

**Keywords:** Infective endocarditis; dental focal infection; cardiac surgery; heart valve surgery; antibiotic prophylaxis; preoperative dental assessment; prosthetic valve endocarditis.

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# Infective Endocarditis and Dental Infection

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## Abstract

Infective endocarditis (IE) is a severe disease associated with high morbidity and mortality despite advances in antimicrobial therapy and cardiac surgery. The oral cavity has long been recognized as a potential source of bacteremia capable of seeding damaged native or prosthetic heart valves. Dental foci of infection—including untreated caries, periodontal disease, apical abscesses, retained roots, and peri-implant infections—may contribute to transient bacteremia, particularly during invasive dental procedures but also during routine daily activities such as tooth brushing and mastication. Current international guidelines emphasize maintaining optimal oral health rather than relying solely on antibiotic prophylaxis. This review summarizes the mechanisms linking oral disease to IE, identifies high-risk cardiac patients, discusses preoperative dental assessment before cardiac surgery, and reviews current recommendations regarding antibiotic prophylaxis.

Received-13-05-2026  
Revised-20-06-2026  
Accepted-28-06-2026  
Doi: 10.1922/ejprd.v34i4s.1430

**Introduction**

Infective endocarditis (IE) remains one of the most challenging infections encountered in cardiovascular medicine. Despite improvements in diagnosis and treatment, hospital mortality ranges between 15% and 30%, while one-year mortality may exceed 30% (1,2).

Approximately 30–40% of IE cases are caused by viridans streptococci originating from the oral cavity, although *Staphylococcus aureus* has become the predominant pathogen in many developed countries (1,2,8).

Because many patients undergoing cardiac surgery receive prosthetic valves or intracardiac prosthetic material, identification and elimination of dental infectious foci before surgery have become standard practice in most cardiac centers (1,3).

**Oral Microbiology and Mechanisms of Endocarditis**

The oral cavity harbors more than 700 bacterial species and constitutes one of the largest microbial ecosystems in the human body (4,5).

The microorganisms most frequently implicated in oral-related infective endocarditis include:

- Viridans streptococci
- *Streptococcus sanguinis*
- *Streptococcus mitis*
- *Streptococcus oralis*
- *Granulicatella* spp.
- *Abiotrophia* spp. (4,5)

Development of infective endocarditis generally requires four sequential events:

Activity	Frequency of bacteremia
Tooth brushing	20–68%
Dental flossing	20–58%
Chewing food	7–51%
Tooth extraction	40–100%
Scaling/root planing	36–88%

Consequently, poor oral hygiene probably contributes more to the lifetime risk of infective endocarditis than occasional dental procedures (4,5).

**Patients at Highest Risk**

Current international guidelines recommend special preventive measures for patients with:

- Prosthetic heart valves
- Previous infective endocarditis
- Prosthetic material used for valve repair
- Certain congenital heart diseases
- Cardiac transplant recipients who subsequently develop valvular disease (1–3)

**Preoperative Dental Evaluation**

Comprehensive dental assessment before elective cardiac surgery aims to eliminate active oral infection before prosthetic valve implantation (1,3).

1. Endothelial injury
  2. Formation of sterile platelet-fibrin thrombus
  3. Transient bacteremia
  4. Bacterial adhesion and vegetation formation (6,7)
- This mechanism was first described experimentally by Durack and remains the accepted model of IE pathogenesis (6).

**Periodontal Disease**

Periodontitis represents the most common chronic oral infectious focus associated with bacteremia (4,5).

Patients with severe periodontal disease experience transient bacteremia not only after invasive dental procedures but also during routine daily activities such as tooth brushing and chewing (5).

Moreover, periodontal inflammation is associated with elevated systemic inflammatory biomarkers including C-reactive protein, interleukin-6, and tumor necrosis factor- $\alpha$ , suggesting a potential link between chronic oral inflammation and cardiovascular disease (4,5).

**Daily Bacteremia Versus Dental Procedures**

Historically, infective endocarditis prevention focused on administering antibiotic prophylaxis before dental procedures. However, studies have demonstrated that the cumulative exposure to bacteremia resulting from daily activities such as tooth brushing and mastication greatly exceeds that associated with a single dental extraction (5).

The examination should include:

- Comprehensive oral examination
- Panoramic radiography
- Periodontal evaluation
- Assessment of tooth mobility
- Identification of retained roots
- Detection of periapical pathology
- Evaluation of dental implants (1,3,5)

**Timing Before Cardiac Surgery**

Whenever possible, dental treatment should be completed 7–14 days before elective cardiac surgery to allow adequate mucosal healing and reduce postoperative infectious complications (1,3). Emergency cardiac surgery should not be delayed solely because of untreated dental disease; dental management can be undertaken after stabilization if clinically appropriate (1).

**Antibiotic Prophylaxis**

Current ESC and ACC/AHA guidelines recommend antibiotic prophylaxis only for patients at highest risk undergoing dental procedures involving manipulation of gingival tissue or the periapical region of teeth (1–3).

The standard regimen consists of:

Amoxicillin 2 g orally 30–60 minutes before the procedure.

Alternative regimens for patients allergic to penicillin include cephalexin (when appropriate), azithromycin, clarithromycin, or doxycycline (1,3).

- Lower incidence of postoperative bacteremia (4,5,9,10).

### Evidence Supporting Dental Screening

Several observational studies suggest that untreated oral infection may contribute to postoperative infective endocarditis and prosthetic valve infection, although randomized trials are lacking (4,5,7–10).

Preoperative dental screening has been associated with:

- Reduced postoperative infectious complications.
- Earlier identification of occult oral pathology.
- Improved oral health maintenance.

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### Conclusion

Maintenance of excellent oral health is now considered the cornerstone of infective endocarditis prevention. Current evidence suggests that the cumulative bacteremia associated with chronic oral disease and poor dental hygiene exceeds that resulting from isolated dental procedures. Therefore, meticulous dental evaluation before elective cardiac surgery, elimination of active oral infection, and lifelong dental surveillance in high-risk patients represent essential components of modern infective endocarditis prevention strategies..