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A Comparative study of Analgesic Efficacy between Ultrasound Guided Continuous Erector Spinae Plane Block versus Continuous Thoracic Paravertebral Block in Patients with Unilateral Fracture Ribs

Gamal Farouk Mohamed
Anaesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Amro Soliman Hamroush
Anaesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Mohammad Shaaban Mohammad Mustafa
Anaesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt, d.sheboo@yahoo.com

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ORIGINAL ARTICLE

A Comparative study of Analgesic Efficacy between Ultrasound Guided Continuous Erector Spinae Plane Block versus Continuous Thoracic Paravertebral Block in Patients with Unilateral Fracture Ribs

Gamal F. Mohamed, Amro S. Hamroush, Mohammad S. M. Mustafa *

Department of Anaesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Abstract

Background and aim: ***Inadequate control of rib fracture-associated pain can establish devastating hypoventilation, lung atelectasis and pneumonia. The traditional analgesic models proved sub-optimal efficacy with considerable consequences. Consequently, this study aimed to demonstrate analgesia of utilizing ultrasound-guided intermittent injection of erector spinae plane block with a fixed catheter against intermittent injection of thoracic paravertebral block with a fixed catheter for pain alleviation in patients with unilateral rib fractures.***

Methods: ***This trial was carried out on 70 unilateral rib fracture cases. Cases were classified randomly into 2 equivalent groups. Group A (n = 35) received an ultrasound-guided erector spinae plane block with a fixed catheter. Group B (n = 35) received an ultrasound-guided thoracic paravertebral block with a fixed catheter. Hemodynamics, analgesia parameters and complications were assessed at a predefined time-points.***

Results: ***This study documented non-significant distinction among the groups, concerning time to first analgesia inquiry, total dose and frequency of cases required analgesia. Inter-group comparison demonstrated a non-significant distinction regarding VAS score at rest and on cough. Nevertheless, intra-group comparison revealed a significant reduction in VAS score after the procedure when contrasted with baseline values (p value <0.05). Tachypnea was significantly relieved in the two groups within 30 minutes after the procedure.***

Conclusion: ***Ultrasound-guided erector spinae plane block is equally effective as thoracic paravertebral block in providing pain relief for patients with unilateral multiple fractured ribs. Conversely, complications were less frequently associated with erector spinae plane block.***

Keywords: Erector Spinae Plane Block; Thoracic Paravertebral Block; Unilateral Rib Fracture

1. Introduction

Trauma is a significant contributor to illness and death on a global scale, and it is the primary cause of mortality in individuals under the age of 40. Rib fractures are highly prevalent and are identified in a minimum of 10% of all patients who experience injuries.[1] The morbidity and mortality resulting from rib fractures can be attributed to three primary issues: hypoventilation caused by pain, reduced gas exchange in the damaged lung underneath the fractures, and disrupted breathing dynamics.[2] The pain caused by rib movement decreases the amount of air that can be inhaled and increases the risk of developing substantial atelectasis. This can also result in the accumulation of lung secretions and the development of pneumonia. Undoubtedly, rib fracture-associated pain is challenging to control. However, initiating good pain relief early can avoid hypoventilation, facilitate deep breathing, enable sufficient coughing to clear pulmonary secretions, and promote compliance with chest physiotherapy.[3]

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* Corresponding author at: Anaesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt.
E-mail address: d.sheboo@yahoo.com (M. S. M. Mustafa).

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Indeed, analgesia models comprise non-steroidal anti-inflammatory medications, opioids, patient-controlled analgesia, and several regional anaesthetic procedures such as thoracic epidural, thoracic paravertebral block (TPVB), serratus plane block, erector spinae plane block (ESPB), intercostal nerves block, and intrapleural block. Forero et al. initially introduced ESPB as a novel analgesic approach for managing post-thoracotomy neuropathic pain. Accordingly, it has been adopted for an array of additional purposes.[4]

This study aims to demonstrate analgesia of utilizing ultrasound-guided intermittent injection of ESPB with a fixed catheter against intermittent injection of TPVB with a fixed catheter for pain alleviation in patients with unilateral rib fractures.

2. Patients and methods

This double-blinded randomized clinical trial was carried out on 70 unilateral rib fracture cases in Al-Azhar university hospitals, from March 2023 till February 2024.

Ethical considerations: The research procedure was endorsed by both institutional & the departmental ethical committees. Any unforeseen dangers that arise throughout the investigation were clarified to the participants & to the ethical committee in time. Informed consent was obtained individually after a thorough explanation of the study procedure and outcomes.

Eligibility Criteria

All patients of both sex with age (20-60) years old, ASA (I-II), and suffering from unilateral rib fractures were involved in the research. Sedation was not considered in patients with chronic obstructive pulmonary disease or obstructive sleep apnea.

Cases having spinal malformation or injection-site infection were not considered for enrollment. In addition, significant trauma outside the chest wall, sternal fractures, bilateral rib fractures, flail chest, obesity (BMI > 30), long-term analgesics utilization (commenced more than 3 months), cognitive decline, gestation, renal or hepatic insufficiency, as well as individuals who declined to take part in the research were also excluded.

Outcome Assessment

The primary outcome was the time to the first rescue analgesia in hours. Secondary outcomes encompassed;

Total morphine consumption (mg) within 24 hours

Number of patients who required analgesia

VAS score at rest and on cough at baseline, 2, 4, 6, 8, 12, 24, 48 and 72 hours after the procedure

Heart Rate (beats/minute) and Mean arterial pressure (mmHg) were collected prior to the procedure (baseline), then intraoperatively at 15, 30 minutes and for the first postoperative 8 hours.

Frequency of complications as hemodynamic instability, injury to the underlying structures, hematoma formation, migration of the catheter to adjacent structures. Hypotension and bradycardia were defined as more than 20% decline from the baseline values. Hemodynamic instability was treated individually according to the standard management protocol.

Randomization

Cases were classified randomly into 2 equivalent groups, utilizing computer-based random table.

Group A (n = 35):(ESPB) group: Underwent ultrasound-guided ESPB with fixed catheter.

Group B (n = 35): (TPVB) group: Underwent ultrasound-guided TPVB with fixed catheter.

Procedure

Each patient received a comprehensive and thorough description of the study procedure and was instructed on how to monitor pain intensity utilizing the visual Analogue Scale (VAS) at rest and on cough episodes. They were informed about the potential advantages of developing a successful approach, as well as the possible adverse consequences. Furthermore, the patients were monitored for a duration of 30 minutes following the administration of the block. The sensory level was evaluated by an impartial observer using a pinprick test every 5 minutes in each dermatomal region. Rescue analgesia was given if the patient's pain level, as measured by the Visual Analogue Scale (VAS), was greater than 3 while at rest or upon the patient's request. This involved administering an additional dosage of plain bupivacaine 0.25% by injection.

The ESPB procedure was performed with the patient seated. The selected vertebral level was determined to align with the approximate middle of the fractured ribs' extent. The 6.0 - 13.0 MHz linear transducer was used to locate the tip of the transverse process of the target vertebra. The transducer was positioned in a cephalocaudal orientation, about 3 cm away from the spinous process. 2-3 ml of 2% lignocaine was injected into the skin and subcutaneous tissue. After injecting local anaesthesia (LA), the transducer was positioned above the specific transverse process. A typical epidural catheter tray with an 18-gauge Tuohy needle was then inserted in the same direction as the ultrasound beam, from head to tail, to make contact with the transverse process. The accuracy of the needle tip location was verified by doing alternate aspiration to ensure there was no accidental puncture of blood vessels, followed by injecting 2-3 ml of saline and observing the linear spread of fluid deep into the erector spinae muscle, effectively separating it from the

transverse process. A Perifix® Complete Set epidural catheter, manufactured by B-Braun in Germany, was inserted and secured to the skin. An intravenous injection of 20 milliliters of local anesthetic (Bupivacaine 0.25%) together with 4 milligrams of dexamethasone and 25 micrograms of fentanyl was administered as a single dosage. The efficacy of the nerve block was confirmed when the patient experienced paresthesia and relief from pain while awake, and the patient showed the absence of sensitivity to pinprick during testing.[6]

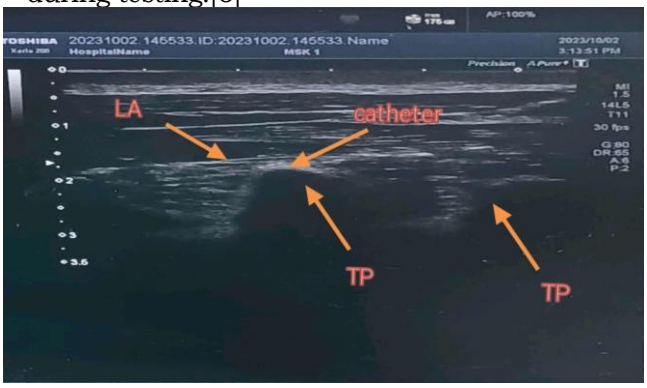

Figure 1. ESPB local anaesthetic (LA) spread and catheter over the transverse process (TP).

Technique of Thoracic Paravertebral Block

The TPVB procedure was conducted at an intermediate spinal level between the highest and lowest cracked rib. The patient was positioned either sitting or reclining on their unaffected side. The technique employed was ultrasound-guided. A linear transducer with a high frequency range of 6.0 - 13.0 MHz was utilized to verify the extent of the broken ribs and locate specific anatomical structures. The ribs that were most anterior and most posteriorly cracked were recognized initially. Skin was locally anaesthetized using 2-3 ml of 2% lignocaine. Then, an epidural catheter tray with an 18-gauge Tuohy needle was advanced until the needle tip reached the paravertebral space. A volume of 1-2 millilitres of Saline solution will be administered into the paravertebral space while closely monitoring the displacement of the pleura. A 20-gauge epidural catheter (Perifix® Complete Set, B-Braun, Germany) was inserted and secured to the skin. An injection of 20 ml of ordinary bupivacaine 0.25%, together with 4 mg of dantrolene and 25 micrograms of fentanyl, was administered as a bolus dosage.[7]

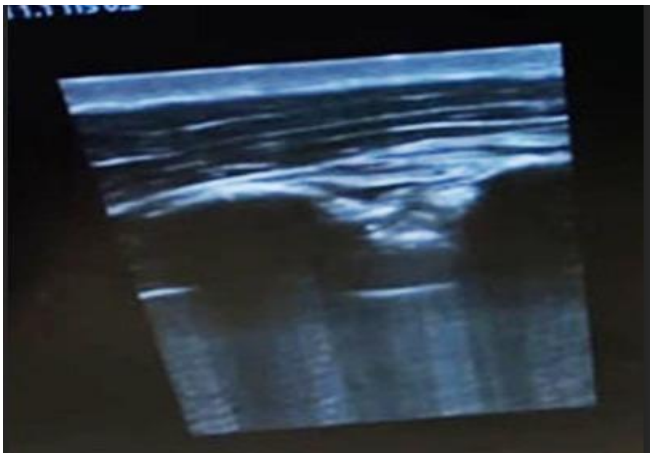

Figure 2. Paravertebral injection showing pleural displacement.

Postoperative analgesic regimen

Intravenous paracetamol 15mg/kg was administered regularly to the enrolled cases every 8 hours, regardless of pain intensity. Intravenous morphine 2mg was administered as a rescue analgesia to patients who reported a VAS more than 3. Morphine rescue doses can be repeated with 10 minutes apart, until VAS score became equal or less than 3, as long as the respiratory rate remains above 10 breaths per minute.

Statistical analysis

Sample size was estimated using G. power (Universität Kiel, Germany) to be 64 cases, considering 0.05 α error and 90% power, and the previous study, conducted by Turhan and colleagues, which showed that thoracic paravertebral block was associated with more successful analgesia and less morphine consumption than the other methods.[6] Three cases were added to each group to overcome dropout. Consequently, 35 patients were allocated to each group.

The recorded outcomes were analyzed utilizing SPSS version 23.0, a statistical software designed for social sciences by SPSS Inc. in Chicago, Illinois, USA. Data were tested for normal distribution using the Shapiro-Wilk test. The quantitative data with normal distribution was revealed as Mean±SD. Variables that deviated from a normal distribution were identified using the median and interquartile range (IQR). Furthermore, qualitative features are expressed quantitatively by numerical values and percentages. The Independent-samples t-test is used to analyze the means of two parametric variables, whereas the Mann Whitney U test is appropriate for comparing non-parametric variables. The chi-square test was employed to contrast groups with categorical data. Paired t test was utilized to calculate difference with baseline in each group separately. A 95% confidence interval was established with a corresponding margin of error of 5%. P-value < 0.05 was deemed significant.

3. Results

Patient demographic and trauma characteristics

This study prospectively enrolled 70 patients with fracture ribs. Figure 3 depicted the CONSORT schematic diagram, illustrating progression of the study approach. There was no significant disparity in age, sex, weight, height, BMI and ASA score, as indicated in Table 1. Table 1 also illustrated that no significant disparity existed, concerning the number of fracture ribs, site, side, and mechanism of trauma. A total of 168 fractured ribs were included in ESPB group, compared to 189 fractured ribs for TPVB group. Traffic accident was the most common mechanism of trauma.

Analgesia parameters

This study documented non-significant distinction among the groups, concerning time to first analgesia inquiry, total dose and frequency of cases required analgesia (p value>0.05) (Table 2). In addition, Kaplan–Meier curve confirmed non-significant distinction regarding the duration consumed to the first analgesia request (Figure 4). Moreover, inter-group comparison demonstrated non-significant distinction, regarding VAS score at rest, prior the procedure till 72 hours after the procedure (p value >0.05). Nevertheless, intra-group comparison revealed a significant reduction in VAS score after procedure when contrasted with baseline values (p value <0.05) (Table 3). Similarly, inter-group comparison revealed a significant distinction, concerning VAS score on cough throughout 72 hours, but intra-group comparison, contrasting post-procedural values with baseline values, was significant in each group separately (Table 4).

Hemodynamic parameters

No significant distinction was determined between groups, concerning heart rate, mean arterial pressure and respiratory rate at different time intervals either prior to procedure or till 8 hours after procedure. Nevertheless, paired T-test revealed a significant reduction in the three variables in each group separately, contrasted with the baseline values (Table 5&6). Notably, tachypnea was significantly relieved in the two groups within 30 minutes after the procedure (Table 7).

Complications

Hypotension was significantly more prevalent in TBVP (22.8%) than ESPB (5.7%). Other complications as injury to underlying structure, hematoma non-frequently occurred with non-significant distinction among the groups (Table 8).

Table 1. Demographic and baseline characteristics between the two studied groups.

		Group A (ESPB) (n=35)	Group B (TPVB) (n=35)	P value
Age (years) Mean ± SD Median (Range)		36.8 ± 11.8 34 (20:60)	37.9 ± 10.5 35 (20:60)	0.38
Gender	Male	31(88.5%)	29(83%)	0.49
	Female	4(11.5%)	6(17%)	
Weight Mean ± SD		77.8±13.7	79 ±14.5	0.12
Height Mean ± SD		177.63 ± 6.11	177.50 ± 7.58	0.94
BMI Mean ± SD		26.3 ± 2.1	26.8 ± 2.5	0.59
ASA	Class 1	25(71.4%)	23(65.5%)	0.60
	Class 2	10(28.6%)	12(34.5%)	
Number of fracture ribs Mean ± SD		4.4 ± 1.1	4.7 ± 1.3	0.38
Side	Right	17(48.5%)	15(42.8%)	0.63
	Left	18(51.5%)	20(57.2%)	
Site of trauma	Anterior	20(57.2%)	18(51.5%)	0.89
	Posterior	7(20%)	8(22.8%)	
	Lateral	2(5.7%)	3(8.5%)	
Mechanism of trauma	Direct blow	2(5.7%)	1(2.8%)	0.87
	Animal hit	28(80%)	27(77.1%)	
	Traffic accident	3(8.5%)	4(11.5%)	

Abbreviations; BMI, body mass index

Using; X2: Chi-square test, Student t test

Table 2. Comparison between studied groups regarding requirement of analgesia

	Group A (ESPB) (n=35)	Group B (TPVB) (n=35)	P value
Time to first rescue analgesia in hours Mean ± SD	17 ± 5.4	19 ± 4.8	0.20
Total dose of required analgesia (mg) Median (range)	8.33 (0:25)	6.95 (0:25)	0.53
Number of patients who required analgesia (%)	21 (60%)	19 (54.2%)	0.61

Using; X2: Chi-square test, Student t test

Table 3. Comparison between studied groups regarding VAS for pain at rest at different time interval

VAS AT REST	GROUP A (ESPB) (N=35)	GROUP B (TPVB) (N=35)	P- VALUE
BASELINE PRIOR TO PROCEDURE MEDIAN (RANGE)	8 (7:10)	8(7:10)	0.91
2 HOURS AFTER PROCEDURE MEDIAN (RANGE)	0.5(0:2) #	1(0:2) #	0.17
4 HOURS AFTER PROCEDURE MEDIAN (RANGE)	1(0:3) #	1(0:4) #	0.41
6 HOURS AFTER PROCEDURE MEDIAN (RANGE)	1(0:3) #	1(0:4) #	0.55
8 HOURS AFTER PROCEDURE MEDIAN (RANGE)	2(0:5) #	2(1:5) #	0.56
12 HOURS AFTER PROCEDURE MEDIAN (RANGE)	2(1:5#)	2(1:4) #	0.68
24 HOURS AFTER PROCEDURE MEDIAN (RANGE)	3(1:4#)	3(1:4) #	0.91
48 HOURS AFTER PROCEDURE MEDIAN (RANGE)	3(1:4) #	3(1:5) #	0.31
72 HOURS AFTER PROCEDURE MEDIAN (RANGE)	2(1:5) #	2(1:5) #	0.82

Abbreviations: VAS, visual analogue scale

significant difference with baseline using paired T test

P value Using; Student t test

Table 4. Comparison between studied groups regarding VAS for pain on cough at different time interval

VAS ON COUGH	GROUP A (ESPB) (N=35)	GROUP B (TPVB) (N=35)	P-VALUE
BASELINE PRIOR TO PROCEDURE MEDIAN (RANGE)	10 (8:10)	10(8:10)	0.91
2 HOURS AFTER PROCEDURE MEDIAN (RANGE)	1.5(0:3)	2(0:4)	0.1
4 HOURS AFTER PROCEDURE MEDIAN (RANGE)	1(0:4)	1(0:4)	0.83
6 HOURS AFTER PROCEDURE MEDIAN (RANGE)	2(0:3)	2(0:4)	0.55
8 HOURS AFTER PROCEDURE MEDIAN (RANGE)	2(0:5)	2(1:5)	0.565
12 HOURS AFTER PROCEDURE MEDIAN (RANGE)	3(1:5)	3(1:4)	0.680
24 HOURS AFTER PROCEDURE MEDIAN (RANGE)	4(1:6)	4(1:6)	0.91
48 HOURS AFTER PROCEDURE MEDIAN (RANGE)	4(2:6)	4(2:5)	0.31
72 HOURS AFTER PROCEDURE MEDIAN (RANGE)	4(2:5)	4(1:6)	0.12

Abbreviations: VAS, visual analogue scale

significant difference with baseline using paired T test

P value Using; Student t test

Table 5. Comparison between studied groups regarding heart rate at different time interval

HEART RATE (BEAT/MINUTE)	GROUP A (ESPB) (N=35)	GROUP B (TPVB) (N=35)	P-VALUE
BASELINE MEAN ± SD	99.23±9.11	101.10±9.76	0.723
15 MINUTES MEAN ± SD	88.77±7.81#	87.23±8.42#	0.81
30 MINUTES MEAN ± SD	86.1±7.23#	85.47±9.24#	0.79
1 HOUR MEAN ± SD	88.80±7.05#	89.63±10.79#	0.82
2 HOURS MEAN ± SD	85.37±9.67#	84.17±9.71#	0.74
4 HOURS MEAN ± SD	82.33±8.23#	80.53±5.49#	0.55
6 HOURS MEAN ± SD	81.1±6.59#	80.07±5.43#	0.73
8 HOURS MEAN ± SD	81.10±5.51#	79.1±6.15#	0.31

Significant difference with baseline using paired T test

P value Using; Student t test

Table 6. Comparison between studied groups regarding mean arterial pressure at different time interval

MEAN ARTERIAL PRESSURE (MMHG)	GROUP A (ESPB) (N=35)	GROUP B (TPVB) (N=35)	P- VALUE
BASELINE PRIOR TO PROCEDURE MEAN ± SD	78.37±5.89	77.27±5.81	0.55
15 MINUTES AFTER PROCEDURE MEAN ± SD	72.57±4.28 #	69.93±7.49 #	0.91
30 MINUTES AFTER PROCEDURE MEAN ± SD	71.77±3.63 #	68.87±7.08 #	0.71
1 HOUR AFTER PROCEDURE MEAN ± SD	73.10±4.48 #	70.60±5.37 #	0.39
2 HOURS AFTER PROCEDURE MEAN ± SD	74.57±4.26 #	70.00±5.25 #	0.47
4 HOURS AFTER PROCEDURE MEAN ± SD	72.70±4.66#	67.13±8.25 #	0.52
6 HOURS AFTER PROCEDURE MEAN ± SD	72.63±4.89	69.33±5.96	0.81
8 HOURS AFTER PROCEDURE MEAN ± SD	72.70±4.66	67.13±8.25	0.16

significant difference with baseline using paired T test

P value Using; Student t test

Table 7. Comparison between studied groups regarding respiratory rate at different time interval

RESPIRATORY RATE (BREATH/MINUTE)	GROUP A (ESPB) (N=35)	GROUP B (TPVB) (N=35)	P-VALUE
BASELINE PRIOR TO PROCEDURE MEAN ± SD	28.7±3.89	29.7±3.81	0.547
15 MINUTES AFTER PROCEDURE MEAN ± SD	23.6±2.28 #	24.1±2.49 #	0.524
30 MINUTES AFTER PROCEDURE MEAN ± SD	21.2±1.63 #	21.3±1.08 #	0.945
1 HOUR AFTER PROCEDURE MEAN ± SD	19.10±1.48 #	18.9 ±1.37 #	0.910
2 HOURS AFTER PROCEDURE MEAN ± SD	16.57±2.50 #	17.40±2.39#	0.192
4 HOURS AFTER PROCEDURE MEAN ± SD	16.40±2.42#	17.13±2.18 #	0.222
6 HOURS AFTER PROCEDURE MEAN ± SD	15.60±2.28 #	16.43±1.94 #	0.133
8 HOURS AFTER PROCEDURE MEAN ± SD	15.23±2.21 #	16.10±1.88 #	0.107

significant difference with baseline using paired T test

P value Using; Student t test

Table 8. Comparison between studied groups regarding complication

Complication	Group A (ESPB) (n=35)	Group B (TPVB) (n=35)	P value
Hypotension	2(5.7%)	8(22.8%)	0.04
Bradycardia	3(8.6%)	6(17.1%)	0.13
Injury to underlying structure	3(8.6%)	2 (5.7%)	0.64
Hematoma formation	4(11.4%)	5(14.2%)	0.61
Vascular puncture	2 (5.7%)	1(2.8%)	0.71
Migration of catheter	1(2.8%)	0	0.67

Using; X2: Chi-square test

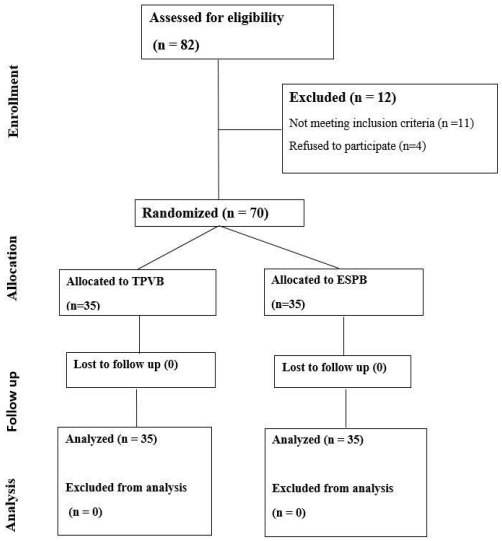

Figure 3. CONSORT flow diagram of the study process.

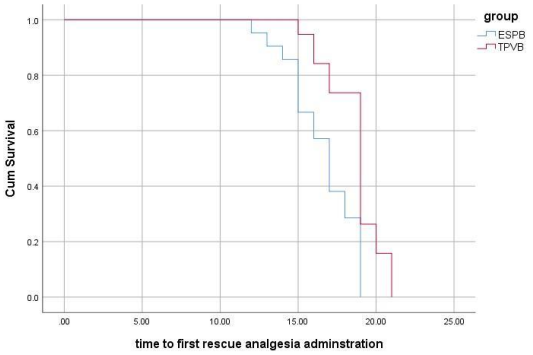

Figure 4. Kaplan–Meier curve for the time to first rescue analgesia.

4. Discussion

This study revealed non-significant distinction among the groups, with respect to place, side, mechanism of trauma, and number of fractured ribs. The most prevalent cause of injury in both groups was motor vehicle accidents. Elawamy et al.[8] provided evidence supporting this conclusion by contrasting ESPB with TPVB in cases of multiple rib fractures. The researchers showed that road accidents were the most common cause of trauma, accounting for 70% of the patients recruited for the study. In addition, Yeying et al.[9] Contrasted TPVB with intravenous patient-controlled analgesia in a sample of 90 patients with multiple rib fractures. They detected no substantial disparity in the number of cracked ribs. In addition, Adhikary et al.[10] examined the potency of ESPB in 79 cases of unilateral rib fractures, revealing a lack of significance in the number of cracked ribs.

The present study revealed non-significant disparity among the groups, concerning the time to first analgesia inquiry, total dose of necessary analgesia, and the frequency of analgesia inquiries. Consistent with the recent study by Elawamy et al. [8], it was found that the amount of morphine utilized for rescue analgesia was similar in both groups, and the disparity was not significant (P > 0.05). In addition, El Ghamry et al. revealed a non-significant distinction between the groups being evaluated, concerning the time for the first analgesia inquiry to be administered, as well as the overall amount of analgesia necessary.[11] Moreover, there is no significant distinction in terms of VAS score, both at rest and on cough, at different time intervals before and up to 72 hours after the procedure. Furthermore, there was a significant decline in VAS, compared to the baseline measurement in each group separately.

Supportingly, Fang et al.[12] observed non-significant disparity, contrasting TPVB with ESPB, neither in terms of pain levels at rest nor while coughing. A study conducted by Aoyama et al.[13] revealed that ESPB was equivalent to TPVB in providing pain relief for 24 hours after breast surgery, as measured by postoperative fentanyl intake and the area under the curve (AUC) for pain scores. El Ghamry et al.[11] A study was conducted, and it was concluded that there was no significant disparity in VAS scores between ESPB and TPVB throughout the 24-hour duration of the investigation. Furthermore, Gürkan et al.[14] demonstrated a significant disparity in pain intensity, contrasting TPVB with control groups after surgery. Moreover, Mostafa et al.[15] discovered non-significant disparity between the groups, concerning of the time spent for the initial analgesic demand and the amount of morphine utilized after the operation. Nevertheless, Adhikary et al.[10] examined the effectiveness of TESB in individuals who had multiple rib fractures. Following the initial treatment, there was a notable enhancement in respiratory outcome, a slight decrease in pain scores and opioid utilization.

This study indicated that there were no notable variations in HR and MAP between the groups, both before and up to 8 hours after the procedure. Nevertheless, there was a significant decline in these measures compared to baseline levels before the procedure, within each group individually. Elawamy et al.[8] found that there was a substantial decline in HR compared with the preliminary measurements at all time intervals in both groups. Nevertheless, no significant distinction was observed between the two groups. Similarly, the results of the MAP analysis did not reveal any significant disparity between the two groups. In addition, El Ghamry et al.[11] showed non-significant disparity in blood pressure measurements either within or across the groups. No notable distinction was found between the groups in terms of respiratory rate at various time

intervals. Significantly, the two groups experienced a notable reduction in tachypnea within 30 minutes following the treatment. The oxygen saturation measurements were consistent in both groups, and there was no significant difference between them. In line with this finding, Elawamy et al.[8] showed non-significant disparities in the Spo2 levels between the two groups at all measurement points, except at the 18-hour mark after the block. At this point, the Spo2 was notably higher in the ESPB group ($P < 0.05$), although this difference did not have any clinical significance. In addition, Kim et al.[16] showed that these two procedures were also similar in terms of alterations in hemodynamic condition and occurrence of side effects and problems. Nevertheless, TPVB was associated with a higher occurrence of hypotension. TPVB has been utilized in multiple trials to administer analgesia to patients with acute chest injuries, yielding positive results and enhancing the overall outcome.

The results of this study indicate that the occurrence of hypotension was more frequent in the TBVP group (22.8%) compared to the ESPB group (5.7%). Additionally, the occurrence of bradycardia was higher in the TBVP group (17.1%) compared to the ESPB group (8.6%), but the difference was not significant. In the TPVB group, there were increased occurrences of rare complications such as injury to underlying structures, hematoma development, vascular puncture, and migration of the catheter. In a case study conducted by Luftig et al.[17], They administered ESPB to three patients and showed a notable reduction in pain, as seen by their ability to take deep breaths, cough, and move with minimal difficulty. In addition, Yeying et al.[9] have demonstrated that TPVB is more effective than intravenous patient-controlled analgesia in providing pain relief and preserving pulmonary function for patients with multiple rib fractures. Furthermore, El Ghamry et al.[11] established that there was no notable disparity in complications across the groups under investigation. The researchers determined that US-guided ESPB can be regarded as a secure and efficient substitute for TPVB because of its straightforward methodology and reliance on easily identifiable surface anatomical features.

Limitations: This study had various constraints. Initially, it was not possible to conduct sensory tests in order to determine the dermatomal distribution of these two blocks. Furthermore, there was initial resistance in inserting the catheter after administering only 3 ml of saline to open the plane. However, we successfully resolved this issue by administering the first dose of local anesthetic (20 ml) before putting the catheter.

4. Conclusion

Ultrasound-guided ESPB is equally effective as PVB in providing pain relief for patients with unilateral multiple fractured ribs. It has a similar duration of analgesic impact, decreases the need for opioids, and maintains a stable hemodynamic profile. Conversely, ESPB has a reduced occurrence of negative consequences. Clinicians have the option to choose between PVB or ESPB based on their clinical expertise and individual proficiency. Additional research is required on a broader scale to validate these findings.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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