cultures) of *C. acnes* skin colonization by day of surgery. The rate of positive cultures from the deep shoulder joint was 3.1% (2/65 patients) with preoperative BPO/C topical treatment, much lower than similar studies which described up to 19.6% positive deep cultures [9,15].

In summary, there is evidence that topical skin treatments can reduce bacterial loads, such as *C. acnes*. However, no studies examined the effect of skin preparations on the most clinically significant end-point—the rate of shoulder PJI. The use of topical BPO with or without clindamycin, whilst encouraging and warranting further study, cannot currently be fully endorsed as standard practice for prevention of shoulder PJI, until further data is available.

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Authors: Mark Falworth, Jeremy Somerson

QUESTION 4: Should the subcutaneous and dermal tissues be disinfected during shoulder arthroplasty?

RECOMMENDATION: There is insufficient evidence for or against disinfection of the subcutaneous and dermal tissues during shoulder arthroplasty.

LEVEL OF EVIDENCE: No Evidence

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

A review of PubMed "(subcutaneous OR irrigation OR disinfection OR topical OR local) AND shoulder AND arthroplasty)" and Google Scholar "shoulder arthroplasty subcutaneous irrigation disinfection topical local" was performed to identify articles comparing strategies for disinfection of the subcutaneous and dermal tissues during shoulder arthroplasty. No such literature was identified. In the absence of specific evidence, basic science research and research in other fields of surgery were reviewed.

Lee et al. [1] performed punch biopsy cultures from the shoulders of volunteers after standard surgical preparation of the skin. Seven of ten subjects revealed positive cultures for *Cutibacterium*. On this basis, the authors concluded that surgical preparation could leave bacteria under the surface of the skin, and further disinfection should be performed.

In a retrospective hip and knee arthroplasty series, Brown et al. [2] compared dilute betadine lavage prior to closure of total hip and knee arthroplasty incisions to controls. The deep infection rate was lower in the group undergoing betadine lavage compared to the control group. In contrast, a similar methodology using chlorhexidine gluconate (CHG) showed no difference between CHG irrigation groups and controls. However, the conclusions may have been confounded by the fact that povidone-iodine was also utilized in the control group [3]. A broader meta-analysis of randomized controlled trials across various surgical specialties found that lavage with dilute betadine reduced the occurrence of surgical site infections in the majority of trials with no reported complications [4].

An intra-articular injection of gentamicin [5] and the application of topical vancomycin powder [6] have also both been described as operative measures to reduce periprosthetic joint infection in shoulder arthroplasty. Although there was no clinical evidence for the use of vancomycin powder in the shoulder, recent literature in the field of spinal surgery has shown a significantly decreased risk of surgical site infection with the use of topical vancomycin

[7]. A retrospective review of 507 shoulder arthroplasty procedures compared 343 patients who received an intra-articular injection of 160 mg gentamycin at the end of surgery to 164 patients who did not; the infection rate in the control cohort was 3% (5 of 164) compared to 0.3% (1 of 343) in the gentamycin cohort [5]. However, the design of the study allowed for bias with confounding variables, including the use of antibiotic impregnated cement, which may have influenced outcomes.

It should be noted that the Centers for Disease Control and Prevention released a recommendation on the use of vancomycin in 1995. Due to concerns for development of antimicrobial resistance, routine utilization of vancomycin in prophylaxis has been discouraged. Instead, use of vancomycin is believed to be acceptable for "prophylaxis for major surgical procedures involving implantation of prosthetic materials or devices at institutions that have a high rate of infections caused by MRSA or methicillin-resistant S. epidermidis." This position statement has not been updated recently or amended to include a discussion of vancomycin powder.

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