Offset Layered Closure May Reduce Wound Infection in EOS Surgery

Alexandra M. Grzywna, BA
Michael P. Glotzbecker, MD
John B. Emans, MD *

Disclosures:
Consultant: Medtronics, Depuy-Synthes
Royalties: Depuy-Synthes
Challenge: *High rate of wound infection* in EOS

- **Reported infection rates:**
  - As high as 24% (see next paper!)
- **Known risk factors:**
  - Neuromuscular
  - Nutrition, Urosepsis
  - VEPTR
- **Known strategies:**
  - Optimize nutrition
  - Sterilize urine
  - Surgical site preparation
  - Appropriate ABX coverage
Index case changed practice – late 2001

- 11 yo with multiple prior thoracotomies for TEF repair, colonic interposition.
  - Thoracogenic scoliosis with multiple fused ribs 60 deg
  - Prior chest wall infection, scarring
  - Multiple parallel thoracotomy scars

- Expansion thoracotomies, VEPTR
  - *One old scar used for part of the new thoracotomy*
  - Significant chest expansion
Index case changed practice – late 2001

• 1 month post op
  – Fell, struck wound on chair while at camp
  – Dehiscence
  – Infection, device removal

• Contributing factors
  – Wound tension
  – Incomplete muscle coverage below
  – Full thickness incision over device
2002 – Staggered Layered Closure

• Primary incisions:
  – VEPTR:
    • Not over device
    • Staggered layers
    • Minimize tension
  – GR:
    • Separate proximal and distal incisions
    • Submuscular placement per Akbarnia
2002 – Staggered Layered Closure

- Lengthening incisions - VEPTR
  - *No full thickness incisions over device*
  - *Staggered layers*
  - Tissue approximation to minimize dead space
  - Watertight closure, dressing
  - Closure – *attending participation*
Staggered superficial and deep incisions

- Lengthening incisions - GR
  - No full thickness incisions over device
  - Staggered layers
  - Tissue approximation to minimize dead space
  - Watertight closure, dressing
  - Closure – attending participation
Clinical Series of EOS Surgeries 1981-2014:

- Single site, surgeon:
  - 137 pts
- Age - Median 4.9 yr
- Etiologies:
  - Congenital - 72
  - Syndromic - 22
  - Idiopathic - 17
  - Neuromuscular - 16
  - Iatrogenic - 10
- Procedures:
  - VEPTR 64
  - GR 63
  - VEPTR/GR 10

- 1267 operations:
  - Index – 121
  - Lengthening – 852
  - Exchange/revision – 249
  - Final fusion – 45

- Length of treatment:
  - Mean 5.97
  - 0.1 – 14.7 yrs

- Infections:
  - 7
Staggered layered closure begun in 2002:

<table>
<thead>
<tr>
<th></th>
<th>&lt; 2002</th>
<th>&gt; 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td>94</td>
<td>1130</td>
</tr>
<tr>
<td>Infections</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Infection Rate</td>
<td>4.3%</td>
<td>0.26%</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>1.2-10.6%</td>
<td>0.05-0.75%</td>
</tr>
</tbody>
</table>

- **Exact binomial proportion test:**
  - $p < 0.001$

- **Odds Ratio = 16.7**
  - 95% Confidence Interval: 3.7 – 75.8
  - $p = .0003$
Discussion:

• Some precedent for effect of layered closure:
  – Feldman 2014
    • Multilayered closure technique found to lowered wound complication rate of non-idiopathic spine fusion incisions
  – Levi 2013
    • Layered soft tissue closure lowered wound complications in tethered cord repair
Limitations:

- Single Institution
- Single Surgeon
  - ?Implications?
- Pre 2002 vs Post 2002
  - Early series
    - Much smaller
    - Includes single rods
    - Includes subcutaneous rods
- How much is just learning curve?
**Conclusions?**

- Offset layered incision/closure and attention to soft tissue may help decrease EOS wound infections.

- 2002 – present infection rate is 0.26% in EOS surgery > 1000 procedures
  - *Encouraging data* compared to reported rates of infection.
Thanks to Ali Gryzwna