

# Continuous Regional Nerve Blocks vs. Thoracic Epidural Block for Rib Fracture Trauma: A Retrospective Cohort Study

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## Background

- Traumatic rib fractures can cause debilitating pain and contribute to morbidity and mortality<sup>1</sup>.
- Inadequate pain management can increase risk of respiratory complications.
- Common analgesic techniques include continuous forms of thoracic epidural block (TEB) or regional nerve blocks paired with multimodal analgesia<sup>2</sup>.
- TEB has been increasingly critiqued for its technical complexity, contraindications, and adverse effects<sup>3</sup>.
- Continuous regional nerve blocks including the erector spinae & serratus anterior plane blocks (ESPB, SAPB) have gained favor as safe and effective alternatives for rib fracture pain<sup>4,5</sup>.
- This single-site, retrospective cohort study compared the analgesic effectiveness of TEB vs. ESPB vs. SAPB for rib fracture pain management.

## Methods

**Hypothesis:** ESPB and SAPB provided non-inferior analgesia to TEB for traumatic rib fractures.

**Population:** 336 patients admitted for rib fracture trauma between 2017 and 2021 who received TEB (n=188), ESPB (n=136), or SAPB (n=12).

**Primary Outcomes:** Average pain (at rest & with activity), opioid consumption during block (MME), and length of stay (ED, ICU, and hospital).

**Ethics Statement:** This study has been approved by the local Institutional Review Board. This study has been deemed minimal risk and a waiver of informed consent was granted by the IRB.

Table 1. Demographic and Baseline Health Characteristics

Characteristic	TEB (n=188)	ESPB (n=136)	SAPB (n=12)	p-value
<b>Age</b> , years, mean ± SD	65 ± 17 <sup>a</sup>	70 ± 17 <sup>b</sup>	63 ± 16 <sup>a,b</sup>	<b>0.024</b>
<b>Sex</b> , n (%)				ns
Female	72 (38.3)	54 (39.7)	4 (33.3)	
Male	116 (61.7)	82 (60.3)	8 (66.7)	
<b>Race</b> , n (%)				ns
Black/African American	5 (2.7)	4 (2.9)	0 (0.0)	
Other	26 (13.8)	14 (10.3)	4 (33.3)	
White	157 (83.5)	118 (86.8)	8 (66.7)	
<b>Ethnicity</b> , n (%)				ns
Hispanic/Latino	23 (12.2)	9 (6.6)	2 (16.7)	
Not Hispanic/Latino	164 (87.2)	124 (91.2)	10 (83.3)	
Unknown	1 (0.5)	3 (2.2)	0 (0.0)	
<b>BMI</b> , median (IQR)	27.6 (7.7)	27.1 (8.1)	29 (7.1)	ns
<b>Comorbidities</b> , n (%)				ns
0	77 (41.0) <sup>a</sup>	38 (27.9) <sup>b</sup>	2 (16.7) <sup>a,b</sup>	
1	58 (30.9) <sup>a</sup>	53 (39.0) <sup>a,b</sup>	7 (58.3) <sup>b</sup>	
2	40 (21.3)	35 (25.7)	2 (16.7)	
3	9 (4.8)	9 (6.6)	0 (0.0)	
4	4 (2.1) <sup>a,b</sup>	1 (0.7) <sup>b</sup>	1 (8.3) <sup>a</sup>	
<b>AIS Rib Fractures</b> , n (%)				nt
2	49 (26.1)	22 (16.2)	0 (0.0)	
3	133 (70.7)	111 (81.6)	12 (100.0)	
4	6 (3.2)	3 (2.2)	0 (0.0)	
<b>Rib Fracture Injury</b> , n (%)				nt
Flail	25 (13.3)	12 (8.8)	0 (0.0)	
Non-Flail	163 (86.7)	124 (91.2)	12 (100.0)	
<b>Surgery during Admit</b> , n (%)				nt
yes	61 (32.4)	44 (32.4)	5 (41.7)	
no	127 (67.6)	92 (67.6)	7 (58.3)	

Figure 1. Average Numeric Pain Scale (NPS): Admission to Block + 7 days

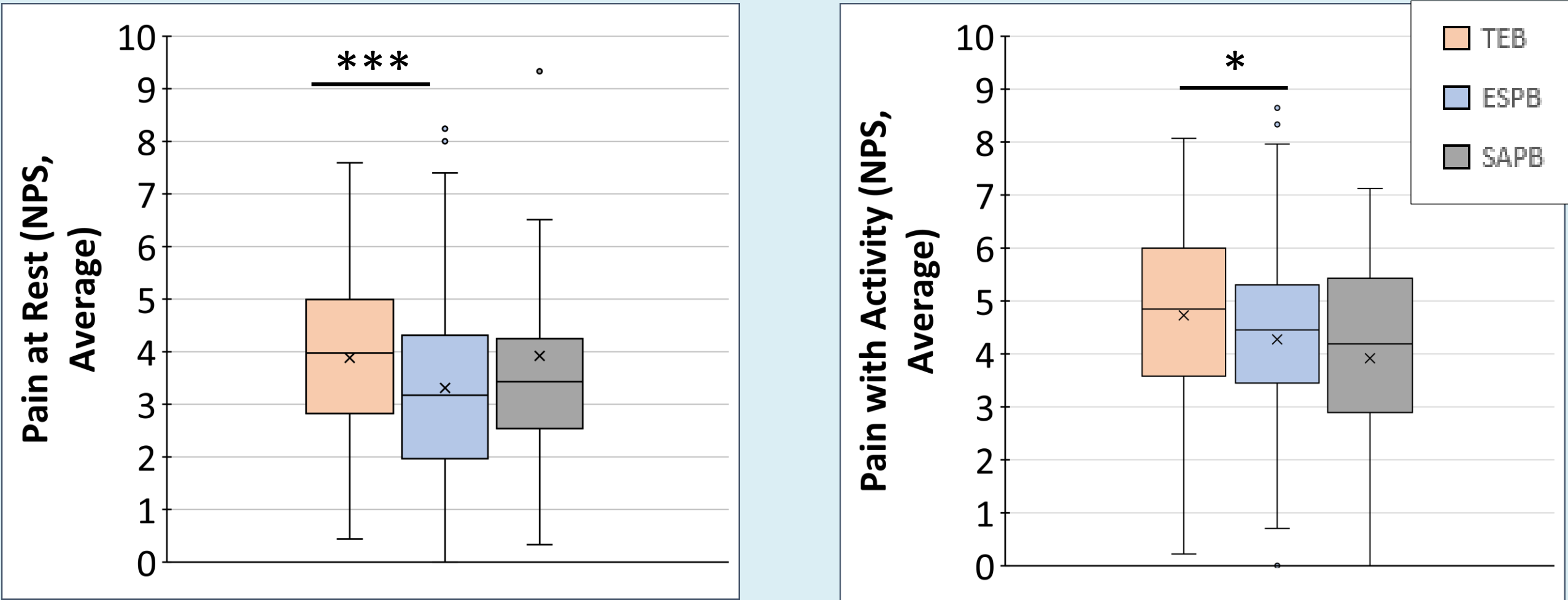


Table 2. Secondary Outcomes

Outcome	TEB (n=188)	ESPB (n=136)	SAPB (n=12)	p-value
<b>Opioid Use</b> MME, median (IQR)	116.3 (176.2)	108.1 (193.6)	124.4 (127.2)	ns
<b>Length of Stay</b> days, mean ± SD				
ED	0.35 ± 0.67	0.40 ± 0.38	0.37 ± 0.47	<b>0.038</b>
ICU	3.54 ± 4.16	3.78 ± 6.02	5.87 ± 6.91	ns
Hospital	8.98 ± 6.73	9.93 ± 9.33	12.03 ± 7.88	ns
<b>Vasoactive Support</b> NEQ, median (IQR)	0.00 (10.00)	0.00 (7.25)	0.00 (49.25)	ns
<b>Time to First VTE ppx</b> days, median (IQR)	0.95 (0.77) <sup>a</sup>	0.63 (0.69) <sup>b</sup>	0.89 (0.95) <sup>a,b</sup>	<b>0.002</b>
<b>Time to First Ambulation</b> days, median (IQR)	2.83 (3.73)	2.71 (3.83)	2.49 (8.39)	ns
<b>Time to Regional</b> days, median (IQR)	0.71 (0.72) <sup>a</sup>	1.03 (1.36) <sup>b</sup>	1.30 (1.19) <sup>b</sup>	<b>&lt;0.001</b>
<b>Ventilation Time</b> days, median (IQR)	3.67 (5.04) <sup>a</sup>	10.21 (9.21) <sup>b</sup>	6.85 (0.0) <sup>a,b</sup>	<b>0.040</b>
<b>Mortality, n (%)</b>				
In-hospital	4 (2.1)	3 (2.2)	0 (0.0)	ns
30-day	8 (4.3)	7 (5.1)	0 (0.0)	ns
<b>Complication, n (%)</b>				-
ARDS	0 (0.0)	0 (0.0)	0 (0.0)	
Delirium	4 (2.1)	5 (3.7)	1 (8.3)	
Encephalopathy	1 (0.5)	0 (0.0)	0 (0.0)	
Infection	3 (1.6)	1 (0.7)	0 (0.0)	
Pneumonia	4 (2.1)	3 (2.2)	0 (0.0)	
VTE	4 (2.1)	0 (0.0)	0 (0.0)	
Tracheostomy	4 (2.1)	3 (2.2)	0 (0.0)	

**Abbreviations:** (Tables 1 & 2) TEB, Thoracic Epidural Block; ESPB, Erector Spinae Plane Block; SAPB, Serratus Anterior Plane block; SD, Standard Deviation; BMI, Body Mass Index; IQR, Interquartile Range, ns, not significant; AIS, Abbreviated Injury Scale; MME, Morphine-Milli-Equivalents; ED, Emergency Department; ICU, Intensive Care Unit; NEQ, Norepinephrine Equivalents; nt, not tested; VTE, Venous Thromboembolism; ppx, prophylaxis; ARDS, Acute Respiratory Distress Syndrome.

## Results

- The ESPB group was older, on average, than the TEB group ( $p=0.024$ , Table 1).
- Pain at rest and with activity were lower among the ESPB group than the TEB group ( $p=0.002$ ,  $p=0.029$ , respectively; Figure 1).
- ESPB had a longer ED length of stay ( $p=0.038$ , Table 2).
- Time to first VTE prophylactic medication was shorter in the ESPB group than the TEB group ( $p=0.002$ ) and VTE events were more common among the TEB group (Table 2).
- Ventilation duration in ICU patients was shorter in the TEB group than the ESPB group ( $p=0.04$ , Table 2).

## Discussion

- All pain management interventions provided effective analgesia for patients with traumatic rib fractures with minimal complications observed. ESPB achieved better analgesia compared to TEB in this study.
- It is plausible the difference in VTE incidence between TEB and ESPB groups is due to the tighter restrictions with anticoagulation use around TEB administration.

## References

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