



## Thoracic Paravertebral Block for Multiple Fractured Ribs

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### Background

Multiple rib fractures are known to contribute to morbidity and mortality in the trauma patient. Risk factors for mortality in patients with blunt chest wall trauma include: age >65 years old, three or more rib fractures, and cardiopulmonary disease.<sup>1</sup> If the patient survives the initial traumatic event and resuscitation, they can still succumb later from post-traumatic pneumonia. Many treatments have been used over the years to improve outcomes including external stabilization and prolonged mechanical ventilation. Currently there is emphasis on pain control facilitating adequate respiration, coughing and ambulation to avoid mechanical ventilation and its complications. There has been various approaches such as; systemic opioids, multimodal analgesics, and regional anesthesia techniques. Thoracic epidural analgesia (TEA) is often the treatment of choice. A meta-analysis from Carrier et al. in 2009 showed reduced ventilator days, with a lower incidence of pneumonia.<sup>2</sup> However TEA is not without its risks. Many trauma patients are frequently hypovolemic and commonly become hypotensive after initiating TEA. Another concern with TEA is a risk of epidural hematoma due to aggressive use of anticoagulants for deep vein thrombosis prophylaxis. Because of these limitations, the thoracic paravertebral blockade (TPVB) has gained more attention in the treatment of multiple fractured ribs. TPVB may provide similar pain control with less risk than neuraxial blockade.

### Treatment

Karmakar et al. investigated the use of the TPVB in a prospective nonrandomized case series.<sup>3</sup> In a set of 15 patients receiving TPVB, there were significant improvements in pain scores at rest and during coughing, respiratory rate, forced vital capacity, peak expiratory flow rate, SaO<sub>2</sub>, and O<sub>2</sub> index compared with their baseline before the procedure. Mohta et al. then compared TPVB to TEA in 2007 with a prospective randomized controlled trial.<sup>4</sup> Both TEA and TPVB improved pain scores as evidenced by the visual analog score for pain, respiratory function, and peak expiratory flow rate. Duration of local anesthetic infusion, ICU length of stay, hospital length of stay, morphine rescue, and pulmonary complications were similar. However, TEA had a higher incidence of hypotension.

Benefits of TPVB over TEA are numerous, especially for unilateral rib fractures. Hypotension, while a risk, is present in a much lower percentage of patients with TPVB versus TEA (6.7% vs 40%).<sup>4</sup> In addition, because TPVB is not a true neuraxial block, a neurological assessment is possible. This is especially important in those with coexisting vertebral body injury. Along this line, TPVB can be placed in those with elevated intracranial pressure. Risk of injury to the spinal cord is less likely, as is the risk of epidural hematoma and epidural abscess. In trained hands, TPVB has even been shown to be technically easier. Because of these benefits, TPVB has gained attention for the treatment of multiple fractured ribs.

Complications of TPVB, while uncommon, were described by Lonnqvist in 1995 while using a blind technique.<sup>5</sup> Complications included hypotension, vascular puncture, pleural puncture, and pneumothorax. Pace et al. showed a better safety profile with ultrasound guidance.<sup>6</sup> In their review, there were six complications out of 1427 thoracic paravertebral injections performed with ultrasound. This included symptomatic bradycardia and hypotension (n = 3), vasovagal episode (n = 1), and evidence of possible local anesthetic toxicity (n = 2). There was no incidence of suspected accidental pleural puncture or symptomatic pneumothorax. One final complication mentioned in the literature is intrathecal spread of local anesthetics after TPVB, presumably from the existence of dural sleeves.

## **Conclusion**

A thorough understanding of each analgesic method for traumatic rib fractures is necessary to implement the optimal approach for each patient. Many modalities have been attempted, yet few have been analyzed critically. TEA anesthesia is advocated as the main analgesic technique with a sound track record, especially for bilateral rib fractures. Recent evidence suggests that TPVB is a viable alternative with fewer complications, especially for unilateral rib fractures. Pain relief must be individualized on the basis of a directed history, clinical examination, and review of the various investigations. Interested readers can learn more about TPVB online for free at [gatorrapworkshop.com](http://gatorrapworkshop.com). (lectures)

## **References**

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