



Review of Dental Management Considerations for Patients with Cardiovascular Conditions

Solmaz Valizadeh¹, Mehdi Hosseinzadeh^{1,*}

¹ Department of Oral and Maxillofacial Radiology, School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran

* **Corresponding Author:** Department of Oral and Maxillofacial Radiology, School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: meahdi.hosseinzadeh@gmail.com

Received: 2 December, 2024; **Revised:** 14 December, 2024; **Accepted:** 15 December, 2024

Abstract

Context: Cardiovascular diseases (CVDs) are among the leading causes of mortality globally, posing unique challenges for dental practitioners. Effective dental care for these patients requires careful planning and adherence to guidelines to prevent complications such as infective endocarditis (IE), excessive bleeding, or cardiovascular emergencies during procedures.

Evidence Acquisition: This review synthesizes evidence from clinical guidelines and peer-reviewed studies on managing patients with cardiovascular conditions in dental settings. Focus areas include antibiotic prophylaxis, anticoagulant management, stress reduction, and emergency preparedness.

Results: Key strategies include tailored antibiotic prophylaxis, cautious management of anticoagulants, and minimizing systemic risks through procedural modifications. Dentists must also be prepared to address stress-induced complications and manage emergencies like angina or arrhythmias during procedures.

Conclusions: Interdisciplinary collaboration between dentists and cardiologists is essential for optimizing the safety and outcomes of dental treatments for cardiovascular patients. By adhering to evidence-based protocols, dentists can significantly enhance both oral and systemic health in this patient population.

Keywords: Cardiovascular Diseases, Dental Care, Antibiotic Prophylaxis, Anticoagulants, Emergency Treatment

1. Context

Cardiovascular diseases (CVDs) encompass a range of conditions, including hypertension, coronary artery disease (CAD), arrhythmias, heart failure, valvular abnormalities, and congenital heart defects (1, 2). With advances in medical therapies, many patients with CVDs now live longer, necessitating comprehensive management during dental treatments (3).

Dental procedures can pose risks for these patients due to systemic interactions, such as stress-induced cardiovascular events or bleeding complications from anticoagulant therapy (4). Consequently, a thorough understanding of cardiovascular conditions, associated medications, and procedural modifications is vital for safe dental care (5, 6).

This review focuses on the critical considerations that dentists must take into account when treating patients with cardiovascular conditions. By providing an evidence-based framework, it aims to guide clinicians in delivering safe and effective care while minimizing risks associated with these prevalent and complex diseases.

2. Evidence Acquisition

The evidence was gathered from clinical guidelines, such as those provided by the American Heart Association (AHA), and peer-reviewed studies focusing on the interplay between cardiovascular health and dental procedures. The review addressed key aspects such as antibiotic prophylaxis, anticoagulation management, stress reduction, and emergency preparedness. Articles from reputable medical and

dental journals were included, and the latest advancements in care strategies were emphasized.

3. Results

Effective dental care for patients with cardiovascular conditions requires careful attention to the specifics of each disease and the patient's medical history. The following are key considerations for managing these patients in the dental office:

3.1. Antibiotic Prophylaxis

To prevent infective endocarditis (IE), antibiotic prophylaxis is often recommended for patients at high risk, including those with prosthetic heart valves, previous episodes of IE, or specific congenital heart defects. The AHA provides guidelines on prophylaxis, with amoxicillin being the first-line antibiotic. For patients with penicillin allergies, alternatives such as clindamycin or azithromycin are recommended. Timing is crucial for prophylaxis, with antibiotics typically administered one hour before invasive dental procedures. While minor dental procedures may not require prophylaxis, invasive procedures, such as extractions, root canal treatments, and periodontal surgeries, necessitate adherence to these guidelines to prevent bacteremia and subsequent endocarditis (4).

3.2. Management of Bleeding Risks

Patients on anticoagulant therapy, including warfarin, direct oral anticoagulants (DOACs), and antiplatelet agents, present a particular challenge due to the increased risk of bleeding. Dentists must carefully assess the need to modify anticoagulant regimens based on the invasiveness of the planned procedure. For minor procedures, such as routine cleanings or restorations, patients may continue their anticoagulants without modification. However, for more complex surgeries (e.g., extractions or periodontal surgery), collaboration with the patient's cardiologist is essential to determine whether to temporarily adjust or pause anticoagulant therapy. Local hemostatic measures, such as sutures, tranexamic acid mouthwashes, or hemostatic sponges, are invaluable tools to manage bleeding during and after dental procedures. It is important to note that switching anticoagulants or altering dosages should

only be done with physician consultation to avoid thromboembolic events (7, 8).

3.3. Local Anesthetics and Drug Interactions

The use of local anesthetics containing vasoconstrictors, such as epinephrine, must be carefully considered in patients with cardiovascular conditions like arrhythmias, poorly controlled hypertension, and those with pacemakers or defibrillators. In these cases, it is prudent to either limit the amount of vasoconstrictor used or opt for epinephrine-free local anesthetics to avoid cardiovascular complications. Additionally, the interaction between NSAIDs and cardiovascular medications, such as aspirin and certain antihypertensive drugs, should guide postoperative pain management. NSAIDs can exacerbate hypertension and interact negatively with anticoagulant therapy, so acetaminophen or opioids may be preferable for postoperative pain relief. Dentists should also be aware of other medications the patient is taking (e.g., beta-blockers, diuretics), as these can influence the choice of local anesthetic and sedative agents (9, 10).

3.4. Stress and Anxiety Management

Stress during dental procedures can significantly affect cardiovascular function, elevating blood pressure, heart rate, and triggering arrhythmias in vulnerable patients. Dentists must adopt strategies to reduce patient anxiety and manage stress. This can include scheduling shorter, less invasive appointments and providing a calm, reassuring environment. Sedation options, such as nitrous oxide (often used for mild sedation) or oral anxiolytics, can be considered for more anxious patients, but care must be taken to monitor respiratory and cardiovascular function throughout the procedure. In cases of extreme anxiety or fear, general anesthesia may be an option, though this requires careful preoperative planning and consultation with the patient's cardiologist. The use of non-invasive stress-reduction techniques, such as deep breathing exercises or guided relaxation, should also be incorporated into practice (11, 12).

3.5. Emergency Preparedness

Cardiovascular patients are at an elevated risk for emergencies during dental procedures, including angina, arrhythmias, or even cardiac arrest. It is

essential that dental practices are well-equipped to handle such emergencies. Key equipment, such as an automated external defibrillator (AED), oxygen delivery systems, and emergency medications, should be available in all dental offices. Staff must be trained in basic life support (BLS) and advanced cardiac life support (ACLS), especially in practices with a high volume of patients with known cardiovascular conditions. Preparation includes developing emergency protocols that cover common cardiovascular events, ensuring that all staff members understand their roles in case of an emergency, and regularly reviewing these protocols through drills and training (13).

4. Conclusions

The dental management of patients with cardiovascular conditions requires meticulous planning, adherence to evolving guidelines, and interdisciplinary collaboration. By considering patient-specific risks, optimizing stress management strategies, and preparing for emergencies, dentists can ensure safe and effective care. This proactive approach not only minimizes complications but also contributes to improving overall patient health and quality of life (Table 1).

Table 1. Considerations for Specific Dental Procedures

Heart Condition	Restorative	Endodontics	Orthodontics	Periodontics	Pediatrics	Extraction/Surgery
Hypertension	Avoid epinephrine in uncontrolled cases (14).	Minimize stress; reduce vasoconstrictors (15)	Delay if poorly controlled (14)	Avoid invasive procedures if blood pressure > 180/110 (14).	Monitor sedation; stress-free environment (16)	Delay for uncontrolled hypertension; monitor blood pressure (11)
CAD	Use local anesthesia with low epinephrine anesthetics; monitor vitals (10)	Avoid stress and excessive bleeding (15)	Proceed in stable CAD; avoid excessive forces (16)	Prophylaxis for invasive procedures (17)	Short appointments with minimal stress (16)	Avoid procedures during active CAD; ensure stress-free environment (11)
Arrhythmias	Avoid vasoconstrictors (18)	Avoid electrical equipment (15)	Evaluate devices for pacemaker safety (15)	Avoid bacteremia-inducing treatments (12)	Non-invasive treatments preferred (16).	Use non-epinephrine anesthetics; shield pacemakers from interference (11).
Heart failure	Only urgent care for decompensated heart failure (14)	Avoid supine positions for extended periods (13).	Postponed until heart failure is stabilized (16).	Monitor oxygen saturation during scaling (18)	Consult pediatric cardiologist (16).	Defer non-essential surgeries in decompensated heart failure; manage oxygen (11)
Prosthetic heart valves	Antibiotic prophylaxis for invasive treatments (17)	Prophylaxis for risk of bacteremia (15)	Generally safe; consider prophylaxis (10).	Aggressive plaque control; scaling and root planning with prophylaxis (13)	Prophylaxis for invasive treatments (16).	Adhere to prophylaxis guidelines; ensure hemostasis (11).
Congenital heart defects	Tailored care; antibiotic prophylaxis (17).	Avoid bacteremia-inducing procedures (18).	Monitor systemic risks; low-risk cases (10)	Emphasize oral hygiene education (16)	Collaboration with pediatric cardiologist (16)	Prophylaxis may be necessary; assess stabilization needs (11)
IE	Strict adherence to prophylaxis guidelines (17)	Antimicrobial rinse before procedures (15)	Consult cardiologist for gingival health (10)	Prophylaxis for all surgical treatments (13)	Focus on preventive care (16)	Prophylaxis and preoperative stabilization (11)

Abbreviation: CAD, coronary artery disease; IE, infective endocarditis.

Footnotes

Authors' Contribution: Study concept and design: S. V. and M. H.; Analysis and interpretation of data: S. V. and M. H.; Drafting of the manuscript: S. V. and M. H.; Critical revision of the manuscript for important intellectual content: S. V. and M. H.

Conflict of Interests Statement: The authors declare that they have no conflicts of interest related to this study.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Funding/Support: The authors declare that this research did not receive any specific grant or financial support from funding agencies in the public, commercial, or not-for-profit sectors.

References

- Habib G, Lancellotti P, Antunes MJ, Bongiorno MG, Casalta JP, Del Zotti F, et al. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective

- Endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J*. 2015;**36**(44):3075-128. [PubMed ID: [26320109](https://pubmed.ncbi.nlm.nih.gov/26320109/)]. <https://doi.org/10.1093/eurheartj/ehv319>.
2. Glenny A, Oliver R, Roberts GJ, Hooper L, Worthington HV. Antibiotics for the prophylaxis of bacterial endocarditis in dentistry. *Cochrane Database Syst Rev*. 2013;**10**. <https://doi.org/10.1002/14651858.CD003813.pub4>.
 3. Southerland JH, Gill DG, Gangula PR, Halpern LR, Cardona CY, Mouton CP. Dental management in patients with hypertension: challenges and solutions. *Clin Cosmet Investig Dent*. 2016;**8**:111-20. [PubMed ID: [27799823](https://pubmed.ncbi.nlm.nih.gov/27799823/)]. [PubMed Central ID: [PMC5074706](https://pubmed.ncbi.nlm.nih.gov/PMC5074706/)]. <https://doi.org/10.2147/CCIDE.S99446>.
 4. Gupta K, Kumar S, Anand Kukkamalla M, Taneja V, Syed GA, Pullishery F, et al. Dental Management Considerations for Patients with Cardiovascular Disease-A Narrative Review. *Rev Cardiovasc Med*. 2022;**23**(8):261. [PubMed ID: [39076626](https://pubmed.ncbi.nlm.nih.gov/39076626/)]. [PubMed Central ID: [PMC11266964](https://pubmed.ncbi.nlm.nih.gov/PMC11266964/)]. <https://doi.org/10.31083/j.rcm2308261>.
 5. ADA. *Guidelines for dental management of patients on anticoagulants*. 2024. Available from: www.ada.org.
 6. Glick M, Greenberg MS, Ship JA. *Burket's Oral Medicine: Diagnosis and Treatment*. Beijing, China: People's Medical Publishing House; 2022.
 7. Ukaegbu K. Management of Bleeding in Dental Surgery: A Mini Review. *SVOA Dentistry*. 2024;**5**(4):158-63.
 8. Wahl MJ. Myths of dental surgery in patients receiving anticoagulant therapy. *J Am Dent Assoc*. 2000;**131**(1):77-81. [PubMed ID: [10649877](https://pubmed.ncbi.nlm.nih.gov/10649877/)]. <https://doi.org/10.14219/jada.archive.2000.0024>.
 9. Gigante B, Levy JH, van Gorp E, Bartoloni A, Bochaton-Piallat ML, Back M, et al. Management of patients on antithrombotic therapy with severe infections: a joint clinical consensus statement of the ESC Working Group on Thrombosis, the ESC Working Group on Atherosclerosis and Vascular Biology, and the International Society on Thrombosis and Haemostasis. *Eur Heart J*. 2023;**44**(32):3040-58. [PubMed ID: [37439553](https://pubmed.ncbi.nlm.nih.gov/37439553/)]. <https://doi.org/10.1093/eurheartj/ehad388>.
 10. Miller C, Rhodus NL, Treister NS, Stoopler ET, Kerr AR. *Little and Falace's Dental Management of the Medically Compromised Patient - E-Book: Little and Falace's Dental Management of the Medically Compromised Patient - E-Book*. Amsterdam, Netherlands: Elsevier Health Sciences; 2023.
 11. Malamed SF. *Sedation: a guide to patient management*. Amsterdam, Netherlands: Elsevier; 2007.
 12. Hopkins S, Gajagowni S, Qadeer Y, Wang Z, Virani SS, Meurman JH, et al. Oral Health and Cardiovascular Disease. *Am J Med*. 2024;**137**(4):304-7. [PubMed ID: [38141902](https://pubmed.ncbi.nlm.nih.gov/38141902/)]. <https://doi.org/10.1016/j.amjmed.2023.11.022>.
 13. Hewett Brumberg EK, Douma MJ, Alibertis K, Charlton NP, Goldman MP, Harper-Kirksey K, et al. 2024 American Heart Association and American Red Cross Guidelines for First Aid. *Circulation*. 2024;**150**(24):e519-79. [PubMed ID: [39540278](https://pubmed.ncbi.nlm.nih.gov/39540278/)]. <https://doi.org/10.1161/CIR.0000000000001281>.
 14. Mingarro-de-Leon A, Chaveli-Lopez B, Gavalda-Esteve C. Dental management of patients receiving anticoagulant and/or antiplatelet treatment. *J Clin Exp Dent*. 2014;**6**(2):e155-61. [PubMed ID: [24790716](https://pubmed.ncbi.nlm.nih.gov/24790716/)]. [PubMed Central ID: [PMC4002346](https://pubmed.ncbi.nlm.nih.gov/PMC4002346/)]. <https://doi.org/10.4317/jced.51215>.
 15. Hypertension A. Arterial Hypertension. In: Diz Dios P, Kumar N, Porter S, Limeres Posse J, editors. *A Practical Approach to Special Care in Dentistry*. Hoboken, New Jersey: WILEY; 2022. p. 146-55. <https://doi.org/10.1002/9781119600077.ch8.1>.
 16. Sanz M, Marco Del Castillo A, Jepsen S, Gonzalez-Juanatey JR, D'Aiuto F, Bouchard P, et al. Periodontitis and cardiovascular diseases: Consensus report. *J Clin Periodontol*. 2020;**47**(3):268-88. [PubMed ID: [32011025](https://pubmed.ncbi.nlm.nih.gov/32011025/)]. [PubMed Central ID: [PMC7027895](https://pubmed.ncbi.nlm.nih.gov/PMC7027895/)]. <https://doi.org/10.1111/jcpe.13189>.
 17. Thornhill MH, Gibson TB, Yoon F, Dayer MJ, Prendergast BD, Lockhart PB, et al. Antibiotic Prophylaxis Against Infective Endocarditis Before Invasive Dental Procedures. *J Am Coll Cardiol*. 2022;**80**(11):1029-41. [PubMed ID: [35987887](https://pubmed.ncbi.nlm.nih.gov/35987887/)]. <https://doi.org/10.1016/j.jacc.2022.06.030>.
 18. Margaix Munoz M, Jimenez Soriano Y, Poveda Roda R, Sarrion G. Cardiovascular diseases in dental practice. Practical considerations. *Med Oral Patol Oral Cir Bucal*. 2008;**13**(5):E296-302. [PubMed ID: [18449113](https://pubmed.ncbi.nlm.nih.gov/18449113/)].