



NEW ZEALAND DENTAL ASSOCIATION

Code of Practice

ANTIBIOTIC PROPHYLAXIS FOR PATIENTS WITH PROSTHETIC JOINT REPLACEMENTS UNDERGOING DENTAL TREATMENT

August 2013

The New Zealand Dental Association has developed this Code of Practice, Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment, based on available evidence and expert advice. This Code of Practice provides guidance to members regarding the provision of antibiotic prophylaxis for dental patients who have prosthetic joint replacements. The Code of Practice for Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment is also intended as a practical resource for members of the New Zealand Dental Association.

This Code of Practice supersedes the NZDA Code of Practice Antibiotic prophylaxis for dental treatment of patients with prosthetic joint replacements (2003)

Contents

Introduction	3
Bacteraemia from oral sources	3
Effectiveness of prophylactic antibiotics	3
Other considerations regarding prophylactic antibiotic use	4
Potential risk groups	4
Reducing bacteraemia risk	5
Concluding comments	5
Recommendations	6
References	7
Bibliography and further reading	9

Introduction

Prosthetic replacement of large joints such as the hip, knee, elbow and shoulder is a common and highly successful orthopaedic surgical procedure. Mechanical failure (loosening or fracture) is the most common complication affecting prosthetic joints followed by joint infection.¹ Joint infection can occur early (< 3 months after surgery), delayed (3 to 24 months after surgery) or late (more than 24 months after surgery).¹⁻² The total rate of joint infection is in the range 0.3% to 1.9%³ with around 30% (0.09% – 0.57% overall) being late infections.⁴ It is thought that most early and delayed infections are acquired in the operating theatre with late infections often being attributed to haematogenous seeding.¹⁻²

Infection of a prosthetic joint replacement is a devastating complication that can lead to loss of the prosthetic joint and serious morbidity for the patient.⁵ Late prosthetic joint infection with streptococci can be more amenable to treatment with debridement and antibiotics compared with staphylococcal infection.⁶ There is a theoretical risk of oral organisms from a dental procedure induced bacteraemia, infecting a prosthetic joint.⁷⁻¹³ Historically, as with bacterial endocarditis prophylaxis, prophylactic antibiotics before invasive dental care have been recommended to reduce the risk of a prosthetic joint infection occurring.

Over the last decade or so, there has been considerable debate around the need for, and effectiveness of, the routine use of antibiotic prophylaxis for individuals who have a prosthetic joint. Orthopaedic groups and associations generally supporting the routine use of prophylactic antibiotics (in a variety of circumstances) and other groups of physicians, infectious disease specialists and dentists suggesting that routine antibiotic prophylaxis in such patients is, based on current evidence, unjustified.

Bacteraemia from oral sources

Bacteraemia with oral bacteria occurs following normal daily activities such as eating and tooth-brushing as well as during certain dental interventions.¹⁴⁻²¹ The intensity of the bacteraemia caused by normal daily activities is similar to that caused by a dental intervention (eg. tooth extraction).^{20, 22} It has been reported that the overall exposure to oral induced bacteraemia from daily activities (due to the repetitive nature of the bacteraemia) is significantly greater (by several magnitudes) than the exposure from dental procedures.^{14, 23, 24} The bacteraemia following a dental procedure is usually of short duration with no detectable bacteraemia in 80% of patients after 60 minutes.^{1, 14, 20, 23-26} It is notable that gingival bleeding is a poor predictor of bacteraemia which can occur in the absence of bleeding. Any 'invasive' oral procedure, whether it causes bleeding or not, has the potential to induce a bacteraemia.^{18, 23, 26}

Berberi *et al* (2010) reported that the low grade bacteraemia caused by dental procedures and by physiologic activities (<1 x 10⁴ colony-forming units per millilitre (CFU)/ml) was substantially lower than the high-density bacteraemia needed to get haematogenous seeding of prosthetic joints in animal models (3-5 x 10⁸ CFU/ml).²⁷

Effectiveness of prophylactic antibiotics

The efficacy of pre-treatment antibiotic prophylaxis in preventing a subsequent transient bacteraemia is equivocal with evidence suggesting that bacteraemia cannot be avoided in all cases, although with prophylaxis any bacteraemia is likely to contain fewer bacterial species.^{16, 21, 22, 24, 25, 28-35} Uçkay *et al* (2008) completed a systematic review analysing 144 studies (including 23 prospective studies but no randomised controlled trials) with respect to the effectiveness of antibacterial prophylaxis in preventing prosthetic joint infection and concluded that the evidence supporting the efficacy of antibacterial prophylaxis is at best very weak.¹

Berbari *et al* (2010) reported in a case control study that antibiotic prophylaxis in high-risk or low-risk dental procedures did not decrease the risk of subsequent total hip or knee infection (adjusted OR, 0.9 [95% CI, 0.5–1.6] and 1.2 [95% CI, 0.7–2.2], respectively) and concluded that pre-procedural antibacterial prophylaxis in patients receiving dental procedures did not alter the risk of subsequent joint infection.²⁷

A number of groups continue to advocate the routine use of prophylactic antibiotics prior to dental care for patients with prosthetic joints.³⁶ Comprehensive reviews of the literature have failed to demonstrate substantive credible evidence of haematogenous infection of prosthetic joints by oral organisms following dental procedures^{1, 5, 8, 10, 24, 27, 37, 39-45} Antibiotic prophylaxis prior to dental procedures may reduce the risk and intensity of any bacteraemia. However there is no evidence that antibiotic prophylaxis reduces or eliminates the risk of late prosthetic joint infection.^{1, 27, 45}

Other considerations regarding prophylactic antibiotic use

The provision of antibiotic prophylaxis carries risks. The relative risk of complications, such as allergy from antibiotics, suggests that these complications outweigh the risk of haematogenous prosthetic joint infection by oral organisms associated with dental procedures. For example, the incidence of acute anaphylaxis to penicillin group antibiotics is reported as between 1 in 2500 and 1 in 10,000 and is fatal in around 10% of those affected.^{46,47} The increasingly problematic issue of bacterial resistance to antibiotics with the associated increase in morbidity and mortality requires practitioners to exercise prescribing restraint and only administer antibiotics where the evidence supports their use.

Potential risk groups

Notwithstanding the evidence available, there is some support for the use of prophylactic antibiotics in a group of patients who, because of other comorbidities, may be at an increased risk of haematogenously spread infection of a prosthetic joint when receiving ‘invasive’ dental procedures (Table 1).^{5, 10, 12, 13, 24, 37, 38} It should be noted that some reports suggest the risk to patients may be overstated.^{27, 33, 48}

Table 1 Invasive Dental Procedures

<p>All dental procedures that involve manipulation of the gingival tissues or the periapical region of the teeth or perforation of the oral mucosa*</p>
<p>* The following procedures and events are not considered invasive</p> <ul style="list-style-type: none"> • Routine anaesthetic injections through non-infected tissues • Taking dental radiographs • Placement and adjustment of removable prosthodontic or orthodontic brackets/appliances • Bleeding from trauma to the lips or oral mucosa
<p><small>Adapted from: The National Heart Foundation of New Zealand Advisory Group Guidelines for the prevention of infective endocarditis associated with dental and other medical interventions. December 2008</small></p>

If antibiotic prophylaxis is administered, it is important that the prophylaxis is active against *viridans streptococci* in particular, as they are the oral organisms that would be expected to be associated with a dental procedure-induced haematogenous prosthetic joint infection. Table 2 details suitable antibiotic regimens.^{24, 36, 49, 50}

Table 2 Antibacterial recommendations to reduce the risk of dentally-induced bacteraemia

Standard	Amoxicillin (oral) 2.0g one hour before the procedure. No follow-up dose Or Cephalexin (oral) 2.0g one hour before the procedure. No follow-up dose
Penicillin allergy	Clindamycin (oral) 600mg one hour before the procedure. No follow-up dose Or Clarithromycin (oral) 500mg one hour before the procedure. No follow-up dose

Antibiotic prophylaxis is not indicated for dental procedures in patients with osseous pins, plates and screws.³⁸

If a patient with a prosthetic joint replacement provides recommendations about antibacterial prophylaxis which differ from those in this guideline the dental practitioner should contact the patient's medical practitioner to discuss this. If the recommendation of the doctor differs from those in this guideline and the doctor insists on antibacterial prophylaxis then the doctor should be asked to make the prescription for this or if this is too inconvenient for the patient then the dentist may choose to make the prescription documenting in the patient record that it was requested by the doctor. It should be noted however, the dentist is ultimately responsible for making the treatment recommendation.

Reducing bacteraemia risk

Whilst the data regarding the implications of poor oral health on bacteraemia risk is contradictory the weight of evidence suggests that the incidence and magnitude of bacteraemia of oral origin appears to be related to the degree of oral and gingival inflammation, the concentration of microorganisms²¹ in the area, and the degree of tissue trauma.^{14, 22, 23, 27, 51, 53-55} To reduce this bacteraemic risk, patients should have a healthy mouth prior to joint replacement and maintain good oral health through regular and effective home care procedures and regular dental examination (and treatment as required).^{50, 56, 57}

Patients with prosthetic joint replacements who present with acute oral infections should receive prompt treatment to remove the source of infection and therapeutic antibiotics should be administered when indicated.³⁸

Concluding comments

The low risk of late haematogenous prosthetic joint infection from oral organisms secondary to a dental procedure, the absence of compelling data for an association between dental procedures and prosthetic joint infection, and the risk of antibiotic associated complications all argue strongly against the routine use of antibiotics before dental procedures.⁵³ Because of comorbidities, some individuals may be at greater risk of a joint infection and in these individuals antibiotic prophylaxis may be justified.

Recommendations

There is no scientific evidence that supports the routine use of antibiotic prophylaxis in healthy individuals undergoing dental procedures who have received a prosthetic joint replacement and therefore such prophylaxis is not justified.

On balance clinicians may consider (in consultation with the patients doctor) prophylaxis for patients who have a theoretical increased risk of joint infection because of severely compromised immune function or previously infected prosthetic joints, noting that prophylaxis is not indicated for otherwise healthy individuals.

It is prudent that all patients scheduled for prosthetic joint replacement have a dental examination, and treatment as required, to reduce and remove oral sources of bacteraemia.

Patients with a prosthetic joint replacement should minimise their risk of bacteraemia arising from oral sources by maintaining good oral health through, regular and effective home care procedures and regular dental examination (and treatment as required).

References

1. Uckay I, Pittet D, Bernard L, Lew D, Perrier A, Peter R. Antibiotic prophylaxis before invasive dental procedures in patients with arthroplasties of the hip and knee. *J Bone Joint Surg (Br)* 2008; 7: 833-104
2. Zimmerli W, Trampuz A, Ochsner PE. Prosthetic joint infections. *New Engl J Med* 2004; 351(16):1645-1654
3. Del Pozo JL, Patel R. Infection associated with prosthetic joints. *N Engl J Med* 2009; 361(8):787-794
4. Giulieri SG, Graber P, Ochsner PE, Zimmerli W. Management of infection associates with total hip arthroplasty according to a treatment algorithm. *Infection* 2004; 32(4):222-228
5. Tong DC, Rothwell BR. Antibiotic prophylaxis in dentistry: A review and practice recommendations. *J Am Dent Assoc* 2000; 131:366-373
6. Meehan AM, Osmon DR, Duffy MCT, Hanssen AD, Keating MR. Outcome of penicillin-susceptible streptococcal prosthetic joint infection treated with debridement and retention of the prosthesis. *Clin Inf Dis* 2003;36:845-849
7. Jacobsen JJ, Murray W. Prophylactic coverage of dental patients with artificial joints: A retrospective analysis of thirty-three infections in hip prostheses. *Oral Surg Oral Med Oral Path* 1980; 50 (2):130-133.
8. Ainscow DA, Denham RA. The risk of haematogenous infection in total joint replacements. *J Bone Joint Surg Br* 1984;66(4):580-582
9. Lindqvist C, Slätis P. Dental bacteremia: a neglected cause of arthroplasty infections? Three hip cases. *Acta Orthop Scand* 1985; 56(6):506-508
10. Jacobsen JJ, Millard HD, Plezia R, Blankenship JR. Dental treatment and late prosthetic joint infections. *Oral Surg Oral Med Oral Path* 1986; 61:413-417
11. Jacobsen JJ, Matthews LS. Bacteria isolated from late prosthetic joint infections: dental treatment and chemoprophylaxis. *Oral Surg Oral Med Oral Path* 1987; 63 (1):122-126
12. Waldman BJ, Mont MA, Hungerford DS. Total knee arthroplasty infections associated with dental procedures. *Clin Orthop Relat Res* 1997; 343:164-172
13. La Porte DM, Waldman BJ, Mont MA, Hungerford DS. Infections associated with dental procedures in total hip arthroplasty. *J Bone Joint Surg Br* 1999;81(1):56-59
14. Guntheroth WG. How important are dental procedures as a cause of infective endocarditis? *Am J Cardio* 1984; 54:797-801
15. van der Meer JT, Van Wijk W, Thompson J, Vandenbroucke JP, Valkenburg HA, Michel MF. Efficacy of antibiotic prophylaxis for prevention of native-valve endocarditis. *Lancet* 1992; 339(8786):135-139.
16. Hall G, Nord CE, Heimdahl A. Elimination of bacteraemia after dental extraction: Comparison of erythromycin and clindamycin for prophylaxis of infective endocarditis. *J Antimicrob Chemother* 1996;37(4):783-795
17. Lockhart PB, Brennan MT, Fox PC, Norton HJ, Jernigan DB, Strausbaugh LJ. Decision-making on the use of antimicrobial prophylaxis for dental procedures: A survey of infectious disease consultants and review. *Clin Infect Dis* 2002; 34(12):1621-1626
18. Roberts GJ, Gardner P, Longhurst P, Black AE, Lucas VS. Intensity of bacteraemia associated with conservative dental procedures in children. *Br Dent J* 2000;188(2):95-98
19. Roda RP, Jimenez Y, Carbonell E, Gavalga C, Munoz MM, Perez GS. Bacteraemia originating in the oral cavity. A review. *Med Oral Patol Oral Cir Bucal* 2008; 13(6):E355-E362
20. Lockhart PB, Brennan MT, Sasser HC, Fox PC, Paster BJ, Bahrani-Mougeot FK. Bacteraemia associated with toothbrushing and dental extraction. *Circulation* 2008; 117(24) 3118-25
21. Lockhart PB, Brennan MT, Thornhill M, Michalowicz BS, Noll J, Bahrani-Mougeot FK, Sasser HC. Poor oral hygiene as a risk factor for infective endocarditis-related bacteraemia. *J Am Dent Assoc* 2009;140: 1238-1244
22. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, Bolger A, Cabell CH, Takahashi M, Baltimore RS, Newburger JW, Strom BL, Tani LY, Gerber M, Bonow RO, Pallasch T, Shulman ST, Rowley AH, Burns JC, Ferrieri P, Gardner T, Goff D, Durack DT. Prevention of infective endocarditis – Guidelines from the American Heart Association. *Circulation* 2007; 116: 1736-1754
23. Roberts GJ. Dentists are innocent! “Everyday” bacteremia is the real culprit: A review and assessment of the evidence that dental surgical procedures are a principal cause of bacterial endocarditis in children. *Pediatr Cardiol* 1999; 20(5): 317-325
24. Guay DR. Antimicrobial prophylaxis in noncardiac prosthetic device recipients. *Hosp Pract (Minneap)* 2012; 40(1): 44-74
25. Lockhart PB, Brennan MT, Kent ML, Norton HJ, Weinrib DA. Impact of amoxicillin prophylaxis on the incidence, nature, and duration of bacteremia in children after intubation and dental procedures. *Circulation* 2004; 109: 2878-2884

26. Tomás I, Alvarez M, Limeres J, Potel C, Medina J, Diz P. Prevalence, duration, and aetiology of bacteremia following dental extractions. *Oral Dis* 2007;13(1):56-62.
27. Berbari EF, Osmon DR, Carr A, Hanssen AD, Baddour LM, Greene D, Kupp LI, Baughan LW, Harmsen WS, Mandrekar JN, Therneau TM, Steckelberg JM, Virk A, Wilson WR. 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
28. van der Meer JT, Thompson J, Valkenburg HA, Michel MF. Epidemiology of bacterial endocarditis in the Netherlands: II. Antecedent procedures and use of prophylaxis. *Arch Intern Med* 1992; 152:1869-1873.
29. Hall G, Hedstrom SA, Heimdahl A, Nord CE. Prophylactic administration of penicillin's for endocarditis does not reduce incidence of postextraction bacteremia. *Clin Infect Dis* 1993; 17(2):188-194.
30. Skiest DJ, Coykendall AL. Prosthetic hip infection related to a dental procedure despite antibiotic prophylaxis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995;79(5):661-663.
31. Hall G, Heimdahl A, Nord CE. Bacteremia after oral surgery and antibacterial prophylaxis for endocarditis. *Clin Inf Dis* 1999; 29: 1-8
32. Hanssen AD, Osman DR The use of prophylactic antimicrobial agents during and after hip arthroplasty. *Clin Orthod Relat R* 1999; 369: 124-138
33. Lockhart PB, Loven B, Brennan MT, Fox PC. The evidence base for the efficacy of antibiotic prophylaxis in dental practice. *J Am Dent Assoc* 2007; 138: 458-473
34. Bahrani-Mougeot FK, Paster BJ, Coleman S, Ashar J, Barbuto S, Lockhart PB. Diverse and novel oral bacterial species in blood following dental procedures. *J Clin Microbiol* 2008;46(6):2129-2132.
35. Seymour RA, Hogg SD Antibiotics and chemoprophylaxis *Periodontal* 2000 2008; 46: 80-108
36. American Academy of Orthopaedic Surgeons / American Association of Orthopaedic Surgeons. Information Statement - Antibiotic prophylaxis for bacteraemia in patients with joint replacements. February 2009
37. Thyne GM, Ferguson JW Antibiotic prophylaxis during dental treatment in patients with prosthetic joints. *J Bone Joint Surg* 1991; 73-B(2): 191-194
38. American Dental Association/American Academy of Orthopaedic Surgeons. Advisory statement: antibiotic prophylaxis for dental patients with total joint replacements. *J Am Dent Assoc* 2003; 134: 895-899
39. Scott JF, Morgan D, Avent M, Graves S, Goss AN. Patients with artificial joints; do they need antibiotic cover for dental treatment? *Aust Dent J* 2005; 50 Suppl 2: S45-S53
40. Vandercam B, Jeumont S, Cornu O, Yombi JC, Lecouvet F, Lefevre P, Ireng LM, Gala JL Amplification-Based DNA Analysis in the Diagnosis of Prosthetic Joint Infection *J Mol Diagn* 2008; 10(6) 537-43
41. Napeñas JJ, Lockhart PB, Epstein JB. Comment on the 2009 American Academy of Orthopaedic Surgeons' Information statement on antibiotic prophylaxis for bacteraemia in patients with joint replacements. *J Can Dent Assoc* 2009; 75(6): 447-449
42. Oswald TF, Gould FK Dental treatment and prosthetic joints Antibiotics are not the answer *J Bone Joint Surg* 2008; 90-B(7): 825-826
43. Ching DW, Gould IM, Rennie JA, Gibson PI. Prevention of late haematogenous infection in major prosthetic joints. *J Antimicrob Chemother* 1989; 23: 676-680
44. Rodgers J, Richards D. No evidence to link prosthetic joint infections with dental procedures. *Evidence Base Dentistry* 2008; 9(4): 103-104
45. Aminoshariae A, Kulild J. Premedication of patients under-going dental procedures causing bacteremia after total joint arthroplasty. *J Endod* 2010;36(6):974-7
46. Mandell GL, Bennett JE, Dolin R (eds) in Mandell, Douglas and Bennett's Principles and Practice of Infectious Disease. 5th edition 2000. Churchill Livingstone
47. Oliver R, Roberts GJ, Hooper L, Worthington HV Antibiotics for the prophylaxis of bacterial endocarditis in dentistry (Review) *Cochrane Database Syst Rev* 2008;(4): CD003813 accessed 7 Feb 2013
48. Seymour RA, Whitworth JM, Martin M. Antibiotic prophylaxis for patients with joint prostheses – still a dilemma for dental practitioners *Brit Dent J* 2003; 194(2):649-653
49. The National Heart Foundation of New Zealand Advisory Group Guidelines for the prevention of infective endocarditis associated with dental and other medical interventions. December 2008
50. Olsen I, Snorrason F, Lingaas E. Should patients with hip joint prosthesis receive antibiotic prophylaxis before dental treatment? *J Oral Microbiol* 2010; 2; 5265 – DOI: 10.3402/jom.v2i0.5265
51. Lockhart PB An analysis of bacteremias during dental extractions. A double-blind, placebo-controlled study of chlorhexidine. *Arch Intern Med* 1996; 156(5):513-520
52. Morris AM, Howie S. Recommendations for antibiotics in patients with joint prosthesis are irresponsible and indefensible. *J Can Dent Assoc* 2009; 75(7):513-515

53. Bender IB, Naidorf IJ, Garvey GJ. Bacterial endocarditis: A consideration for physician and dentist. *J Am Dent Assoc* 1984; 109:415-420
54. Everett ED, Hirschmann JV. Transient bacteraemia and endocarditis prophylaxis: a review. *Medicine* 1977; 56:61-77
55. Forner L, Larsen T et al. Incidence of bacteraemia after chewing, tooth brushing and scaling in individuals with periodontal inflammation. *J Clin Perio* 2006; 33:401-07
56. Bartzokas CA, Johnson R, Jane M, Martin MV, Pearch PK, Saw Y. Relation between mouth haematogenous infections in total joint replacement. *Br Med J* 1994;309:506-9
57. Assael LA. Oral bacteraemia as a cause of prosthesis failure in patients with joint replacements. *J Oral Maxillofac Surg* 2009; 67:1789-1790

Bibliography and further reading

Prevention of orthopaedic implant infection in patients undergoing dental procedures. Evidence-based guideline and evidence report. American Academy of Orthopaedic Surgeons and American Dental Association 2012 accessed at http://www.aaos.org/research/guidelines/PUDP/PUDP_guideline.pdf on 28 Feb 2013

American Academy of Pediatric Dentistry. Guidelines on antibiotic prophylaxis for dental patients at risk for infection. Clinical Guideline adopted 1990, revised 2011

Benoit G, Pickett FA. Antibiotic prophylaxis with prosthetic joint replacement. What is the evidence? *Can J Dent Hygiene* 2011; 45(2); 103-108

Canadian Dental Association Position on Antibiotic prophylaxis for dental patients with total joint replacement. LINK
 Dios DP, Carmona TI, Posse LJ, Henriquez MJ, Feijoo FJ, Fernándezama. Comparative efficacies of amoxicillin, clindamycin and monifloxacin in prevention of bacteremia following dental extractions. *Antimicrob Agents Chemother* 2006; 50(9): 2996-3002

Dinsbach NA. Antibiotics in dentistry: Bacteremia, antibiotic prophylaxis, and antibiotic misuse, *General Dentistry* 2012; 200-207

Hanssen AD, Osman DR, Nelson CL. Prevention of deep prosthetic joint infection. *Am J Bone Joint Surg* 1996; 78-A(3):458-471

Holgate ST. Penicillin allergy: how to diagnose and when to treat. *Br Med J* 1988; 296: 1213-1214

Koung EE, Ng FY, Yan CH, Fang CXF, Chiu PKY. Antibiotic prophylaxis after total joint replacements. *Hong Kong Med J* 2009; 15: 458-462

Little JW, Jacobsen JJ, Lockhart PB. The dental treatment of patients with joint replacements. A position paper from the American Academy of Oral Medicine. *J Am Dent Assoc* 2010; 141: 667-671.

Pulido L, Ghanem E, Joshi A, Purtill JJ, Parvizi J. Periprosthetic Joint Infection. *Clin Orthop Relat Res* 2008; 466: 1710-1715

Simmons NA, Ball AP, Cawson RA, Eykyn SJ, Hughes SPF, McGowan DA, Shanson DC. Case against antibiotic prophylaxis for dental treatment of patients with joint prostheses. *Lancet* 1992; 339: 301

Treatment Guidelines from The Medical Letter 2012; 10 (122): 73-78

Code of Practice Approved by NZDA Board	August 2013
Annual review and revision	Scheduled August 2014
Annual review and revision	Scheduled August 2015
Expert panel review scheduled	Commence January 2016