Critical Review Form
Single-Arm Study

Palachick BJ, Carver RA, Byars DV, Martyak MT, Collins JN. Erector Spinae Plane Blocks for Traumatic Rib Fractures: A Prospective, Interventional Study. Am Surg. 2022 Sep;88(9):2124-2126.

Objectives: **"The aim of our study was to evaluate subjective pain and vital capacity by way of incentive spirometry levels after administration of an ESPB [erector spinae plane block] for patients with acute rib fractures." (p. 2125)**

Methods: **This was a prospective, single-arm interventional study conducted by the trauma service at a level 1 trauma center (Eastern Virginia Medical School) over 2 years. Patients 18 years or older with multiple rib fractures admitted to the trauma service were offered an ultrasound-guided ESPB. At consent, baseline pain score (0-10) and incentive spirometry (IS) value (best of 5 attempts) were recorded; for bilateral fractures, the side with greater subjective pain determined laterality.**

Under ultrasound guidance, the T6 spinous process was identified, and a 22G spinal needle was advanced to a plane deep to the erector spinae muscle and superficial to the transverse process, confirmed by hydro-dissection. Fifty cc of "RECK" solution (ropivacaine 123 mg, epinephrine 0.25 mg, clonidine 0.04 mg, and ketorolac 15 mg) was injected. Blocks were performed 12-36 hours after trauma service admission, primarily by the surgical critical care fellow, with some performed by surgical residents under supervision. Pain score and IS were reassessed approximately 16 hours post-ESPB. Additional data (length of stay, mortality, mechanism, comorbidities, lung disease/smoking history, pneumothorax/chest tube, number of ribs fractured, ICU days, pneumonia) were collected but not included in the primary statistical analysis given the small sample.

ESPB was performed on 56 patients, with complete data obtained from 45. Mean age was 59 years, and 67% of patients were male. The most common mechanism of injury was fall (55.4%) followed by motor vehicle collision (28.6%). The average number of ribs fractured was 6.8, and average length of stay was 7.7 days.37.5% of patients had a pneumothorax, and 30.4% had a chest tube (81.0% of those with a pneumothorax).

Critical Review Form: Single-Arm Study

Guide	Comments
Are the results valid?	
Was the study planned and executed in a reasomable fashion?	
Did the authors state a sensible aim for the study	Yes. The authors aimed to evaluate the effect of erector spinae plane blocks on the management of pain in patients with multiple, traumatic rib fractures. Such patients often require large amounts of opioid analgesia to allow deep inspiration, which can lead to respiratory depression on their own. The ability to minimize opioid use with nerve blocks is beneficial to patients and clinicians.
Were consecutive patients included?	Uncertain. The authors do not report if this was a consecutive or convenience sample and provide no information on patients who were eligible but not included, either due to lack of consent, ineligibility, or lack of screening.
Was data collected prospectively?	Yes. This was a prospective data. It is therefore unclear how data was missing from 20% of included patients.
Was the endpoint (outcome) appropriate to the study aim?	While the authors did not report a primary outcome, they reported changes in pain score, changes in incentive spirometry volumes, and complications. These outcomes are appropriate to the study aim.
Was there an unbiased, objective evaluation of the endpoints?	Somewhat. Pain scores are subjective, but reported but the patient, and seem appropriate. Incentive spirometer volumes, when measured appropriately, are objective.
Was the follow-up period appropriate to the primary endpoint?	Yes. While 16 hours seems an appropriate time for measurement, it would have been more helpful to see measurements at multiple times following the block.
Was follow-up complete?	Uncertain. The authors report missing data for 20% of patients, but it is unclear which data were missing or if this included outcome data.
What are the results?	
What were the outcomes?	• Mean pain scores decreased significantly from 7.93 (SD 1.95) pre-block to 4.47 (SD 2.40) post-block ($p < .001$). • Mean incentive spirometry volumes increased significantly from 1160 cc (SD 690) pre-block to 1495 cc (SD 775) post-block ($p = .035$). • No procedure-related complications occurred. • Average length of stay was 7.7 days; average number of ribs fractured was 6.8. • 33.9% required ICU admission (average ICU LOS 5.6 days); 2 mortalities occurred, unrelated to the block.

	• 2 cases of pneumonia were diagnosed prior to the block (done to assist with extubation) and were excluded from analysis.
How precise was the estimate of the outcomes? (i.e. what 95% CIs were associated with the results?)	Unknown. The authors do not report confidence intervals for the outcomes.
How can I apply the results to patient care?	
Were the study patients similar to my patient?	Likely yes. This study was conducted at a large, US, level I trauma center. Authors unfortunately provide very little in the way of demographic data or medical comorbidities.
Were all clinically important outcomes considered?	No. The authors reported mean pain scores, incentive spirometry volumes, and length of stay. They did not report oxygen requirements, opioid analgesia requirements, or patient satisfaction.
Are the likely treatment benefits worth the potential harm and costs?	Uncertain. This was a very small, single-arm study with a significant amount of missing data and limited reported of key information (including demographics and methodology). While pain scores and incentive spirometry volumes improved 16 hours following ESPB, with no procedure-related complications, the limitations of the study make it difficult to interpret these results in real-world practice.

Limitations

1. **This was a single-arm study with no comparison group, making it impossible to truly understand the potential efficacy of treatment. Pain and IS scores 16 hours after ESPB were compared to baseline values, and it is entirely possible that improvements in these values was due to time alone rather than ESPB efficacy.**
2. **The authors do not report the dates over which the study was performed.**
3. **The authors do not report if this was a consecutive or convenience sample and provide no information on patients who were eligible but not included, either due to lack of consent, ineligibility, or lack of screening.**
4. **Complete data was obtained in only 45 of 56 patients (80%).**
5. **Authors unfortunately provide very little in the way of demographic data or medical comorbidities.**

Bottom Line

This very small, single-arm study with a significant amount of missing data and limited reported of key information (including demographics and methodology)

found that among patients admitted to the trauma service of a level 1 trauma center with multiple rib fractures, pain scores and incentive spirometry volumes improved 16 hours following ESPB, with no procedure-related complications. The limitations of the study make it difficult to interpret these results in real-world practice.