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RISCO CARDIOVASCULAR NA IMPLANTODONTIA: DA ESTABILIDADE CLÍNICA À TOMADA DE DECISÃO CIRÚRGICA

CARDIOVASCULAR RISK IN IMPLANT DENTISTRY: FROM MEDICAL STABILITY TO SURGICAL DECISION-MAKING

RIESGO CARDIOVASCULAR EN IMPLANTOLOGÍA DENTAL: DE LA ESTABILIDAD CLÍNICA A LA TOMA DE DECISIONES QUIRÚRGICAS

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ABSTRACT

Cardiovascular diseases are common among patients seeking oral rehabilitation with dental implants and require proportionate clinical assessment before elective surgery. This narrative review discusses cardiovascular risk in implant dentistry, emphasizing medical stability, current symptoms, recent cardiovascular events or interventions, medication-related considerations, and procedural complexity. Evidence specific to dental implant surgery remains limited; therefore, general noncardiac surgery guidelines were used as a conceptual framework and are not assumed to be validated for outpatient dental implant procedures. For limited implant placement under local anesthesia, stable cardiovascular disease alone generally does not justify extensive cardiovascular testing solely because surgery is planned. Conversely, active ischemic symptoms, decompensated heart failure, hemodynamically significant arrhythmias, severe symptomatic valvular disease, hypertensive emergencies, or other evidence of acute instability warrant postponement and medical reassessment. Antithrombotic therapy should not be empirically interrupted, and infective endocarditis prophylaxis should be restricted to guideline-defined high-risk cardiac conditions undergoing relevant invasive dental procedures.

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Keywords: Cardiovascular diseases; Dental implants; Risk assessment; Oral surgery; Clinical decision-making.

RESUMO

As doenças cardiovasculares são frequentes entre pacientes que buscam reabilitação oral com implantes dentários e exigem avaliação clínica proporcional antes de procedimentos cirúrgicos eletivos. Esta revisão narrativa discute o risco cardiovascular na Implantodontia, com ênfase na estabilidade clínica, sintomas atuais, eventos ou intervenções cardiovasculares recentes, considerações relacionadas aos medicamentos e complexidade do procedimento. As evidências específicas para cirurgia de implantes permanecem limitadas; por isso, diretrizes gerais de cirurgia não cardíaca foram utilizadas como estrutura conceitual, sem pressupor que sejam validadas para procedimentos ambulatoriais de Implantodontia. Em procedimentos limitados sob anestesia local, a presença isolada de doença cardiovascular geralmente não justifica investigação cardiovascular extensa apenas pela indicação do implante. Por outro lado, sintomas isquêmicos ativos, insuficiência cardíaca descompensada, arritmias hemodinamicamente significativas, doença valvar grave sintomática, emergências hipertensivas ou outras evidências de instabilidade aguda justificam adiamento e reavaliação médica. A terapia antitrombótica não deve ser interrompida empiricamente, e a profilaxia para endocardite infecciosa deve ser restrita às condições cardíacas de alto risco definidas em diretrizes e aos procedimentos odontológicos invasivos relevantes.

Palavras-chave: Doenças cardiovasculares; Implantes dentários; Avaliação de risco; Cirurgia oral; Tomada de decisão clínica.

RESUMEN

Las enfermedades cardiovasculares son frecuentes entre los pacientes que buscan rehabilitación oral con implantes dentales y requieren una evaluación clínica proporcional antes de los procedimientos quirúrgicos electivos. Esta revisión narrativa analiza el riesgo cardiovascular en implantología dental, con énfasis en la estabilidad clínica, los síntomas actuales, los eventos o intervenciones cardiovasculares recientes, las consideraciones relacionadas con los medicamentos y la complejidad del procedimiento. La evidencia específica para la cirugía de implantes dentales sigue siendo limitada; por ello, las guías generales para cirugía no cardíaca se utilizaron como marco conceptual, sin asumir que estén validadas para procedimientos ambulatorios de implantología dental. En procedimientos limitados realizados bajo anestesia local, la presencia aislada de enfermedad cardiovascular generalmente no justifica una evaluación cardiovascular extensa únicamente por la indicación del implante. Por otro lado, los síntomas isquémicos activos, la insuficiencia cardíaca descompensada, las arritmias hemodinámicamente significativas, la enfermedad valvular grave sintomática, las emergencias hipertensivas u otras evidencias de inestabilidad aguda justifican el aplazamiento del procedimiento y una reevaluación médica. La terapia antitrombótica no debe interrumpirse de forma empírica, y la profilaxis para la endocarditis infecciosa debe restringirse a las condiciones cardíacas de alto riesgo definidas en las guías y a los procedimientos odontológicos invasivos pertinentes.

Palabras clave: Enfermedades cardiovasculares; Implantes dentales; Evaluación del riesgo; Cirugía oral; Toma de decisiones clínicas.

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INTRODUCTION

Cardiovascular diseases remain among the leading causes of morbidity and mortality worldwide and are increasingly prevalent among adults seeking oral rehabilitation with dental implants. Consequently, implant clinicians should incorporate cardiovascular assessment into treatment planning while avoiding disproportionate investigation. Contemporary perioperative guidance recommends a stepwise approach in which cardiovascular testing follows the same clinical indications used outside the surgical setting, rather than being ordered routinely because surgery is planned (THOMPSON et al., 2024; GUALANDRO et al., 2024).

The relationship between cardiovascular disease and implant outcomes is complex and cannot be reduced to the presence or absence of a specific diagnosis. Available evidence suggests, for example, that hypertension alone is not clearly associated with increased implant failure, but this biological outcome should not be conflated with perioperative cardiovascular safety (HAMADÉ; EL-DISOKI; CHRCANOVIC, 2024). Similarly, evidence concerning antihypertensive medication and implant outcomes remains limited and does not support drug-specific clinical conclusions (MISHRA; SONNAHALLI; CHOWDHARY, 2024).

Preoperative cardiovascular assessment should therefore focus on identifying active or unstable conditions that may increase the risk associated with elective surgery. Symptoms such as ongoing ischemic chest pain, worsening dyspnea or orthopnea, syncope, hemodynamic instability, or clinically significant uncontrolled arrhythmia warrant medical reassessment before elective treatment. At the same time, stable patients undergoing limited outpatient implant procedures should not be subjected routinely to stress testing, echocardiography, biomarkers, or formal cardiac risk scores solely because implant surgery is planned (THOMPSON et al., 2024).

General noncardiac surgery guidelines were used as a conceptual framework for assessing medical stability; many of their recommendations have not been specifically developed or validated for outpatient dental implant surgery. Limited implant placement under local anesthesia generally imposes substantially less physiological stress than major noncardiac surgery, and risk assessment should therefore remain proportional to the patient's clinical condition and the magnitude of the planned dental procedure (THOMPSON et al., 2024; GUALANDRO et al., 2024).

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In addition to the underlying cardiovascular disease, perioperative management must consider factors directly related to dental treatment. Blood pressure assessment, anxiety and pain control, appropriate use of local anesthetic vasoconstrictors, antithrombotic management, and the extent and duration of surgery may influence clinical safety. The dental clinician remains responsible for the dental treatment decision, whereas medical consultation should clarify cardiovascular stability, relevant restrictions, recent events, and medication-specific considerations when these issues are uncertain.

Therefore, this narrative review aims to examine cardiovascular risk in implant dentistry from the perspective of medical stability and surgical decision-making. Particular emphasis is placed on preoperative assessment, hypertension, coronary artery disease, heart failure, arrhythmias, valvular disease, cardiovascular medications, vasoconstrictor use, antithrombotic therapy, and infective endocarditis. The review also distinguishes perioperative cardiovascular safety from implant biological outcomes and proposes an evidence-informed, non-validated clinical framework for outpatient implant surgery.

MATERIALS AND METHODS

This study was designed as a narrative review aimed at examining cardiovascular risk assessment and clinical decision-making in patients undergoing dental implant therapy. The review focused on the relationship between cardiovascular stability, medication-related considerations, procedural complexity, and the safety of elective implant surgery. An updated bibliographic check was performed on 5 September 2026, with emphasis on current cardiovascular guidelines and dental-specific evidence. The review was not intended to provide a systematic quantitative synthesis.

A non-systematic search of the scientific literature was conducted using PubMed/MEDLINE, with complementary citation tracing and Google Scholar used where appropriate to identify additional relevant publications. Search concepts were combined around dental implants and cardiovascular conditions, including (“dental implants” OR “implant surgery”) AND (“cardiovascular disease” OR hypertension OR “coronary artery disease” OR “myocardial infarction” OR “heart failure” OR arrhythmia OR “valvular disease” OR anticoagulants OR “antiplatelet therapy” OR vasoconstrictors OR epinephrine OR “infective endocarditis”). The literature search was updated through September 5, 2026. No fixed starting date was imposed; emphasis was placed on contemporary guidelines, recent systematic reviews and meta-analyses, and landmark publications when clinically relevant.

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Priority was given to contemporary clinical practice guidelines, systematic reviews and meta-analyses, and dental-specific clinical literature. Narrative reviews and landmark studies were retained when they provided clinically relevant context or addressed areas in which implant-specific evidence was limited. Evidence was interpreted according to its type and scope: guideline recommendations, systematic reviews/meta-analyses, dental clinical evidence, narrative reviews, and extrapolation from general noncardiac surgery literature were not treated as equivalent levels of evidence.

Publications were selected based on relevance to outpatient implant surgery and cardiovascular decision-making. General perioperative guidelines were used only as a conceptual framework because their recommendations were developed for noncardiac surgery broadly and have not necessarily been validated for dental implant surgery. Google Scholar was treated as a complementary source for citation tracing rather than as a primary database; therefore, it was not subjected to an exhaustive, count-based screening process. The review did not aim to provide a systematic estimate of the number of records retrieved or screened.

The information identified was synthesized narratively and organized into clinically relevant domains: medical stability before implant surgery; hypertension and hemodynamic control; coronary artery disease and heart failure; arrhythmias and valvular disease; vasoconstrictor use; cardiovascular and antithrombotic medications; infective endocarditis; indications for postponement; and a practical, author-proposed framework. No formal risk-of-bias assessment or GRADE evaluation was performed because this was a narrative review.

THE CARDIOVASCULAR PATIENT IN THE IMPLANT CHAIR

The clinical reasoning in this review should distinguish two related but different domains. Domain A—perioperative medical safety concerns the probability of cardiovascular instability during or around the procedure. Domain B—implant biological outcome concerns osseointegration, implant survival, and implant failure. Evidence addressing one domain should not be used to infer conclusions about the other.

The growing prevalence of cardiovascular disease among adults seeking oral rehabilitation requires implant clinicians to incorporate cardiovascular risk assessment into routine treatment planning. However, the presence of a

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cardiovascular diagnosis should not automatically be interpreted as a contraindication to implant therapy. Instead, the clinical relevance of cardiovascular disease depends largely on its severity, current stability, symptom burden, functional capacity, pharmacological management, and the complexity of the planned surgical procedure (GUPTA et al., 2022; HALVORSEN et al., 2022).

A practical cardiovascular assessment should begin with a detailed medical history addressing the specific diagnosis, duration of disease, current symptoms, previous cardiovascular events, hospitalizations, coronary intervention or stent placement, medication changes, and relevant treatment restrictions. Additional testing should be requested only when clinically indicated. Routine stress testing, echocardiography, biomarkers, RCRI, or NSQIP-based stratification should not be automatically applied to limited outpatient dental implant procedures, because these tools were developed for broader noncardiac surgical populations and are not validated for routine use in dental implant surgery. In patients with good or adequate functional capacity and a low-risk or limited procedure, routine stress testing is likewise not indicated solely because surgery is planned (THOMPSON et al., 2024).

The concept of medical stability is therefore more clinically meaningful than the mere presence of cardiovascular disease. A patient with a well-controlled chronic condition and no relevant symptoms may safely undergo routine dental treatment, whereas an individual with an apparently less severe diagnosis but active symptoms or recent clinical deterioration may require postponement and medical reassessment. This approach is consistent with perioperative cardiovascular guidelines, which emphasize the integration of patient-related risk, clinical status, and procedure-related factors when determining the appropriateness of elective surgery (HALVORSEN et al., 2022; MEHILLI; WINHARD, 2023).

MEDICAL STABILITY BEFORE IMPLANT SURGERY

HYPERTENSION AND HEMODYNAMIC CONTROL

Hypertension is one of the most common cardiovascular conditions encountered in dental practice and is frequently present in patients seeking implant rehabilitation. Its relevance to implant dentistry involves two distinct questions: implant biological outcomes and perioperative cardiovascular safety. Contemporary blood-pressure management should follow the 2025 AHA/ACC guideline, which

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replaced the 2017 guideline and emphasizes accurate measurement, confirmation of the clinical context, and assessment of overall cardiovascular risk (JONES et al., 2025).

In patients with known hypertension or cardiovascular disease, a history of poor blood-pressure control, or an elective invasive procedure, preoperative blood-pressure measurement is a reasonable component of clinical assessment. Dental recommendations, including those summarized by the American Dental Association, provide practical criteria for repeating measurements and considering deferral of elective care when values are markedly elevated. For example, the ADA framework recommends repeat measurement when pressure is above 160/100 mmHg and advises against elective dental treatment when a confirmed elevation persists, with urgent medical evaluation when very high values or concerning symptoms are present. These values should be interpreted as clinical guidance rather than universal absolute thresholds, particularly because the 2025 AHA/ACC guideline has superseded the older hypertension classification framework (AMERICAN DENTAL ASSOCIATION, 2022; JONES et al., 2025).

A single elevated blood-pressure measurement should not by itself be interpreted as definitive evidence that surgery is unsafe. Anxiety, pain, white-coat effect, inappropriate cuff size, and measurement technique can influence readings. Decisions should integrate repeat measurements, the patient's usual blood-pressure values, symptoms, medication adherence, and the overall clinical context. The 2025 AHA/ACC guideline also emphasizes the role of out-of-office measurements in selected patients to identify white-coat or masked hypertension (JONES et al., 2025).

CORONARY ARTERY DISEASE AND PREVIOUS ISCHEMIC EVENTS

Patients with coronary artery disease require careful assessment before elective implant surgery. The presence of a previous myocardial infarction or coronary intervention does not automatically preclude dental implant treatment, and no universal fixed waiting interval should be applied after myocardial infarction. Assessment should consider the type and severity of the event, current stability, residual ischemic symptoms, ventricular function, recent PCI or stent placement, and the antithrombotic regimen (THOMPSON et al., 2024; GUALANDRO et al., 2024).

Active or unstable symptoms, particularly chest pain suggestive of myocardial ischemia, require cardiovascular assessment before elective procedures. Similarly,

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recent acute coronary syndromes or clinically significant changes after coronary intervention warrant individualized planning. In patients with recent PCI, interruption of aspirin, clopidogrel, prasugrel, ticagrelor, or dual antiplatelet therapy should not be undertaken empirically by the dental clinician because the thrombotic consequences may outweigh the bleeding risk of a limited dental procedure (THOMPSON et al., 2024).

For implant clinicians, the practical implication is clear: elective rehabilitation should not proceed solely because the surgical procedure itself appears limited. The cardiovascular condition must first be stable, and the dentist should understand whether the patient has recently experienced an acute event or undergone coronary intervention. When uncertainty exists, communication with the treating cardiologist is preferable to empirical modification of medications or unnecessary cancellation of treatment.

HEART FAILURE

Heart failure represents a clinically important condition because perioperative risk is strongly influenced by disease stability and functional status. Patients with compensated chronic heart failure may tolerate limited procedures, whereas decompensated disease warrants postponement and medical optimization. Perioperative guidance also recognizes the relevance of newer therapies, including sodium-glucose cotransporter 2 inhibitors (SGLT2 inhibitors), although hospital fasting protocols for major surgery should not be automatically transposed to short dental procedures performed under local anesthesia without fasting (THOMPSON et al., 2024).

Symptoms requiring particular attention include worsening dyspnea, new or progressive orthopnea, peripheral edema, unexplained fatigue, reduced exercise tolerance, and recent hospitalization for cardiovascular decompensation. New or progressive orthopnea should prompt clinical reassessment before elective surgery rather than being managed solely by chair positioning.

The dental team should also consider practical measures that may improve patient comfort and safety, including shorter appointments, appropriate chair positioning when orthopnea is present, and avoidance of unnecessary procedural stress. More importantly, patients with evidence of recent deterioration should be

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referred for medical reassessment before implant surgery is scheduled (GUPTA et al., 2022).

ARRHYTHMIAS AND CARDIAC IMPLANTABLE ELECTRONIC DEVICES

Arrhythmias encompass a broad spectrum of conditions ranging from clinically stable rhythm disorders to abnormalities associated with significant hemodynamic compromise. Elective implant surgery should be reconsidered when there is a newly diagnosed or clinically changing arrhythmia, syncope, hypotension, chest pain, dyspnea, inadequate ventricular rate control, or other evidence of hemodynamic instability. Stable, appropriately managed rhythm disorders do not by themselves constitute a contraindication to implant surgery.

The presence of a pacemaker or implantable cardioverter-defibrillator is not itself a contraindication to conventional dental implant surgery. The clinically relevant issue is the underlying cardiac condition and whether the patient is stable.

VALVULAR HEART DISEASE

Valvular heart disease represents a heterogeneous group requiring individualized assessment. Hemodynamic severity and infective endocarditis prophylaxis are separate considerations: severe valvular disease may increase perioperative risk without automatically creating an indication for antibiotic prophylaxis, whereas a stable prosthetic valve may qualify for prophylaxis because of endocarditis risk. Symptoms such as exertional dyspnea, syncope, chest pain, or signs of heart failure should prompt attention to hemodynamic severity (OTTO et al., 2021).

Particular attention should be given to patients with symptoms suggestive of hemodynamic compromise, including exertional dyspnea, syncope, chest pain, or signs of heart failure. In such situations, the priority should be clarification and optimization of the cardiovascular condition rather than progression toward elective implant rehabilitation.

Certain high-risk cardiac conditions are relevant to infective endocarditis prevention. Current recommendations identify patients with prosthetic valves or prosthetic material used for valve repair, previous infective endocarditis, selected congenital heart disease, and cardiac transplant recipients with valvular disease as

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groups in whom prophylaxis may be considered for relevant invasive dental procedures. Implant surgery involving perforation of the oral mucosa may fall within the dental procedures for which prophylaxis is recommended in these high-risk patients (WILSON et al., 2021; DELGADO et al., 2023).

BLOOD PRESSURE, STRESS, AND VASOCONSTRICTORS

The use of vasoconstrictors in local anesthetic solutions remains one of the most frequently discussed issues in the management of cardiovascular patients. Concerns regarding epinephrine-induced increases in heart rate and blood pressure are most relevant when high doses are used or inadvertent intravascular injection occurs. Contemporary dental guidance continues to support cautious use rather than blanket avoidance in appropriately selected stable patients (AMERICAN DENTAL ASSOCIATION, 2022).

Available evidence suggests that limited amounts of epinephrine-containing local anesthetic can be used in many patients with controlled cardiovascular disease when appropriate precautions are observed. When vasoconstrictor exposure is intentionally limited in cardiovascular patients, a commonly recommended cautious maximum is approximately 0.04 mg of epinephrine per appointment; this should be presented as a pragmatic clinical limit rather than as a universally proven safe threshold. Aspiration, slow injection, the minimum effective dose, and adequate pain control remain important precautions. The evidence base supporting these recommendations is limited and includes older studies (BADER; BONITO; SHUGARS, 2002; AMERICAN DENTAL ASSOCIATION, 2022).

The decision to use a vasoconstrictor should therefore be individualized. A well-controlled patient with stable cardiovascular disease may benefit from effective local anesthesia and improved intraoperative hemostasis. Conversely, patients with uncontrolled hypertension, unstable ischemic symptoms, severe arrhythmias, or other forms of cardiovascular instability require a more cautious approach, with elective treatment potentially postponed until medical optimization is achieved (GUPTA et al., 2022; HALVORSEN et al., 2022).

Stress reduction is equally important. Preoperative anxiety may increase sympathetic activity and contribute to hemodynamic changes during treatment. Shorter appointments, adequate pain control, effective communication, and avoidance of unnecessarily prolonged procedures may help reduce physiological

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stress. In complex implant rehabilitation, staging treatment may be preferable to performing extensive surgical interventions during a single appointment in vulnerable patients.

CARDIOVASCULAR MEDICATIONS AND IMPLANT OUTCOMES

Cardiovascular medications should be evaluated not only because of their perioperative implications but also because some pharmacological classes may influence bone metabolism and peri-implant biological processes. The available evidence regarding these relationships remains limited and heterogeneous, and direct causal conclusions should therefore be avoided (MISHRA; SONNAHALLI; CHOWDHARY, 2024).

Antihypertensive medications represent a particularly interesting area of investigation. The available systematic review included only three studies and concluded that the evidence was insufficient to draw drug-specific conclusions about implant outcomes (MISHRA; SONNAHALLI; CHOWDHARY, 2024). Therefore, biological plausibility regarding effects on bone remodeling should not be converted into evidence of a clinical benefit or indication to alter cardiovascular therapy.

Another clinically relevant consideration involves perioperative management of antithrombotic therapy. Dental implant-specific evidence indicates that continuation of oral anticoagulants or antiplatelet agents during implant surgery generally results in bleeding that can be controlled with local hemostatic measures, although the evidence is heterogeneous and information on more extensive procedures remains limited (BAJKIN et al., 2020; DAWOUD et al., 2021; ZOU; HUA, 2023; BOCCATONDA et al., 2023). Clinical planning should therefore integrate four elements: thrombotic risk, bleeding risk, procedure extent, and feasibility of local hemostasis. Warfarin, direct oral anticoagulants, aspirin, P2Y12 inhibitors, and dual antiplatelet therapy should be considered according to their specific indication and patient risk. Heparin bridging is not routine for most patients and should not be instituted automatically. The dental clinician should not empirically discontinue antithrombotic therapy; when modification is being considered for extensive surgery or unusual bleeding risk, it should be coordinated with the prescribing physician or relevant specialist (THOMPSON et al., 2024).

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INFECTIVE ENDOCARDITIS AND IMPLANT SURGERY

Dental implant surgery may involve perforation of the oral mucosa, raising questions regarding prevention of infective endocarditis in susceptible individuals. However, cardiovascular disease alone does not justify antibiotic prophylaxis. Current US and European recommendations restrict prophylaxis to selected high-risk cardiac conditions and relevant invasive dental procedures (WILSON et al., 2021; DELGADO et al., 2023).

The prevention of infective endocarditis should not be reduced to antibiotic administration before dental procedures. Maintenance of adequate oral hygiene and control of chronic oral infection are fundamental components of risk reduction because bacteremia may occur during routine daily activities such as tooth brushing and mastication (WILSON et al., 2021; LOCKHART; BOLGER; BADDOUR, 2021).

Before implant placement, clinicians should therefore determine whether the patient belongs to a guideline-defined high-risk cardiac group for whom prophylaxis is recommended. Relevant groups include patients with prosthetic cardiac valves or prosthetic material used for valve repair, previous infective endocarditis, selected congenital heart disease, and cardiac transplant recipients with valvular disease. When uncertainty exists, consultation with the treating cardiologist is appropriate. Antibiotic prophylaxis should not be prescribed solely because a patient has a cardiac murmur, hypertension, coronary artery disease, or a general history of cardiovascular disease (WILSON et al., 2021; DELGADO et al., 2023).

WHEN SHOULD IMPLANT SURGERY BE POSTPONED?

Because dental implant therapy is elective, the threshold for postponing treatment should be lower when significant cardiovascular instability is suspected. The objective is not to deny rehabilitation to patients with cardiovascular disease but to avoid performing an elective procedure during a period of increased medical vulnerability.

Implant surgery should be reconsidered or postponed in the presence of active cardiovascular symptoms or evidence of clinical instability. Relevant warning signs include ongoing ischemic chest pain, recent acute coronary events requiring individualized reassessment, decompensated heart failure, newly diagnosed or hemodynamically significant arrhythmias, syncope, severe symptomatic valvular

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disease, hypertensive emergencies, or other evidence of acute cardiovascular instability (THOMPSON et al., 2024; GUALANDRO et al., 2024).

Recent cardiovascular interventions may also influence treatment timing. Patients who have undergone recent coronary procedures may require uninterrupted antiplatelet therapy, making unnecessary interruption for elective dental surgery potentially hazardous. The decision should therefore balance thrombotic risk, bleeding risk, procedural extent, and the feasibility of local hemostatic measures rather than applying a fixed interval or empiric medication interruption (THOMPSON et al., 2024).

Conversely, controlled chronic cardiovascular disease should not automatically result in indefinite postponement of implant therapy. Current Brazilian guidance notes that patients with controlled heart disease receiving optimized treatment can generally undergo dental procedures safely with appropriate routine care and individualized precautions. The clinical challenge is therefore to distinguish stable disease requiring appropriate precautions from unstable disease requiring medical optimization before elective treatment.

A PRACTICAL FRAMEWORK FOR CARDIOVASCULAR RISK ASSESSMENT IN IMPLANT DENTISTRY

Clinical decision-making should integrate four fundamental questions: (1) Is there active or decompensated cardiovascular disease? (2) Is the patient clinically stable and is the planned procedure limited? (3) Is there a medication-specific issue requiring coordination, particularly involving antithrombotic therapy or recent PCI/stenting? and (4) What is the magnitude of the planned surgery? This framework is adapted from the literature reviewed and is intended for proportionate clinical reasoning, not as a substitute for individualized medical assessment.

The first step is to identify the cardiovascular diagnosis and determine whether the patient is currently symptomatic. The second is to evaluate disease control, recent events, hospitalizations, medication changes, coronary intervention or stent placement, and clinically relevant treatment restrictions. The third is to consider the planned procedure itself, including duration, number of implants, grafting, sedation, and expected bleeding. The fourth is to decide whether medical consultation is necessary. Useful questions for consultation include: Is the cardiovascular condition currently stable? Was there a recent event or intervention? Are there specific

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procedural restrictions? How should antithrombotic therapy be managed, if at all? Is infective endocarditis prophylaxis indicated? The physician provides information regarding medical stability and treatment, while the dentist remains responsible for the dental treatment decision and its invasiveness, duration, staging, hemostatic plan, and alternatives.

For conceptual purposes, procedures may be described as limited (for example, a single implant with short operative time under local anesthesia), intermediate (multiple implants or limited grafting), or extensive (full-arch rehabilitation, major grafting, sinus lift, prolonged surgery, or procedures involving sedation). These categories are conceptual and are not validated cardiovascular risk classes. The framework should therefore not be interpreted as a validated score, clinical prediction rule, or formal guideline for dental implant surgery.

The proposed framework is summarized in Table 1.

Table 1. Author-proposed evidence-informed framework for cardiovascular assessment before dental implant surgery

Clinical domain	**Key questions**	**Findings compatible with proceeding***	**Findings requiring postponement or medical reassessment**	Evidence basis / main limitation
Current cardiovascular status	Is the patient clinically stable? Are there new or worsening symptoms?	Stable chronic disease; no new symptoms	Chest pain, worsening dyspnea, syncope, progressive edema, recent clinical deterioration	Dental/clinical assessment; no validated dental threshold
Blood pressure	Is blood pressure elevated relative to the patient's usual status? Are symptoms present? Was the	Stable clinical context; repeated/appropriately interpreted measurement;	Persistent marked elevation, concerning symptoms, or suspected hypertensive	Guideline; general perioperative evidence not dental-specific

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	measurement repeated?	no concerning symptoms	emergency requiring evaluation	
Coronary artery disease	Recent ACS/MI or PCI? Stent? Active ischemic symptoms? Antiplatelet regimen?	Stable disease; no active ischemia; antithrombotic plan established	Active ischemia, recent event requiring reassessment, or uncertainty about essential antiplatelet therapy	Guideline; general perioperative evidence not dental-specific
Heart failure	Is the condition compensated? Has there been recent decompensation?	Clinically compensated disease	Decompensated heart failure, worsening orthopnea, edema, or recent hospitalization	Clinical assessment; device presence alone not a contraindication
Arrhythmias	Is the rhythm disorder controlled and hemodynamically stable?	Stable and adequately managed arrhythmia	New/change in arrhythmia, syncope, hypotension, chest pain, dyspnea, inadequate rate control, or hemodynamic instability	Guideline; hemodynamic severity distinct from IE prophylaxis
Valvular disease	Is significant valvular disease symptomatic?	Stable disease without relevant symptoms	Severe symptomatic valvular disease or signs of hemodynamic compromise	Dental evidence + perioperative extrapolation; class/procedure heterogeneity

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Medication profile	Are anticoagulants/antiplatelets being used? Recent PCI/stent? Can local hemostasis control expected bleeding?	Established regimen; no empirical interruption; local hemostatic plan feasible	Uncertain management after recent PCI/stent, unusually high bleeding risk, or extensive surgery requiring specialist coordination	Guideline + dental evidence; prophylaxis restricted to high-risk groups
Procedure complexity	Limited, intermediate, or extensive procedure? Duration? Grafting? Sedation?	Limited outpatient procedure under local anesthesia; predictable duration	Extensive grafting/full-arch/prolonged surgery or sedation in a medically vulnerable patient	Conceptual framework; not a validated procedure-risk class
Infective endocarditis risk	Does the patient meet criteria for prophylaxis?	No indication or appropriate guideline-based prophylaxis	Uncertainty regarding high-risk cardiac status requiring clarification	Guideline + clinical judgment; no validated score
Need for medical consultation	Is the cardiovascular status sufficiently understood?	Clear diagnosis and stable clinical condition	Uncertain diagnosis, active symptoms, recent event, or unclear medication management	Author-proposed synthesis; not a validated decision rule

*Proceeding with treatment should always be based on individualized clinical judgment and does not imply the absence of risk. The framework is an author-proposed, evidence-informed synthesis derived from the literature reviewed; it is not a validated cardiovascular risk score or clinical guideline for dental implant surgery.

Scope: This framework is primarily intended for outpatient dental implant procedures performed under local anesthesia. Sedation, extensive grafting,

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prolonged full-arch procedures, and other higher-complexity interventions may require additional individualized planning.

Source: Author-proposed synthesis informed by Halvorsen et al. (2022), Mehilli and Winhard (2023), Thompson et al. (2024), Gualandro et al. (2024), the 2025 AHA/ACC hypertension guideline, and dental-specific literature.

DISCUSSION

This distinction is particularly relevant for hypertension. The 2024 systematic review and meta-analysis concerns implant failure, not perioperative cardiovascular safety, and therefore should not be used to infer that uncontrolled hypertension is safe for surgery or that hypertension alone predicts perioperative cardiovascular complications (Hamadé et al., 2024).

Another important finding is that cardiovascular risk management in implant dentistry extends beyond the surgical procedure itself. Pain, anxiety, prolonged appointments, and inadequate anesthesia may contribute to hemodynamic changes. In stable cardiovascular patients, cautious use of epinephrine may be appropriate; a commonly recommended limit of approximately 0.04 mg is a pragmatic precaution rather than a universally validated safety threshold, and the evidence supporting it is limited (BADER; BONITO; SHUGARS, 2002; AMERICAN DENTAL ASSOCIATION, 2022).

The management of cardiovascular medications requires particular caution. Implant clinicians should avoid empirically modifying antihypertensive or antithrombotic therapy. Dental-specific evidence indicates that continuation of antithrombotic agents during implant surgery generally permits bleeding control with local measures, although bleeding risk may vary according to drug class and procedure extent. The practical decision should balance thrombotic risk, bleeding risk, surgical magnitude, and local hemostatic feasibility. This is especially important after PCI or stent placement, when inappropriate interruption of antiplatelet therapy may expose the patient to thrombotic risk (THOMPSON et al., 2024; BOCCATONDA et al., 2023).

The limitations of the available evidence should also be acknowledged. Much of the literature addressing cardiovascular disease and implant dentistry is heterogeneous and frequently focused on isolated conditions. Dental-specific

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evidence is strongest for selected questions such as blood pressure, vasoconstrictors, antithrombotic-associated bleeding, and infective endocarditis prevention, whereas recommendations concerning broader perioperative testing and cardiovascular stratification are largely extrapolated from noncardiac surgery. Most importantly, these general perioperative recommendations have not been specifically validated for outpatient dental implant surgery. Because this was a narrative review rather than a systematic review, no exhaustive record count, formal risk-of-bias assessment, or GRADE evaluation was performed. The proposed framework is therefore intended as an evidence-informed clinical aid rather than a validated decision rule.

Overall, the central message is that successful implant treatment in cardiovascular patients depends less on the presence of a diagnostic label and more on appropriate clinical assessment. Stable patients undergoing limited outpatient procedures generally require proportionate precautions rather than extensive cardiology testing solely because implant surgery is planned. Conversely, evidence of acute or decompensated cardiovascular instability should lower the threshold for postponement and medical reassessment.

CONCLUSION

Cardiovascular disease alone should not determine eligibility for dental implant therapy. For limited outpatient implant procedures performed under local anesthesia, clinical decision-making should distinguish stable chronic cardiovascular disease from active or decompensated conditions and should integrate current symptoms, recent cardiovascular events or interventions, medication-related considerations, and procedural complexity. Stable patients generally require proportionate precautions rather than routine extensive cardiovascular testing solely because implant surgery is planned. Conversely, active ischemic symptoms, decompensated heart failure, hemodynamically significant arrhythmias, severe symptomatic valvular disease, hypertensive emergencies, or other evidence of acute cardiovascular instability justify postponement of elective treatment. Antithrombotic and cardiovascular medications should not be empirically modified by the dental clinician, and infective endocarditis prophylaxis should be restricted to guideline-defined high-risk cardiac conditions undergoing relevant invasive dental procedures.

This stability-oriented and procedure-specific approach may improve safety while avoiding unnecessary exclusion or over-investigation of patients with controlled cardiovascular disease. The proposed framework should be interpreted as an author-

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derived, evidence-informed synthesis and not as a validated cardiovascular risk score or clinical guideline for dental implant surgery.

The clinical decision should ultimately remain proportional to the patient's medical stability, the invasiveness and duration of the dental procedure, and the feasibility of appropriate local measures and interdisciplinary communication when indicated.

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