

Comment on the 2009 American Academy of Orthopaedic Surgeons' Information Statement on Antibiotic Prophylaxis for Bacteremia in Patients with Joint Replacements

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The American Academy of Orthopaedic Surgeons (AAOS) recently released a new information statement on antibiotic prophylaxis for patients who have had a total joint replacement.¹ An earlier statement was developed jointly with the American Dental Association (ADA) in 1997 and revised in 2003. The new statement was not developed collaboratively with the ADA, but is intended “as an educational tool based on the opinion of the authors.”

Changes from the Earlier Statement

The 2009 statement recommends antibiotic prophylaxis for patients who have undergone total joint replacement before any invasive procedure that may produce bacteremia, regardless of the length of time after the joint replacement surgery. It also consolidates recommendations for all invasive procedures, both dental and medical. This is a departure from the 2003 statement, which limited use of antibiotic prophylaxis to the first 2 years following joint replacement surgery and to patients with comorbidities that might place them at increased risk of procedure-related bacteremia (e.g., immunocompromised patients) for more than 2 years after surgery. What remains essentially unchanged from the

2003 statement is the exclusion of antibiotic prophylaxis for patients with pins, plates, screws or other hardware that is not within a synovial joint and a special emphasis on patients with comorbidities.

The AAOS justifies its support for antibiotic prophylaxis by citing the “potential adverse outcomes and cost of treating an infected joint replacement.” The 2009 statement is based on the assumptions that

- bacteremia from oral flora arising from dental procedures causes prosthetic joint infections (PJIs)
- there is a temporal relation between dental procedures and PJIs
- antibiotic prophylaxis prevents bacteremia from dental procedures and subsequent PJIs
- one cannot compare late PJIs and infective endocarditis, because of differing anatomy, blood supply, microorganisms and mechanisms of infection.

Issues Surrounding the AAOS's Assumptions

There are problems with all 4 assumptions. First, close analysis of the many reported cases demonstrates that PJI is rarely caused by bacterial species common to the mouth,

and there is no credible evidence to link PJIs with dental procedures. Many case reports purport to link dental procedures with PJIs on the basis of bacterial family or group of bacteria (e.g., *Streptococcus viridans*), rather than a specific organism known to colonize the mouth. In fact, we could find no well documented case of total joint infection where the reported species was specific to the teeth or mouth, using either standard methods of species identification or modern molecular methods demonstrating genetically identical bacterial species from the mouth and the infected joint.²⁻⁵ Furthermore, the incidence of PJIs from viridans streptococci reported in controlled epidemiologic studies is 0.06 cases per 1,000 joint-years,⁶ which is comparable to the incidence of viridans group endocarditis in the general population, for which the American Heart Association (AHA) does not recommend antibiotic prophylaxis.

Second, evidence of a temporal relation between dental procedures and the onset of PJIs has always been circumstantial.⁷

Third, there are case reports of PJI occurring after dental procedures despite antibiotic prophylaxis,^{8,9} and it is well established that bacteremia from tooth extractions occurs despite standard prophylactic antibiotic regimens.¹⁰

Fourth, although the authors point out differences between late PJI and infective endocarditis, it is clear that upwards of 50% of cases of infective endocarditis are caused by oral bacterial species,¹¹ whereas little or no data suggest a connection between late PJI and dental procedures. Despite this, recommendations for PJI are going in the opposite direction from those for infective endocarditis.^{12,13}

Need for Sound Basis and Greater Clarity

The 1997 and 2003 joint statements were intended to reduce risk to patients from the unnecessary use of antibiotics. Although the new statement acknowledges the issue of risk versus benefit, it represents a departure from the original intent. Fatal anaphylactic reactions are estimated to occur in 15–25 patients per million who receive a dose of penicillin, although these estimates may be overstated.¹⁴ However, the incidence of a life-threatening anaphylactic reaction to a single dose of antibiotics exceeds that of life-threatening PJI from oral bacterial flora. In addition, the continued use and misuse of antibiotics has led to the development of bacterial resistance, which is a significant public health concern and a significant cost to the health care system.

The new statement no longer defines specific dental procedures that cause bacteremia. The prudent approach for the practitioner who is considering antibiotic prophylaxis would be to use the criteria established in the 2007 AHA guidelines, which suggest coverage for “all dental procedures that involve manipulation of gingival

tissue or the periapical region of teeth or perforation of the oral mucosa.”¹² Unlike previous AAOS statements, the 2009 statement does not recommend an antibiotic regimen for patients allergic to penicillin, in which case the previous recommendation of 600 mg clindamycin might be considered.

The new statement references case reports from the 1970s; there are no references from the past 10 years citing recent work on bacteremia in general or PJI infection related to dental procedures in particular.

Of greatest concern to practitioners and patients should be the frequent bacteremia of oral flora from daily activities such as tooth brushing, flossing and chewing food. This concern is intensified for those with poor dentition or oral hygiene or a periodontal condition. Although the magnitude of bacteremia from tooth brushing is likely less than that from a single tooth extraction, the frequency of this common activity that may cause bacteremia far exceeds that of dental office procedures.¹⁰ Given that the mouth is a rare source of bacteria causing a PJI, it is even more unlikely and rare that a PJI is the result of a dental procedure. All practitioners should put greater emphasis on promoting good oral hygiene and eliminating oral disease in this group of at-risk patients, both before and after prosthetic joint surgery.

The new version of the AAOS statement is bound to increase confusion in the clinical care arena. Although there are statements to the effect that clinicians should use their own judgment, both orthopedic surgeons and dentists are unlikely to do this, if only for medical-legal reasons. The result will be exponentially greater numbers of patients exposed to antibiotics. The weight of scientific evidence strongly suggests that the new statement lacks an evidence base and is a return to a pre-1997 era when clinicians were confused by inconsistent dogma. The 1997 and 2003 joint recommendations provided some clarity, but were overdue for revision. However, the lack of definition of invasive dental procedures, alternate antibiotic regimens for penicillin-allergic patients and the all-encompassing nature of the new guidelines will lead to a significant increase in the use of antibiotics and time spent in unnecessary consultations between orthopedic surgeons and a wide variety of other clinicians. ♦

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