

Dental Care and Heart Valve Surgery: Current Concepts and Clinical Practice

Abstract

Dental care is an integral component of the preoperative assessment and long-term management of patients undergoing cardiac surgery. Poor oral health is associated with transient bacteremia, infective endocarditis (IE), prosthetic valve infection, systemic inflammation, and adverse postoperative outcomes. The increasing use of prosthetic heart valves, annuloplasty rings, vascular grafts, and transcatheter valve prostheses has renewed interest in optimizing oral health before cardiac interventions. Current international guidelines recommend dental evaluation before elective valve surgery whenever feasible, although evidence supporting routine prophylactic dental extraction remains limited. The timing of dental procedures, perioperative antibiotic prophylaxis, and postoperative oral hygiene require careful multidisciplinary coordination between cardiologists, cardiac surgeons, anesthesiologists, and dentists. This mini-review summarizes current evidence regarding oral health assessment, preoperative dental management, timing of interventions, infective endocarditis prevention, and future directions in perioperative dental care.

Keywords: cardiac surgery; dental care; infective endocarditis; prosthetic valve; oral health; valve surgery

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Introduction

The relationship between oral health and cardiovascular disease has attracted increasing scientific attention over the past three decades. Oral infections represent one of the most frequent sources of transient bacteremia capable of seeding damaged endocardium or implanted prosthetic material. Patients undergoing cardiac surgery, particularly valve replacement or repair, are especially vulnerable because prosthetic materials provide an ideal surface for bacterial adhesion and biofilm formation (1,2).

Dental disease—including untreated caries, periodontal disease, periapical abscesses, and retained roots—may increase the risk of postoperative infective endocarditis (IE), although direct causal evidence remains difficult to establish (3). Consequently, modern cardiac surgery programs routinely incorporate dental screening into the preoperative work-up of patients undergoing elective valve procedures.

The objectives of this review are to summarize current evidence regarding:

- oral manifestations relevant to cardiac surgery;
- mechanisms linking oral disease with infective endocarditis;
- preoperative dental assessment;
- timing of dental interventions;
- postoperative oral care;
- recommendations from major international guidelines.

Oral Health and Cardiovascular Disease

Poor oral hygiene contributes to chronic periodontal inflammation characterized by persistent bacteremia and elevated circulating inflammatory mediators.

Common oral microorganisms implicated include:

- *Streptococcus sanguinis*
- *Streptococcus mitis*
- *Streptococcus oralis*
- *Streptococcus mutans*
- *Enterococcus faecalis*
- *Staphylococcus aureus* (less commonly oral but important in postoperative infection)

Transient bacteremia occurs during:

- tooth brushing
- flossing
- chewing
- dental extraction
- periodontal procedures

Although bacteremia after dental procedures is well recognized, routine daily activities probably account for the majority of cumulative bacterial exposure (4).

Why Dental Care Matters Before Cardiac Surgery

The risk becomes particularly important in patients receiving: mechanical prosthetic valves, bioprosthetic valves, mitral valve repair rings, annuloplasty devices, ascending aortic grafts, homografts, transcatheter valves

Foreign materials rapidly become coated with plasma proteins, facilitating bacterial adherence and biofilm formation (5).

Once prosthetic valve endocarditis develops, mortality remains between 20–40%, despite advances in surgery and antimicrobial therapy (6).

Therefore, prevention is considerably more effective than treatment.

Mechanisms Linking Oral Disease to Infective Endocarditis

The pathogenesis follows several sequential steps:

1. Oral infection develops.
2. Daily bacteremia occurs.
3. Endocardial injury exposes extracellular matrix proteins.
4. Platelet-fibrin thrombus forms.
5. Circulating bacteria adhere.
6. Vegetation enlarges
7. Persistent infection develops

Viridans streptococci remain among the commonest pathogens in native valve endocarditis originating from oral flora (7).

Preoperative Dental Assessment

Most centers recommend comprehensive dental examination before elective valve surgery.

Evaluation should include:

Medical History

- previous infective endocarditis
- prosthetic valves
- congenital heart disease
- anticoagulation
- diabetes
- immunosuppression

Clinical Examination

Assessment includes:

- dental caries
- periodontal disease
- fractured teeth
- retained roots
- gingivitis
- oral ulceration
- abscesses
- mucosal lesions
- oral hygiene

Radiographic Evaluation

Panoramic radiography (orthopantomogram) identifies:

- occult abscesses
- cysts
- retained roots
- impacted teeth
- periapical pathology

Several observational studies demonstrate that 20–50% of patients referred for valve surgery require some form of dental treatment before surgery (8).

Which Dental Conditions Require Treatment?

Generally accepted indications include:

Mandatory treatment

- active abscess
- acute periodontal infection

- symptomatic periapical lesions
- retained infected roots
- severe periodontal disease
- non-restorable teeth

Usually treated

- advanced caries
- fractured infected teeth
- chronic periapical granulomas

Usually not delaying surgery

- asymptomatic wisdom teeth
- mild gingivitis

Suggested intervals:

Dental procedure	Suggested interval before surgery
Cleaning	1–2 days
Simple filling	1–2 days
Root canal	3–5 days
Simple extraction	7–10 days
Surgical extraction	10–14 days

Emergency cardiac surgery should never be delayed solely for routine dental treatment.

Should Teeth Be Extracted Routinely?

Historically, aggressive dental extraction was common before valve replacement.

Current evidence suggests this approach is unnecessary.

Recent systematic reviews have shown:

- no randomized trials
- inconsistent observational evidence
- no proven reduction in postoperative IE
- risk of unnecessary tooth loss
- delayed cardiac surgery

Current philosophy favors:

"Treat infection rather than remove teeth indiscriminately."

Antibiotic Prophylaxis

According to current guidelines (10–12), antibiotic prophylaxis before invasive dental procedures is recommended for patients with:

- prosthetic heart valves
- previous infective endocarditis
- prosthetic valve repair material
- selected congenital heart diseases
- cardiac transplant recipients with valvulopathy

Standard regimen:

Amoxicillin 2 g orally 30–60 minutes before procedure

Alternative (penicillin allergy):

- Clindamycin is no longer recommended in many recent guidelines because of the risk of severe adverse effects and *Clostridioides difficile* infection.
- Alternatives include azithromycin, clarithromycin, or doxycycline, depending on the guideline and patient-specific factors (10–

- small restorations
- cosmetic problems

The urgency of cardiac surgery ultimately determines the extent of dental intervention.

Timing of Dental Procedures

Optimal timing remains controversial.

Current practice generally recommends completing dental treatment 7–14 days before elective cardiac surgery to allow adequate mucosal healing and reduce postoperative bacteremia (9).

12). Importantly, antibiotic prophylaxis does not replace good oral hygiene.

Oral Hygiene After Cardiac Surgery

Patients should receive lifelong education regarding:

- twice-daily tooth brushing
- fluoride toothpaste
- interdental cleaning
- regular dental visits (every 6–12 months)
- smoking cessation
- diabetes control
- treatment of periodontal disease

Poor long-term oral hygiene is probably more important than occasional dental procedures in preventing IE.

Special Considerations**Mechanical Valve Patients**

Patients receiving lifelong anticoagulation require coordination between dentist and cardiologist.

Most simple dental procedures can be safely performed without interrupting warfarin therapy if the international normalized ratio (INR) is within the therapeutic range, using local hemostatic measures (13).

Patients Receiving Direct Oral Anticoagulants (DOACs)

For most minor dental procedures, temporary interruption of DOAC therapy is often unnecessary. However, decisions should be individualized based on the bleeding risk of the procedure, renal function, and thromboembolic risk (14).

Transcatheter Valve Patients

The increasing number of patients undergoing transcatheter aortic valve implantation (TAVI) has emphasized the importance of dental assessment before implantation, as infective endocarditis

following TAVI carries a high mortality.

Current Guideline Recommendations

Guideline	Recommendation
2023 European Society of Cardiology IE Guidelines	Dental evaluation before elective valve surgery; emphasize oral hygiene and targeted antibiotic prophylaxis for high-risk patients (10).
2020 American College of Cardiology/American Heart Association Valve Disease Guideline	Dental evaluation before prosthetic valve implantation when feasible (11).
American Dental Association	Routine oral care; antibiotic prophylaxis only for selected high-risk cardiac patients (12).

Future Perspectives

Future research should focus on:

- randomized studies evaluating preoperative dental treatment;
- standardized dental screening protocols;
- oral microbiome analysis;
- rapid molecular diagnostics;
- artificial intelligence-assisted dental imaging;
- multidisciplinary perioperative pathways integrating dentistry into cardiac surgical care.

Conclusion

Dental care is a fundamental component of comprehensive cardiac surgical management, particularly in patients undergoing valve surgery or implantation of prosthetic material. Although definitive evidence linking routine preoperative dental treatment with reduced postoperative infective endocarditis is limited, current guidelines consistently recommend identifying and treating active oral infections before elective surgery. Optimal care requires close collaboration among cardiac surgeons, cardiologists, infectious disease specialists, anesthesiologists, and dental professionals. Long-term maintenance of oral hygiene and regular dental follow-up remain the cornerstone of infective endocarditis prevention.

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