

QUESTION 7: Should perioperative antibiotics be withheld prior to obtaining an intraoperative aspirate and/or tissue samples for culture in suspected infected revision total joint arthroplasty (TJA) cases?

RECOMMENDATION: Administration of perioperative antibiotics during revision arthroplasty should be based on the degree of suspicion for periprosthetic joint infection (PJI) and the results of preoperative culture results. If suspicion for PJI is low or if the infecting organism in a PJI case has been preoperatively identified, then perioperative antibiotics should be administered. In patients with high suspicion for PJI in whom preoperative cultures are negative, perioperative antibiotics should be withheld to improve the yield of intraoperative samples taken for culture.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 81%, Disagree: 16%, Abstain: 3% (Super Majority, Strong Consensus)

RATIONALE

Chronic PJI remains one of the most difficult conditions to treat in the field of arthroplasty. Furthermore, when such infections are culture-negative they become even more difficult to treat, as targeted antibiotic therapies are impossible. It has been previously demonstrated that antibiotic administration prior to establishing a causative organism increases the risk of culture-negative infection [1]. However, the need to withhold pre-incision antibiotic prophylaxis remains controversial.

A comprehensive review of the literature identified eight applicable studies that evaluated the impact of perioperative antibiotic prophylaxis on culture yield. Two were randomized clinical trials [2,3], and two more were prospective cohort studies [4,5]. One was a systematic review of the literature [6]. Three were retrospective studies [7–9] with large cohorts of patients who had both pre- and postoperative cultures available for comparison, making both very high-quality retrospective studies.

Overall, the literature overwhelmingly supports giving prophylactic antibiotics at the onset of the case, rather than holding them for cultures to be obtained. The first study to critically examine the issue was a retrospective review of 171 PJI patients [7], all confirmed by a positive preoperative culture. In this study, the authors observed a nearly identical false negative culture for those patients who had received preoperative antibiotics at the onset of the case (12.5%), and those for whom antibiotics were withheld prior to culture (8%) ($p = 0.34$). Furthermore, in all cases, intraoperative cultures isolated the same organism as preoperative cultures. In a follow-up prospective study [5] analyzing a separate patient population, the same group identified 26 infected knee replacements and compared intraoperative cultures following prophylactic antibiotic administration to preoperative aspirations. In all cases, the intraoperative cultures yielded the same organism as the pre-operative aspiration.

Similarly, a randomized clinical trial of 65 confirmed PJI patients [3] demonstrated concordant intraoperative cultures in 82% of patients who received prophylactic antibiotics, compared to 81% in patients for whom antibiotics were withheld. Additionally, a smaller randomized clinical trial [2] found identical rates of positive intraoperative culture between patients who received antibiotics prior to incision and those who did not.

In a prospective study utilizing an intraoperative control, Bedencic et al. [4] took cultures prior to and after administration of antibiotics from the same surgical site and demonstrated no statistical difference in colony forming units (CFUs) between the two sets of cultures. Furthermore, antibiotic concentrations from the surgical bed were above the minimum inhibitory concentration at the time of the second culture. The only false negatives observed were in cases of coagulase-negative *Staphylococcus* and *C. acnes*.

In a recent systematic review of the literature [3,6], pooled results from seven studies demonstrated a statistically significant difference in false-negative cultures if antibiotics were withheld, however a subgroup analysis of chronic PJI failed to reproduce this result.

Most recently, a retrospective review of 425 total knee arthroplasty (TKA) revisions [8] compared culture yield in 114 patients who received preoperative antibiotic prophylaxis versus 284 patients in whom antibiotics were withheld preoperatively. The authors observed no significant difference in culture yields between the two groups ($p = 0.78$). Furthermore, when these patients were classified in accordance with the Musculoskeletal Infection Society (MSIS) diagnostic criteria for PJI, there remained no significant difference in infection rates seen between the two groups (7.1% in the preoperative prophylaxis group vs. 6.7% in the antibiotic withheld group, $p = 0.88$). The authors concluded withholding preoperative prophylaxis to maximize culture yield is likely not as critical as previously thought.

Another recent retrospective review of 110 patients [9] undergoing orthopaedic joint procedures assessed the influence of antibiotic prophylaxis within 30 to 60 minutes prior to surgery with respect to positive *C. acnes* culture and joint infection [9]. The study categorized patients into two cohorts: infected cases if two or more positive cultures, and contaminated cases if less than two positive cultures, resulting in 64 infected patients and 46 patients with contaminated cultures. While patients in the infected cohort received perioperative prophylaxis more often (72.8% versus 55.8%, $p < 0.001$), no difference was found with respect to time to positive culture regardless of administration of perioperative antibiotics (7.07 days versus 7.11 days, $p = 0.300$). Furthermore, no association was found between administration of perioperative antibiotics and the proportion of sample positivity (71.6% versus 65.9%, $p = 0.390$).

Similar to the previously-mentioned studies, the authors concluded in favor of administration of preoperative antibiotic prophylaxis to protect against surgical site infection.

Overall, the literature supports not withholding pre-incision antibiotics for cases of suspected prosthetic joint infection. It should be noted one common limitation in the aforementioned studies remains the consistency with diagnostic tests (i.e., variable number of intraoperative cultures and no use of sonication). However, given the fact that there is a relatively significant false negative rate of intraoperative cultures, especially in cases of lower virulence organisms, we recommend obtaining preoperative aspiration following an antibiotic holiday to help identify a causative organism prior to revision surgery.

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