**SH19**: What is the best presurgical skin preparation in the operating room? (antiseptic solutions, concentrations, order of use)

**Liaison:** Benjamin Zmistowski
**Lead delegate:** Daniel Davis
**Supportive delegates:** Abdul-Ilah Hachem, Shaojie Wang

**Response:** An alcohol-based solution is the optimal pre-operative skin preparation. *C. acnes* burden may be reduced when hydrogen peroxide is included prior to skin preparation.

**Strength of Recommendation:** Limited

**Delegate Vote:** 45 (92%) agree; 2 (4%) disagree; 2 (4%) abstain

**Rationale:** To identify existing literature on this topic, a PubMed/Medline search was used from database inception to September 2024. The following MeSH terms with appropriate Boolean operators were used to search for the listed question: "Skin preparation", "shoulder replacement", "shoulder arthroplasty", "joint replacement", "chlorhexidine", "hydrogen peroxide", "benzoyl peroxide", "povidone iodine". A manual search was then performed forward and backward on relevant citations and related articles to those that were found in the search. After completing the search there were 697 articles with 363 unique articles to review after removing duplicates. These articles were screened for relevance based on titles, which left 82 articles. The abstracts of these articles were then reviewed in detail to leave 24 articles for full text review. After full text review, 11 articles were found to be pertinent.

Four articles included were related to the type of prep used and its efficacy in eradicating primarily *C acnes*. The remaining 7 studies evaluate the effectiveness of adding hydrogen peroxide to what is considered routine surgical skin preparation. Two studies evaluated the effectiveness of alcohol based chloraprep in eradicating *C acnes* from the skin. Saltzman et al performed a comparison of ChloraPrep, DuraPrep and iodine-soaked gauze sponges in reducing positive cultures of the skin with swab. Chloraprep was found to be the most effective with 7% of samples with positive cultures, all of which were *C. acnes*. Duraprep skin swabs demonstrated a 19% positive culture rate (12% C. acnes) and iodine gauze demonstrated a 31% positive culture rate (15% C. acnes).[1] MacLean et al evaluated the effectiveness of Chloraprep to provide long term sterility and found that number of positive cultures from the skin correlated with increased time from skin prep.[2] Moor et al evaluated the effectiveness of iodine preparation followed by an additional iodine preparation after skin incision, which significantly reduced *C. acnes* culture at the incision after the second iodine preparation. There was also a significant reduction in deep cultures and those taken on surgical instruments.[3] While Chloraprep is the standard skin preparation in most studies, one pilot study evaluated a new topical skin prep of protocatechuic acid. The study found there was a significant decrease in the bacterial load around the shoulder with effectiveness against C. acnes, but more research is needed for broader recommendations.[4]

Six articles were identified in the literature evaluating the effectiveness of adding hydrogen peroxide prior to the standard chlorhexidine prep in the operating room. One study was a two

year follow up of another and one study evaluated culture positivity of arthroscopic suture tails. Four of the studies evaluated the skin biopsies with three including deep cultures. There were 297 patients evaluated in the four studies with an average positive culture in the dermis of 20% in the hydrogen peroxide group for *C. acnes* and an average positive culture rate for *C. acnes* of 25% in the control group. While positive cultures were on average lower in the treatment group for skin and dermal cultures, they did not reach statistical significance. Only one study found statistical significant differences in between the treatment and control groups in deep cultures during open surgeries.[5-8] Mizels et al performed a 2-year follow-up to the group of patients who were studied to evaluate for periprosthetic infection and found there was a 27% revision rate in the control group with 7% positive culture for C acnes and a 9% revision in the hydrogen peroxide group with 0% positive culture for C. acnes. Neither of these differences met statistical significance.[9] Yamakado et al. evaluated culture positivity in suture tails comparing standard chlorhexidine prep to the addition of hydrogen peroxide in 151 arthroscopic cases. There was a 50% reduction in positive C. acnes cultures in the hydrogen peroxide group versus the control (6.8% versus 13%), but this did not reach statistical significance.[10]

While benzoyl peroxide is generally utilized in the days leading up to surgery to decrease the bacterial load of the shoulder, one study evaluated its efficacy when combined with chlorhexidine as a preoperative prep in the operating room compared to chlorhexidine alone. Of 22 participants pre-prep cultures demonstrated nearly 100% culture positivity for C. acnes. Post-prep cultures were reduced to an average of 20% in the study group and 13.5% in the control group, which was not statistically significant. Based on this one study it does not appear that adding benzoyl peroxide as an operating room prep agent changes the skin culture positivity for C. acnes.[11]

No studies reported significant side effects or reactions to the hydrogen peroxide.

**References**


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