

# Beyond guidelines: surgical stabilization of rib fractures in patients with chronic pain

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## CASE PRESENTATION

An adult patient presented after a high-speed motor vehicle collision with left 7–10 rib fractures and left hemopneumothorax. At the transfer facility, they required chest tube placement and intubation due to hypoxia. The patient was admitted to our intensive care unit (ICU) and was successfully extubated on hospital day 1. Of note, the patient had a history of pelvic radiation, and their home chronic pain regimen included the following: 80 mg oxycodone extended release and hydrocodone taken as needed 10–325 up to 8 pills per day. The pain service was consulted on hospital day 1, and despite an erector spinae plane block and epidural analgesia catheter placement, the patient experienced two uncontrolled pain crises overnight. The trauma service requested a new CT chest with 3D reconstruction on hospital day 3, which revealed multiple oblique fractures with displacement of ribs 7–10 ([figure 1](#)). Worsening atelectasis further underscored the need for intervention. Per the Chest Wall Injury Society Guideline, the patient did not meet the traditional criteria for rib plating at admission or with the new CT chest.<sup>1</sup> The patient had >3 ipsilateral acute rib fractures within ribs 3–10 with >pulmonary physiologic derangements (pain score >5/10 and poor cough) despite locoregional anesthesia and multimodal pain therapy; however, the ribs were not severely displaced ( $\geq 50\%$  of the rib width on axial CT). The patient's acute pain crisis has now prompted a re-evaluation of their management strategy.

## WHAT WOULD YOU DO?

- Placement of a non-narcotic elastomeric pump that automatically and continuously delivers local anesthetic
- Surgical stabilization of the rib fractures
- Surgical stabilization of the rib fractures and intercostal nerve cryoablation of intercostal spaces 7–9
- Surgical stabilization of the rib fractures and intercostal nerve cryoablation of intercostal spaces 7–10 with the risk of causing abdominal muscle bulging

## WHAT WE DID AND WHY

Discussions with the pain service revealed there were no viable alternatives to achieve better pain control. The patient had severe pain over rib 10 at the location of the most severe fracture on CT. Additionally, they had new paradoxical motion of the chest wall isolated to this rib. After discussions with the patient and family, we proceeded with

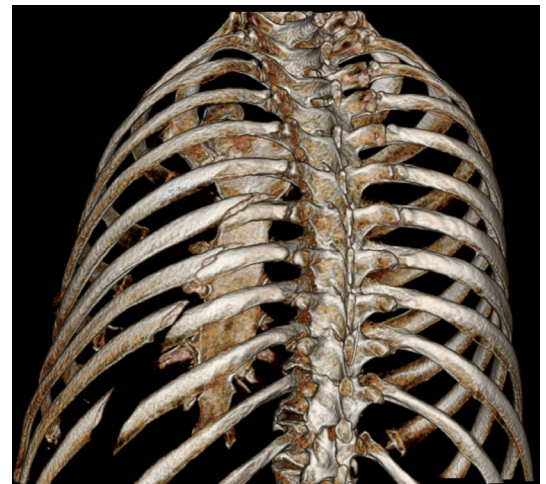
rib stabilization to improve respiratory mechanics and pain control. Notably, due to the new clinical finding of paradoxical motion during the physical examination, the patient now met the criteria for surgical stabilization.<sup>1</sup>

The trauma surgery team performed an open reduction and internal fixation of left ribs 8–10 and evacuation of hemothorax ([figure 2](#)). We offered intercostal nerve cryoablation, which uses a freezing method to temporarily block pain signals from nerves in the affected area ([figure 3](#)). The effect is similar to a local anesthetic but lasts several months during the patient's recovery. Typically, cryotherapy should only be applied at intercostal spaces T3 through T9. If performed lower than space T9, there is the risk of abdominal wall bulging, rectus muscle paralysis, and rectus muscle atrophy.<sup>2</sup>

We performed cryotherapy of intercostal nerves (7–10) with the acknowledgment of potential risks in pursuit of maximum pain control, especially at the fracture site that was causing the patient the most pain on physical examination. Despite the severity of the patient's pain before surgery, the combination of this therapy and rib stabilization allowed them to be transitioned to an oral pain medication and be downgraded from the ICU.

## DISCUSSION

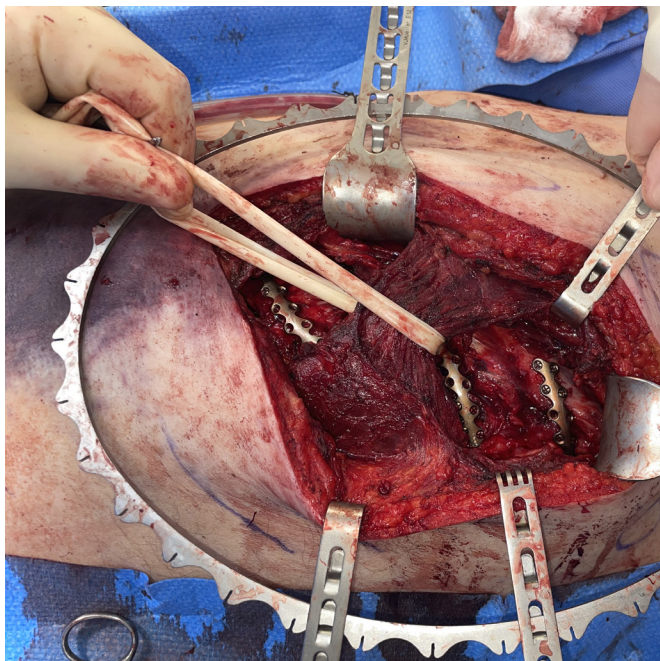
This case presents a unique scenario where a patient with chronic pain and complex rib fractures, initially deemed ineligible for surgical intervention based solely on adherence to national guidelines, ultimately required emergent surgical stabilization on hospital 5 due to an escalating pain crisis and



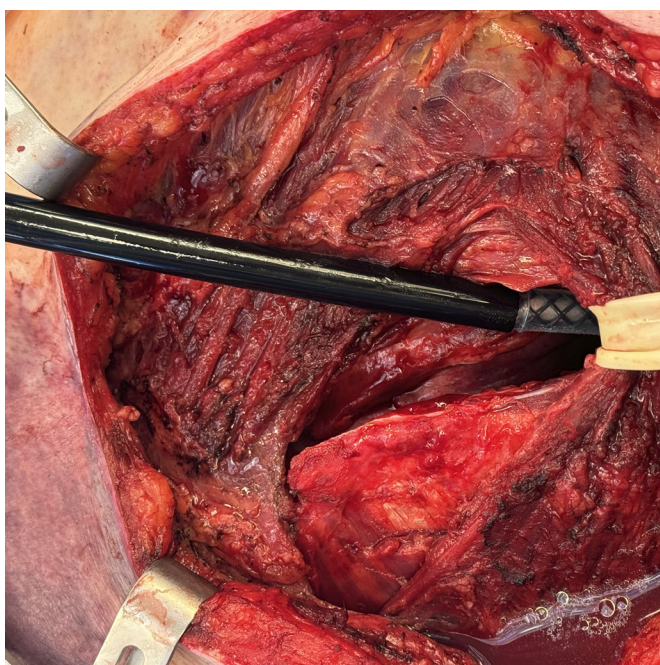
**Figure 1** Three-dimensional CT reconstruction of the chest wall, left rib fractures (7–10).

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**Figure 2** Use of Denis-Browne retractor to improve the exposure of the fractured ribs.



**Figure 3** Cryotherapy probe used with laparoscopic camera to perform intercostal nerve cryoablation.

worsening respiratory mechanics. This patient failed maximum conservative management of their rib fractures and our team thought they required delayed surgical stabilization of their rib fractures. Ideally, rib fractures should be stabilized within 72 hours of presentation.<sup>1</sup>

While conventional recommendations dictate surgical intervention for patients with specific fracture patterns (ie, flail chest or multiple bicortical offset fractures), severe displacement in several ribs or evidence of paradoxical chest motion, this patient initially fell outside these criteria, with only one rib displaying greater than 50% displacement. This case demonstrates the need in select patient populations (ie, with severe chronic pain) to consider early rib stabilization when they possess pulmonary physiologic derangements despite locoregional anesthesia and multimodal pain therapy (but do not meet the displacement or fracture pattern guidelines).<sup>1,3,4</sup>

This case reminds us that evolving clinical presentations necessitate continuous re-evaluation by the trauma team of the treatment approach that may not align with current guidelines. Given this changing clinical picture and the urgency of the patient's pain crisis, a tailored approach was necessary, irrespective of the conventional guidelines. This decision underscored the commitment to prioritizing the patient's individual circumstances and adapting to their changing clinical needs.

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