Surgical Site Preparation Solutions and Evidence Based Practice

Barlow Bird

Dixie State University

Surgical Site Preparation Solutions and Evidence Based Practice

**Introduction**

Surgical site infections are a top concern every time a patient is wheeled back to the Operating Room. For this literature review the author will be reviewing articles that discuss current evidence for the use of chlorhexidine and povidone–iodine in preoperative skin antisepsis. The goal will be to determine which prep solution provides the best protection from surgical site infections according to current evidence. For this review the author selected four research articles to review.

**Clean Contaminated Surgical Antisepsis**

The first article is a systematic review and meta-analysis of preoperative antisepsis in clean contaminated surgeries; it compares the results from surgeries that utilized chlorhexidine, and surgeries that utilized povidone-iodine solutions for preoperative skin preparation. The main focus was on clean contaminated surgeries rather than surgical procedures that would be deemed clean. By focusing on clean contaminated surgeries the authors felt they would have a more accurate perspective of the effectiveness of the prep solutions, due to the fact that surgical site infections are more likely to occur in clean contaminated surgeries than clean procedures, which results because of the increased exposure to bacterial organisms. The review utilized a total of six research studies that had data from a combined group of 5031 patients (Davies, Noorani, Rabey, & Walsh, 2010). The main outcome measured was the rate of post-operative surgical site infections with the second being intra-abdominal infections. Each of the six articles reviewed reported post-operative rates in surgical site infections. After analysis the authors stated, “SSI occurred in 145 (5.7%) of 2529 patients who had chlorhexidine” and “198 (7.9%) of 2502 who had povidone-iodine antisepsis” (Davies et al., 2010). The results for intra-abdominal infection rates were only shared by three of the articles and were stated as “38 (2.1%) of 1803 chlorhexidine-treated patients versus 39 (2.2% of 1812 who had povidone-iodine” (Davies et al., 2010). These results are believed to show a significant difference between the use of chlorhexidine and povidone-iodine solution in preventing surgical site infections, with chlorhexidine being the optimal solution. The rates of intra-abdominal infections did not show the same extent of variance between the solutions, but not all studies utilized, included such results. The authors admitted there were limitations to this study, which included the meta-analysis not being randomized, and the variance in how each solution was applied based on personal techniques utilized by individual healthcare professionals (Davies et al., 2010).

**Surgical Antisepsis in Cesarean Sections**

The second article reviewed by this researches was titled “can we reduce the surgical site infection rate in cesarean sections using a chlorhexidine-based antisepsis protocol” (Amer-Alshiek et all., 2013). This article was a retrospective study that reviewed the rates of post-operative surgical site infections on women undergoing elective and non-elective cesarean sections. The sample included two sets of data obtained from 163 women each time. On the first set of data collection the sample was preoperatively prepared with 10% povidone-iodine scrub solution for a total of three applications, dried with a sterile towel, then scrubbed with three applications of 10% solution of povidone-iodine in 65% alcohol. On the second data collection round the sample was preoperatively prepared with 2% chlorhexidine for three applications, dried with a sterile towel, and scrubbed with three applications of 70% alcohol. The procedure for preoperative preparation was the same for each group and included “a scrub area from the xiphoid to the upper thigh level and reaching the midaxillar line laterally” (Amer-Alshiek et all., 2013). To maintain consistency with results each member of both samples was dosed with 750mg of Cefuroxime Axetil as their preoperative prophylactic antibiotic. The authors of this article listed the individual outcome variables as being “SSI, post CS emergency room visit, and long length of stay defined as hospital stay of more than 5 days” (Amer-Alshiek et all., 2013). The results of the study showed that povidone-iodine had a rate of 10.4% post-operative SSI, with 2% chlorhexidine method only having a 3.07% SSI rate (Amer-Alshiek et all., 2013). Admittedly the authors of this article recognized there are many independent variables involved in such studies, which can hinder the efficacy of the results, but they believe their results to be valuable in determining ways to decrease SSI in cesarean section births, and recommend the use of chlorhexidine-based solutions in CS procedures.

**Surgical Antisepsis in Gynecological Laparotomies**

The next article under review for this paper is similar in nature as the last article with the exception of the surgical procedure. For this article the surgical procedure in question was elective gynecological laparotomies. Emphasis of this article was on determining ways to reduce morbidity and morality, patient and hospital expense involved with surgical site infections, and improving the overall patient safety and experience. The solutions tested were providone-iodine 10% scrub followed by providone-iodine 10% in 65% alcohol solution, and 2% chlorhexadine followed by 70% alcohol. Each patient was dosed with the same 750mg of cefuroxime axetil prophylactic I.V. antibiotic, had a similar health status, and similar risk factors (Levin et al., 2011). Similar preoperative preparation, types of incisions, usage of drains, sutures, and bandage placement were used for all patients. It was found that patients receiving the chlorhexadine protocol experienced a rate of SSI of 4.5%, while the patients on the providone-iodine protocol experienced an SSI rate of 14.6% (Levin et al., 2011). It was also found that patients who experienced the most SSI’s had similar factors in common such as older age, higher BMI’s, hypertension, type 2 diabetes mellitus, immunodeficiency, and having received the providone-iodine protocol (Levin et al., 2011). Although there are variables at play there is a significant increase in SSI’s when providone-iodine protocols were utilized for elective gynecological laparotomy surgeries. The authors of this article believe this evidence is important when considering the type of preparation solution in order to decrease the patient’s mortality, morbidity, overall cost, and improving their overall surgical experience.

**Combination Surgical Antisepsis**

The final article reviewed by this researcher was a retrospective study done in the Netherlands. The study was conducted from 2010 to 2011 where a different prep solution was used from year to year. During the first year the preoperative antisepsis prep solution was an iodine-alcohol, and the second year was a chlorhexadine-alcohol solution. Surgeries included in this study encompassed all patients who underwent breast, colon, or vascular surgery. The authors found that the patients treated with idodine-alcohol solution experienced an SSI rate of 6.1%, while patients in the second year who were treated with chlorhexadine-alcohol solution experienced an SSI rate of 3.8% (Charehbili, Swijnenburg, van den Bremer van de Velde, & van Gijn, 2014). Factors attributed to the differences in infection rate were “male gender, acute surgery, absence of antibiotic prophylaxis, and longer hospital length of stay” (Charehbili et al., 2014). Despite the difference in infection rate between iodine and chlorhexadine protocols the authors do not believe this number to be of significance in determining the efficacy of one protocol over the other when considering the variables involved. More research is indicated to further explore the differences in the two protocols in a more controlled environment in-order to determine the individual effectiveness of each preoperative prep solution (Charehbili et al., 2014).

**Conclusion**

Given the risk in mortality, morbidity, and the additive cost surgical site infections can add to a patients experience when undergoing surgery, determining ways to minimize these infections is of key importance. There has been much debate between what preoperative solution provides the best results. The two most common types include chlorhexidine and povidone–iodine for preoperative skin antisepsis. The question is which solution should be used and for what types of procedures. Reviewing the above articles is one step in the right direction for determining the answer to this question.

Reference

Amer-Alshiek, J., Alshiek, T., Almog, B., Lessing, J. B., Satel, A., Many, A., & Levin, I. (2013). Can we reduce the surgical site infection rate in cesarean sections using a chlorhexidine-based antisepsis protocol?. *Journal Of Maternal-Fetal & Neonatal Medicine, 26(*17), 1749-1752. doi:10.3109/14767058.2013.798291

Charehbili, A., Swijnenburg, R., van de Velde, C., van den Bremer, J., & van Gijn, W. (2014). A Retrospective Analysis of Surgical Site Infections after Chlorhexidine-Alcohol versus Iodine-Alcohol for Pre-Operative Antisepsis. *Surgical Infections, 15*(3), 310-313. doi:10.1089/sur.2012.185

Levin, I., Amer-Alshiek, J., Avni, A., Lessing, J. B., Satel, A., & Almog, B. (2011). Chlorhexidine and Alcohol Versus Povidone-Iodine for Antisepsis in Gynecological Surgery. *Journal Of Women's Health (15409996), 20*(3), 321-324. doi:10.1089/jwh.2010.2391

Noorani, A., Rabey, N., Walsh, S. R., & Davies, R. J. (2010). Systematic review and meta-analysis of preoperative antisepsis with chlorhexidine versus povidone-iodine in clean-contaminated surgery. *British Journal Of Surgery, 97*(11), 1614-1620. doi:10.1002/bjs.7214