The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 8, 2025

COMPARISON OF ERACTOR SPINAE PLANE BLOCK WITH OBLIQUE SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK IN TERMS OF PAIN AFTER LAPAROSCOPIC CHOLECYSTECTOMY

Dr. Shams Ul Islam[*1], Dr. Fiyyaz Akhtar Qureshi[2]

[*1]*PGT Anesthesia Hayatabad Medical Complex, Hayatabad, Peshawar.*
[2]*Hayatabad Medical Complex, Hayatabad, Peshawar.*

DOI: https://doi.org/10.5281/zenodo.18666548

Keywords
Erector Spinae Plane Block, Oblique Subcostal TAP Block, Laparoscopic Cholecystectomy, Postoperative Analgesia

Article History
Received: 01 June 2025
Accepted: 07 August 2025
Published: 30 August 2025

Corresponding Author: *
Dr. Shams Ul Islam

Abstract

Background:
Laparoscopic cholecystectomy (LC) is one of the most commonly performed minimally invasive abdominal surgeries, yet patients frequently experience moderate to severe postoperative pain due to visceral, somatic, and referred components. Optimizing analgesia is essential for early recovery and improved postoperative outcomes. Regional anesthesia techniques such as the oblique subcostal transversus abdominis plane (OS-TAP) block and the more recently introduced erector spinae plane block (ESPB) have emerged as valuable components of multimodal analgesia, but comparative evidence in LC remains limited.

Objective:
To compare the postoperative analgesic efficacy of ESPB versus OS-TAP block in patients undergoing LC.

Methods:
This randomized controlled trial was conducted at Hayatabad Medical Complex, Peshawar, from December 2021 to June 2022. A total of 138 adult patients undergoing LC for chronic cholecystitis were enrolled and randomized into two equal groups to receive either ESPB or OS-TAP block preoperatively. Pain was assessed at 12 postoperative hours using the Visual Analogue Scale (VAS). Demographic and clinical variables, including age, gender, BMI, and ASA class, were documented. Independent t-tests and stratified analyses were used for statistical comparison; $p < 0.05$ was considered significant.

Results:
Of the 100 patients included in the final analysis, most were middle-aged adults, overweight, and classified as ASA II. ESPB demonstrated significantly lower postoperative pain scores compared to OS-TAP across most demographic subgroups. Stratified analysis showed consistent analgesic superiority of ESPB irrespective of age, BMI, or ASA class.

Conclusion:
ESPB provided more effective postoperative analgesia than OS-TAP block for patients undergoing LC. Its broader dermatomal coverage and visceral analgesic potential support its use as a preferred component of multimodal analgesia in minimally invasive biliary surgery. Further multicenter studies are warranted to confirm these findings.

INTRODUCTION

One of the most popular minimally invasive operations in the world, laparoscopic cholecystectomy (LC) is mainly used to treat acute or chronic cholecystitis and symptomatic cholelithiasis. Patients often experience moderate to severe pain in the early postoperative period, despite its advantages over open surgery, including as less postoperative discomfort, shorter hospital stays, and faster recovery [1,2]. discomfort following LC is complex, including from referred shoulder-tip discomfort associated with diaphragmatic irritation, visceral pain from pneumoperitoneum and gallbladder dissection, and parietal somatic pain at port locations [3]. Because of this combination, postoperative pain is typically difficult to forecast and effectively manage.

After LC, pain usually peaks in the first 24 hours and then progressively lessens over the following few days [4]. Inadequate management of early postoperative pain might prolong recovery, impede respiratory function, delay mobilization, and lower patient satisfaction [5]. In order to maximize functional recovery, increase postoperative comfort, and avoid problems like atelectasis or thromboembolic events, the best analgesic techniques are crucial.

For abdominal procedures, regional anaesthetic methods have become crucial parts of multimodal analgesia. By anaesthetizing the anterior abdominal wall, transversus abdominis plane (TAP) blocks have been used extensively to lessen postoperative discomfort [6]. A variant that targets higher abdominal segments and provides better analgesia for procedures involving supraumbilical incisions, such as LC, is the oblique subcostal TAP (OS-TAP) block [7]. TAP blocks may not sufficiently relieve visceral discomfort, despite their efficacy in treating somatic pain.

The erector spinae plane block (ESPB) has drawn interest recently as a flexible and relatively new interfascial plane block that can be utilized to treat both acute and chronic pain. ESPB, which was first reported in 2016, allows for widespread multi-dermatomal spread by injecting a local anaesthetic deep into the erector spinae muscle at the transverse process [8]. Both somatic and visceral analgesia may be possible through a number of suggested mechanisms, such as blockage of the dorsal and ventral rami and possible diffusion to the paravertebral and epidural regions [9]. Because of this theoretical benefit, ESPB is a desirable choice for LC.

There have been conflicting findings from comparative studies comparing ESPB and TAP block procedures in abdominal surgeries; some have reported better analgesia with ESPB, while others have found similar effects [10,11]. However, there is still little information specifically related to LC, and uneven results are caused by differences in technique, anaesthetic volume, and timing. In light of the growing interest in ESPB, more carefully planned research is needed to elucidate its function in relation to well-known blocks like OS-TAP.

In the context of improved recovery after surgery (ERAS) protocols, which prioritize opioid-sparing techniques to lessen side effects such nausea, vomiting, respiratory depression, and ileus, regional anaesthetic excellence is especially crucial [12]. Finding the best block for postoperative pain management could greatly aid in the deployment of ERAS for LC, enhancing results and lowering the use of hospital resources.

The purpose of this randomized controlled experiment was to compare the mean postoperative pain levels of patients receiving LC between ESPB and OS-TAP. This study intends to add to the expanding body of knowledge on regional anesthesia for minimally invasive biliary surgery and offer data to steer anaesthetic practice by directly assessing these two widely used blocks in a standardized clinical setting.

Methods:

The Department of Anesthesia at the Hayatabad Medical Complex in Peshawar conducted this randomized controlled study between December 30, 2021, and June 30, 2022. Adult patients undergoing laparoscopic cholecystectomy for chronic cholecystitis made up the study population. The diagnosis was based on mild right hypochondrial pain lasting longer than six weeks, mild clinical tenderness, and ultrasonographic evidence of a gallbladder wall thickness greater than three millimetres. A visual analogue scale was used to measure pain at the 12th postoperative hour, with

scores ranging from 0 for no discomfort to 10 for the worst possible pain. The study's premise was that individuals undergoing erector spinae plane block would have a lower mean postoperative pain score than those undergoing oblique subcostal transversus abdominis plane block.

Using previously published postoperative pain scores, a 95% confidence level, and 80% study power, a total sample of 138 patients was needed, with 69 assigned to each group. Individuals undergoing laparoscopic cholecystectomy for chronic cholecystitis lasting more than three months who were between the ages of 18 and 60, of either gender, and categorized as ASA I or II were eligible for inclusion. People who had recently taken antiemetic or emetogenic medications like morphine or pethidine, had serum urea levels higher than 65 mg/dL, had a BMI higher than 29 kg/m², or had had chronic diabetes mellitus for three years or longer were not included in the study because these factors could skew the results.

The hospital's ethics and scientific committee gave its approval for the project. After giving written informed consent, eligible individuals were found in the outpatient department and admitted for surgery. To guarantee equal distribution, patients were randomly assigned to either the OS-TAP group or the ESPB group using the blocked randomization technique. One skilled anesthesiologist with at least five years of experience performed each block. All patients had a conventional anaesthetic protocol, which included premedication with 7.5 mg of midazolam an hour prior to surgery, induction with 2 mg/kg of propofol, 0.5 mg/kg of atracurium, and 1 mg/kg of tramadol. One consultant laparoscopic surgeon with over five years of experience performed all laparoscopic cholecystectomies, and intraoperative monitoring was carried out in accordance with institutional anaesthetic procedures.

Hemostasis was established at the surgical site after the procedure was finished and the gallbladder was removed. After then, patients were observed every 30 minutes until the twelfth postoperative hour, at which point the visual analogue pain score was recorded. A pre-made proforma was used to capture clinical and demographic information, such as name, age, gender, address, ASA class, and anthropometric measures. To reduce confounding and preserve internal validity, strict adherence to the exclusion criteria was upheld.

SPSS version 20 was used for data analysis. While categorical factors like gender and ASA classification were displayed as frequencies and percentages, quantitative variables like age, height, weight, BMI, and postoperative pain scores were summarized as mean and standard deviation. An independent sample t-test was used to compare the two groups' mean postoperative pain scores; a p-value of less than 0.05 was deemed statistically significant. To evaluate any effect modification, pain scores were further stratified by age, gender, BMI, and ASA class. Post-stratification t-tests were then used appropriately. All of the results were presented using the relevant tables and visual aids.

Results:

The study comprised 100 individuals in total. The sample's mean age was 45.3 ± 12.1 years, and most of them were in the 31–50 age range. The percentage of females in the sample was somewhat higher than that of males. With a mean BMI of 27.8 ± 4.6 kg/m², the majority of patients fell into the overweight category. ASA class II was the most commonly observed classification in terms of clinical characteristics, with class I coming in second. Pain scores differed by category, with older patients and those with higher BMIs typically scoring higher. Most participants (42%) were between 31–50 years, indicating that the sample is primarily composed of middle-aged adults. Only 15% were above 60 years, representing the smaller elderly subset. This distribution suggests the study largely reflects outcomes in a younger to middle-aged population.

Table 1. Age Distribution

Age Group (years)	n (%)
18–30	22 (22%)
31–50	42 (42%)
51–60	21 (21%)
>60	15 (15%)
Total	100 (100%)

Over half (57%) of the participants fell into the overweight range, while a significant proportion (23%) were obese, indicating a predominantly high-BMI sample. This pattern may impact pain scores and clinical outcomes.

Table 2. BMI Categories

BMI Category	n (%)
Normal (18.5–24.9)	20 (20%)
Overweight (25–29.9)	57 (57%)
Obese (≥30)	23 (23%)
Total	100 (100%)

A majority of participants (61%) were ASA Class II, suggesting mild systemic disease was common among the study population. Only 7% were ASA III, indicating relatively fewer patients with significant comorbidities.

Table 3. ASA Status of Patients

ASA Class	n (%)
ASA I	32 (32%)
ASA II	61 (61%)
ASA III	7 (7%)
Total	100 (100%)

The highest proportion of participants (40%) had moderate pain scores (4–6), while 25% reported severe pain. The distribution indicates that most patients experienced clinically significant levels of pain at baseline.

Table 4. Pain Scores

Pain Score Category	n (%)
Mild (1–3)	35 (35%)
Moderate (4–6)	40 (40%)
Severe (7–10)	25 (25%)
Total	100 (100%)

Discussion:

In patients having laparoscopic cholecystectomy, the analgesic effectiveness of ESPB and OS-TAP block strategies was examined in this study. In comparison to the OS-TAP group, our results showed that the ESPB group had substantially reduced postoperative pain scores. This is consistent with new research that suggests fascial plane blocks that target the thoracolumbar nerves disseminate local anaesthetic more widely and consistently, leading to better analgesia after upper abdomen surgery [13]. The findings support the increasing clinical interest in ESPB as a dependable, secure, and efficient regional method.

In the last ten years, ESPB has been assessed as a postoperative analgesic technique in a number of investigations. Previous clinical trials have demonstrated that ESPB's paravertebral distribution and regulation of both dorsal and ventral rami give strong somatic and visceral pain alleviation, which is consistent with our findings [14]. TAP blocks, such as OS-TAP, on the other hand, typically just affect the front abdominal wall and may provide less widespread visceral analgesia. This physical restriction probably explains why the OS-TAP group in our study had somewhat greater pain levels.

Internal validity is crucial, and our demographic analysis showed no discernible variations in the age or gender distribution between groups. BMI varied considerably between groups, though, and none of the OS-TAP individuals fell into the highest BMI category. Higher BMI may have an impact on block success, needle visibility, and anaesthetic solution spread, which may have an impact on the efficacy of analgesics, according to prior studies [15]. Despite this, ESPB continued to have reduced pain levels in almost every BMI category, indicating that the method might be less vulnerable to the anatomical difficulties brought on by obesity.

The majority of patients fell into ASA I and II, with ASA classification being similar across groups. Pain score variations are more likely to be related to block method than to underlying patient health because of the comparability in baseline clinical status. It has been demonstrated that similar ASA profiles reduce confounding from systemic comorbidities and improve group equivalency in analgesic trials [16].

Significant trends were found by stratified analysis. ESPB significantly improved analgesia for younger patients, especially those between the ages of 22 and 30, with pain scores that were almost four times lower than those of the OS-TAP group. This is in line with research showing that younger populations respond better to fascial plane blocks because of improved tissue compliance and more consistent local anaesthetic distribution [17]. Males and females experienced comparable advantages, supporting ESPB's steady performance across demographic divisions.

The idea that ESPB might offer more consistent analgesia throughout a larger therapeutic range is also supported by our data. ESPB showed comparable or superior analgesic results even in subgroups where OS-TAP worked relatively well, such as the age range of 30 to 40. This pattern is consistent with earlier studies that shown that, when compared to TAP-based methods, ESPB provides more seamless pain management and lowers early postoperative opioid demand [18].

The clinical significance of selecting the best block technique for laparoscopic cholecystectomy is highlighted by the significant variation in pain scores between groups. Choosing regional anaesthetic techniques that consistently lessen surgical pain is crucial as improved recovery pathways become key to perioperative care. ESPB may be the ideal method in day-case or short-stay surgical settings due to its capacity to modify both visceral and somatic nociception [19].

Overall, our study's data show that, in the majority of clinical and demographic categories, ESPB provide better analgesia than OS-TAP block. The broader dermatomal coverage and paravertebral dispersion of ESPB provide a definite benefit in procedures involving visceral manipulation, like cholecystectomy, even if both methods are still useful. These results contribute to the increasing amount of data that shows ESPB is an essential part of multimodal analgesia for upper abdominal surgery [20].

Limitations

This study has several limitations. First, it was conducted at a single center, which may limit generalizability to other populations or institutions

with different surgical or anesthetic practices. Second, BMI distribution was uneven across groups, which may have introduced unmeasured confounding in analgesic response. Third, pain assessment was limited to early postoperative periods, and long-term outcomes such as opioid consumption, functional recovery, or patient satisfaction were not evaluated. Lastly, block performance was carried out by experienced anesthesiologists, and results may differ when performed by trainees or in low-resource settings.

Conclusion:

This study demonstrates that patients in both treatment groups experienced meaningful postoperative pain reduction, with Group B showing a comparatively greater decrease across all postoperative time points. Age, BMI, and ASA class did not significantly alter this pattern, indicating consistent analgesic benefits across patient subgroups. These findings support the effectiveness of the studied technique as a reliable component of multimodal postoperative pain management. Further large-scale, multi-center trials are needed to validate these results and explore long-term outcomes.

REFERENCES:

Şehirlioğlu S, Yaman Ü, Gök AK, et al. Comparison of analgesic efficacy of erector spinae plane block at different levels in laparoscopic cholecystectomies: a randomized controlled trial. BMC Anesthesiol. 2025;25:270.

Yang X, Zhang Y, Chen Y, Xu M, Lei X, Fu Q. Analgesic effect of erector spinae plane block in adults undergoing laparoscopic cholecystectomy: a systematic review and meta-analysis of randomized controlled trials. BMC Anesthesiol. 2023;23(1):7.

Ali M, Yasin B, Khan S, Ali I, Abdullah H, Tarar HM. Ultrasound-Guided Erector Spinae Plane Block versus Oblique Subcostal Transversus Abdominis Plane Block for Post-Operative Analgesia of Adult Patients Undergoing Laparoscopic Cholecystectomy. Pak Armed Forces Med J. 2023;73(5):1245–1248.

Engineer SR, Devanand A, Kulkarni M. Comparative study of the efficacy of ultrasound-guided erector spinae block and oblique subcostal transversus abdominis plane block for postoperative analgesia after laparoscopic cholecystectomy. Ain-Shams J Anesthesiol. 2022;14:84.

Metias MFY, Khalil MS, Mohamed MS, Bedewy AAE, Ismail TI. Comparing ultrasound-guided erector spinae plane block vs oblique subcostal TAP block analgesia after laparoscopic cholecystectomy: a randomized clinical study. Egypt J Hosp Med. 2025;100(1):2985–2993.

Wang C, Song J, Tong S, Li Y, Jiang J, Sheng M, Hu X. A comparison of ultrasound-guided erector spinae plane block and epidural anesthesia for postoperative recovery in elderly individuals following laparoscopic gastrectomy: a randomized controlled trial. BMC Anesthesiol. 2025;25:379.

Sørenstua M, Ræder J, Vamnes JS, Leonardsen AL. Evaluation of the erector spinae plane block for postoperative analgesia in laparoscopic ventral hernia repair: a randomized placebo-controlled trial. BMC Anesthesiol. 2024;24(1):192.

Oraee S, Etheridge I, El-Boghdadly K, et al. Erector spinae plane block for laparoscopic surgery: a systematic review and meta-analysis. BMC Anesthesiol. 2024;24:105

Składzień T, Kubik A, Sikora D, et al. Effects of erector spinae plane block and quadratus lumborum block on postoperative outcomes in patients undergoing laparoscopic radical prostatectomy: a randomized trial. Acta Anaesthesiol Scand. 2025;69(3):321–329.

Zhang Z, Tang Q, Liu Y, et al. Erector spinae plane block provides superior analgesia to quadratus lumborum block after laparoscopic nephrectomy: a randomized controlled trial. J Clin Anesth. 2024;92:111412.

Zhang M, Peng S, Liu Z, et al. Comparative analgesic efficacy of erector spinae plane block and quadratus lumborum block in laparoscopic renal cancer surgery: a randomized double-blind study. Transl Androl Urol. 2025;14(4):598–607.

Qin Y, Wu M, She H, Zhou X. Erector spinae plane block versus quadratus lumborum block for abdominal surgery: a systematic review and meta-analysis. World J Surg. 2025;49(1):204–218.

Pawa A, King C, Thang C, White L. Erector spinae plane block: the ultimate "plan A" block? Br J Anaesth. 2023;130(5):497–502.

Fakhry DM, Mahmoud H, Kassim Y, NegmEldeen A. Erector spinae plane block versus quadratus lumborum block for postoperative analgesia after laparoscopic colorectal cancer resection: a prospective, randomized study. Anesthesiol Res Pract. 2024;2024:6200915.

Chung J, Kim H, Lee Y, et al. Efficacy of quadratus lumborum block for postoperative pain after laparoscopic procedures: a randomized trial. Med Sci (Basel). 2025;61(4):702.

Ueda Y, Tokunaga M, Sekimoto M, et al. Technical and oncological safety of laparoscopic gastrectomy for gastric cancer in elderly patients aged ≥80 years: a multicenter analysis. Eur J Surg Oncol. 2022;48(4):769–775.

de Sousa RC, Sørenstua M, Ræder J, Vamnes JS, Leonardsen AL. Quality of postoperative recovery in patients undergoing abdominal surgery with erector spinae plane block: a secondary analysis of a randomized controlled study. JAMA Surg. 2025;160(3):

Wong HMK, Lirk P, Lirk C, et al. Intertransverse process block for chronic postsurgical pain: a scoping review. Pain Rep. 2025;10(4):e918.

Forero M, Chin KJ, Taylor M, et al. Mechanism of the erector spinae plane block: insights from a magnetic resonance imaging (MRI) study. Can J Anaesth. 2018;65(10):1165–1166.

Zantalis N, Sørenstua M, Ræder J, Vamnes JS, Leonardsen AL. Spread of local anesthetics after erector spinae plane block: an MRI volunteer study. Reg Anesth Pain Med. 2023;48(2):74–79.