

Antibiotic Prophylaxis for Dental Patients at Risk for Infection

Review Council

Council on Clinical Affairs

Latest Revision

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Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that numerous medical conditions predispose patients to bacteremia-induced infections. Because it is not possible to predict when a susceptible patient will develop an infection, prophylactic antibiotics are recommended when these patients undergo procedures that are at risk for producing bacteremia. These recommendations are intended to help practitioners make decisions regarding antibiotic prophylaxis for dental patients at risk.

Methods

Recommendations on antibiotic prophylaxis for dental patients at risk for infection were developed by the Clinical Affairs Committee and adopted in 1990.¹ This document is a revision of the previous version, last revised in 2014², and based on a review of current dental and medical literature pertaining to post procedural bacteremia-induced infections. This revision included database searches using key terms: infective endocarditis (IE), bacteremia, antibiotic prophylaxis, and dental infection. Articles were evaluated by title and/or abstract and relevance to dental care for children, adolescents, and those with special health care needs. Thirty-five citations were chosen from this method and from references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians. In addition, “Prevention of infective endocarditis: Guidelines from the American Heart Association,”³ “Infective Endocarditis in Childhood: 2015 Update: A Scientific Statement From the American Heart Association,”⁴ and the American Dental Association (ADA) report “The use of prophylactic antibiotics prior to dental procedures in patients with prosthetic joints”⁵ were reviewed.

Background

Bacteremia, bacteria in the bloodstream, is anticipated following invasive dental procedures and can lead to complications in an immunodeficient patient.^{6,7} High risk cardiac disease, immunosuppression, and immunodeficiencies may compromise one’s ability to fight simple infection. The rationale for antibiotic prophylaxis is to reduce or eliminate transient bacteremia caused by invasive dental procedures.⁸

Antibiotic usage may result in the development of resistant organisms.^{3, 6,7,9-11} Utilization of antibiotic prophylaxis for patients at risk does not provide absolute prevention of infection. Post-procedural symptoms of acute infection (e.g., fever, malaise, weakness, lethargy) may indicate antibiotic failure and need for further medical evaluation.

The decision to use antibiotic prophylaxis should be made on an individual basis. Some medical conditions that may predispose patients to post-procedural infections are discussed below. This is not intended to be an exhaustive list; rather, the categorization should help practitioners identify children who may be at increased risk. If a patient reports a syndrome or medical condition with which the practitioner is not familiar, it is appropriate to contact the child’s physician to determine susceptibility to bacteremia-induced infections.

To date, the evidence base supporting the efficacy and use of antibiotic prophylaxis is limited, especially in the pediatric population. Many of the indications are based on consensus.^{4,12-14} The conservative use of antibiotics is indicated to minimize the risk of developing resistance to current antibiotic regimens.^{3,9,15,16} Given the increasing number of organisms that have developed resistance to current antibiotic regimens, as well as the potential for an adverse anaphylactic reaction to the drug administered, it is best to be judicious in the use of antibiotics for the prevention of IE³ or other distant-site infections.^{9,11,17}

Recommendations

Antibiotic prophylaxis is recommended with certain dental procedures,^{3,4,6,8,18} but this should be directed against the most likely infecting organism. When procedures involve infected tissues or are performed on a patient with a compromised host response, additional doses or a prescribed pre- and post-operative regimen of antibiotics may be necessary. Emphasis should be placed on the prevention of disease, establishment of good oral health care habits, and routine oral health assessments through a dental home. This may prevent the frequent need for the use of antibiotic therapy and, thus, decrease the risks of resistance and adverse events relation to use of antibiotics.^{8,19,20}

Patients with cardiac conditions

Infective endocarditis is an example of an uncommon but life-threatening complication resulting from bacteremia. The incidence of pediatric admissions due to infective endocarditis was between 0.05 and 0.12 cases per 1000 admissions in a multicenter study of U.S. children's hospitals from 2003-2010.⁴ Only a limited number of bacterial species have been implicated in resultant postoperative infections; Viridans group streptococci, *Staphylococcus aureus*, Enterococcus species are the main microorganisms implicated in IE.^{3,4} Enterococcal and other organisms such as *Haemophilus* species, *Aggregatibacter* species, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella* species are less common.⁴ Routine daily activities such as toothbrushing, flossing, and chewing contribute more to the incidence of bacteremia when compared to dental procedures.⁴ Thus, focus has shifted from antibiotic prophylaxis to an emphasis on oral hygiene and the prevention of oral diseases.^{4,8,13,14,18,20}

In 2007, the American Heart Association (AHA) revised its guidelines for the prevention of IE and reducing the risk for producing resistant strains of bacteria.³ The significant reasons for the revision include³:

- "IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities than from bacteremia caused by a dental, GI tract, or GU tract procedure."³ (Daily activities would include toothbrushing, flossing, chewing, using toothpicks, using water irrigation devices, and other activities.)
- "Prophylaxis may prevent an exceedingly small number of cases of IE if any, in individuals who undergo a dental, GI tract, or GU tract procedure.
- The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy.
- Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE."³

The AHA guidelines focus on antibiotic prophylaxis prior to certain dental procedures for patients in the highest risk group (See Table 1).^{3,4,6} Globally, there is still a lack of consensus with regards to the benefit of antibiotic prophylaxis for prevention of infective endocarditis. Since the change in recommendations, the rate and incidence of IE have been low.⁴

Children with cyanosis with specific periodontal concerns may have an increased risk of IE, which makes optimum oral hygiene very important.^{3,4,22} At-risk patients with poor oral hygiene and gingival bleeding after routine activities (e.g., toothbrushing) have shown an increased incidence of bacteremia as a measure for risk of IE.^{3,22,23} The focus should be on maintaining good oral hygiene, routine dental examinations, infection control to reduce bacteremia, and discouraging tattooing or piercing rather than relying on antibiotic prophylaxis for patients at risk.^{13,14,18-20,23} These patients and their parents need to be educated and motivated to maintain personal oral hygiene through daily plaque removal, including flossing.³ There is a shift in the emphasis on improved access to dental care and oral health in patients with underlying cardiac conditions at high risk for IE and less focus on a dental procedure and antibiotic coverage.⁴ Professional prevention strategies should be based upon the individual's assessed risk for caries and periodontal disease.

In addition to those diagnoses listed in the AHA guidelines, patients with a reported history of injection drug use may be considered at risk for developing IE in the absence of cardiac anomalies.²² Patients also should be discouraged from tattooing and piercing.^{13,14,24} Consultation with the patient's physician may be necessary to determine susceptibility to bacteremia-induced infections.

Antibiotics are recommended for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa for cardiac patients with the highest risk³ (see Tables 1 and 2). Specific antibiotic regimens can be found in Table 3. Practitioners and patients/parents can review the entire AHA guidelines in the AHA *Circulation* archives³ (available at "<http://circ.ahajournals.org/cgi/content/full/116/15/1736>") for additional background information as well as discussion of special circumstances (e.g., patients already receiving antibiotic therapy, patients on anti-coagulant therapy).

Patients with compromised immunity

Non-cardiac patients with a compromised immune system may be at risk for complications of bacteremia and distant site infection following invasive dental procedures. Existing evidence does not support the extensive use of antibiotic prophylaxis; prophylaxis should be limited to immunocompromised patients and those at high risk.¹⁹ Consultation with the patient's physician is recommended for management of patients with a compromised immune system. Although there is not enough data to support its use, high risk patients who should be considered for use of prophylaxis includes, but is not limited to, those with^{13,14,25}:

1. Immunosuppression* secondary to:
 - a. human immunodeficiency virus (HIV);
 - b. severe combined immunodeficiency (SCIDS);
 - c. neutropenia;
 - d. cancer chemotherapy; or
 - e. hematopoietic stem cell or solid organ transplantation.
2. History of head and neck radiotherapy.
3. Autoimmune disease (e.g., juvenile arthritis, systemic lupus erythematosus).
4. Sickle cell anemia.²⁶
5. Asplenicism or status post splenectomy.

7. Uncontrolled diabetes mellitus.
8. Bisphosphonate therapy.^{27,28}
9. Hemodialysis.

*Discussion of antibiotic prophylaxis for patients receiving immunosuppressive therapy and/or radiation therapy appears in a separate AAPD document.²⁹

Patients with shunts, in dwelling vascular catheters, or medical devices

The AHA recommends that antibiotic prophylaxis for nonvalvular devices, including indwelling vascular catheters (e.g., central lines) and cardiovascular implantable electronic devices (CIED), is indicated only at the time of placement of these devices in order to prevent surgical site infection.^{23,25} The AHA found no convincing evidence that microorganisms associated with dental procedures cause infection of CIED and nonvalvular devices at any time after implantation.^{23,25} The infections occurring after device implantation most often are caused by *Staphylococcus aureus* and coagulase negative staphylococci or other microorganisms that are non-oral in origin but are associated with surgical implantation or other active infections.^{23,28,30} Consultation with the child's physician is recommended for management of patients with nonvalvular devices.

Ventriculoatrial (VA), ventriculocardiac (VC), or ventriculovenous (VV) shunts for hydrocephalus are at risk of bacteremia-induced infections due to their vascular access.^{25,31} In contrast, ventriculoperitoneal (VP) shunts do not involve any vascular structures and, consequently, do not require antibiotic prophylaxis.^{25,31} Consultation with the child's physician is recommended for management of patients with vascular shunts.

Patients with prosthetic joints

For patients with a history of total joint arthroplasty, deep hematogenous infections can lead to life threatening complications such as a loss of the prosthetic joint or even increased morbidity and mortality.^{32,33} Given the increasing risk of developing antibiotic resistance and adverse reactions, antibiotic prophylaxis prior to dental procedures is not recommended in the prevention of prosthetic joint infections.⁵

Consultation with the child's physician may be necessary for management of at-risk patients as well as patients with other implanted devices (e.g., Harrington rods, external fixation devices).^{25,32-35}

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Table 1. CARDIAC CONDITIONS ASSOCIATED WITH THE HIGHEST RISK OF ADVERSE OUTCOME FROM ENDOCARDITIS FOR WHICH PROPHYLAXIS WITH DENTAL PROCEDURES IS REASONABLE

Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
 Previous infective endocarditis
 Congenital heart disease (CHD)*
 Unrepaired cyanotic CHD, including palliative shunts and conduits
 Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first six months after the procedure †
 Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
 Cardiac transplantation recipients who develop cardiac valvulopathy

* Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD.
 † Prophylaxis is reasonable because endothelialization of prosthetic material occurs within six months after the procedure.
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Table 2. DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS REASONABLE FOR PATIENTS IN TABLE 1

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa**

* The following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa.

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Table 3. REGIMENS FOR A DENTAL PROCEDURE

| Situation | Regimen: Single Dose 30 to 60 min Before Procedure | | |
|---|--|---------------------------------|--|
| | Agent | Adults | Children |
| Oral | Amoxicillin | 2 g | 50 mg/kg |
| Unable to take oral medication | Ampicillin | 2 g IM or IV | 50 mg/kg IM or IV |
| | OR | 1 g IM or IV | 50 mg/kg IM or IV |
| Allergic to penicillins or ampicillin—oral | Cefazolin or ceftriaxone | | |
| | Cephalexin* | 2 g | 50 mg/kg |
| | OR | 600 mg | 20 mg/kg |
| | Clindamycin | 500 mg | 15 mg/kg |
| | OR | | |
| Allergic to penicillin or ampicillin and unable to take oral medication | Azithromycin or clarithromycin | | |
| | Cefazolin or ceftriaxone† OR Clindamycin | 1 g IM or IV 600 mg IM or IV | 50 mg/kg IM or IV 20 mg/kg IM or IV |

IM indicates intramuscular; IV, intravenous.
 * Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
 † Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.
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Table 4. MANAGEMENT OF PATIENTS WITH PROSTHETIC JOINTS UNDERGOING DENTAL PROCEDURES

Management of patients with prosthetic joints undergoing dental procedures

Clinical Recommendation:

In general, for patients with prosthetic joint implants, prophylactic antibiotics are **not** recommended prior to dental procedures to prevent prosthetic joint infection.

For patients with a history of complications associated with their joint replacement surgery who are undergoing dental procedures that include gingival manipulation or mucosal incision, prophylactic antibiotics should only be considered after consultation with the patient and orthopedic surgeon.* To assess a patient's medical status, a complete health history is always recommended when making final decisions regarding the need for antibiotic prophylaxis.

Clinical Reasoning for the Recommendation:

- There is evidence that dental procedures are not associated with prosthetic joint implant infections.
- There is evidence that antibiotics provided before oral care do not prevent prosthetic joint implant infections.
- There are potential harms of antibiotics including risk for anaphylaxis, antibiotic resistance, and opportunistic infections like *Clostridium difficile*.
- The benefits of antibiotic prophylaxis may not exceed the harms for most patients.
- The individual patient's circumstances and preferences should be considered when deciding whether to prescribe prophylactic antibiotics prior to dental procedures.

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* In cases where antibiotics are deemed necessary, it is most appropriate that the orthopedic surgeon recommend the appropriate antibiotic regimen and when reasonable write the prescription.