SH21: What are the optimal peri-operative antibiotics for primary shoulder arthroplasty? What if allergic to cefazolin?

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Response: A regionally appropriate first-generation cephalosporin, dosed according to body weight, remains the preferred antibiotic choice for patients undergoing primary shoulder arthroplasty.

For those colonized with methicillin-resistant *Staphylococcus aureus* (MRSA), weight-adjusted Vancomycin may be added.

In cases of confirmed cephalosporin anaphylaxis, Vancomycin should be administered.

Strength of Recommendation: Moderate

Delegate Vote: 48 (98%) agree; 1 (2%) disagree; 0 abstain

Rationale:

MEDLINE/PubMed, Web of Science, Scopus Clinicaltrials.gov, and Cochrane Library were searched from database inception to September 2024 and screened for relevant studies. The search terms used included "antibiotic*", "shoulder", "arthroplasty", and "replacement". Additionally, a manual search of reference lists from the included studies, previous systematic reviews, and literature reviews was performed to find any additional eligible studies. The initial search identified 699 references. After removing duplicates, 306 studies were screened by title and abstract, and 36 were reviewed in full-text. Ultimately, 19 studies were included.[1,4–6,9,11–18,20–25] Three studies were classified as level I evidence,[16,20,21] four were level III,[5,6,13,14,17,23–25] and eight were level IV.[1,4,9,11,12,15,18,22] Comparative studies on antibiotic prophylaxis and its impact on the risk of postoperative joint infection remain limited.[5,14,20,25] Seven studies focused on *Cutibacterium acnes* colonization in the context of shoulder surgery, [11,12,15,16,21,23,24] including two randomized controlled trials that examined whether adding doxycycline to the standard prophylactic regimen would reduce *Cutibacterium acnes* colonization.[16,21] Both trials concluded that doxycycline was ineffective in decolonizing the shoulder and may not decrease the risk of postoperative joint infections.

Cutibacterium acnes, coagulase-negative *Staphylococcus*, and *Staphylococcus aureus* are the most common organisms responsible for shoulder periprosthetic joint infections (PJI), and prophylactic antibiotics should target these pathogens.[7,15] Most studies included in this review used cefazolin as the primary prophylactic antibiotic for non-beta-lactam-allergic patients.[5,12,14,16,18,23–25] In one study, gentamicin was used alongside cefazolin as a second antibiotic,[11] while two studies combined vancomycin with cefazolin.[6,20] One of these was a randomized controlled trial evaluating the addition of vancomycin in patients without methicillin-resistant *Staphylococcus aureus* (MRSA) colonization.[20] The trial found that adding vancomycin to cefazolin prophylaxis did not significantly reduce infections compared to placebo in shoulder arthroplasty patients without known MRSA colonization. In patients colonized with MRSA, a glycopeptide such as teicoplanin or vancomycin is recommended, with vancomycin being the most commonly used.[10] However, studies have shown a higher risk of PJI with vancomycin compared to cefazolin, likely due to vancomycin's narrower spectrum of activity. Therefore, when possible, vancomycin should be combined with cefazolin to broaden coverage.[2,8] Other prophylactic regimens identified in the review included oxacillin,[9] cephalosporine combined with penicillin,[9] ceftriaxone plus vancomycin,[5,15] cloxacillin and cloxacillin with benzylpenicillin.[4]

Two national registers in the United States have shown that patients who reported any antibiotic allergy had increased likelihood of PJI.[1,22] For those with a reported beta-lactam allergy, vancomycin and clindamycin are the most commonly prescribed antibiotics.[5,6,9,14,16,17,23–25] A study comparing infection risk after primary shoulder arthroplasty based on antibiotic prophylaxis found that patients who received clindamycin had a higher risk of infection compared to those given cefazolin, while no increased risk was observed in patients receiving vancomycin compared to cefazolin.[25] A significant proportion of individuals who self-report beta-lactam allergies may be misdiagnosed and could safely receive cefazolin following appropriate allergy testing.[19] Therefore, in confirmed cases of true beta-lactam allergy, vancomycin should be the preferred antibiotic option.

Ensuring bactericidal tissue concentrations of antibiotics at the time of incision is essential for reducing postoperative infections. The recommended prophylactic intravenous cefazolin dosage is 1g for patients weighing less than 60 kg, 2g for those between 60-120 kg, and 3g for those over 120 kg, administered 30-60 minutes before skin incision.[3] Only five of the included studies that used cefazolin for antibiotic prophylaxis reported both the dosage and timing of administration.[11,12,23,24] Four studies noted the use of postoperative doses within the first 24 hours after surgery.[6,9,11,15,17] One study found no difference in PJI rates between single-dose and 24-hour cefazolin combined with vancomycin regimens.[6] For vancomycin, weight-based dosing of 15 mg/kg, up to a maximum of 2g, is recommended.[3] Two studies reported administering a second dose of vancomycin 12 hours post-surgery,[6,15] while two others continued vancomycin for 24 hours.[9,17] However, the most critical factor for effective antibiotic prophylaxis is administering vancomycin completely at least 30 minutes prior to the incision, ideally over a period of 1 to 2 hours.[13,14]

TABLE 1. Recommended antimicrobial prophylaxis for patients undergoing primary shoulder arthroplasty**.**

Clinical Situation	Antimicrobial Recommended
No beta-lactam allergy	Cefazolin 2 g IV (1g if patient weighs <60 Kg and 3g if >120 Kg) starting within 3060 minutes prior to incision; re-dose Q 4 hours; postoperative doses not required and should not be given beyond 24 hours.
Personal history of MRSA infection or colonization	Vancomycin 15 mg/Kg IV (maximum dose 2g) starting within 2 hours prior to incision and completed at least 30 minutes prior to the incision; postoperative doses not required and should not be given beyond 24 hours. We favor the addition of cefazolin to vancomycin.
Confirmed beta-lactam allergy	Vancomycin 15 mg/Kg IV (maximum dose 2 g) starting within 2 hours prior to incision and completed at least 30 minutes prior to the incision; postoperative doses not required and should not be given beyond 24 hours.

IV: intravenous; MRSA: methicillin-resistant Staphylococcus aureus

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