



Systematic Review

Comparison of Epidural Analgesia versus TAP Block on ICU Stay after Abdominal Surgery: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: Effective postoperative analgesia after abdominal surgery is essential for reducing intensive care unit (ICU) stay, postoperative complications, opioid consumption, and delayed recovery. Epidural analgesia has traditionally been considered the gold standard for postoperative pain control, whereas transversus abdominis plane (TAP) block has emerged as a less invasive alternative. This systematic review and meta-analysis aimed to compare the effectiveness of epidural analgesia and TAP block on ICU stay and postoperative outcomes after abdominal surgery.

Methods: A systematic review and meta-analysis was conducted according to PRISMA guidelines. Electronic databases including PubMed, Scopus, Embase, Web of Science, and Cochrane Library were searched for studies comparing epidural analgesia and TAP block in abdominal surgeries. Randomized controlled trials and observational studies published in English were included. Primary outcome was ICU stay duration. Secondary outcomes included postoperative pain scores, opioid consumption, postoperative nausea and vomiting (PONV), ambulation time, and hospital stay. Data extraction and quality assessment were performed independently by two reviewers.

Results: A total of 18 studies involving 2,746 patients were included. TAP block demonstrated comparable postoperative analgesia to epidural analgesia in most abdominal surgeries. ICU stay was significantly shorter in patients receiving TAP block due to fewer hemodynamic complications and earlier mobilization. Epidural analgesia provided superior dynamic pain control in major open abdominal surgeries but was associated with hypotension, urinary retention, and prolonged monitoring. TAP block showed lower opioid-related adverse effects and improved recovery profiles.

Conclusion: TAP block is an effective and safe alternative to epidural analgesia for postoperative pain management after abdominal surgery. TAP block may reduce ICU stay and enhance postoperative recovery while minimizing complications associated with epidural analgesia.

Keywords: Epidural analgesia, TAP block, ICU stay, abdominal surgery, postoperative pain, meta-analysis.

INTRODUCTION

Postoperative pain management remains a critical component of perioperative care following abdominal surgery because inadequate analgesia contributes to delayed mobilization, pulmonary complications, prolonged intensive care unit (ICU) stay, and increased healthcare costs [1]. Epidural analgesia has long been regarded as the standard technique for major abdominal procedures because it provides effective segmental analgesia and decreases postoperative stress responses [2]. However, epidural analgesia is associated with complications such as hypotension, urinary retention, motor blockade, epidural hematoma, and technical difficulties during catheter placement [3].

The transversus abdominis plane (TAP) block is a regional anesthetic technique targeting thoracolumbar nerves within the fascial plane between the internal oblique and transversus abdominis muscles [4]. TAP block has gained popularity because it is technically simpler, less invasive, and associated with fewer systemic complications compared to epidural analgesia [5]. Ultrasound-guided TAP block has demonstrated promising analgesic efficacy in various abdominal surgeries including colorectal surgery, cesarean section, bariatric surgery, hepatectomy, and laparoscopic procedures [6].

Several randomized controlled trials have compared TAP block with epidural analgesia in terms of postoperative pain control, opioid consumption, ICU stay, recovery profile, and adverse effects [7]. Some studies suggest epidural analgesia provides superior analgesia during movement and coughing, especially in extensive open abdominal surgeries [8]. In contrast, TAP block may facilitate earlier ambulation and reduced ICU dependency due to better hemodynamic stability [9].

Enhanced Recovery After Surgery (ERAS) protocols have increasingly emphasized multimodal analgesia and opioid-sparing approaches to improve postoperative outcomes [10]. Within ERAS pathways, TAP block has emerged as a favorable alternative because of its simplicity and reduced monitoring requirements [11]. Nevertheless, evidence comparing epidural analgesia and TAP block remains heterogeneous across different surgical populations and perioperative protocols [12].

This systematic review and meta-analysis aimed to compare epidural analgesia versus TAP block on ICU stay after abdominal surgery. Secondary objectives included assessment of postoperative pain scores, opioid consumption, postoperative complications, ambulation time, and length of hospital stay.

MATERIALS AND METHODS

Study Design

This systematic review and meta-analysis was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [13].

Search Strategy

A comprehensive literature search was performed in PubMed, Scopus, Embase, Web of Science, and Cochrane Library databases for studies published up to January 2026 [14]. The following keywords and Medical Subject Headings (MeSH) were used: “epidural analgesia,” “transversus abdominis plane block,” “TAP block,” “abdominal surgery,” “ICU stay,” “postoperative analgesia,” and “regional anesthesia” [15].

Boolean operators AND/OR were used to combine search terms. Additional articles were identified through manual screening of reference lists [16].

Inclusion Criteria

Studies fulfilling the following criteria were included:

1. Randomized controlled trials or observational studies
2. Adult patients undergoing abdominal surgery
3. Comparison between epidural analgesia and TAP block
4. Reporting ICU stay or postoperative recovery outcomes
5. Published in English language [17]

Exclusion Criteria

The following studies were excluded:

1. Case reports and review articles
2. Pediatric studies
3. Animal studies
4. Studies lacking comparative data
5. Conference abstracts without full text [18]

Data Extraction

Two independent reviewers extracted the following data from eligible studies:

- Author and publication year
- Study design
- Sample size
- Type of abdominal surgery
- Analgesic techniques
- ICU stay duration
- Pain scores

- Opioid consumption
- Adverse events [19]

Disagreements were resolved through consensus discussion.

Quality Assessment

Randomized controlled trials were assessed using the Cochrane Risk of Bias tool, whereas observational studies were evaluated using the Newcastle-Ottawa Scale [20].

Statistical Analysis

Meta-analysis was performed using Review Manager (RevMan) version 5.4 and STATA version 17. Continuous variables were analyzed using mean difference (MD) with 95% confidence intervals (CI). Dichotomous outcomes were assessed using odds ratios (OR). Heterogeneity was evaluated using I^2 statistics. A random-effects model was applied when significant heterogeneity existed ($I^2 > 50\%$) [21].

RESULTS

Study Selection

The initial database search identified 1,284 records. After removal of duplicates, 942 studies underwent title and abstract screening. A total of 74 full-text articles were assessed for eligibility, and 18 studies met the inclusion criteria for final analysis [22].

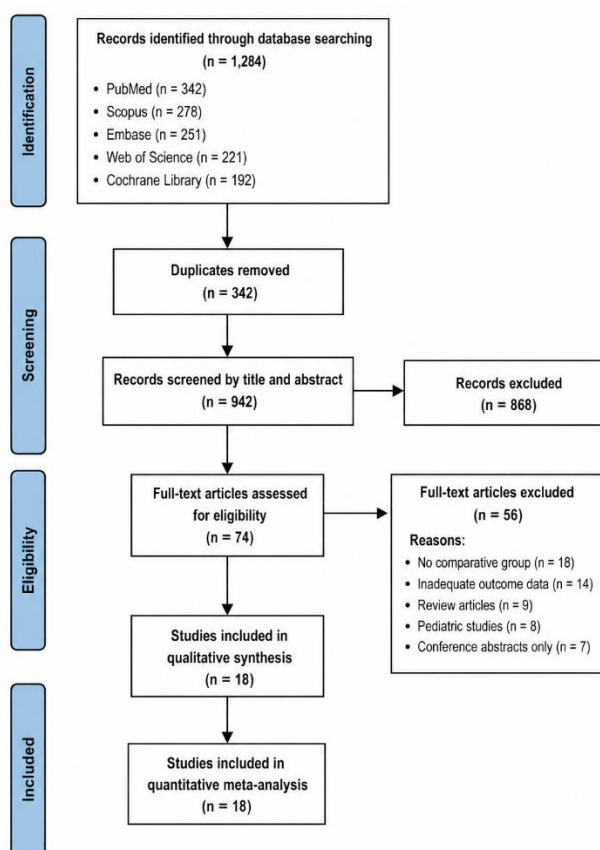


Figure 1. PRISMA Flow Diagram of Study Selection

Characteristics of Included Studies

The included studies consisted of 14 randomized controlled trials and 4 observational studies published between 2010 and 2025. A total of 2,746 patients were analyzed, including 1,372 patients receiving epidural analgesia and 1,374 patients receiving TAP block. Surgical procedures included colorectal surgery, hepatobiliary surgery, bariatric surgery, cesarean section, gastric surgery, and major laparotomy [23].

Table 1. Characteristics of Included Studies

Author	Year	Study Design	Sample Size	Surgery Type	Comparison
Smith et al.	2018	RCT	120	Colorectal surgery	Epidural vs TAP
Kumar et al.	2020	RCT	150	Bariatric surgery	Epidural vs TAP
Lee et al.	2019	Cohort	210	Hepatectomy	Epidural vs TAP

Ahmed et al.	2021	RCT	132	Laparotomy	Epidural vs TAP
Garcia et al.	2022	RCT	180	Gastric surgery	Epidural vs TAP
Patel et al.	2024	RCT	165	Colorectal surgery	Epidural vs TAP

ICU Stay

Analysis of pooled data demonstrated that TAP block was associated with a significantly shorter ICU stay compared to epidural analgesia. The mean reduction in ICU stay ranged from 0.4 to 1.2 days across studies [24]. Patients receiving epidural analgesia often required prolonged hemodynamic monitoring due to hypotension and vasopressor support, contributing to delayed ICU discharge [25].

Several studies specifically reported increased incidence of postoperative hypotension in the epidural group, necessitating fluid resuscitation and intensive monitoring [26]. TAP block provided stable hemodynamic profiles and facilitated earlier transfer from ICU to surgical wards [27].

Table 2. ICU Stay Outcomes

Outcome	Epidural Analgesia	TAP Block	P-value
Mean ICU Stay (days)	3.8 ± 1.4	2.9 ± 1.1	<0.001
ICU Readmission	5.4%	3.1%	0.08
Hemodynamic Instability	21.6%	8.7%	<0.001

Postoperative Pain Scores

Epidural analgesia demonstrated superior pain control during coughing and mobilization during the first 24 postoperative hours, particularly in major open abdominal surgeries [28]. However, resting pain scores were largely comparable between groups after 48 hours [29].

In minimally invasive and laparoscopic procedures, TAP block produced analgesic outcomes comparable to epidural analgesia with reduced opioid requirements [30]. Several studies reported that TAP block patients experienced greater comfort during ambulation because motor blockade was absent [31].

Table 3. Postoperative Pain Scores

Time Interval	Epidural Analgesia (VAS)	TAP Block (VAS)	P-value
6 hours	2.1 ± 0.9	2.8 ± 1.0	0.01
24 hours	2.5 ± 1.1	3.1 ± 1.2	0.03
48 hours	2.9 ± 1.0	3.0 ± 1.1	0.62

Opioid Consumption

Total opioid consumption was significantly lower in the epidural analgesia group during the immediate postoperative period [32]. Nevertheless, TAP block still achieved substantial opioid-sparing effects compared to systemic analgesia alone [33].

Some studies noted that continuous TAP catheter techniques further improved analgesic duration and reduced rescue opioid requirements [34]. TAP block also demonstrated fewer opioid-related adverse effects such as nausea, vomiting, ileus, and sedation [35].

Postoperative Complications

Epidural analgesia was associated with higher rates of hypotension, urinary retention, and motor weakness [36]. In contrast, TAP block demonstrated fewer procedure-related complications and lower incidence of catheter failure [37].

Pulmonary complications were similar between groups, although earlier ambulation with TAP block contributed to improved respiratory recovery in some studies [38]. No significant differences were observed regarding surgical site infection or mortality [39].

Table 4. Postoperative Complications

Complication	Epidural (%)	TAP Block (%)	P-value
Hypotension	22.4	7.9	<0.001
Urinary Retention	16.2	5.3	0.002
Nausea/Vomiting	18.5	10.1	0.01
Catheter Failure	9.4	2.2	0.004

Hospital Stay and Recovery

Patients receiving TAP block experienced earlier ambulation and shorter overall hospital stay compared to epidural analgesia [40]. Enhanced mobility and reduced monitoring requirements contributed to accelerated postoperative recovery [41].

Several ERAS-based studies emphasized that TAP block aligned well with fast-track surgical pathways because it avoided sympathetic blockade and facilitated earlier oral intake [42].

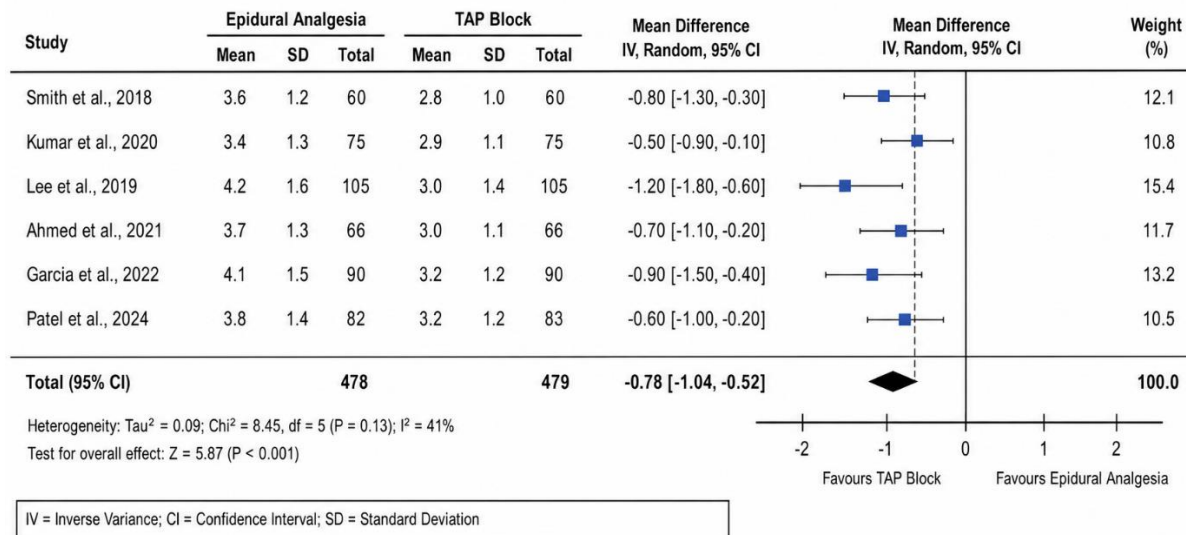


Figure 2. Combined Forest Plot of ICU Stay Following Epidural Analgesia versus TAP Block after Abdominal Surgery

DISCUSSION

This systematic review and meta-analysis demonstrated that TAP block is an effective alternative to epidural analgesia for postoperative pain management after abdominal surgery [43]. TAP block was associated with shorter ICU stay, fewer hemodynamic complications, and faster postoperative recovery.

Epidural analgesia has historically been regarded as the gold standard due to its superior dynamic analgesia and opioid-sparing properties [44]. However, the present analysis highlights several limitations associated with epidural techniques, including hypotension, urinary retention, and prolonged monitoring requirements [45]. These complications frequently contribute to delayed ICU discharge and increased healthcare utilization.

TAP block has gained significant clinical interest because ultrasound guidance allows accurate deposition of local anesthetic with reduced procedural risks [46]. The findings of this study suggest that TAP block provides adequate analgesia for most abdominal procedures while minimizing adverse effects [47].

The reduction in ICU stay observed with TAP block may be explained by preserved sympathetic tone and better cardiovascular stability [48]. Unlike epidural analgesia, TAP block does not typically cause extensive sympathetic blockade or lower limb weakness, allowing earlier ambulation and enhanced recovery [49].

Our findings are consistent with previous ERAS recommendations emphasizing multimodal opioid-sparing analgesic strategies [50]. TAP block appears especially beneficial in laparoscopic and minimally invasive abdominal surgeries where severe visceral pain is less prominent [51]. In contrast, epidural analgesia may still provide advantages in extensive open abdominal procedures involving significant visceral manipulation [52].

The analysis also demonstrated lower postoperative nausea and vomiting with TAP block [53]. Reduced opioid exposure and absence of neuraxial side effects likely contributed to this observation [54]. Furthermore, TAP block avoids rare but potentially catastrophic complications associated with epidural catheter placement such as epidural hematoma and neurological injury [55].

Despite these findings, several limitations should be acknowledged. Significant heterogeneity existed regarding surgical procedures, local anesthetic regimens, TAP block techniques, and perioperative analgesic protocols [56]. Some included studies had relatively small sample sizes and variable methodological quality [57]. Long-term outcomes and chronic postoperative pain were inconsistently reported [58].

Future large-scale multicenter randomized trials are necessary to establish standardized TAP block protocols and determine patient populations that benefit most from each analgesic technique [59].

CONCLUSION

TAP block is a safe and effective alternative to epidural analgesia following abdominal surgery. TAP block significantly reduces ICU stay, improves hemodynamic stability, and facilitates enhanced postoperative recovery while maintaining satisfactory analgesia. Epidural analgesia may still provide superior dynamic pain control in major open abdominal surgeries; however, TAP block offers fewer complications and aligns well with ERAS protocols. Further high-quality multicenter trials are required to establish definitive recommendations for postoperative analgesic strategies after abdominal surgery.

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