

Bedside Percutaneous Cryoneurolysis Technique for Management of Acute Rib Fracture Pain in Adult Trauma Patients

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BACKGROUND

Acute pain due to rib fractures causes significant in-hospital morbidity and can significantly impact patients' quality of life after discharge.¹ Inadequate pain control can lead to ineffective pulmonary hygiene, weak cough, and respiratory compromise.¹ Intraoperative transthoracic cryoneurolysis of the intercostal nerves can improve postoperative pain;² however, there are limited analgesia options for non-operative patients. Intercostal cryoneurolysis (IC) devices are FDA-approved and could provide an alternative to opioids.³

OBJECTIVE

- Describe the use of a bedside hand held cryotherapy device
- Determine feasibility of bedside IC in patients with traumatic rib fractures
- Describe the impact of bedside IC on pain management
- Obtain information relating to patient satisfaction

METHODS

- Prior to the procedure, the patient was consented and evaluated for baseline status of pain, functionality, sleep quality, and IS.
- Bedside IC was performed with ultrasound (US) guidance by a surgeon using local analgesia (Figure 1).
- IC was deployed at least once per fracture and adapted to real-time feedback from the patient during the procedure.
- Perception of rib-specific pain and location of the pain were assessed by a physical between each treatment and prior to termination of the intervention.
- The patient was followed by the research team throughout admission at set time intervals.
- A discharge survey was completed to assess patient satisfaction and functional condition.

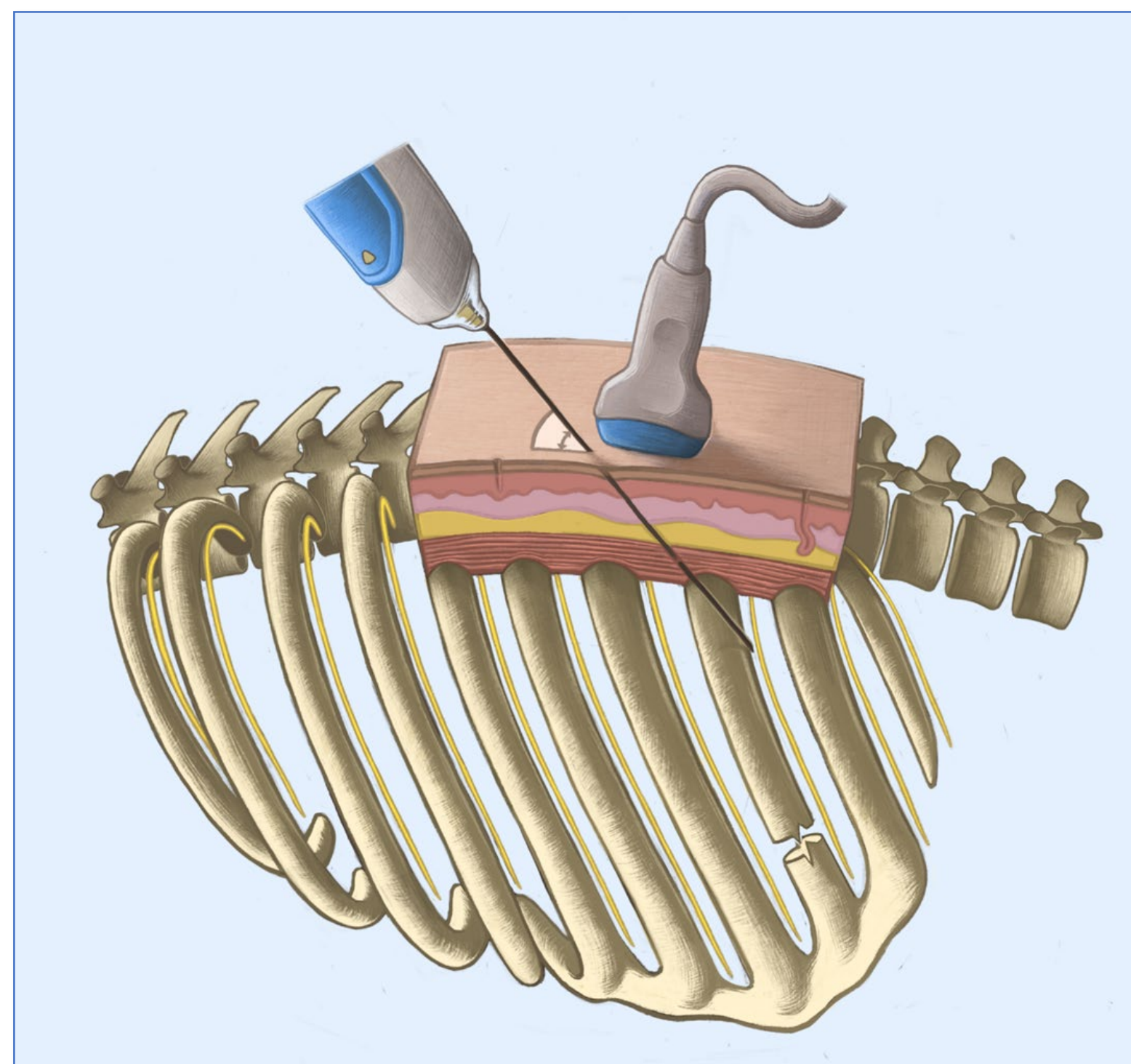


Figure 1. Bedside intercostal nerve cryoneurolysis.



SUMMARY OF METHODS

Study Design: Prospective interventional case series (n=5)

Participants: ≥18 years old, acute pain attributed to rib fracture(s), not a candidate for surgical stabilization of rib fractures (SSRF)

Intervention: Bedside IC under US guidance

Outcome measures: Pain assessment (NRS/MPQ) at rest, hospital length of stay, ICU length of stay, ventilator days, pain interference (BPI), sleep interference (MOS-Sleep), sleep quality (PSQI), quality of life assessment, incentive spirometry (IS), adverse events, re-admissions, and patient satisfaction

Data Sources: Patient interviews and electronic medical records

RESULTS

Table 1. Patient-reported pain rating (0-10/10) and incentive spirometry volumes (cc) before and after bedside intercostal nerve cryoneurolysis to treat rib fractures

Case	Pre-IC		1 hour		8 hours		16 hours		24 hours	
	Pain rating	IS	Pain rating	IS	Pain rating	IS	Pain rating	IS	Pain rating	IS
76M 1 fx	8/10	800	0/10	1000	0/10	1250	0/10	1500	0/10	1250
29M 4 fxs	8/10	1500	5/10	1500	5/10	2400	5/10	2400	7/10	2300
61M 5 fxs	10/10	2000	4/10	2100	1/10	1700	6/10	2000	8/10	2100
38F 4 fxs	7/10	1000	2/10	1200	2/10	1250	4/10	1250	3/10	1500
88M 3 fxs	7/10	1000	2/10	1500	4/10	1500	1/20	2000	0/10	2250

Abbreviations: F, female; fxs, fractures; IC, intercostal nerve cryoneurolysis; IS, incentive spirometry; M, male

- Patients were 29-88 years old with 1-5 single-sided rib fractures.
- Motor vehicle collision as the most common mechanism of injury.
- Overall pain management was universally described as "Better".
- All patients reported the procedure as a perceived asset to their recovery at the time of discharge.
- 14-day follow-up average pain score was 2.8/10 and no patients reported needing pain medicine for their rib fracture.

CONCLUSIONS

- Percutaneous IC is a putative viable adjunct to multimodal pain control for patients with rib fractures and should be considered in patients with difficult pain control.
- This technique provides a trauma team-driven bedside intervention in non-SSRF patients.
- Further studies are required to fully assess IC efficacy and post-discharge outcomes.
- Utility must also be assessed in patients with altered mental status or on mechanical ventilation.

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