Title: Parasternal intercostal block for pain after sternotomy for cardiac surgery: not ready for routine use.

Report by: Dr. Rebecca Ashcroft

Clinical Scenario: You are the clinical fellow rotating through a new cardiac surgery ICU. Some of the surgeons instill local anesthesia parasternally (parasternal intercostal block) while others do not. You wonder about the efficacy of this intervention in post op pain control and the associated risks. Some of these surgeons’ patients appear to have a higher rate of pneumothorax.

Three part Question: Does parasternal intercostal block improve post op pain control in cardiac surgery patients post sternotomy?

Search strategy:

Detailed review the MESH headings available in Pubmed indicated no corresponding mesh heading for parasternal blockade. Final search strategy used the following terms: “Cardiac surgery and (intercostal block or parasternal block)” with the limits of “Clinical trial”.

Of the 55 papers identified, 7 papers were selected for further review. Four of the seven papers were excluded: one was in German, and three studies used sternal infusions (not parasternal intercostal blocks).

Included articles were also cross checked for related references.

Search Outcome:
<table>
<thead>
<tr>
<th>Author, date, journal, and Country</th>
<th>Design and Sample size</th>
<th>Drug, dose and technique</th>
<th>Alternate forms of analgesia post op</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weakness</th>
<th>Study strengths</th>
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</table>
| McDonald et al. 2005 Anesthesia and Analgesia, USA. | Randomized, placebo controlled, double blind  
N = 20 ( 17 completed study)  
“Fast track cardiac surgery pts”  
Study stopped after interim analysis revealed significantly less morphine use. | 54 mL of 0.25% levobupivacaine with 1:400000 epi prior to sternal wire placement at parasternally, at sternotomy incision and mediastinal chest tube sites or 54 mL of saline | IV morphine titrated to respiratory rate by anesthesia. IV PCA morphine. | Pain and respiratory function in the first post op 24 hours | Decreased morphine use at 4hrs, increased Aa gradient, PaO2, and higher pH values in treatment group. No difference in time to extubation. | Small sample size, also included sternal wound and mediastinal tube insertion infiltration. No difference in time to extubation, VAS scores at rest or with coughing. | Measurements of serum levobupivacaine to monitor for potential toxicity. Enrollment only after hemodynamic stability ensured post bypass. No complications reported. |
| Barr et al. 2007 J Cardiothoracic and Vas Anes, Australia. | Randomized, controlled, double-blind trial  
N = 88  
N= 45 for ropivacaine, | Parasternal intercostal block ropivacaine 0.75% 40 mL or 40 mL of saline | PCA morphine, acetaminophen, tramadol for those who exceeded PCA Max. If transitioned to ward in first 24hrs, codeine and acetaminophen. | Primary outcomes post op sternal wound pain and analgesia requirements. Secondary outcomes low oxygen sat (< 95%), and hypertension. | Significantly less pain for 24 hrs in ropivacaine group. Lower pain scores at extubation. Increased desats in saline group and more hypertension. | No details regarding pneumothorax rate. Protocolized extubation—no difference in time to extubation. | Details regarding pts post randomization included in study. Follow up to 30 days to monitor for post infiltration deep sternotomy wound infection. Effect of ropivacaine infiltration lasting to end of study period at 24 hours. Largest effect till 12 hr mark. |
| Chaudry et al. 2012 J Cardiothoracic Vas Anes, India. | Randomized, controlled, double blind study  
N = 30 (children)  
14 pts in | 0.5% ropivacaine injection total dose below 5mg/kg: 5 doses of 0.5 to 2 mL 2-6th parasternal intercostal space or | IV fentanyl boluses 1-2 mcg/kg/min prn, 15mg/kg Tylenol Q6H via og till PO tolerated. | Time to extubation, post op sternal wound pain, and 24 hr cumulative fentanyl dosage | Decreased time to extubation and decreased cumulative 24hr fentanyl dosage. Significantly decreased pain | Highly selected “fast track” cardiac surgery patients. | First study in children. Decreased fentanyl use extended beyond expected duration of |
ropivacaine group | saline before wound closure | scores till hr 20 in ropivacaine group | ropivacaine.

Comments:

Cardiac surgery patients are unlikely to receive opioid free anesthetics and post-operative care. Care in the post op period also includes analgesia for discomfort related to invasive tubes, lines and incisions outside of the thorax (i.e. venous and arterial graft sites). As in the above studies, opioids are commonly administered for pain after cardiac surgery. Opioids have multiple side effects; sedation, nausea/vomiting, pruritus and constipation. Techniques that allow narcotic sparing may help avoid these side effects and improve overall pain control.

Thoracic epidural infusions and intrathecal opioid administration are not without the risks of epidural or intrathecal hemorrhage and subsequent neurologic compromise in the setting of systemic anticoagulation for cardiopulmonary bypass. Parasternal intercostal blocks may allow narcotic sparing without the risks of epidural or intrathecal hemorrhage.

In this Best Bets review, the small number of studies and their strict inclusion/exclusion criteria limit applicability of parasternal intercostal blocks to every day clinical practice. Parasternal intercostal blocks may have a role in patients with high narcotic use or in highly selected “fast track” cardiac surgery patients in whom narcotic sparing is desired. Additional studies are needed to determine the optimal drug, dose, and rate of potential side effects such as pneumothorax or secondary sternal infection. Until such data are published—intercostal blocks should be limited to highly selected cases or clinical trials.

References:

McDonald et al. Parasternal block and local anesthetic infiltration with levobupivacaine after cardiac surgery with desflurane: the effect on postoperative pain, pulmonary function, and tracheal extubation times. Anesthesia and Analgesia 2005; Jan; 100 (1): 25-32.
