International Journal of Research in Medical Sciences
Lollen L et al. Int J Res Med Sci. 2025 Nov;13(11):4815-4822
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20253607

Original Research Article

Comparison of thoracic epidural analgesia and ultrasound guided erector spinae plane block for post operative pain control following laparoscopic cholecystectomy: a randomized clinical trial

Lippi Lollen[1], Ningri Sengul[2], Dhayanithy M.[1]*, L. Pradipkumar Singh[1], Taba Annu[1], Kiki Maria Marak[1]

[1]Department of Anaesthesiology, Regional Institute of Medical Sciences, Imphal, Manipur, India
[2]Department of Paediatric Cardiac Anaesthesiology, Regional Institute of Medical Sciences, Imphal, Manipur, India

Received: 22 August 2025
Revised: 06 October 2025
Accepted: 09 October 2025

***Correspondence:**
Dr. Dhayanithy M.,
E-mail: drdhaya8004@gmail.com

ABSTRACT

Background: Effective management of postoperative pain is a cornerstone of modern perioperative care, critically influencing patient recovery and overall outcomes. Over the past several decades, significant advancements in regional anesthesia techniques have transformed the landscape of perioperative analgesia.
Methods: The study groups were divided into two, named group A and group B. The total sample size was 80 (40 patients in each group). In Group A, Thoracic epidural analgesia was given at T8-T9 epidural space via paramedian approach using 7.5ml of 0.75% Ropivacaine diluted with 7.5ml of Normal saline and 7.5mcg Dexmedetomidine, and in the Group B, Erector spinae plane block was given bilaterally at T9 transverse process level using 7.5ml of 0.75% Ropivacaine diluted with 22.5ml of Normal saline and 7.5mcg of Dexmedetomidine.
Results: Duration of analgesia was more in the Thoracic Epidural Analgesia (TEA) group with 894±115.93 mins. There was no significant difference in the dosage of rescue analgesic, however the TEA group needed lesser rescue dosages than those in ESPB group. Pain scores were similar across both groups at all time intervals. Hemodynamic parameters varied early on, with TEA maintaining higher heart rates and MAP values initially. Side effects were comparable between the groups.
Conclusions: This randomized clinical trial comparing Thoracic Epidural Analgesia (TEA) and Ultrasound-Guided Erector Spinae Plane Block (ESPB) for post-operative pain control following laparoscopic cholecystectomy found that TEA demonstrated a significantly longer duration of analgesia compared to ESPB.

Keywords: Dexmedetomidine, Erector spinae plane block, Post operative pain, Thoracic epidural

INTRODUCTION

Effective management of postoperative pain is a cornerstone of modern perioperative care, critically influencing patient recovery and overall outcomes. Adequate pain control not only ensures patient comfort and satisfaction but also facilitates early mobilization, reduces the incidence of postoperative complications such as pulmonary atelectasis and deep vein thrombosis (DVT) and shortens the duration of hospitalization.[1] Over the past several decades, significant advancements in regional anesthesia techniques have transformed the landscape of perioperative analgesia, particularly in thoracic and abdominal surgeries. Among these techniques, Thoracic Epidural Analgesia (TEA) has long been considered the gold standard for managing pain following major thoracotomies, owing to its ability to provide superior analgesia and modulate the surgical stress response.[2] However, despite these advantages, TEA is not without limitations. Its invasive nature, potential for hemodynamic

instability, risk of dural puncture, and contraindications in certain patient populations have led clinicians and researchers alike to explore alternative strategies for regional anesthesia.[3]

In recent years, there has been a paradigm shift towards the incorporation of novel regional anesthetic techniques, particularly the Erector Spinae Plane Block (ESPB), into postoperative pain management protocols for thoracic and abdominal surgeries. Originally described in 2016, ESPB has gained popularity due to its ease of administration, favourable safety profile, and promising analgesic outcomes.[4] By targeting the fascial plane deep to the erector spinae muscle, ESPB allows for the diffusion of local anesthetic agents into the paravertebral space, thereby achieving a multi-dermatomal sensory blockade.[5] This mechanism of action is thought to offer comparable benefits to TEA in terms of analgesia while mitigating some of the risks associated with neuraxial blockade.[6] The rapid adoption of ESPB in clinical practice is underscored by a growing volume of literature that attests to its efficacy in reducing postoperative pain scores, opioid consumption, and associated complications in diverse surgical populations.[7] Despite these promising findings, the comparative effectiveness of TEA and ESPB remains a subject of ongoing debate within the anesthesiology community. While some studies have reported comparable analgesic outcomes between the two techniques, others have highlighted the superiority of one modality over the other in specific clinical settings.[8,9] A meta-analysis investigating the efficacy of these blocks revealed significant heterogeneity in the results, attributable in part to differences in the surgical procedures, patient populations, and block performance protocols across studies.[10]

One potential avenue for enhancing the efficacy of regional anesthesia is the addition of adjuvants to the local anesthetic agents used in these blocks. Dexmedetomidine, an alpha-2 adrenergic receptor agonist, has emerged as a promising adjuvant due to its sedative, analgesic, and opioid-sparing effects.[11] When used in conjunction with local anesthetics like ropivacaine, dexmedetomidine has been shown to prolong the duration of analgesia, improve block quality, and facilitate hemodynamic stability during the perioperative period.[12] Although isolated studies have examined the use of dexmedetomidine as an adjuvant in ESPB, limited evidence exists regarding its incorporation into TEA protocols.[13]

Laparoscopic cholecystectomy represents an ideal model for investigating these regional anesthesia techniques in combination with Dexmedetomidine. As one of the most commonly performed laparoscopic procedures worldwide, laparoscopic cholecystectomy offers a homogeneous study population with consistent surgical stimuli and postoperative pain patterns.[14] The minimally invasive nature of the surgery, combined with the potential for significant postoperative discomfort, underscores the need for an optimized analgesic regimen that not only ensures adequate pain relief but also facilitates early ambulation and reduces hospital stay.[15] By focusing on patients undergoing laparoscopic cholecystectomy, this study aims to provide robust, clinically relevant data that can inform best practices in postoperative pain management.

The integration of Dexmedetomidine into regional anesthesia protocols is underpinned by its multimodal mechanism of action. Beyond its sedative properties, dexmedetomidine exerts an analgesic effect by inhibiting the release of norepinephrine and reducing sympathetic outflow, ultimately lowering the pain threshold.[16] When used as an adjuvant, it enhances the quality of blockade by prolonging sensory and motor blockade duration without significantly increasing the risk of adverse effects.[12] In addition to the potential benefits in terms of analgesia, the use of dexmedetomidine as an adjuvant may confer additional advantages, including reduced perioperative opioid requirements. By potentially lowering the overall opioid burden, the combination of regional anesthesia techniques with dexmedetomidine may contribute to safer and more sustainable pain management strategies in the postoperative period. This pharmacologic profile makes dexmedetomidine a valuable addition to both TEA and ESPB regimens, particularly in the context of surgeries where effective pain management is paramount.

The present study is designed to address a critical gap in the literature by directly comparing the analgesic efficacy and safety profiles of TEA and ESPB when both techniques are augmented with Dexmedetomidine as an adjuvant to Ropivacaine. The primary objective is to determine whether the addition of Dexmedetomidine can enhance the analgesic outcomes of ESPB to a degree comparable to, or even exceeding, those of TEA in patients undergoing laparoscopic cholecystectomy. Secondary outcomes include assessments of hemodynamic stability, absence of opioid-related side effects, recovery milestones such as time to ambulation, and overall patient satisfaction with pain management. In summary, this study seeks to rigorously compare TEA and ESPB each augmented with Dexmedetomidine as an adjuvant to Ropivacaine in the context of laparoscopic cholecystectomy. By addressing existing gaps in the literature and standardizing the use of adjuvants across both techniques, the research aims to provide robust evidence on the comparative efficacy, safety, and overall impact on postoperative recovery. The outcomes of this investigation have the potential to refine current analgesic practices and inform the development of optimized, patient-centred pain management protocols that enhance surgical recovery and improve quality of life.

METHODS

A prospective, single blinded, randomized control trial study was conducted in the Department of Anaesthesiology, Regional institute of medical sciences (RIMS), Imphal, Manipur from April 2023 to March 2025 consisting of 80 patients totally. The permission of the Research Ethics Board, RIMS, Imphal, Manipur was

obtained before initiating the study. Informed written consent were taken from all patients.

Inclusion criteria includes Patients of either sex, Age group between 18-60 years, ASA (American Society of Anaesthesiologist) Grade 1 and 2 and BMI 18-30 kg/m^2. Exclusion criteria includes Allergic to local anaesthetics, Contraindications to epidural analgesia (abnormal coagulation profile, local infection, pre-existing neurological deficit of torso or lower limbs and spinal diseases), pregnancy, cognitive impairment and patient refusal.

The study groups were divided into two, named group A and group B. The total sample size was 80 (40 patients in each group). Patients were allocated by using block randomization chart. Block size of 4 was used and a randomization sequence was generated from the website www.sealedenvelope.com by entering the required data. Randomization quotes were provided in opaque sealed envelope which was opened before allocating the group for intervention.

In Group A, Thoracic epidural analgesia was given at T8-T9 epidural space via paramedian approach using 7.5ml of 0.75% Ropivacaine diluted with 7.5ml of Normal saline and 7.5mcg Dexmedetomidine, so that 15ml of 0.375% Ropivacaine was given over 10-15 minutes in aliquots of 5ml, and in the Group B, Erector spinae plane block was given bilaterally at T9 transverse process level using 7.5ml of 0.75% Ropivacaine diluted with 22.5ml of Normal saline and 7.5mcg of Dexmedetomidine, so that 15ml of 0.187% Ropivacaine was given bilaterally to each side.

Tablet Alprazolam 0.5mg was given at bedtime on the previous day of surgery. Tablet Pantoprazole 40mg and tablet Metoclopramide 10mg was given in the morning 2 hours before the surgery. Injection Glycopyrrolate 0.004mg/kg was given intramuscular 30-60 minutes before the induction of anesthesia. Intravenous access was established with 18G or 20G cannula on a suitable vein for maintenance fluid.

On arrival at the OT baseline monitoring of Heart Rate (HR), Non-Invasive Blood Pressure (NIBP), oxygen saturation (SpO_2) and Electrocardiogram (ECG) was started. For the group A (TEA), before induction an epidural catheter (18G) inserted about 3-4cm inside the T8-T9 epidural space via paramedian approach either in sitting or lateral position after local skin infiltration with 1-2 ml of 2% Lignocaine. After preoxygenation for 3min, general anesthesia was induced with Propofol 1.5-2 mg/kg iv followed by Succinylcholine 1-2mg/kg to facilitate endotracheal intubation. Anaesthesia was maintained with Oxygen, Nitrous oxide and Sevoflurane (0.6-1.5%) plus supplemental Fentanyl 2mcg/kg and Vecuronium 0.08mg/kg followed the top-ups. For the group B (ESPB), after induction patient was positioned in lateral position (left or right) and bilateral erector spinae plane block was given under ultrasonographic guidance at T9 transverse process level. Duration of analgesia was counted from the movement of activation of either TEA or ESPB. Intraoperative hemodynamic (HR and MAP) was recorded every 5 minutes for 1st 30minutes then 15 minutes till the end of operation. Bradycardia (HR<50/min) and hypotension (SBP<90mmHg or less than 80% of baseline) was treated with injection atropine 0.3-0.6mg and inj. Mephentermine 3mg iv incremental doses along with fluid resuscitation. Towards the end of the operation, residual neuromuscular blockade was reversed with injection Neostigmine 0.05mg/kg and Glycopyrrolate 0.008mg/kg before endotracheal extubation. Patients were shifted to Post Anesthesia Care Unit (PACU) if they were able to maintain airway and obey command for observation.

RESULTS

Table 1 compares various parameters of the two groups, Thoracic epidural analgesia (TEA) and Erector Spinae Plane Block (ESPB). No statistically significant difference between the two groups was observed as revealed by the p value.

The mean weight of the TEA group was 72.47 kg (with SD±6.39), whereas the mean weight of the ESPB group was 74.20 kg and a standard deviation of 5.63. The p-value for weight comparisons were found to be 0.204, which also suggests that there is no significant difference in weight between the two groups.

Table 1: Comparison of parameters of two groups.

Variables		TEA (n=40) (%)	ESPB(n=40) (%)	p value
Age of the participant in years		51.70±6.817	50.98±6.620	0.631
Sex	Male	18 (22.5)	22 (27.5)	0.371
	Female	22 (27.5)	18 (22.5)	
Weight in kgs		72.47±6.39	74.20±5.63	0.204
Height in cm		167.10±5.883	168.23±5.722	0.389
ASA I		22 (27.5)	18 (22.5)	0.251
ASA II		18 (22.5)	22 (27.5)	
Duration of surgery		88.45±5.421	89.05±5.301	0.618
Duration of analgesia		894±115.931	828±81.750	0.004
Total dose of rescue analgesic		84.63±30.264	90.00±30.382	0.430

In TEA group, the majority were female while in ESPB group majority were male. In the ASA classification also, the majority, i.e.,27.5%, were ASA I in TEA group while majority were 27.5% are ASA II in ESPB group. No significant associations were observed in both sex and ASA classification between the two groups. The duration of surgery was also the same between the two groups (TEA: 88.45±5.4 vs. 89.05±5.30; p value=0.618).

However, statistically significant differences were observed in the duration of analgesia outcomes between the two groups. Duration of analgesia was more in the TEA group with 894±115.93 mins. There was no significant difference in the dosage of rescue analgesic, however the TEA group needed lesser rescue dosages than those in ESPB group.

Table 2: Comparative analysis of VAS at rest and at cough between TEA (n=40) and ESPB (n=40) over time.

Time	VAS at rest			VAS at cough		
	TEA	ESPB	P value	TEA	ESPB	P value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
0 hour	4±0.555	4.03±0.698	0.860	5.08±0.572	5.05±0.714	0.863
6 hour	3.25±0.494	3.28±0.554	0.832	4.10±0.545	4.05±0.714	0.726
12 hour	2.28±0.506	2.38±0.586	0.416	3.10±0.545	3.05±0.714	0.726
24 hour	1.25±0.439	1.33±0.474	0.465	2.20±0.405	2.05±0.714	0.252

Table 3: Comparative analysis of heart rate and mean arterial pressure between TEA (n=40) group and ESPB (n=40) group over time.

Time	Heart rate			MAP		
	TEA	ESPB	P value	TEA	ESPB	P value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
0 minute	78.8±12.6	81.9±10.8	0.299	96.1±11.3	95.8±10.3	0.915
5 minute	77.7±13.3	71.0±9.7	0.029	93.5±14.1	84.4±11.9	0.009
10 min	77.5±12.5	66.7±7.7	<0.01	95.5±14.8	88.7±15.8	0.092
15 min	76.7±12.8	63.5±8.3	<0.01	96.6±12.4	88.6±12.0	0.013
20 min	78.6±12.3	60.2±7.3	<0.01	98.0±14.1	89.4±10.3	0.009
30 min	80.7±14.1	61.2±8.1	<0.01	99.07±9.98	92.0±11.7	0.015
40 min	80.8±13.9	65.3±8.4	<0.01	98.9±10.9	89.2±11.2	0.001

Table 2 presents a comparative analysis of VAS scores at rest and VAS scores at cough between two groups TEA and ESPB at different time intervals (0, 6, 12, and 24 hours). At initial time, i.e., 0 hour, between the groups there was no statistically significant difference (p=0.860).

A similar result was observed in the VAS score at cough at the same time interval between the groups (p=0.863). Such a pattern of no significant difference in the VAS score at rest for two groups continued up to 24 hours.

Table 3 compared the heart rate and mean arterial pressure (MAP) measurements between the TEA and ESPB groups at various time intervals. At the initial time, i.e., 0 minutes, no significant differences in heart rate were observed between the two groups. A similar result was also observed in MAP. However, significant differences begin at 5 minutes, where the TEA group shows a higher heart rate (77.7±13.3) compared to the ESPB group (71.0±9.7, p=0.029), and a similar trend is observed for MAP (TEA: 93.5±14.1 vs. ESPB: 84.4±11.9; p=0.009). Significant variations in MAP are also noted at 15 minutes (p=0.013) and 20 minutes (p=0.009). Although the differences in heart rate remain significant up to 40 minutes, the MAP difference becomes highly significant at this time (p=0.001), while the heart rates for TEA and ESPB do not differ significantly at 30 minutes.

Overall, these findings indicate that the TEA group maintains higher heart rates and MAP values early on, suggesting different cardiovascular responses between the two treatment groups throughout the assessment period.

Table 4 compared the Ramsay score between the TEA and ESPB groups at various time intervals. At the initial time, i.e., 0.5 hours, no significant differences in Ramsay scores were observed between the two groups. Similarly, no significant differences in Ramsay scores were observed between the two groups at p=0.656 for both 1 hours and 2 hours.

This trend continued till 24 hours where there was no significant difference in Ramsay score of TEA and ESPB groups (p=0.421).

Table 5 Shows association of symptoms with the two groups TEA and ESPB. There was no significant difference in the proportion of hypotensive patients in the TEA group and ESPB group (p=0.112). Also, no significant difference was seen in in the proportion of those

who had vomiting as a symptom in both the TEA and ESPB groups (p=0.805). There was no significant difference in the proportion of patients who had nausea and shivering in both the groups, p= 1.000 and p=0.251 respectively.

Table 4: Analysis of Ramsay score between TEA (n=40) group and ESPB (n=40) group over time.

Time	Ramsay Score		p value
	TEA	ESPB	
	Mean±SD	Mean±SD	
0.5 hour	3.18±0.385	3.28±0.290	0.452
1 hour	2.40±0.496	2.45±0.504	0.656
2 hours	2.40±0.496	2.45±0.504	0.656
6 hours	1.95±0.389	1.90±0.441	0.592
12 hours	3.48±0.905	3.73±0.877	0.213
24 hours	2.58±0.781	2.73±0.877	0.421

Table 5: Association between TEA (n=40) group and ESPB (n=40) group over time.

Symptoms		ESPB, N	TEA, N	p value
Hypotension	Absent	27	20	0.112
	Present	13	20	
Vomiting	Absent	28	29	0.805
	Present	12	11	
Nausea	Absent	12	12	1.000
	Present	28	28	
Shivering	Absent	27	22	0.251
	Present	13	18	

Mean pulse rate among TEA group was 78.02±3.548 per minute and among ESPB group was 78.15±3.060 (Figure 1).

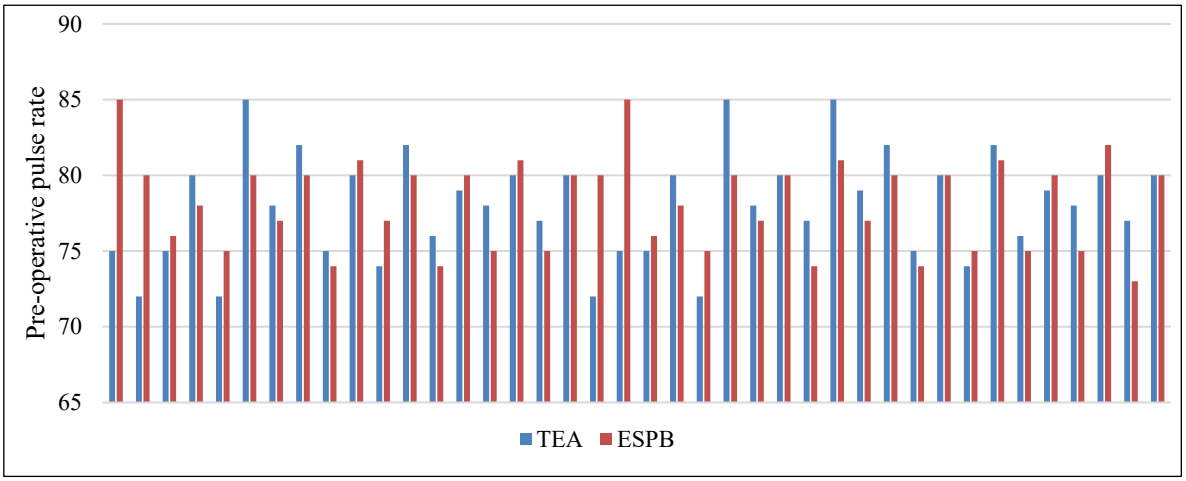

Figure 1: Shows the preoperative pulse rate between TEA and ESPB groups.

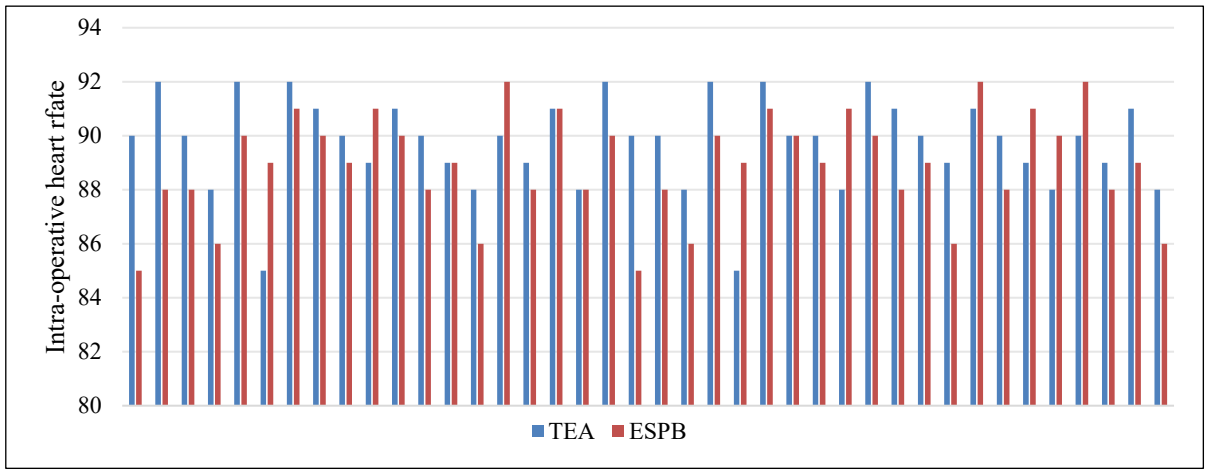

Figure 2: Shows the intra-operative heart rate between TEA and ESPB groups.

Mean heart rate of TEA Group was 78.8±12.6 and ESPB was 81.9±10.8 (Figure 2).

Mean map of TEA 96.1±11.3 and ESPB 95.8±10.3 (Figure 3).

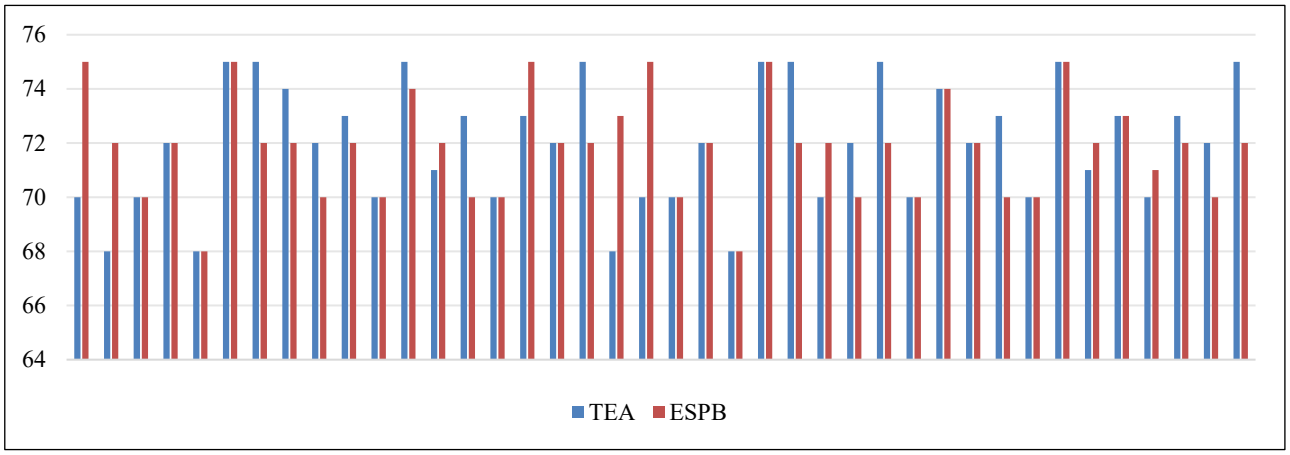

Figure 3: Shows the intra-operative mean arterial pressure between TEA and ESPB groups.

DISCUSSION

Postoperative pain management is a critical aspect of surgical care, impacting patient recovery, morbidity, and overall satisfaction. Historically, thoracic epidural analgesia (TEA) has been considered the gold standard for post-thoracotomy pain control. However, recent advancements have led to the emergence of the Erector Spinae Plane Block (ESPB) as a viable alternative. This study aimed to analyze and compare TEA and ESPB based on their efficacy in various surgical settings.

A study by Karoo et al comparing TEA and ESPB in patients undergoing modified radical mastectomy found that while the mean duration of analgesia was significantly longer in the ESPB group (20±5.60 hours vs. 2.72±4.73 hours), the total doses of rescue analgesics and Visual Analogue Scale (VAS) scores remained comparable over 24 hours.[17] This contrasted with our study which found that TEA (894±115.93 mins.) demonstrated a significantly longer duration of analgesia compared to ESPB. Also, in our study total doses of rescue analgesics remained lower in TEA group as compared to ESPB group but was not found to be statistically significant. Contrary to this, Sakaa et al evaluated the efficacy of ESPB in open cholecystectomy and found that patients receiving ESPB had higher mean numeric pain scale (NPS) values and a significantly increased need for rescue opioids within 24 hours postoperatively.[18] This suggests that ESPB may not be as effective as TEA in abdominal surgeries, at least in the doses used in the study.

In one study by Zubair et al they evaluated ESPB in donor hepatectomy and found that ESPB significantly improved pain control, reduced opioid consumption, and demonstrated a better safety profile than TEA.[19] This reinforces the potential of ESPB in major abdominal surgeries, this is in contrast to our study which from the results suggest that TEA has a significantly better analgesic control than ESPB and in our study there was no significant difference in the symptoms like nausea, hypotension, shivering etc. which indicate comparable safety profile between the two procedures. In a study conducted by Nagaraja et al comparison was made between ESPB and TEA in cardiac surgeries and found that while VAS scores were comparable up to 12 hours, TEA provided better pain control beyond this period.[20] However, in our study no significant difference in the mean VAS score was observed between the groups.

In vascular surgery by Raghavendra et al, it was found that the duration to first rescue analgesia was shorter in ESPB compared to TEA, this was similar to our study where the TEA group showed longer duration to first rescue analgesia as compared with ESPB group.[21] Also like our study, Diwan et al analyzed patients with rib fractures and found that while early postoperative pain control was comparable, TEA resulted in better long-term pain relief and reduced fentanyl consumption.[22] Also, in another study conducted by Reddy et al in a paediatric population found that ESPB provided prolonged analgesia compared to TEA, suggesting its potential use in paediatric populations.[23] Hence our study reinforces that TEA can provide prolonged pain relief, whereas ESPB although a newer technique, while useful for short to medium duration procedures, may not last as long as TEA in terms of continuous analgesia.

This study followed a randomized approach, reducing selection bias and improving the validity of findings, further, the use of block randomization and predefined intervention protocols ensured consistency across participants. Blinding at participant level helped to minimize bias in pain perception and self-reported outcomes. The study directly compares two commonly used regional analgesic techniques, TEA and ESPB, providing valuable clinical insights. The study assesses pain scores (VAS), sedation (Ramsay), hemodynamic stability, and complications, giving a comprehensive understanding of analgesic effectiveness.

This study has few limitations. The study primarily assesses pain relief within 24 hours, limiting the understanding of long-term analgesic efficacy. Blinding at

only the participants level and lack of blinding at the assessor and intervention level may introduce observer bias. As both tea and ESPB are skill-dependent it could potentially introduce variability in block effectiveness. Differences in individual pain perception, surgical techniques, and response to anesthesia may influence results. While pain scores are evaluated, the study does not include long-term functional outcomes such as ambulation or hospital stay duration.

CONCLUSION

Thoracic Epidural Analgesia (TEA) has long been considered the gold standard for post-thoracotomy pain relief, the emergence of Erector Spinae Plane Block (ESPB) since 2016 has gained significant attention for its efficacy in thoracic and abdominal surgeries. Existing literature presents mixed findings, with some studies suggesting comparable outcomes between TEA and ESPB, while others indicate TEA's superiority. This randomized clinical trial comparing Thoracic Epidural Analgesia (TEA) and Ultrasound-Guided Erector Spinae Plane Block (ESPB) for post-operative pain control following laparoscopic cholecystectomy found that TEA demonstrated a significantly longer duration of analgesia compared to ESPB. However, the total consumption of rescue analgesia did not differ significantly between the two groups, though TEA required slightly fewer doses. Pain scores (VAS at rest and during coughing) were similar across both groups at all time intervals. Hemodynamic parameters varied early on, with TEA maintaining higher heart rates and MAP values initially. Sedation levels, incidence of hypotension, nausea, vomiting, and shivering were comparable between the groups. Overall, while TEA provided prolonged analgesia, ESPB remained a viable alternative with similar efficacy and fewer cardiovascular effects.

Recommendations

Further large-scale randomized controlled trials with uniform methodologies are necessary to definitively establish ESPB's efficacy and safety profile compared to TEA, particularly in laparoscopic procedures and other minimally invasive surgeries.

Given the growing evidence supporting the efficacy of Erector Spinae Plane Block (ESPB) in various surgical procedures, it should be considered a viable alternative to Thoracic Epidural Analgesia (TEA) for post-operative pain management, particularly in patients where TEA is contraindicated or difficult to administer.

ACKNOWLEDGEMENTS

Authors would like to thank the Department of Anaesthesiology, Regional Institute of Medical Sciences, Imphal, Manipur, India for their support during study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of RIMS, Imphal, Manipur

REFERENCES

1. Rawal N. Current issues in postoperative pain management. Eur J Anaesthesiol. 2016;33(3):160-171.
2. Harrop-Griffiths W, Sampson C. Thoracic epidural analgesia. Br J Anaesth. 2010;105(suppl_1):i35-i42.
3. Ueshima H, Kitamura A. Experiences with the erector spinae plane block: A meta-analysis of its efficacy and safety. J Clin Anesth. 2018;44:82-89.
4. González J, Macías C, Martínez A. Systematic review and meta-analysis of regional analgesia techniques for thoracotomy. Pain Med. 2017;18(9):1645-54.
5. McHardy F, Wallace A. Postoperative pain. Br J Anaesth. 1998;80(2):145-52.
6. Sessler DI, Riker RR. Postoperative pain and recovery. J Clin Anesth. 2019;39:166-73.
7. Schneider M, van den Heuvel M. Dexmedetomidine as an adjuvant in regional anesthesia: A comprehensive review. Reg Anesth Pain Med. 2017;42(1):18-28.
8. Memtsoudis SG, Mazumdar M, Mazumdar M, et al. Clinical outcomes after laparoscopic cholecystectomy: A comparison of regional versus general anesthesia. Surg Endosc. 2016;30(8):3453-60.
9. Zelter MA, Schumann R. Regional anesthesia in laparoscopic surgery: Current perspectives. Minim Invasive Ther Allied Technol. 2018;27(5):294-301.
10. Barazanchi AM, Knudsen MK. A randomized trial of preoperative thoracic epidural analgesia versus erector spinae plane block in laparoscopic cholecystectomy. Anaesthesia. 2018;73(11):1379-85.
11. Yoo S, Kim J, Lee D, Kim JB. Erector spinae plane block: A narrative review of its use in surgical patients. Anesth Analg. 2017;124(4):1125-32.
12. El-Boghdadly K, Pawa A, Chin KJ. The rising popularity of the erector spinae plane block: A review of the evidence. Br J Anaesth. 2018;120(5):963-70.
13. Bar M, Gozdemir M, Erden I, et al. Comparison of the analgesic efficacy of single-shot thoracic paravertebral block with dexmedetomidine versus ropivacaine alone in major thoracic surgery. J Clin Anesth. 2020;64:109784.
14. Ahiskalioglu, A., Akar, T. F., Aydin, C., et al. (2017). The use of dexmedetomidine as a local anesthetic adjuvant improves block onset and duration: A meta-analysis. European Journal of Anaesthesiology, 34(8), 592–602.
15. Tighe, P., & Ouellette, M. (2016). Comparative evaluation of thoracic epidural analgesia and erector spinae plane block efficacy in postoperative analgesia: A systematic review. Regional Anesthesia, 39(5), 451–459.
16. Blanco, R., Fajardo, M., & Maldonado, T. (2016). Ultrasound description of the erector spinae plane

block: A novel technique for managing thoracic neuropathic pain. Anaesthesia, 71(3), 450–451.
17. Karoo K, Kumar M, Sinha M. A randomised prospective single-blind pilot study to compare the analgesic efficacy of thoracic epidural block and erector spinae plane block in breast cancer surgery. Ind J Anaes. 2022;66(Suppl 3):S148-53.
18. Sakae TM, Yamauchi LHI, Takaschima AKK, Brandão JC, Benedetti RH. Comparison between erector spinal plane block and epidural block techniques for postoperative analgesia in open cholecystectomies: a randomized clinical trial. Braz J Anesthesiol. 2020;70(1):22-7.
19. Zubair M, Adil Khan M, Khan MNA, Iqbal S, Ashraf M, Saleem SA. Comparison of continuous thoracic epidural with erector spinae block for postoperative analgesia in adult living donor hepatectomy. Cureus. 2022;14(3):e23151.
20. Nagaraja PS, Ragavendran S, Singh NG, Asai O, Bhavya G, Manjunath N, Rajesh K. Comparison of continuous thoracic epidural analgesia with bilateral erector spinae plane block for perioperative pain management in cardiac surgery. Ann Card Anaesth. 2018;21(3):323-27.
21. Ragavendran S, Raghu C, Prasad SR, Arasu T, Nagaraja PS, Singh NG, et al. Comparison of epidural analgesia with ultrasound-guided bilateral erector spinae plane block in aorto-femoral arterial bypass surgery. Ann Card Anaesth. 2022;25(1):26-33.
22. Diwan SM, Adhye B, Nair A, Sancheti P. Comparison of thoracic epidural and thoracic erector spinae plane block for pain relief of posterolateral rib fractures—a retrospective cohort study. Ain-Sham J Anesthesiol. 2022;14(1).
23. Reddy NV, Ghodke S, Hiremath RN, Nimbannavar SM, Kulkarni MK. Comparison of thoracic epidural and ultrasound guided erector spinae plane block in pediatric thoracic surgeries. BLDE University J Heal Sci. 2022;7(2):271-5.

Cite this article as: Lollen L, Sengul N, Dhayanithy M, Singh LP, Annu T, Marak KM. Comparison of thoracic epidural analgesia and ultrasound guided erector spinae plane block for post operative pain control following laparoscopic cholecystectomy: a randomized clinical trial. Int J Res Med Sci 2025;13:4815-22.