

# The dental treatment of patients with joint replacements

## A position paper from the American Academy of Oral Medicine

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**T**he history of total hip replacement dates back to the 1700s.<sup>1</sup> The postoperative infection rate during the 1950s was close to 12 percent.<sup>2,3</sup> Most prosthetic joint infections occur within three months after surgery and are termed “early infections,” thought to be caused by wound contamination. Those occurring later than three months after surgery are called “late prosthetic joint infections” (LPJIs) and are caused by either wound contamination or the hematogenous spread of bacteria from a distant site.<sup>4</sup> Across time, several techniques reduced the postoperative infection rate to a range of less than 1 to 2 percent.<sup>4</sup> These procedures allowed for total hip, total knee and other joint replacements to become commonplace in the 1970s and beyond.<sup>5-8</sup> Two of the more important techniques were the use of short-term primary antibiotic prophylaxis (AP) (prophylaxis administered just before the placement of the prosthesis) and the use of a laminar airflow system in the operating room.<sup>9</sup>

During the 1970s and early part of the 1980s, the orthopedic community focused attention on the possible role of bacteremia resulting

## ABSTRACT

**Background.** In February 2009, the American Academy of Orthopaedic Surgeons (AAOS) published an information statement in which the organization “recommends that clinicians consider antibiotic prophylaxis [AP] for all total joint replacement patients prior to any invasive procedure that may cause bacteremia.” The leadership of the American Academy of Oral Medicine (AAOM) thought that there was a need to respond to this new statement.

**Methods.** The authors reviewed the literature on this subject as it relates to the AAOS’s February 2009 information statement. The draft of the resulting report was reviewed and approved by the leadership of the AAOM and several dentists in North America who have expertise on this subject.

**Results.** The risk of patients’ experiencing drug reactions or drug-resistant bacterial infections and the cost of antibiotic medications alone do not justify the practice of using AP in patients with prosthetic joints.

**Conclusions.** The authors identified the major points of concern for a future multidisciplinary, systematic review of AP use in patients with prosthetic joints. In the meantime, they conclude that the new AAOS statement should not replace the 2003 joint consensus statement.

**Clinical Implications.** Until this issue is resolved, dentists have three options: inform their patients with prosthetic joints about the risks associated with AP use and let them decide; continue to follow the 2003 guidelines; or suggest to the orthopedic surgeon that they both follow the 2003 guidelines.

**Key Words.** Antibiotic prophylaxis; prosthetic joint; infection; antibiotics; medically complex patients; guidelines; recommendations.

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from dental procedures as a source of LPJIs.<sup>10-13</sup> Results of opinion surveys of orthopedic surgeons during this period suggested that more than 90 percent favored administering secondary AP before performing dental procedures to patients who had undergone joint replacement.<sup>14,15</sup> Results from later surveys continued to show support for AP among orthopedic surgeons and infectious-diseases specialists.<sup>16,17</sup>

Because the scientific literature never provided strong support for AP use, many physicians and dentists became concerned about the appropriateness of this practice as a standard of care. In 1988, a group of selected orthopedic surgeons, dentists and infectious diseases specialists held a workshop in Chicago, sponsored by the American Dental Association (ADA), to address this issue. As a result of this meeting, several attendees presented a paper in 1990 stating that there was limited evidence to support AP but that the workshop participants nevertheless recommended it until additional information became available.<sup>18</sup> Later in 1990, the ADA Council on Dental Therapeutics published the results of the 1988 meeting, stating that there were limited data to support the continuation of the use of AP for dental patients with prosthetic joints.<sup>19</sup>

In 1997, after continued collaboration and with input from members of the Infectious Diseases Society of America (IDSA), the ADA and American Academy of Orthopaedic Surgeons (AAOS) published an advisory statement regarding the dental treatment of patients with prosthetic joints.<sup>20</sup> This statement was modified slightly in 2003.<sup>21</sup> According to the statement, AP use was not recommended for patients with pins, plates or screws, or for otherwise healthy patients with total joint replacements. Patients at greater risk due to specific medical conditions should be considered candidates for prophylaxis. These included patients whose prostheses were less than two years old or those who had “high-risk” conditions such as inflammatory arthropathies (rheumatoid arthritis, systemic lupus erythematosus), drug-induced or radiation-induced immunosuppression, previous joint infection, malnourishment, hemophilia, human immunodeficiency virus infection, insulin-dependent diabetes or malignancy.<sup>21</sup> Fol-

lowing the American Heart Association (AHA) guidelines for cardiac patients,<sup>22</sup> the statement classified various dental procedures according to a presumed associated incidence of risk of bacteremia.<sup>22</sup>

In February 2009, without collaborative involvement with organized dentistry or nonorthopedic physician specialties, the AAOS published what it labeled an “Information Statement” entitled “Antibiotic Prophylaxis for Bacteremia in Patients With Joint Replacements.”<sup>23</sup> It states that it “was developed as an educational tool based on the opinions of the authors. Readers are encouraged to consider the information presented and reach their own conclusions.” The 2003 ADA/AAOS guidelines contained the fol-

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lowing statement: “The risk/benefit and cost/effectiveness ratios fail to justify the administration of routine antibiotic prophylaxis.”<sup>21</sup> The new 2009 AAOS information statement suggests a different position: “Given the potential adverse outcomes and cost of treating an infected joint replacement, the AAOS recommends that clinicians consider antibiotic prophylaxis for all total joint replacement patients prior to any invasive procedure that may cause bacteremia.”<sup>23</sup> There was no clear explanation or scientific basis for this change in position.

If one were to follow the information statement of the AAOS authors, the following four assumptions all would have to be true for a clinician to believe the actions are in the patient’s best interest:<sup>24</sup>

- bacteremia from oral flora arising from dental procedures causes LPJIs;
- there is a temporal relationship between dental procedures and LPJIs;
- AP prevents bacteremia resulting from dental procedures and subsequent LPJIs;
- one cannot compare late LPJIs and infective endocarditis because of differing anatomy, blood

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**ABBREVIATION KEY.** **AAOM:** American Academy of Oral Medicine. **AAOS:** American Academy of Orthopaedic Surgeons. **ADA:** American Dental Association. **AHA:** American Heart Association. **AP:** Antibiotic prophylaxis. **CIED:** Cardiovascular implantable electronic device. **IDSA:** Infectious Diseases Society of America. **LPJI:** Late prosthetic joint infection.

supply, microorganisms and mechanisms of infection.

All four assumptions have potential problems.

- Analysis of reported cases of LPJIs demonstrates that joint infections rarely are caused by bacterial species common to the mouth, and there is no credible evidence to link LPJIs with dental procedures.<sup>25-31</sup>

- Evidence of a temporal relationship between dental procedures and the onset of LPJIs is circumstantial.<sup>29</sup>

- There are case reports of LPJI's having occurred after dental procedures despite the use of AP.<sup>32,33</sup>

In addition, it is well established that bacteremia resulting from invasive dental procedures occurs despite use of standard AP, and that routine events such as toothbrushing also cause bacteremia.<sup>34</sup>

- With regard to the differences between LPJI and infective endocarditis, even if there are differences in the anatomy, microbiology and possible pathogenesis of LPJI and infective endocarditis, they have the common feature of an underlying mechanism of putative hematogenous spread from the mouth. Despite this fact, it is of interest that the 2007 AHA recommendations<sup>35</sup> reduce, by about 90 percent, the number of patients with cardiac conditions whom the 1997 AHA guidelines<sup>22</sup> recommended for receipt of AP, despite the fact that as many as 50 percent of cases of infective endocarditis are caused by oral bacterial species.<sup>34</sup> In contrast, there are few or no scientific data to suggest a connection between LPJI and species specific to the mouth—yet the AAOS information statement<sup>23</sup> suggests that all patients with prosthetic joints should be considered candidates for AP when undergoing dental procedures. An analogy could be made to infections of cardiovascular implantable electronic devices (CIEDs), which, like LPJIs, are caused almost exclusively by staphylococcal and other nonoral flora. A recent AHA statement regarding CIED-related infections states that “the predominance of staphylococci as pathogens ... rather than oral flora suggests that antibiotic prophylaxis for dental procedures is of little or no value” and “there is currently no scientific basis for the use of prophylactic antibiotics before routine invasive dental, gastrointestinal, or genitourinary procedures to

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prevent CIED infection.”<sup>36</sup>

During the past 70 years, widespread use of antibiotics has resulted in a significant increase in the prevalence of drug-resistant bacterial infections. The ADA<sup>37</sup> warned that use of antibacterial drugs should be reserved for the management of active infectious disease and considered for the prevention of hematogenously spread infection in patients at high risk of acquiring infection. Retrospective analyses of clinical isolates acquired during the past decade have documented clearly an increase in resistance among the *Viridans* streptococci.<sup>38,39</sup> An important factor influencing the emergence of resistance in a bacterial population is the selective pressure applied by antibiotics that, in turn, leads to reduced microbial sus-

ceptibility.<sup>40</sup> Moreover, an increasing number of antibiotic-induced drug interactions is being reported, especially those involving accumulation of medications that have narrow therapeutic indexes.<sup>41</sup> Acknowledging the increase in microbial resistance, the following statement appears in the 1997, 2003 and 2009 AAOS advisory statements: “Any perceived potential benefit of antibiotic prophylaxis must be weighed against the known

risks of antibiotic toxicity; allergy; and development, selection and transmission of microbial resistance.”<sup>20,21,23</sup> Finally, we estimate that the cost for single-dose amoxicillin would be approximately \$60 million per year in the United States, if the 2009 AAOS information statement<sup>23</sup> replaces the 2003 consensus statement. (We estimate the prevalence of people with prosthetic joints in the United States to be more than 7,000,000. If this number is multiplied by the number of dental office visits per person per year—our estimate is two—the result is 14,000,000. If we then multiply this number by our mean estimate for the cost of a single dose of amoxicillin, including pharmacist involvement—our estimate is \$4.26—the result is a potential cost of \$59,640,000 for antibiotics prescribed per year in the United States for this purpose [P. Lockhart, unpublished data, April 2010].) This estimate does not include the substantial cost to patients and dental practices for canceled appointments due to patients' arriving at the office without having taken their antibiotics.

Given the 2009 AAOS statement, dentists have

three options. First, they may want to inform their patients who have prosthetic joints about the lack of scientific evidence to support AP in their situation and the potential for a drug reaction to AP so that patients can make informed decisions. The problem with this approach is that patients may become confused by the conflicting information.

Second, dentists may choose to base their clinical decisions entirely on the 2003 consensus statement and other literature published since then. The problem with this approach is potential medicolegal jeopardy if they do not contact the orthopedist for recommendations and then follow them.

A third, and perhaps better, option for the dentist would be to contact the patient's orthopedic surgeon, briefly discuss or outline in a letter the current dilemma and suggest that they both follow the 2003 guidelines until a new joint consensus statement is approved. If the orthopedist elects to follow the 2009 AAOS information statement and recommends AP for a patient who would not receive AP according to the 2003 guidelines, then the dentist has the option to ask the orthopedist to write the prescription for antibiotics. (On the other hand, if a patient requires AP according to the 2003 guidelines,<sup>21</sup> the dentist should not ask the orthopedist to write the prescription for antibiotics, because this is the dentist's responsibility.) The rationale for this approach is the contrast between the lack of evidence for the practice of administering AP and the real concerns about drug reactions, resistant strains of bacteria and costs to the health care system. The problem with this approach is that there inevitably will be an increase in the number of telephone calls to or amount of other communication with orthopedists, as well as a potential conflict if the orthopedist is asked to write the prescription. Similarly, from a medicolegal perspective, telephone conversations are considered a "gray" area should the issue of litigation arise.

With any of the above options, the dentist should note in the patient's dental record the content of any discussions with patients and other clinicians. With regard to cases of LPJI that might arise as a result of oral flora (less than 5 percent), the emphasis should be on attaining optimal oral health before surgery and maintaining excellent oral hygiene and preventing dental and periodontal disease after surgery to decrease the frequency of physiologic bacteremia.<sup>42</sup>

In response to the AAOS information statement, several members of the American Academy of Oral Medicine (AAOM) sent letters to the presidents of the ADA, AAOS and AAOM stating their concern (J.W. Little and colleagues, written communication to J. Zuckerman, AAOS president, May 28, 2009). The AAOS responded by stating, "The AAOS would welcome the opportunity to formally work with interested organizations such as the IDSA and the ADA to develop a more evidence-based approach to these recommendations or identify possible study designs to obtain more helpful evidence in the future" (J. Zuckerman and colleagues, written communication to J.W. Little and colleagues, June 11, 2009). The purpose of this correspondence was to stimulate the ADA, AAOS and IDSA to meet in the near future to develop evidence-based recommendations for the dental treatment of patients with total joint replacements.

## CONCLUSION

Our article identifies the major points of concern for a future systematic review by a multispecialty collaboration. In the meantime, given that the 2009 information statement<sup>23</sup> is more an opinion than an official guideline, the AAOM believes that it should not replace the 2003 joint consensus statement prepared by the relevant organizations: the ADA, the AAOS and the IDSA.<sup>21</sup> ■

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