Intracavity lavage and wound irrigation for prevention of surgical site infection: systematic review and network meta-analysis

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Intracavity lavage and wound irrigation

- Surgical site infections (SSIs) are wound infections that occur after an operative procedure.
- They are costly and associated with poorer patient outcomes, increased mortality, morbidity and reoperation rates.
- Surgical wound irrigation and intracavity lavage (ICL) are intraoperative techniques
- These may reduce the rate of SSIs through removal of dead or damaged tissue, metabolic waste, and wound exudate.
Systematic literature review

- Systematic literature review (SLR) compared ICL techniques on SSI
- Searched Cochrane Wounds Specialised Register, the Cochrane Central Register of Controlled Trials, Ovid MEDLINE, Ovid Embase, and EBSCO CINAHL Plus.
- Included all RCTs of surgical procedures with primary wound closure where intraoperative washout method was only systematic difference
- SLR identified 59 studies involving 14,738 participants
- 12 of these from reference searching, suggesting publication bias.
- Meta-analysis found limited evidence of differences between techniques.
- Important comparisons (e.g. antibiotic vs antiseptics) could not be conducted due to lack of direct evidence.
- We applied network meta-analysis to attempt to boost certainty and fill in gaps.
Classification of irrigation options

• Reference treatment was nonantibacterial (incl. saline solutions) irrigation.
• Alternatives were no irrigation and antiseptic (incl. iodine) irrigation.
• In addition, there were four classes of antibiotics, with 17 options in total.
  • Cephalosporins (8 in total): cefazolin, cephapirin, cefoxitin, cefotetan, cefamandole, cephalothin, cefoxin, moxolactam
  • Penicillins (2): ampicillin, clindamycin
  • Other antibiotics (1): taurolidine PVP
  • Aminoglycosides (6 mono or combo): tetracycline, kanamycin sulphate +cephalothin sodium, kanamycin, gentamicin, gentamicin+clindamicin, chloramphenicol succinate
• An assumption that all 17 antibiotic options were independent was not viewed as clinically plausible and would lead to sparse evidence.
• This gives a total of 7 interventions and the following network of evidence...
Network of evidence

• Network meta-analysis can indirectly compare treatment options.
• This allows, for example, a comparison of antibiotics vs antiseptics, despite the lack of a direct RCT comparison.
• Node size represents number of trials on each treatment.
• Edge thickness represents trials on that comparison.
• We used a random effects network meta-analysis due to substantial heterogeneity between trials.
• This choice was supported on the basis of DIC and deviance and heterogeneity assessments ($sd^2$ and $I^2$).
Results of network meta-analysis

- Indicate aminoglycoside, penicillin, and antiseptics have a lower risk of SSI than nonantibacterial irrigation.

- Aminoglycoside has lowest SSI risk with limited uncertainty....
Risk of bias

- We used Cochrane risk of bias tool to assess risk of bias in each RCT.
- Here present all-domain bias
- Quantified contribution of each trial to the comparisons with nonantibacterial irrigation.
- Area represents proportion of evidence at each bias category.
- All important evidence at unclear or high risk of bias.
- Evidence at high risk of bias due to performance issues.
- Other domains only at low or unclear risk of bias
Meta-regression on wound contamination

- Degree of contamination varied across RCTs.
- Used meta-regression to explore impact of wound contamination
- Only 4 RCTs on ‘clean’ wounds, so merged with ‘clean-contaminated’
- Results suggest penicillin and aminoglycoside remain optimal
- However, these options better in clean or clean-contaminated wounds.

<table>
<thead>
<tr>
<th></th>
<th>Clean/Clean-contaminated (n=25)</th>
<th>Contaminated/Dirty/Mixed (n=17)</th>
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</thead>
<tbody>
<tr>
<td>OR no irrigation</td>
<td>0.834 (0.45, 1.51)</td>
<td>1.05 (0.56, 2)</td>
</tr>
<tr>
<td>OR antiseptic</td>
<td>0.508 (0.257, 0.913)</td>
<td>0.64 (0.336, 1.15)</td>
</tr>
<tr>
<td>OR cephalosporin</td>
<td>0.616 (0.281, 1.3)</td>
<td>0.778 (0.347, 1.7)</td>
</tr>
<tr>
<td>OR penicillin</td>
<td>0.21 (0.0416, 0.838)</td>
<td>0.266 (0.0564, 1)</td>
</tr>
<tr>
<td>OR other</td>
<td>0.615 (0.203, 1.82)</td>
<td>0.774 (0.262, 2.33)</td>
</tr>
<tr>
<td>OR aminoglycoside</td>
<td>0.263 (0.129, 0.521)</td>
<td>0.331 (0.155, 0.705)</td>
</tr>
</tbody>
</table>
Conclusions

- Penicillin or aminoglycosides likely best solutions for ICL to prevent SSI.
  - However, no clarity on which of these is best!
- Majority of evidence at unclear or high risk of bias
  - Particularly high risk due to issues with performance
- Adjustments for wound contamination did not impact treatment decision
  - Penicillin and aminoglycoside more beneficial for clean or clean-contaminated
- Issues with publication bias remain
  - Also found evidence of inconsistency between direct and indirect evidence.
- Recommend high quality randomised controlled comparison of penicillin and aminoglycoside
Thank you!

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