Pain Control for Rib Fractures

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Conflict of Interest
No Conflict of Interest
Rib Fracture

- Most common thoracic injury
- Increase morbidity and mortality
- Pulmonary function is compromised
- Acute pain control is critical
Principles

• Inadequate pain control
  • Inability to cough and breath deeply
  • Sputum retention
  • Atelectasis
  • Reduction in FRC
  • Compromised lung compliance
  • Ventilation-perfusion mismatch
  • Hypoxemia
  • Respiratory failure
Principle

• Resuscitation precedes pain relief

• Multimodal analgesia is recommended
Options

• Medication
  • Oral
  • IV

• Regional analgesia
  • Topical
  • Intercostal nerve block
  • Intrapleural
  • Paravertebral block
  • Epidural

• Surgical Fixation
First Aid

• Analgesia

• Deep breathing and coughing

• Avoid taping / bandaging / splinting
Medication

• Acetaminophen
• NSAID
  • Ketorolac, ibuprofen, voltaren, tramadol
• Opioids
  • Morphine, fentanyl, codeine, PCA
• Gabapentin
• Tricyclics
IV Narcotics

Advantages
• Rapid onset
• Less painful than IM & SC

Disadvantages
• Respiratory depression
• RN certification
• Must wean
• Peaks and troughs
PCA

Advantages
• Better than IV bolus
• Continuous baseline
• Patient controlled

Disadvantages
• Patient must comprehend
• Machine errors
• Family interference
• Weaning
• Sedation
Lidocaine 5% patch Mechanism

- Penetrates the skin
- Binds sodium channels
- Block influx sodium
- Reduce abnormal ectopic discharges produced by damaged nerves

www.endo.com
Randomized, double-blind, placebo-controlled trial using lidocaine patch 5% in traumatic rib fractures.

- Ingalls NK, Horton ZA, Bettendorf M, Frye I, Rosdrigues C

  - Michigan State University/Grand Rapids Medical Education and Research Center, Grand Rapids, MI, USA.
Pain Assessment and Narcotic Utilization

- IV Narcotics
  - Placebo
  - Lidocaine Patch
  - p = 0.88

- PO Narcotics
  - Placebo
  - Lidocaine Patch
  - p = 0.22

- Pain
  - Placebo
  - Lidocaine Patch
  - p = 0.39
# Outcome Comparison

<table>
<thead>
<tr>
<th></th>
<th>Lidocaine group</th>
<th>Placebo group</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary complications#</td>
<td>72.7% (24/33)</td>
<td>72% (18/25)</td>
<td>0.95</td>
</tr>
<tr>
<td>Length of Stay#</td>
<td>7.8 ± 1.1</td>
<td>6.2 ± 0.7</td>
<td>0.28</td>
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</table>

# Mean ± SEM  

* Median (interquartile range)
Conclusions

• Lidocaine patches do not decrease narcotic pain medication use
• No difference in
  • pain scores
  • pulmonary complications
  • length of stay
• Should not be routinely used
Paravertebral Block

Advantages
• Avoids sedation and ventilation
• Allows neuro assessment
• Can spare lumbar and sacral nerves
• Simple
• Less hypotension

Disadvantages
• Vascular puncture
• Pneumothorax
• Inadvertent epidural anesthesia
• Spread to the opposite site
• Horner’s
• Expertise
Thoracic Paravertebral Block
Intercostal Nerve Block

Advantages
• Improved PFTs

Disadvantages
• Multiple injections
• Painful
• Time consuming
• Local anesthetic toxicity
• Difficult for upper ribs
• Pneumothorax
Intrapleural

Advantages

• Less complications
  • Hypotension
  • Urinary retention
  • Lower extremity paresthesia

Disadvantages

• Loss of anesthetics via chest tube
• Tension pneumothorax if tube is clamped
• Impaired diffusion if hemothorax
• Posture-dependent
Epidural

Advantages
• Improved PFTs
• Reduced airway resistance
• Improved breathing
• Improved immune response

Disadvantages
• Technically difficult
• May mask abdominal pathology
• Hypotension
• Urinary retention
• Epidural hematoma
• Paralysis
Thoracic Epidural


RCT n=28
Effect of epidural analgesia in patients with traumatic rib fractures: a systematic review and meta-analysis of randomized controlled trials

L’effet de l’analgésie péridurale chez les patients présentant des fractures de côtes multiples: une revue systématique et une méta-analyse des essais randomisés contrôlés

François M. Carrier, MD · Alexis F. Turgeon, MD · Pierre C. Nicole, MD · Claude A. Trépanier, MD · Dean A. Fergusson, PhD · Daniel Thauvette, MD · Martin R. Lessard, MD

Received: 28 August 2008/Revised: 3 November 2008/Accepted: 5 January 2009/Published online: 11 February 2009
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<table>
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<tr>
<th>Study</th>
<th>Epidural n/N</th>
<th>Control n/N</th>
<th>Peto odds ratio 95% CI</th>
<th>Weight %</th>
<th>Peto odds ratio 95% CI</th>
<th>Year</th>
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<tbody>
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<td>0 / 9</td>
<td>0 / 10</td>
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<td>20.5</td>
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<tr>
<td>Moon</td>
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<td>0 / 11</td>
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<td>1.6 [0.3, 9.3]</td>
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### ICU LOS

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Epidural Mean (SD)</th>
<th>N</th>
<th>Control Mean (SD)</th>
<th>WMD (random) 95% CI</th>
<th>Weight %</th>
<th>WMD (random) 95% CI</th>
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<tbody>
<tr>
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<td>5.90 (1.40)</td>
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<td>18.70 (5.20)</td>
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<td>1989</td>
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<tr>
<td>Sahin</td>
<td>12</td>
<td>10.20 (2.10)</td>
<td>15</td>
<td>9.80 (3.20)</td>
<td>0.40 [-1.61, 2.41]</td>
<td>28.34</td>
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<td>1993</td>
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<tr>
<td>Moon</td>
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<td>4.30 (4.00)</td>
<td>11</td>
<td>4.10 (5.10)</td>
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<td>-3.72 [-11.43, 3.99]</td>
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High-methodological quality studies (2 studies)

| Total   | 35 |                   | 35 |                   | 0.01 [-3.54, 3.57]   | 100.00   |                     |      |

Thoracic epidural with local anesthetics (3 studies)

| Total   | 47 |                   | 50 |                   | 0.31 [-1.44, 2.05]   | 100.00   |                     |      |

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### Hospital LOS

<table>
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<th>Study</th>
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<th>Epidural Mean (SD)</th>
<th>N</th>
<th>Control Mean (SD)</th>
<th>WMD (random) 95% CI</th>
<th>Weight %</th>
<th>WMD (random) 95% CI</th>
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<td>Makersie</td>
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<td>8.70 (4.20)</td>
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<td>7.10 (6.20)</td>
<td>1.40 [-3.54, 6.34]</td>
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<td>Moon</td>
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<td>11.00 (6.10)</td>
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<td>9.60 (6.20)</td>
<td>1.80 [1.27, 2.33]</td>
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<td>-6.68 [-19.79, 6.42]</td>
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High-methodological quality studies (2 studies)

| Total   | 35 |                   | 35 |                   | 1.55 [-2.72, 5.82]   | 100.00   |                     |      |

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### Duration of mechanical ventilation

<table>
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<tr>
<th>Study</th>
<th>N</th>
<th>Epidural Mean (SD)</th>
<th>N</th>
<th>Control Mean (SD)</th>
<th>WMD (random) 95% CI</th>
<th>Weight %</th>
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<td>Ullman</td>
<td>15</td>
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<td>Sahin</td>
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<td>1.30 (0.80)</td>
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<td>5.50 (2.40)</td>
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<td>8.00 (16.00)</td>
<td>24</td>
<td>9.00 (26.00)</td>
<td>1.00 [-13.37, 11.37]</td>
<td>22.50</td>
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<td>2004</td>
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<tr>
<td>Total</td>
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<td></td>
<td>52</td>
<td></td>
<td>-7.51 [-16.25, 1.23]</td>
<td>100.00</td>
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</tbody>
</table>

Thoracic epidural with local anesthetics (2 studies)

| Total   | 34 |                   | 39 |                   | -4.17 [-5.45, -2.88] | 100.00   |                     |      |
Conclusions  No significant benefit of epidural analgesia on mortality, ICU and hospital LOS was observed compared to other analgesic modalities in adult patients with traumatic rib fractures. However, there may be a benefit on the duration of mechanical ventilation with the use of thoracic epidural analgesia with local anesthetics. Further research is required to evaluate the benefits and harms of epidural analgesia in this population before being considered as a standard of care therapy.
Surgical Fixation

- ≥ 4 segment flail
- Intubated
- “Stove in” chest
- Thoracotomy for other indications

Don’t:
- Severe head injury
- Other life threatening injuries
Take Home

- Pain control
- Pain control
- Pain control
CHEST is BEST™