



BRIEF ANSWERS
TO SPECIFIC
CLINICAL
QUESTIONS

Q: Do patients with prosthetic joints require dental antimicrobial prophylaxis?

ERIC OMAR GOMEZ, MD

Department of Medicine, Division of Infectious Diseases,
Mayo Clinic College of Medicine, Rochester, MN

DOUGLAS R. OSMON, MD, MPH

Department of Medicine, Division of Infectious Diseases,
Mayo Clinic College of Medicine, Rochester, MN

ELIE F. BERBARI, MD

Department of Medicine, Division of Infectious Diseases,
Mayo Clinic College of Medicine, Rochester, MN

A: We believe the available evidence does not support routine antimicrobial prophylaxis before dental procedures in patients who have undergone total joint replacement, even though the practice is very common¹ and even though professional societies recommend it in patients at high risk,² or even in all patients.³

On the other hand, good oral hygiene prevents dental disease and decreases the frequency of bacteremia from routine daily activities, and thus should be especially encouraged in patients with prosthetic joints or in those undergoing total joint arthroplasty.

■ AN UNCOMMON BUT SERIOUS PROBLEM

By 2030, an estimated 4 million total hip or total knee replacements per year will be performed in the United States.⁴ Most patients have a satisfactory outcome, but in a small percentage the prosthesis fails prematurely.

Prosthetic joint infection is the second most common cause of prosthetic failure leading to loss of joint function, after aseptic loosening.⁵ Its treatment often requires removal of the infected prosthesis and prolonged intravenous antimicrobial therapy. The cost incurred with each episode of prosthetic joint infection is estimated to exceed \$50,000.¹

Because of the morbidity and substantial cost associated with managing this condition, investigators have focused on identifying preventable risk factors for it.

■ RISK FACTORS FOR PROSTHETIC JOINT INFECTION

Factors associated with a higher risk of prosthetic joint infection include prior joint surgery, failure to give antimicrobial prophylaxis during surgery, immunosuppression, perioperative wound complications, a high American Society of Anesthesiologists (ASA) score, prolonged operative time, and a history of prosthetic joint infection.^{6,7} The primary predisposing factors are related to the foreign body itself and to the opportunities for and the degree of exposure of the prosthesis to microorganisms during surgery. Bacteremia, especially with *Staphylococcus aureus*, has been recognized as a risk factor for hematogenous prosthetic joint infection.⁶

Whether dental procedures pose a risk of prosthetic joint infection has been debated for decades. Common daily activities such as toothbrushing and chewing can cause transient bacteremia in up to 40% of episodes.⁸

Extrapolating from the guidelines for preventing endocarditis, the American Dental Association (ADA)² and the American Academy of Orthopaedic Surgeons (AAOS)³ have issued guidelines favoring antimicrobial prophylaxis in patients with prosthetic joints. However, given the significant differences in the pathophysiology, microbiology, and anatomy of infection between infective endocarditis and prosthetic joint infection, extrapolating the recommendations may not be valid.

doi:10.3949/ccjm.77a.10062

Whether dental procedures pose a risk of prosthetic joint infection has been debated for decades

■ MICROBIOLOGY OF PROSTHETIC JOINT INFECTION AND DENTAL FLORA

Staphylococci, the most common cause of prosthetic joint infection, are uncommon commensals of the oral flora and have been rarely implicated in bacteremia occurring after dental procedures.⁹ In contrast, viridans-group streptococci constitute most of the facultative oral flora and are the most common cause of transient bacteremia after dental procedures that result in trauma to the gingival or oral mucosa.¹⁰ However, viridans-group streptococci account for only 2% of all hematogenous prosthetic joint infections.⁹

■ DO DENTAL PROCEDURES INCREASE THE RISK OF PROSTHETIC JOINT INFECTION?

Prolonged or high-grade bacteremia is associated with prosthetic joint infection. On the other hand, data are scant on the association between low-grade or transient bacteremia and prosthetic joint infection.

After dental procedures, bacteria can be found in the blood, but at much lower levels ($< 10^4$ cfu/mL) than that needed for hematogenous seeding of prostheses in animal studies ($3\text{--}5 \times 10^8$ cfu/mL).¹¹ Transient, low-grade bacteremia occurs not only after dental procedures but also, as mentioned, after common activities such as chewing, brushing, or flossing.¹ The cumulative exposure to transient bacteremia through these daily activities is several times higher than the single exposure that a person is subjected to during dental procedures.¹²

■ WHAT IS THE EVIDENCE?

Most of the current evidence linking dental procedures or dental manipulation to prosthetic joint infection is based on reports of single cases of infections that occurred after dental procedures.

In two retrospective reviews, late hematogenous prosthetic joint infection associated with a dental source occurred after 0.2% of primary knee arthroplasties¹¹ and 6% of primary hip arthroplasties.¹³

Ainscow and Denham¹⁴ followed 1,000 patients who underwent total joint replacement over 6 years. Of these, 226 subsequently un-

derwent dental procedures without receiving antimicrobial prophylaxis, and none developed a prosthetic joint infection.

In a recently published case-control study,¹ our group assessed 339 patients with prosthetic joint infection and 339 patients with prosthetic joints that did not become infected. In this study, neither low-risk nor high-risk dental procedures were associated with an increased risk of prosthetic knee or hip infections (odds ratio [OR] 0.8; 95% confidence interval [CI] 0.4–1.6). Moreover, prophylactic use of antimicrobials before dental procedures was not associated with a lower risk.

However, a factor that *was* associated with a lower risk of prosthetic joint infection was good oral hygiene (OR 0.7; 95% CI 0.5–1.03). Good oral hygiene and prevention of dental disease could potentially decrease the frequency of bacteremia from daily activities and may even protect against prosthetic joint infection. Further study of the association of poor dental health and the risk of prosthetic joint infection is warranted.

■ GUIDELINES AND RECOMMENDATIONS

Despite the lack of evidence suggesting an association between prosthetic joint infection and dental procedure, surveys of orthopedists, dentists, infectious disease specialists, and other health care professionals show that a significant number of them recommend antimicrobial prophylaxis for patients with a prosthetic joint prior to a dental procedure.¹

In 2003, a consensus panel of the AAOS and the ADA recommended routine consideration of antimicrobial prophylaxis in patients at high risk due to both patient factors and the type of dental procedure.² Patient factors thought to confer high risk are immunosuppression, diabetes, malnourishment, human immunodeficiency virus infection, prior prosthetic joint infection, hemophilia, malignancy, and a prosthesis less than 2 years old. High-risk dental procedures are tooth extractions, periodontal procedures, root canal surgery, and dental cleaning in which bleeding is anticipated.

In a recent statement, the AAOS recommended antimicrobial prophylaxis in all patients with prosthetic joints.³

Staphylococci cause most prosthetic joint infections, but are uncommon commensals of the oral flora

Concerns about promoting antimicrobial resistance and about adverse reactions from antimicrobial use may outweigh any hypothetical benefit related to prevention of prosthetic joint infection. Analyses of cost, risks, and benefits argue against this practice.³

In summary, the current evidence does not support the use of antimicrobial therapy

to prevent prosthetic joint infection in patients with total joint replacement undergoing dental procedures. However, good oral hygiene should be encouraged to prevent dental disease and to decrease the frequency of bacteremia from routine daily activities in patients who have undergone or will be undergoing total joint arthroplasty. ■

REFERENCES

1. **Barbari EF, Osmon DR, Carr A, et al.** Dental procedures as risk factors for prosthetic hip or knee infection: a hospital-based prospective case-control study. *Clin Infect Dis* 2010; 50:8–16.
2. **American Dental Association; American Academy of Orthopedic Surgeons.** Antibiotic prophylaxis for dental patients with total joint replacements. *J Am Dent Assoc* 2003; 134:895–899.
3. **American Academy of Orthopaedic Surgeons.** Information statement: antibiotic prophylaxis for bacteremia in patients with joint replacements. <http://www.aaos.org/about/papers/advistmt/1033.asp>. Accessed October 28, 2010.
4. **Kurtz S, Ong K, Lau E, Mowat F, Halpern M.** Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am* 2007; 89:780–785.
5. **Roberts VI, Esler CN, Harper WM.** A 15-year follow-up study of 4606 primary total knee replacements. *J Bone Joint Surg Br* 2007; 89:1452–1456.
6. **Del Pozo JL, Patel R.** Clinical practice. Infection associated with prosthetic joints. *N Engl J Med* 2009; 361:787–794.
7. **Barbari EF, Hanssen AD, Duffy MC, et al.** Risk factors for prosthetic joint infection: case-control study. *Clin Infect Dis* 1998; 27:1247–1254.
8. **Durack DT.** Prevention of infective endocarditis. *N Engl J Med* 1995; 332:38–44.
9. **Deacon JM, Pagliaro AJ, Zelicof SB, Horowitz HW.** Prophylactic use of antibiotics for procedures after total joint replacement. *Bone Joint Surg Am* 1996; 78:1755–1770.
10. **Kaye D.** Infective endocarditis. In: Rose LF, Kaye D, editors. *Internal Medicine for Dentistry*, 2nd ed. Mosby: St. Louis, MO; 1990:156–161.
11. **Waldman BJ, Mont MA, Hungerford DS.** Total knee arthroplasty infections associated with dental procedures. *Clin Orthop Relat Res* 1997; 343:164–172.
12. **Guntheroth WG.** How important are dental procedures as a cause of infective endocarditis? *Am J Cardiol* 1984; 54:797–801.
13. **LaPorte DM, Waldman BJ, Mont MA, Hungerford DS.** Infections associated with dental procedures in total hip arthroplasty. *J Bone Joint Surg Br* 1999; 81:56–59.
14. **Ainscow DA, Denham RA.** The risk of haematogenous infection in total joint replacements. *J Bone Joint Surg Br* 1984; 66:580–582.

ADDRESS: Elie F. Barbari, MD, Mayo Clinic College of Medicine, 200 First Street SW, Rochester, MN 55905; e-mail barbari.elie@mayo.edu.

80 Years ago in the *Cleveland Clinic Bulletin*

He should be put to bed in a sunny, airy room. In the lobar type of pneumonia, the patients stand cold air well; in the lobular type they usually require heated air, but each type of patient should be in a well ventilated room preferably with air in motion. The covering should not be burdensome. The initial chill in a case of pneumonia has so impressed the laity that many patients are found to be almost smothered with clothing. The diet should be light but nourishing, milk frequently forming the staple part of it. More important is the ingestion daily of about 3,000 c.c. of fluid. The increased temperature with resultant perspiration, and increased respirations cause a rapid loss of water and dehydration in itself is a cause of much discomfort. A pitcher of water should always be convenient to the bedside. Initial purgation is usually advised followed thereafter by the use of enemata if necessary.

McDonald RH. The present status of the treatment of pneumonia. *Cleve Clin Bull* 1931; 1(1):52-66.

