Prevention of Cesarean Wound Complications

Brett Einerson, MD MPH

2/26/2016 - Project ECHO
1. Brief Background
2. What works?
3. What doesn’t work?
4. What’s new?
5. What’s next?
No disclosures.
Defining “Wound Complication”

Our focus today:
Wound infection
Wound disruption

Not in focus today:
Uterine incisions
OB lacerations

SSI = Surgical Site Infection
The cost.

$3,400 to $4,000 per surgical site infection

$500 million per year in the U.S.

Olsen. Infect Control Hosp Epidemiol. 2010
So...

How can we prevent wound complications in patients undergoing cesarean?
What we do that works.
What we do that works.

• Pre-incision antibiotics
Prophylactic Antibiotic Use and Infectious Morbidity

Smail et al. Cochrane Database 2014.
Mackeen et al. Cochrane Database 2014.

*P<0.05
Reminder: Guidelines for Cesarean

“A single dose of cefazolin before incision.”

- **Timing**: 15-60 min before incision
- **Dose**: 2g (3g if ≥120kg)
- **Redose**: 4 hrs
- **Allergy?**: Clinda 900mg + Gent 5mg/kg
- **Multi-dose?**: No

ACOG Practice Bulletin No 120. 2011.
What we do that works.

- Pre-incision antibiotics
- Closure of subcutaneous layer >2cm
  Meta-analysis of 6 RCTs (n=875)
  - No effect when <2cm
  - But if >2cm...

Wound complications when subcutaneous tissue ≥2cm deep

<table>
<thead>
<tr>
<th>Condition</th>
<th>Risk Ratio</th>
<th>Baseline Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruption</td>
<td>0.66</td>
<td>14.3%</td>
</tr>
<tr>
<td>Seroma</td>
<td>0.42</td>
<td>8.5%</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1.03</td>
<td>1.6%</td>
</tr>
<tr>
<td>Infection</td>
<td>0.98</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

What we do that works.

- Pre-incision antibiotics
- Closure of subcutaneous layer >2cm
- Suture the skin (or staple?)
## Skin: Suture vs Staple

- **Meta-analysis (2011)**
  - 5 RCTs + 1 prospective cohort, n=1,487

### Meta-analysis: wound complications

<table>
<thead>
<tr>
<th>Study identification</th>
<th>OR (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frishman (1997)</td>
<td>5.43 (0.25, 118.96)</td>
<td>1.07</td>
</tr>
<tr>
<td>Johnson (2007)</td>
<td>1.73 (1.02, 2.95)</td>
<td>52.75</td>
</tr>
<tr>
<td>Gaertner (2008)</td>
<td>0.70 (0.15, 3.32)</td>
<td>9.05</td>
</tr>
<tr>
<td>Rousseau (2009)</td>
<td>0.34 (0.01, 8.58)</td>
<td>3.42</td>
</tr>
<tr>
<td>Cromi (2010)</td>
<td>1.50 (0.13, 17.14)</td>
<td>2.30</td>
</tr>
<tr>
<td>Basha (2010)</td>
<td>3.12 (1.73, 5.62)</td>
<td>31.41</td>
</tr>
<tr>
<td>Overall (I-squared=13.7%, P=.327)</td>
<td>2.06 (1.43, 2.98)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Skin: Suture vs Staple

- Two newer large RCTs (n=1,114)
  - >65% obese

All Wound Complications

<table>
<thead>
<tr>
<th></th>
<th>Mackeen 2014</th>
<th>Figueroa 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Wound Complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackeen 2014</td>
<td>10.6%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Figueroa 2013</td>
<td>4.9%</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

*P<0.05

Wound Infection

<table>
<thead>
<tr>
<th></th>
<th>Mackeen 2014</th>
<th>Figueroa 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound Infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staples</td>
<td>3.7%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Sutures</td>
<td>2.4%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>
What we do that works.

- Pre-incision antibiotics
- Closure of subcutaneous layer >2cm
- Suture the skin (or staple?)
What we tried that **doesn’t** work.
What we tried that doesn’t work

• Multiple doses of prophylactic antibiotics

  – Cochrane Meta-analysis of 51 Trials:

    Multi- vs Single-dose to prevent wound infection

    OR 0.92 (95% CI 0.70-1.23)

Alfirevic. Cochrane Database. 2014
What we tried that doesn’t work

• Multiple doses of prophylactic antibiotics
• Perioperative supplemental oxygen

Three RCTs (total n= 1,559)

1. Gardella: 80% vs 30% O₂ → No Benefit
2. Scifres: 10L vs 2L →
3. Duggal: 80% vs 30% O₂ → ? Harm

What we tried that \textit{doesn’t} work

- Multiple doses of prophylactic antibiotics
- Perioperative supplemental oxygen
- Routine subcutaneous drain

Three Meta-analyses of RCTs agree...

- No benefit in cesarean
- No benefit in obese
- No benefit in general

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Gates. Cochrane Database. 2013
What we tried that doesn’t work

• Multiple doses of prophylactic antibiotics
• Perioperative supplemental oxygen
• Routine subcutaneous drain

What about in obese cesarean patients?

Multicenter RCT
n=280, mean BMI 48, subcut >4cm

<table>
<thead>
<tr>
<th></th>
<th>Suture</th>
<th>Suture+Drain</th>
<th>Adj OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seroma (%)</td>
<td>9.0</td>
<td>10.6</td>
<td>1.01 (0.44-2.32)</td>
</tr>
<tr>
<td>Composite (%)</td>
<td>17.4</td>
<td>22.7</td>
<td>1.21 (0.65-2.26)</td>
</tr>
</tbody>
</table>

Ramsey. Obstet Gynecol. 2005
What we tried that *doesn’t* work

- Multiple doses of prophylactic antibiotics
- Perioperative supplemental oxygen
- Routine subcutaneous drain
What’s new?

Society for Maternal-Fetal Medicine

SMFM 36th Annual Meeting — The Pregnancy Meeting™
February 1–6, 2016
Hilton Atlanta
Atlanta, GA
What’s new?

• Skin antisepsis: the debate ends?
Skin Antisepsis (in 2015)

- CHX vs Iodophor base +/- alcohol

- Meta-analysis:
  - 6 low quality RCTs (n=1522)
  - No difference in SSI or endometritis

Hadiati. Cochrane Database. 2014
A Randomized Trial Comparing Skin Antiseptic Agents at Cesarean Delivery

Methodius G. Tuuli, M.D., M.P.H., Jingxia Liu, Ph.D., Molly J. Stout, M.D., M.S.C.I., Shannon Martin, R.N., Alison G. Cahill, M.D., M.S.C.I., Anthony O. Odibo, M.D., M.S.C.E., Graham A. Colditz, M.D., Dr.P.H., and George A. Macones, M.D., M.S.C.E.

ABSTRACT
Skin Antisepsis \textbf{(in 2016)}

- Tuuli RCT
  - $n=1147$ cesareans
WHAT'S NEXT?
What’s next?

• Broad spectrum prophylactic antibiotics
### Broad spectrum: Better?

<table>
<thead>
<tr>
<th>Complication</th>
<th>Cefotetan + doxy + azithro (n=301)</th>
<th>Cefotetan + placebo (n=296)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endometritis (%)</td>
<td>16.9</td>
<td>24.7</td>
<td>.020</td>
</tr>
<tr>
<td>Wound infection (%)</td>
<td>0.8</td>
<td>3.6</td>
<td>.030</td>
</tr>
<tr>
<td>Postoperative stay (hr)</td>
<td>95</td>
<td>104</td>
<td>.016</td>
</tr>
</tbody>
</table>

#### Infection rates over time

- **1992-1996 (Cephalosporin)**
  - Endometritis: 23%
  - Wound Infection: 2.1%

- **1997-2000 (Trial Extended)**
  - Endometritis: 3.1%
  - Wound Infection: 1.3%

- **2001-2006 (Routine Extended)**

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C/SOAP

- Multicenter RCT
  MFMU
  n=2103

- Preop Abx: Cefazolin vs Azithro + Cefazolin

![Graph showing infection rates:]
- Infection (any): 12.0% (Cefazolin), 6.1% (Azithro + Cefazolin)
- Wound Infection: 6.6% (Cefazolin), 2.4% (Azithro + Cefazolin)
- Readmit/Visit: 8.2% (Cefazolin), 5.0% (Azithro + Cefazolin)
- Neonatal Morbidity: 3.4% (Cefazolin), 4.4% (Azithro + Cefazolin)