

Cardiometabolic Conditions in Implant Dentistry: Shared Risk, Evidence Limits and Coordinated Care

Cardiovascular disease, obesity and metabolic syndrome in risk assessment, procedural planning and supportive peri-implant care



Core message: cardiometabolic conditions can coexist with peri-implant disease through shared biological, behavioural and social pathways. Current evidence does not establish that one condition directly causes the other or that peri-implant treatment prevents cardiovascular events.

Educational material for dental students, postgraduate trainees and academic teachers

Cardiometabolic multimorbidity in implant care

Cardiovascular disease includes coronary, cerebrovascular, peripheral vascular and heart conditions with different causes and clinical implications. Obesity describes excess adiposity that may impair health, while metabolic syndrome identifies a cluster of metabolic abnormalities. These categories overlap, but they are not interchangeable.

Clinical context	What it describes	Why it matters in implant dentistry
Cardiovascular disease	A broad group that includes atherosclerotic disease, heart failure, arrhythmias and other cardiac or vascular disorders.	Current stability, functional capacity, medication and recent events may affect procedural safety.
Obesity	A chronic disease involving excess or dysfunctional adipose tissue. BMI is common but does not directly measure visceral fat or metabolic health.	Ergonomics, access, comorbidity, wound biology and maintenance delivery may require adaptation.
Metabolic syndrome	A constellation involving central adiposity, dysglycaemia, raised blood pressure, high triglycerides and low HDL cholesterol.	Components may cluster and confound one another; definitions and thresholds differ among authorities.
Multimorbidity	Two or more chronic conditions in one person, often with multiple medicines and care teams.	The combined clinical burden matters more than any single diagnostic label.

Avoid collapsing distinct conditions into one risk label

Hypertension does not carry the same procedural implications as unstable angina or decompensated heart failure. BMI does not reveal glycaemic control, body composition, physical capacity or vascular disease. A useful assessment identifies the actual diagnosis, current control, complications and treatment.

Clinical framing: record the specific condition and its stability instead of assigning a generic “systemically compromised” label.

Shared pathways do not establish shared causation

Peri-implantitis is a plaque-associated inflammatory condition. Cardiometabolic diseases also involve inflammatory, vascular and metabolic pathways. Parallel biology can make an association plausible, but plausibility alone cannot establish direction, independence or clinical magnitude.

Shared domain	Possible connection	Interpretive boundary
Low-grade inflammation	Adipose tissue and vascular lesions can contribute to circulating inflammatory mediators.	A nonspecific systemic marker cannot identify its tissue source.
Endothelial and microvascular function	Impaired perfusion may influence wound oxygenation and repair.	A cardiovascular diagnosis does not prove impaired healing at one implant site.
Insulin resistance and dysglycaemia	Altered immune and bone-cell responses may modify susceptibility.	Diabetes control requires separate assessment; metabolic syndrome is not a substitute measure.
Oxidative stress	Excess reactive species can affect vascular and skeletal cell function.	No routine redox test predicts peri-implant disease.
Behavioural and social exposure	Smoking, diet, activity, access to care and maintenance adherence may affect both disease groups.	These factors can create confounding rather than a direct biological pathway.

Local peri-implant inflammation still requires a local diagnosis

Plaque, prosthetic cleansability, implant position, residual cement, tissue conditions and supportive care remain central. Cardiometabolic disease cannot explain bleeding, suppuration or bone loss without clinical and radiographic evaluation.

Biological plausibility supports research and vigilance. It does not permit a claim that peri-implantitis causes cardiovascular disease or that cardiovascular disease directly causes peri-implantitis.

Cardiovascular disease: association remains uncertain

Published reviews reach different levels of confidence. A 2023 meta-analysis of five observational studies reported a small association between cardiovascular disease and peri-implantitis. The 2025 AO/AAP systematic review found heterogeneous cardiovascular definitions, few cross-sectional studies and insufficient comparable data for meta-analysis. The newer synthesis therefore supports a cautious interpretation.

Evidence question	Current interpretation	Reason for caution
Do cardiovascular conditions occur more often with peri-implant disease?	Some observational studies report associations.	Definitions range from hypertension to atherosclerosis and broad, unspecified cardiovascular disease.
Is the association independent?	Uncertain.	Age, smoking, diabetes, periodontitis, medicines and socioeconomic conditions may affect both outcomes.
Which condition comes first?	Usually unresolved.	Most available studies are cross-sectional and cannot establish temporality.
Does peri-implant treatment improve cardiovascular outcomes?	No demonstrated clinical benefit.	Intervention studies with cardiovascular endpoints are lacking.
Should cardiovascular biomarkers diagnose peri-implant disease?	No.	Circulating markers are nonspecific and do not replace local examination.

A statistical association is not a preventive claim

Even when an observational estimate reaches statistical significance, residual confounding and exposure misclassification may remain. Consent language should state that peri-implant therapy aims to control local disease and preserve implant support. It should not promise prevention of myocardial infarction, stroke or another systemic outcome.

Evidence statement: coexistence and limited observational associations justify comprehensive history taking, but direct cardiovascular causality remains unproven.

Obesity and metabolic syndrome

Adipose tissue functions as an endocrine and immune organ. Adipocyte enlargement, macrophage recruitment and insulin resistance can create a chronic inflammatory environment. This mechanism can modify healing and host response, although clinical peri-implant outcomes remain influenced by plaque, periodontitis, smoking, diabetes and treatment access.

Evidence area	Finding	Limitation
Implant failure	A 2026 meta-analysis found no statistically significant difference between groups with and without obesity.	Only four studies reported failure; heterogeneity was substantial.
Peri-implant indices	Pooled data showed less favourable plaque, bleeding, probing depth and marginal bone measures in obesity.	Certainty was very low and heterogeneity ranged from high to extreme.
Confounder control	Observed differences may reflect obesity-related biology, shared behaviour or comorbidity.	The studies included in the 2026 review did not provide adjusted outcome estimates.
Body-size measurement	Most studies used BMI.	BMI can misclassify adiposity and gives limited information about visceral fat or metabolic health.
Metabolic syndrome	Components may cluster in patients with peri-implant disease.	Direct syndrome-specific evidence remains sparse and definitions vary.

Weight-neutral clinical communication

Avoid assuming poor hygiene, non-adherence or low motivation from body size. Ask about access, dexterity, breathlessness, positioning tolerance and self-care barriers directly. Adapt the environment and maintenance strategy to the person rather than the label.

A constellation, not a dental diagnosis

Metabolic syndrome is diagnosed within medical care using a defined set of criteria. Dental teams should record established diagnoses and individual components without creating a peri-implant-specific syndrome threshold.

Balanced conclusion: obesity may identify a patient who needs closer monitoring, but the present evidence does not support denying implant care on BMI alone.

Confounding, temporality and causal interpretation

Cardiometabolic and oral diseases accumulate over years. The same factors can influence exposure, outcome and access to treatment. Careful interpretation therefore requires more than a comparison between patients with and without one diagnosis.

Requirement	Question to ask	Common error
Clear phenotype	How were peri-implantitis, obesity and cardiovascular disease defined?	Combining unlike diagnoses into one category.
Correct unit of analysis	Were results analysed by patient or by implant?	Treating multiple implants in one patient as independent observations.
Temporality	Did the systemic condition clearly precede the oral outcome, or vice versa?	Inferring direction from cross-sectional coexistence.
Confounder adjustment	Were smoking, diabetes, periodontitis, age, plaque and maintenance considered?	Calling an unadjusted estimate an independent effect.
Longitudinal measurement	Were systemic and oral exposures updated during follow-up?	Assuming one baseline measure remained unchanged.
Intervention test	Does changing the proposed exposure change the outcome?	Treating biological plausibility as proof of treatment benefit.

Patient-level interpretation

A person may have obesity, diabetes, hypertension, periodontitis and smoking exposure simultaneously. Assigning a complication to one factor can obscure modifiable local causes. The most useful clinical response addresses each verified exposure and monitors change over time.

Three levels of certainty: plaque-associated peri-implant inflammation is established; integrated risk management is actionable; direct cardiometabolic causality remains unresolved.

Pre-operative assessment and procedural safety

Domain	Document	Clinical response
Specific diagnoses	Coronary or cerebrovascular disease, arrhythmia, heart failure, hypertension, obesity, diabetes and sleep-disordered breathing.	Base planning on the actual condition and its stability.
Recent clinical course	Hospital admission, acute cardiovascular event, new or worsening chest symptoms, breathlessness, syncope or major treatment change.	Postpone elective invasive care and seek medical assessment when instability is suspected.
Functional capacity	Tolerance of ordinary activity, positioning and appointment duration.	Adapt chair position, treatment length and staging.
Vital signs when indicated	Blood pressure, pulse and other observations according to history and local standards.	Repeat unexpected values and follow local escalation protocols.
Oral risk	Periodontitis, plaque, active infection, prosthetic access and maintenance history.	Control active disease before elective implant placement.
Procedure burden	Surgical extent, grafting, bleeding, pain, stress and recovery requirements.	Use focused medical coordination when the result may change timing or technique.

Medical consultation should answer a focused question

Describe the planned procedure and ask whether the condition is stable, whether recent events affect timing and whether medication or monitoring requires adaptation. A generic request for "clearance" may transfer responsibility without clarifying the clinical decision.

Urgent care and elective surgery are different decisions

Acute infection and pain still require assessment and appropriate management. Elective implant placement, augmentation or peri-implant surgery can be sequenced after medical stabilization when the combined risk is unacceptable.

Safety principle: new chest pain, breathlessness at rest, syncope, decompensated heart failure or another sign of acute instability requires prompt medical evaluation rather than routine elective treatment.

Medication review without unsafe interruption

Cardiometabolic treatment commonly involves antiplatelet or anticoagulant medicines, antihypertensives, lipid-lowering agents and glucose-lowering therapy. The medication list can affect bleeding management, postural tolerance, salivary symptoms, drug interactions and appointment planning.

Medication context	Dental relevance	Safe principle
Antiplatelet and anticoagulant therapy	Bleeding risk depends on the medicine, indication, procedure and local haemostatic strategy.	Do not stop prescribed therapy without a case-specific plan from the responsible clinician.
Antihypertensive therapy	Postural symptoms, xerostomia and blood-pressure response may affect care.	Change chair position gradually and assess symptoms rather than assuming intolerance.
Lipid-lowering therapy	Usually does not change the peri-implant diagnosis or create a special surgical protocol.	Record the medicine and relevant interactions; do not infer implant benefit from observational findings.
Glucose-lowering therapy	Meal timing, fasting and hypoglycaemia risk may affect appointments.	Follow the patient-specific medical plan and do not change therapy independently.
Multiple medicines	Adverse effects and interactions become harder to attribute.	Use an updated list and check procedure-specific prescribing before treatment.

Local haemostasis and coordinated prescribing

Many dental procedures can proceed with prescribed antithrombotic therapy using appropriate local measures, but the decision depends on procedure-specific guidance and individual thrombotic and bleeding risk. The dental team should never advise interruption solely for convenience.

Medication effects do not change disease definitions

Bleeding on probing is interpreted within peri-implant diagnostic criteria. Antithrombotic therapy can influence bleeding expression, but it does not create or exclude peri-implantitis without the accompanying clinical and radiographic findings.

Medication principle: preserve the indication for systemic treatment. Coordinate modifications only when the responsible prescriber and dental clinician have evaluated the same procedure and patient.

Integrated prevention and supportive peri-implant care

The strongest clinical actions do not require proof that one disease causes another. Local biofilm control protects peri-implant tissues, while smoking cessation, blood-pressure care, metabolic control and physical activity have established general-health value. Each intervention should be justified by its own evidence.

Care component	Action	Claim boundary
Local disease control	Treat periodontitis, peri-implant mucositis and peri-implantitis according to diagnosis.	The goal is control of local inflammation and preservation of support.
Prosthetic access	Ensure cleansable contours and access for examination and professional instrumentation.	Systemic optimization cannot correct an inaccessible restoration.
Risk-factor support	Encourage smoking cessation, glycaemic care and adherence to cardiovascular treatment.	The dental team supports existing medical goals rather than prescribing cardiometabolic treatment.
Maintenance interval	Set recall from combined local, metabolic, behavioural and prosthetic risk.	Obesity or cardiovascular disease alone does not dictate a universal interval.
Outcome monitoring	Compare probing, bleeding, suppuration and bone levels with baseline records.	Blood biomarkers cannot replace longitudinal local measurements.

Transparent communication

Avoid	Prefer
"Peri-implantitis can cause a heart attack."	"The conditions may share risk pathways, but direct cardiovascular causation has not been established."
"Treating the implant will improve your heart disease."	"Treatment aims to control local disease; systemic outcome benefit remains unproven."
"Obesity means the implant will fail."	"Current evidence does not show a clear increase in implant failure, although closer tissue monitoring may be appropriate."
"Stop your blood thinner before surgery."	"Medication decisions require a procedure-specific assessment and coordinated plan."

Integrated care is additive: local disease treatment, cardiometabolic optimization and supportive maintenance address different parts of the patient's risk profile.

Clinical synthesis and selected references

Clinical synthesis

- Identify the exact cardiovascular and metabolic diagnoses, their current stability and relevant complications.
- Separate biological plausibility, observational association and demonstrated causation.
- Interpret obesity evidence cautiously because current pooled peri-implant findings have very low certainty and major heterogeneity.
- Do not use BMI, a cardiovascular diagnosis or a systemic biomarker as a stand-alone implant eligibility rule.
- Control local plaque-associated disease and maintain access for hygiene and professional care.
- Do not interrupt antithrombotic or other cardiometabolic medication without an individualized coordinated plan.
- Explain that peri-implant treatment targets local disease and has no established cardiovascular preventive effect.
- Use longitudinal supportive care based on combined local, systemic, behavioural and prosthetic risk.

Selected references

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Educational use and limitations

This material supports clinical reasoning and interdisciplinary communication. It does not replace individualized cardiovascular assessment, medication management, emergency protocols or procedure-specific clinical guidance.

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