Evidence Based Medicine – Skin antiseptic for caesarean delivery

Which skin antiseptic agent works better with caesarean delivery?

Source: A Randomized Trial Comparing Skin Antiseptic Agents at caesarean Delivery. Tuuli MG et al. New England Journal of Medicine 2016 Feb 18;374(7):647-55. Summary by: Dr. Anand R, Assistant Professor, Department of Biochemistry, CMC Vellore

**Key Question:** Is chlorhexidine a better skin antiseptic agent than iodine in caesarean delivery?

**Authors’ conclusion:** Use of chlorhexidine-alcohol significantly lowers risk of surgical site infection when compared with iodine-alcohol.

**Background**
Caesarean sections are amongst the commonest surgeries performed worldwide and surgical site infections of caesarean sections can originate from pathogens of skin and/or vagina. Evidence is limited about the efficacy of antiseptic agents for preoperative antisepsis in caesarean delivery.

**Methods and Results**

<table>
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<tr>
<th>Study design</th>
<th>Single center, randomized control trial</th>
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| Research method | • Inclusion criteria for study subjects: Pregnant women undergoing Caesarean delivery  
• Exclusion criteria: Known allergy to chlorhexidine, alcohol, iodine, or a prior skin infection adjacent to the operative site  
Study participants were randomly assigned to chlorhexidine group (2% chlorhexidine gluconate with 70% isopropyl alcohol) or iodine group (8.3% povidone–iodine with 72.5% isopropyl alcohol). |
| Study outcome | Incidence of superficial or deep surgical site infection was checked within 30 days of caesarean delivery |
| Study Participants | A total of 1147 participants were recruited into the study and assigned into the chlorhexidine group (N=572) or iodine group (N=575). |
| Results | • **Incidence of surgical site infections were lesser in chlorhexidine group [Relative risk 0.55 (95% confidence interval 0.34–0.90); p=0.02]**  
• Incidence of infections were not different between emergency/elective procedures and type of wound closure (suture vs. stapler); not affected by coexistent obesity, diabetes and other co morbidities  
• No differences in incidence of allergic reactions, wound complications, and endometritis |
| Limitations | • Study was conducted in a single center  
• Participants and intervention providers were not blinded  
• Follow up was done by telephone interview |

**Discussion:**
An earlier prospective study (2010) which looked at postoperative infections in patients undergoing clean-contaminated surgery (Eg. Gastrointestinal, thoracic) concluded that chlorhexidine-alcohol used for skin antisepsis before surgery reduced the risk of surgical site infection by 41% compared with povidone-iodine. The current study though confined to patients undergoing Caesarean section is similar in conclusion and provides further evidence that chlorhexidine is superior to iodine while preparing the skin before a surgical procedure. A limitation of this study however, is that the follow-up was based on telephonic interviews with those who did not report any symptoms of an infection and hospital admission reviews of only those who developed an infection, rather than a clinical examination of all patients by a trained healthcare provider. Despite this, the evidence seems to favour the use of chlorhexidine over the more traditionally used povidone-iodine.

**EXPERT COMMENTS:** Dr. Ashish Gupta, Professor, Department of Plastic surgery, CMC Vellore
The superiority of chlorhexidine with alcohol is well established in cleansing the skin before insertion of vascular catheters. Centre of disease control and prevention (CDC) recommends chlorhexidine based preparation be
used to cleanse the site of insertion of vascular catheter. A CDC estimate from 2001 suggests that approximately 290,000 surgical site infections (SSI) occur every year. Approximately 8,000 patient deaths are associated with these infections. In-spite of this no recommendation exists for the preoperative use of specific skin antiseptics.

One of the most important risk factors for SSI is the presence of bacteria in the wound at the time of surgery. The purpose of skin preparation is to reduce the bacteria on the skin before making incision. Several antiseptic agents are available for preoperative preparation of skin. The iodophors (e.g. povidone-iodine), alcohol containing products, chlorhexidine are the most commonly used agents.

The ideal properties of an antimicrobial agent
- Broad spectrum
- Rapid bactericidal activity
- Residual properties on the skin
- None or minimal systemic absorption

Alcohol is readily available, inexpensive, and remains the most effective and rapid-acting skin antiseptic. Aqueous alcohol (70% to 92%) solutions have germicidal activity against bacteria, fungi, and viruses, but spores can be resistant. One potential disadvantage of the use of alcohol in the operating room is its flammability. Both chlorhexidine gluconate and iodophores have broad spectra of antimicrobial activity.

**Comparison of Antimicrobial Agents**

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<tr>
<th></th>
<th>Iodophors</th>
<th>Alcohol</th>
<th>Chlorhexidine</th>
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<tbody>
<tr>
<td>Broad Spectrum</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Rapid Activity</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Residual Activity</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Activity in Blood / Organic matter</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>No Systemic Absorption</td>
<td>-</td>
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<td>✓</td>
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The Superiority of 2% Chlorhexidine with 70% isopropyl alcohol Compared to Traditional Iodophors

**Rapid action**
The 70% isopropyl alcohol in Chlorhexidine - alcohol rapidly kills microorganisms versus free iodine, which requires two minutes to begin antimicrobial activity.

**Persistent action**: Chlorhexidine -alcohol maintains antimicrobial activity for at least 48 hours compared to two hours for free iodine.

**Broad spectrum activity**: Chlorhexidine-alcohol antimicrobial activity is effective against microorganisms including gram-positive and gram-negative bacteria, Methicillin-resistant staphylococcus aureus (MRSA), Vancomycin-resistant enterococci (VRE), clostridium difficile, acineobacter, and most viruses and fungi.

**Active in protein rich bio-materials**: Remains active in the presence of blood, serum, and other protein-rich biomaterials unlike traditional iodophors, which are neutralized.

**Low incidence of local irritation**: Chlorhexidine-alcohol demonstrates low incidence of irritation

For more than four decades Betadine have been used in hospitals worldwide as an important first line of defence against topical infection, but now "weight of evidence" is firmly on the side of chlorhexidine with isopropyl alcohol as a preoperative skin cleansing, rather than povidone iodine.