 95% CI. A funnel plot was created to explore the possibility of publication bias.

Risk of bias in individual studies

Two authors (DKB and RHR) independently assessed the methodological quality of the included studies as per Cochrane methodology (RoB 2 tool – revised tool for risk of bias in randomised trials).[15]

Trial sequential analysis

To assess the robustness of the meta-analysis, a TSA was performed for the primary outcome using TSA program version 0·9.5·10 Beta (www.ctu.dk/tsa).[16] Positive and negative conventional boundaries were added, assuming a two-sided alpha error of 5%. Meta-analysis monitoring boundaries for definite benefit and harm,

diversity-adjusted required information size (RIS) and boundaries for futility were identified, assuming an overall type I error of 5%, power of 80% and pooled effect size obtained from the actual meta-analysis.

Summary of findings

A summary of findings table was created for the main outcomes using GRADEpro GDT (GRADE Profiler Guideline Development Tool, McMaster University and Evidence Prime, 2022; www.gradepro.org). Two authors (RHR and SM) assessed the quality of evidence obtained regarding each outcome independently using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) considerations. Disagreements were resolved by reaching a consensus through discussion.

RESULTS

Initially, 1268 articles were identified through database searches and additional sources [Figure 1]. After eliminating duplicates, retracted articles and title and abstract screening, 28 articles were identified. Out of these, 15 were undergoing trials, data for one could not be retrieved and six involved different interventions. Ultimately, six articles were included in the analysis.

This meta-analysis incorporated data from 492 patients, encompassing six RCTs.[5-10] Within these studies, two RCTs compared modified TLIP to the ESP block,[5,7] while the other four compared classical TLIP to the ESP block [Table 1].[6,8-10] The summary of the risk of bias assessment is presented in Figure 2. The summary of evidence generated using GRADEpro GDT is presented in Table 2. In TSA, the cumulative Z score did not cross the trial sequential monitoring boundaries or reach the RIS of 1249 [Figure 3].

Primary outcome: 24-h opioid consumption

Out of the six studies included in the analysis, five used PCA to provide postoperative analgesia, among which two studies used fentanyl,[5,7] one study employed morphine,[8] one study used sufentanil[6] and the other

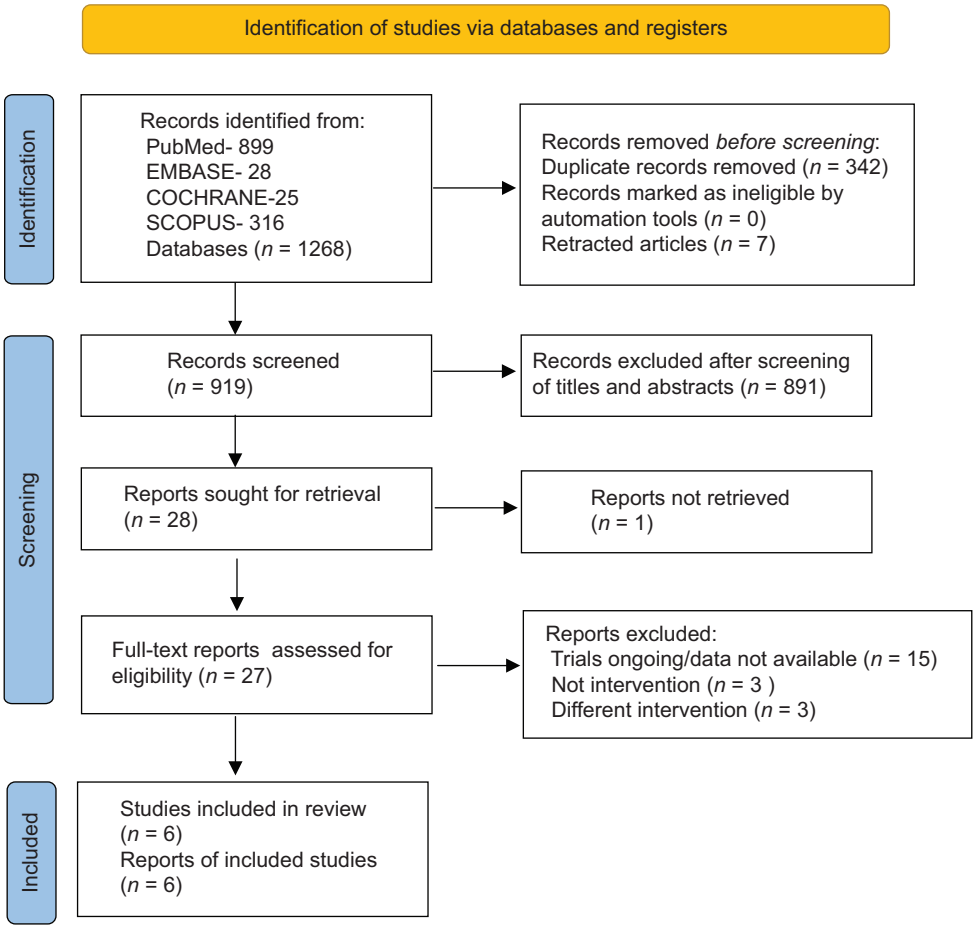

Figure 1: PRISMA flow diagram for database searching and study selection. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses

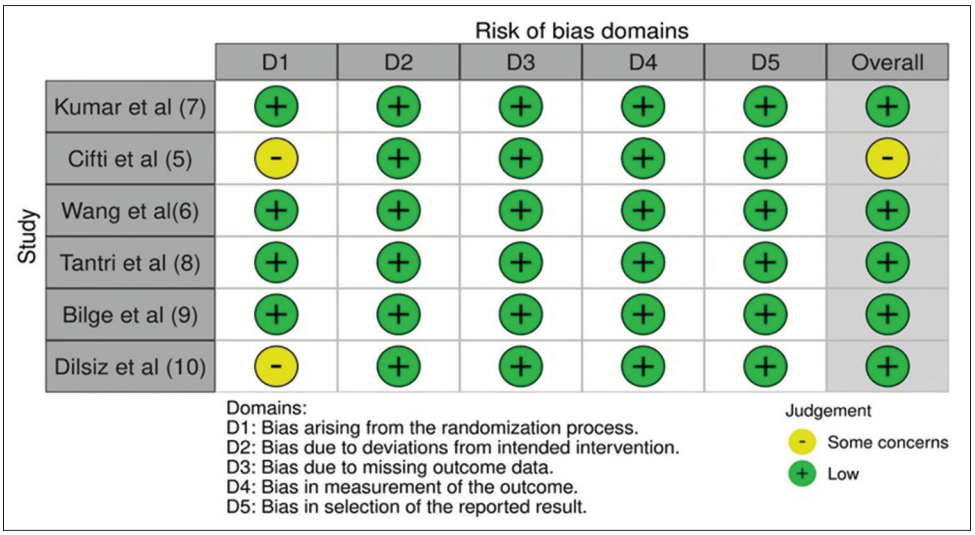

Figure 2: Risk of biases in the individual studies

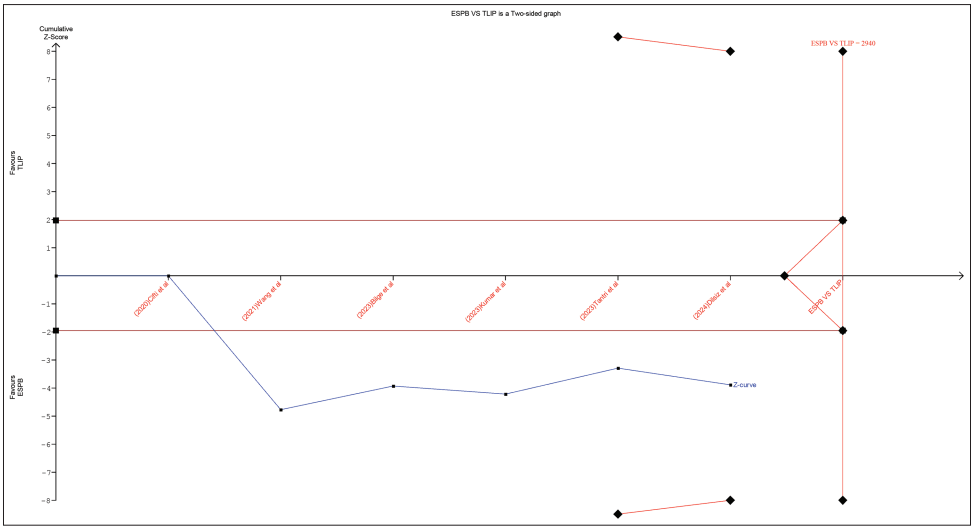

Figure 3: Trial sequential analysis plot. ESP = erector spinae plane, TLIP = thoracolumbar interfascial plane

used tramadol.[10] In the study by Bilge and Başaran,[9] fentanyl was given as 25 μg intravenously to patients with numeric rating scale (NRS) scores of 4–5 and as 50 μg intravenously to patients with NRS scores of ≥6 in the postoperative anaesthesia care unit. The patients received immediate-release oral oxycodone based on their NRS pain scores: 5 mg as needed for NRS scores of 4–6 and 10 mg as needed for NRS scores of 7–10 while in the ward. Since two different opioids were used, we converted the total opioids into their oral morphine equivalent (OME). We calculated the combined mean and SD by adding means and variance and calculating weighted variance to derive the combined SD for final computing.[17,18] In the study conducted by Wang *et al*.,[6] 48-h opioid consumption was reported. Still, the data provided consisted of the mean and SD of the number of PCA clicks within the first 24 h. To estimate the mean and SD of the first 24-h sufentanil consumption, we utilised this data in conjunction with the mean patient weight. Since each study utilised a different opioid, we employed SMD to analyse the data. In the overall analysis of 492 patients, the ESP block had a lower 24-h opioid consumption compared to the TLIP block [SMD −0.32 (95% CI: −0.50, −0.14); $P < 0.001$, $I^2 = 83\%$] [Figure 4]. The funnel plot was asymmetrical, which revealed the presence of publication bias [Figure 5].

Secondary outcome: 24-h opioid consumption in OMEs

We calculated the 24-hour opioid consumption in terms of OME [Figure 6a]. We included the outcome describing 24-h OME consumption here as comparing opioids of different potencies may be better measured

Table 2: Summary of different outcomes with certainty of evidence

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	ESP	TLIP	Relative (95% CI)	Absolute (95% CI)		
24-h opioid consumption												
Six	Randomised trials	Not serious[a]	Serious[b]	Not serious	Serious[c]	None	246	246	-	SMD 0.33 SD lower (0.51 lower–0.15 lower)	⊕⊕◯◯ Low	Critical
Pain score at the end of 24 h post-surgery (assessed with visual analogue scale/numeric rating scale)												
Five	Randomised trials	Not serious[d]	Serious[d]	Not serious	Serious[e]	None	216	216	-	MD 0.17 lower (0.27 lower–0.07 lower)	⊕⊕◯◯ Low	Important
Pain score at the end of 1 h post-surgery (assessed with visual analogue scale/numeric rating scale)												
Five	Randomised trials	Not serious[d]	Serious[d]	Not serious	Serious[e]	None	216	216	-	MD 0.37 lower (0.55 lower–0.18 lower)	⊕⊕◯◯ Low	Important
Nausea and vomiting												
Four	Randomised trials	Not serious[a]	Not serious	Not serious	Serious[g]	None	31/196 (15.8%)	35/196 (17.9%)	OR 1.00 (0.53, 1.89)	0 fewer per 1000 (from 75 fewer to 113 more)	⊕⊕⊕◯ Moderate	Critical
Sedation and respiratory depression												
Three	Randomised trials	Not serious[a]	Not serious	Not serious	Serious[f]	None	14/162 (8.6%)	14/162 (8.6%)	OR 1.00 (0.46, 2.19)	0 fewer per 1000 (from 45 fewer to 85 more)	⊕⊕⊕◯ Moderate	Critical
Pruritus												
Three	Randomised trials	Not serious[a]	Not serious	Not serious	Serious[g]	None	11/166 (6.6%)	11/166 (6.6%)	OR 1.11 (0.45, 2.76)	7 more per 1000 (from 35 fewer to 98 more)	⊕⊕⊕◯ Moderate	Critical

CI=confidence interval, ESP=erector spinae plane, MD=mean difference, OIS=optimal information size, OR=odds ratio, SMD=standardised mean difference, TLIP=thoracolumbar interfascial plane. [a]Two studies did not report on allocation concealment or the randomisation method. [b]The inconsistency is reported to be serious for the outcome of 24-h opioid consumption as the results between the studies are very heterogeneous with high I^2 values of 83%, but different opioids and different interventions used can explain some heterogeneity. [c]The total sample size in our analysis is just under 500, which, while still significantly higher than OIS, presents some limitations. One factor contributing to this downgrade of evidence is using different drugs to measure the same outcome. This diversity in measurement methods can complicate the calculation of OIS, making it more challenging to draw robust conclusions. [d]The heterogeneity is high with varying effect sizes, although the studies tend to sway towards a single direction. [e]The OIS for 25% reduction in pain scores was 712. [f]The OIS for 25% reduction in incidence of adverse events is 1810

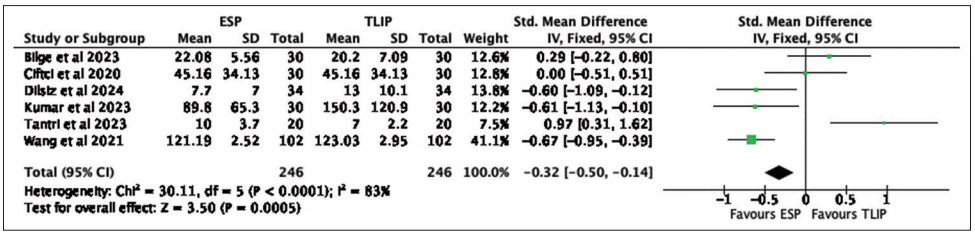

Figure 4: Forest plot demonstrating 24-h opioid consumption. CI = confidence interval, ESP = erector spinae plane block, TLIP = thoracolumbar interfascial plane block, SD = standard deviation

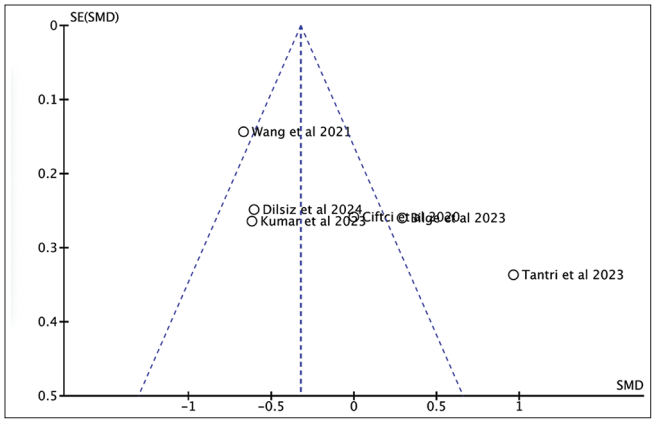

Figure 5: Funnel plot for 24-h opioid consumption

in terms of SMD. In contrast, the difference in terms of OME is a more popular comparison tool and is clinically applicable. The ESP block had a lower 24-h opioid consumption compared to the TLIP block [MD −2.33 (95% CI: −3.50, −1.16); $P < 0.001$, $I^2 = 86\%$].

Secondary outcome: VAS scores at 1 and 24 h post-surgery

VAS scores or NRS scores were recorded across all included studies at the 1- and 24-h post-surgery time points. At the 1-h post-surgery mark, the pain scores were notably lower in the ESP block group in comparison to the TLIP group [SMD −0.38 (95% CI: −0.57, −0.18); $P < 0.001$, $I^2 = 83\%$] [Figure 6b], although one study represented these scores in terms of the time-dependent line graph of mean values, and hence was not included for analysis of this outcome.[9] Similarly, at the 24-h post-surgery point, the pain scores were significantly lower in the ESP block group compared to the TLIP group [SMD −0.57 (95% CI: −0.76, −0.37); $P < 0.001$, $I^2 = 73\%$] [Figure 6c].

Secondary outcome: Adverse events

The analysis considered adverse events, including nausea and vomiting, pruritus, respiratory depression and sedation. One study did not provide information on the occurrence of postoperative nausea and vomiting (PONV), sedation, respiratory depression and pruritus.[8] One study reported PONV and sedation scores as insignificant ($P > 0.05$), although the absolute incidence was not provided. In addition, only three studies reported the incidence of pruritus.[5,6,10] There was no significant difference in the incidence of nausea and vomiting [OR 0.86 (95% CI: 0.50, 1.48); $P = 0.580$, $I^2 = 0\%$], sedation and respiratory depression [OR 1.00 (95% CI: 0.46, 2.19); $P > 0.999$; $I^2 = 0\%$] and pruritus [OR 1.11 (95% CI: 0.45, 2.76); $P = 0.820$, $I^2 = 26\%$] between the two groups [Figure 7].

Risk of bias

In the study by Ciftci *et al*.,[5] there is no information on allocation and blinding, nor is there any information on concealment. In the study by Dilsiz *et al*.,[10] there is no information on concealment either. Randomisation was done using computer assistance, but healthcare providers assessing pain in the postoperative period were not blinded to the intervention, and there is no information regarding the blinding of the block administrator.

Heterogeneity

Heterogeneity was explored using the SMD for the primary outcome. In addition, heterogeneity was addressed by converting each opioid to its OME for analysis. We also performed the analysis using a random-effects model and conducted a cumulative meta-analysis, which did not alter the results of our study.

DISCUSSION

The primary finding of this meta-analysis was that the ESP block resulted in lower 24-h opioid consumption and lower VAS scores at 1 and 24 h post-surgery compared to the TLIP block. Furthermore, there were no significant differences in opioid-related side effects (nausea and vomiting, pruritus, sedation, and respiratory depression) between the two groups.

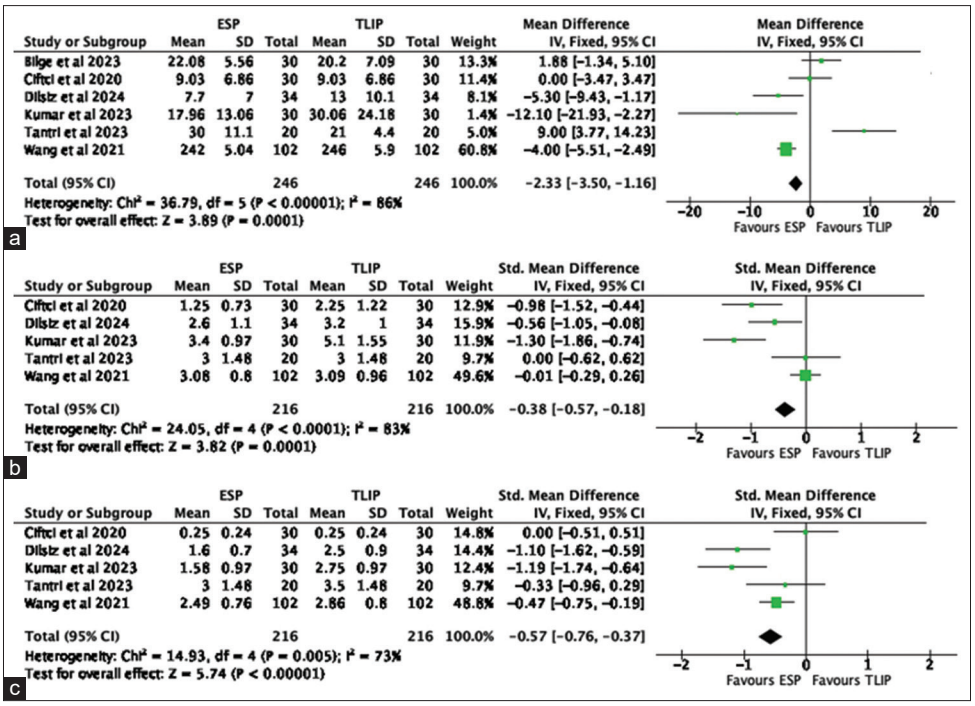

Figure 6: Forest plot illustrating a) 24-h opioid consumption in oral morphine equivalent, b) pain scores at 1 h and c) pain scores at 24 h. CI = confidence interval, ESP = erector spinae plane, SD = standard deviation, TLIP = thoracolumbar interfascial plane

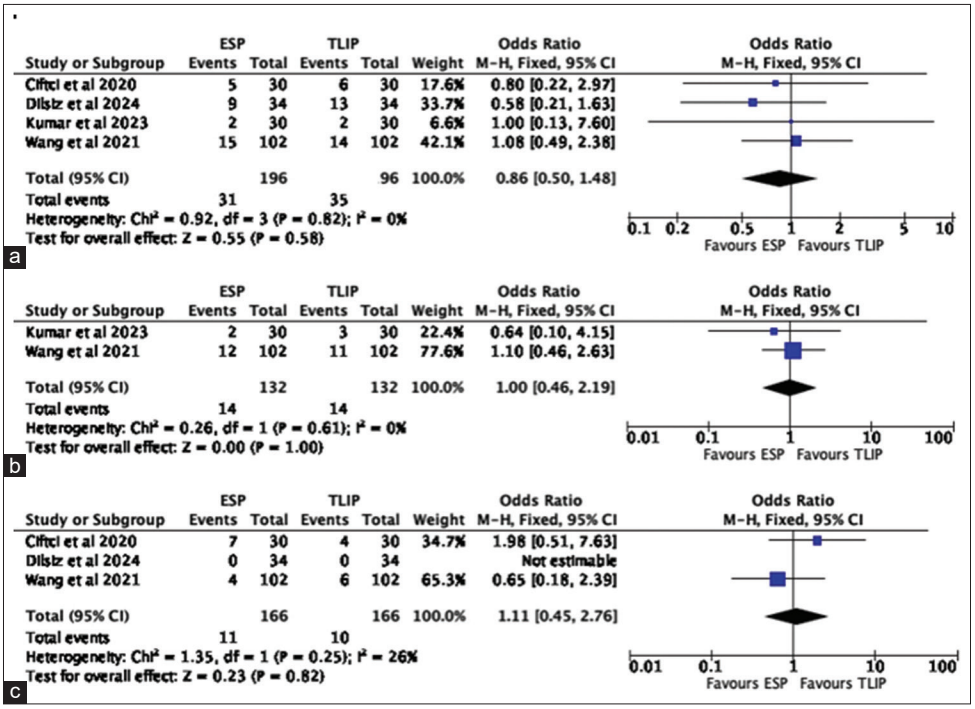

Figure 7: Forest plot illustrating a) nausea and vomiting, b) sedation and respiratory depression, c) pruritus. CI = confidence interval, ESP = erector spinae plane, TLIP = thoracolumbar interfascial plane, M-H = Mantel-Haenszel

ESP is an interfascial block that can act on the spinal nerves' dorsal, ventral rami and craniocaudal spread. There is also spread into the epidural and paravertebral space.[19] However, the TLIP block targets only the sensory dorsal rami and its branches between the multifidus and longissimus muscles. This difference in mechanism can possibly explain the observed improvement in pain scores and reduced opioid consumption with the ESP block.

In a recent meta-analysis on the same subject, Peng *et al*.[11] reported decreased postoperative opioid

consumption and postoperative pain scores with the ESP block. Although the ESP block demonstrated clear benefits in terms of opioid consumption and pain scores in this meta-analysis as well, the TLIP block can still be considered a reasonable option for analgesia during minor lumbar spine surgeries. Newer techniques in spine surgery, such as endoscopic dissections and those with less dissection-like discectomies, are a few examples of TLIP being used safely. In contrast, traditional spinal surgical procedures often involve extensive dissection of subcutaneous tissues, bones and ligaments, resulting in considerable postoperative pain and a notable dependence on opioid analgesics for pain management.[1,20] In addition, increasing research suggested that TLIP blocks exhibit superiority over non-block procedures regarding analgesia requirements (such as total opioid use and time to analgesia) and reported pain levels throughout the hospitalisation period in patients undergoing spinal surgery.[21] Since TLIP blocks only the dorsal rami, it would provide more focused analgesia, and there is no risk of unintended motor blockade which is associated with the ESP block.[22] In a study conducted by Turan *et al*.,[23] they found no difference in VAS scores in the postoperative period, at the 15th minute, at the 4th hour and the 12th hour, although they did not provide any other details of the study.

Our study differs from a similar meta-analysis study by Peng *et al*.[11] in several significant ways. We have added two new studies that were not included in Peng *et al*.'s[11] research. Although the overall results are similar, adding these studies increases the sample size, making our findings more robust. We performed TSA, which provides insights into whether additional studies are needed to reach a definitive conclusion or if further research would be futile. Our TSA analysis indicates that additional studies are necessary to strengthen the findings. Peng *et al*.'s[11] analysis excluded data from the study by Wang *et al*.[6] for the analysis of 24-h opioid consumption, considering only three studies for this outcome. In contrast, our study includes six studies for this outcome, incorporating data through calculations to include Wang *et al*.'s[6] findings. The increased number of studies and sample size enhances the robustness of this primary outcome. We have used GradePro software to grade the certainty of the evidence objectively, a step not taken in Peng *et al*.'s[11] study.

In our study, we found that the magnitude of difference in postoperative VAS scores (0.37 at 1 h and 0.17 at 24 h) and 24-h opioid consumption (OMEs of 2.33 mg), although statistically significant, may have questionable clinical value. In addition, the reduction in 24-h opioid consumption achieved by the ESP block did not translate into reduced opioid-related side effects.

Our review has some limitations. Firstly, the meta-analysis was based on a relatively small sample size. Secondly, there was considerable clinical heterogeneity across the included studies, particularly concerning nerve blockades and using different drugs for postoperative analgesia. Variations existed in terms of the drugs used, volumes administered, concentrations employed and methods of systemic analgesia. This heterogeneity could introduce variability in the results. Given these limitations, it is necessary to interpret the findings of this meta-analysis with caution and emphasise the need for further research with larger sample sizes.

CONCLUSION

In comparison to the TLIP block, the ESP block has significantly lower 24-h opioid consumption and VAS scores at 1 and 24 h in patients undergoing lumbar spine surgery. The incidence of adverse effects is similar with both modalities.

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Conflicts of interest

There are no conflicts of interest.

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SUPPLEMENTARY TABLE 1: SEARCH STRINGS FOR DIFFERENT DATABASES

1. PubMed

   ((“Thoracolumbar”[All Fields] AND (“interfacial”[All Fields] OR “interfacially”[All Fields]) AND (“aircraft”[MeSH Terms] OR “aircraft”[All Fields] OR “plane”[All Fields] OR “planes”[All Fields]) AND (“block”[All Fields] OR “blocked”[All Fields] OR “blocking”[All Fields] OR “blockings”[All Fields] OR “blocks”[All Fields])) OR “TLIP”[All Fields] OR “MTLIP”[All Fields] OR ((“modifiable”[All Fields] OR “modified”[All Fields] OR “modifier”[All Fields] OR “modifiers”[All Fields] OR “modifies”[All Fields] OR “modify”[All Fields] OR “modifying”[All Fields]) AND “TLIP”[All Fields]) OR (((“erector”[All Fields] OR “erectores”[All Fields] OR “erectors”[All Fields]) AND “Spinae”[All Fields] AND (“aircraft”[MeSH Terms] OR “aircraft”[All Fields] OR “plane”[All Fields] OR “planes”[All Fields]) AND (“block”[All Fields] OR “blocked”[All Fields] OR “blocking”[All Fields] OR “blockings”[All Fields] OR “blocks”[All Fields])) OR “ESP”[All Fields] OR “ESPB”[All Fields] OR (“ESP”[All Fields] AND (“block”[All Fields] OR “blocked”[All Fields] OR “blocking”[All Fields] OR “blockings”[All Fields] OR “blocks”[All Fields])))) AND (((“lumbarised”[All Fields] OR “lumbarization”[All Fields] OR “lumbarized”[All Fields] OR “lumbars”[All Fields] OR “lumbosacral region”[MeSH Terms] OR (“lumbosacral”[All Fields] AND “region”[All Fields]) OR “lumbosacral region”[All Fields] OR “lumbar”[All Fields]) AND (“surgery”[MeSH Subheading] OR “surgery”[All Fields] OR “surgical procedures, operative”[MeSH Terms] OR (“surgical”[All Fields] AND “procedures”[All Fields] AND “operative”[All Fields]) OR “operative surgical procedures”[All Fields] OR “general surgery”[MeSH Terms] OR (“general”[All Fields] AND “surgery”[All Fields]) OR “general surgery”[All Fields] OR “surgery s”[All Fields] OR “surgerys”[All Fields] OR “surgeries”[All Fields])) OR ((“spine”[MeSH Terms] OR “spine”[All Fields] OR “spines”[All Fields] OR “spine s”[All Fields]) AND (“surgery”[MeSH Subheading] OR “surgery”[All Fields] OR “surgical procedures, operative”[MeSH Terms] OR (“surgical”[All Fields] AND “procedures”[All Fields] AND “operative”[All Fields]) OR “operative surgical procedures”[All Fields] OR “general surgery”[MeSH Terms] OR (“general”[All Fields] AND “surgery”[All Fields]) OR “general surgery”[All Fields] OR “surgery s”[All Fields] OR “surgerys”[All Fields] OR “surgeries”[All Fields])))

2. Cochrane

   #1 (thoracolumbar interfascial plane block)
   #2 (tlip) OR (modified tlip)
   #3 (modified thoracolumbar interfascial plane block)
   #4 #1 OR #2 OR #3
   #5 (erector spinae plane block) OR (ESP block)
   #6 #4 AND #5
   #7 Lumbar surgery
   #8 Spine surgery
   #9 #7 OR #8
   #10 #6 AND #9

3. EMBASE

   #1. ‘thoracolumbar interfascial plane block’/exp OR
   ‘thoracolumbar interfascial plane block’ OR
   tlip: ti, ab, kw OR mtlip: ti, ab, kw OR ‘modified
   thoracolumbar interfascial plane block’:ti, ab, kw
   OR ‘modified tlip’:ti, ab, kw
   #2. ‘erector spinae plane block’/exp OR ‘erector
   spinae plane block’ OR ‘esp block’:ti, ab, kw OR
   esp: ti, ab, kw
   #3. ‘lumbar surgery’/exp OR ‘lumbar surgery’
   #4. #1 OR #2
   #5. #3 AND #4

4. SCOPUS

#1. 'thoracolumbar interfascial plane block'/exp OR 'thoracolumbar interfascial plane block' OR tlip: ti, ab, kw OR mtlip: ti, ab, kw OR 'modified thoracolumbar interfascial plane block':ti, ab, kw OR 'modified tlip':ti, ab, kw

#2. 'erector spinae plane block'/exp OR 'erector spinae plane block' OR 'esp block':ti, ab, kw OR esp: ti, ab, kw

#3. 'lumbar surgery'/exp OR 'lumbar surgery'

#4. 'spine surgery'/exp OR 'spine surgery'

#5. #3 OR #4

#6. #1 OR #2

#7. #5 AND #6