SH71: What are optimal antibiotics to be added to an antibiotic-loaded cement spacer for treating shoulder PJI?

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Response: There is evidence to suggest that gentamicin alone (the common antibiotic in premade shoulder spacers) has relatively weak and inconsistent action against *C. acnes* compared with other antibiotics such as cephalosporins and vancomycin. As such, the addition of a secondary antibiotic in cement around premade spacers during implantation, or the use of a targeted antibiotic approach when using handmade spacers should be considered.

Strength of Recommendation: Limited

Delegate Vote: 53 (100%) agree; 0 disagree; 0 abstain

Rationale: Treatment of shoulder periprosthetic joint infection often involves the placement of an antibiotic-loaded cement spacer. This strategy has been adopted from the hip and knee arthroplasty experience and literature. The microbiota around the shoulder differs from that of the knee and hip especially with regards to an increase in *Cutibacterium acnes* and coagulase negative staph colonization. The optimal antibiotic agent to be added to a cement spacer in the treatment of shoulder PJI has not been well characterized. PubMed and Google Scholar were searched for the following keywords: “shoulder”, “infection”, “periprosthetic”, “arthroplasty”, “antibiotic”, “spacer” to identify relevant articles through a title screen, abstract review and, finally, a full text review to identify the relevant manuscripts.

After an extensive review of the literature, there is limited clinical evidence to guide optimal choice of antibiotic agents for cement spacers in the treatment of shoulder PJI. A concerning issue with the often-used premade shoulder spacers is that they were adapted from previously developed hip and knee spacers and maintain the standard gentamicin antibiotic formulation. However, it has been shown that gentamicin has relatively weak and inconsistent action against *C. acnes* compared with antibiotics such as cephalosporins, vancomycin, or clindamycin.

In 2023, an in-vitro analysis by Vinod et al [1] showed that ertapenem induced the largest response against *C acnes*, but its effect was relatively short (one week or less) compared to vancomycin alone or vancomycin with gentamicin (35-81 days). Overall, vancomycin and gentamicin in combination demonstrated the most prolonged response for eradication. The response of gentamicin alone was the weakest and lasted at most 14 days, calling into question its use in premade shoulder spacers. Clindamycin is another antibiotic with relatively high efficacy against *C acnes*, however studies have shown a relatively high rate of clindamycin resistance in PJI C acnes isolates [2].

Among coagulase negative staph strains such as *Staphylococcus epidermidis*, an in-vitro analysis by Chowdhury et al [3] showed that ertapenem in combination with either vancomycin or gentamicin allowed for a powerful initial burst of killing followed by consistent antibiotic elution as opposed to gentamicin alone. In-vivo studies of antibiotic elution properties and bioavailability are lacking for shoulder spacers [4].

Given the limited data available, the optimal antibiotic choice for cement spacers in the treatment of shoulder PJI remains unclear. Further studies are required to determine the optimal antibiotic regimen. However, it appears that the use of premade shoulder spacers containing only gentamicin, without the addition of other antibiotics such as vancomycin or ertapenem, is a suboptimal choice for treating the most commonly isolated microorganism in shoulder PJI.

References:

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3. llison Chowdhury, Kevin Kohut, Sonja Pavlesen, John Crane, Thomas Duquin, Matthew DiPaola. In vitro analysis of various antibiotic and cement combinations against S. epidermidis and S. lugdunensis for treatment of periprosthetic shoulder infection. Seminars in Arthroplasty: JSES. Volume 34, Issue 3, 2024, Pages 738-745, ISSN 1045-4527. https://doi.org/10.1053/j.sart.2024.04.007.
4. Namdari S, Sudah SY, Menendez ME, Denard PJ. Antibiotic Spacers for Shoulder Periprosthetic Joint Infection: A Review. J Am Acad Orthop Surg. 2022 Oct 1;30(19):917-924. doi: 10.5435/JAAOS-D-21-00984.