

Medication-Related Risk Assessment in Implant Dentistry: MRONJ, Bleeding and Healing

A practical framework for antiresorptive therapy, antithrombotic treatment, oncology, radiotherapy and medicines that affect recovery



Core message: a medicine name alone rarely determines implant eligibility. Safe planning requires the indication, dose, route, schedule, duration, current disease status and the biological burden of the proposed procedure.

Educational material for dental students, postgraduate trainees and academic teachers

Medication history as a clinical risk map

Medicines can alter bone turnover, haemostasis, immune response, glucose control, vascular function and recovery from surgical stress. The same drug may carry different implications when used for osteoporosis, metastatic cancer or another systemic condition.

Domain	Information to record	Decision supported
Exact exposure	Generic name, dose, route, frequency, start date, last dose and planned duration.	Prevents classification by a vague label such as bone medicine or blood thinner.
Indication	Osteoporosis, malignancy, atrial fibrillation, venous thrombosis, transplantation, inflammatory disease or psychiatric treatment.	Shows the harm that interruption or delay could cause.
Current stability	Recent hospitalization, infection, flare, cytopenia, bleeding, thrombosis or organ decompensation.	Distinguishes stable long-term treatment from an unstable medical course.
Procedure burden	Flap design, osteotomy, augmentation, number of sites, anticipated bleeding and healing demand.	Links systemic risk to the actual intervention.
Local condition	Periodontal and peri-implant inflammation, endodontic infection, hygiene, mucosal trauma and prosthetic access.	Identifies modifiable oral drivers of complication.

Avoid rigid contraindication lists

The terms absolute and relative contraindication can hide important context. A more useful decision is whether to proceed, modify, defer or refer. Active instability, inability to achieve safe haemostasis, severe unresolved immunosuppression or treatment within an unsafe oncology window may justify postponing elective implant surgery. Stable chronic disease may allow treatment after proportionate adaptation.

Medication principle: the dental team should not independently stop, delay or restart a prescribed systemic medicine. Any modification must follow drug-specific guidance or a documented decision by the responsible prescriber.

Antiresorptive therapy and MRONJ

Bisphosphonates suppress osteoclast-mediated resorption and remain in bone for prolonged periods. Denosumab inhibits RANKL and has a reversible pharmacological effect, but unplanned discontinuation can cause rebound bone turnover and vertebral fractures. Romosozumab modifies sclerostin signalling and has also been associated with rare MRONJ. Antiresorptive schedules used for malignant disease generally produce greater MRONJ risk than osteoporosis regimens.

Clinical case definition

AAOMS defines MRONJ through three required elements: current or previous antiresorptive treatment, alone or with immune modulators or antiangiogenic medicines; exposed bone or bone probeable through a fistula in the maxillofacial region for more than eight weeks; and no history of radiation therapy to the jaws or metastatic disease in the jaws.

Clinical state	Meaning	Important boundary
At risk	Relevant medicine exposure without necrotic bone.	Medicine exposure alone is not MRONJ.
Stage 0	Nonspecific symptoms or imaging changes without exposed or probeable bone.	Differential diagnosis is essential; radiographic findings alone can overdiagnose disease.
Stage 1	Exposed or probeable necrotic bone without infection-related symptoms.	Requires assessment and structured surveillance.
Stage 2	Exposed or probeable necrotic bone with infection, inflammation and symptoms.	Often requires antimicrobial and specialist management.
Stage 3	Necrosis with extensive features such as pathological fracture, extraoral fistula or extension beyond alveolar bone.	Requires specialist surgical evaluation.

Diagnostic boundary: osteoradionecrosis follows radiation injury. MRONJ requires the absence of jaw radiotherapy and jaw metastasis in the case definition.

Risk stratification before implant placement

The therapeutic indication strongly changes the decision. AAOMS estimates a low absolute MRONJ risk for osteoporosis therapy, while cancer regimens carry a substantially higher risk. The evidence for implant placement remains incomplete, especially for long-term outcomes and late MRONJ around previously integrated implants.

Treatment context	Implant planning	Communication
Antiresorptive therapy for malignant disease	Avoid elective implant placement during parenteral antiresorptive or relevant antiangiogenic therapy. Reduce dentoalveolar surgery where possible and use specialist coordination for unavoidable care.	Explain the higher MRONJ risk and the priority of cancer treatment.
Bisphosphonate therapy for osteoporosis	Elective surgery is not automatically contraindicated. Assess duration, comorbidities, concurrent corticosteroids or chemotherapy, local infection and procedure extent.	Discuss the low but non-zero risks of MRONJ and early or late implant complications.
Denosumab for osteoporosis	Do not create an unsupervised delay. If timing modification is considered, coordinate with the prescriber because rebound fracture risk follows interruption.	Document the injection schedule and agreed plan.
Previous antiresorptive exposure	Past treatment remains relevant, especially for bisphosphonates. Obtain a complete history even if therapy has ended.	Record medicine, indication, duration and final dose when known.
Established MRONJ	Defer elective implant placement and refer for specialist management.	Separate control of active disease from later rehabilitation decisions.

Risk factors modify, but do not calculate, probability

Poor oral hygiene, periodontal or periapical inflammation, denture trauma, smoking, diabetes, corticosteroids, chemotherapy and longer exposure can increase concern. No validated chairside score combines these variables into an individual probability.

Consent should match uncertainty: state what is known, what remains uncertain and why maintenance and long-term surveillance matter even after successful osseointegration.

Prevention, timing and misleading shortcuts

Prevention begins before high-risk treatment whenever medical timing permits. Comprehensive dental assessment, treatment of infection, stabilization of periodontal disease and elimination of mucosal trauma reduce the likelihood that invasive dental treatment will become necessary during oncology therapy.

Issue	Evidence-based position	Unsafe shortcut
Drug holiday	Evidence is inconclusive. AAOMS reports no consensus and describes drug holidays as controversial.	Automatically stopping a bisphosphonate or denosumab before surgery.
Denosumab timing	Any modification needs prescriber coordination because interruption may cause rebound fractures.	Delaying an injection solely on dental advice.
CTX or another turnover marker	No biomarker has been validated for individual MRONJ risk prediction.	Using a CTX threshold to authorize or prohibit surgery.
Imaging	Radiographs and CBCT support diagnosis, anatomy and differential assessment.	Calling radiographic sclerosis or trabecular change diagnostic of MRONJ by itself.
Antibiotics and antiseptics	Use according to the clinical indication and coordinated surgical protocol.	Assuming medication alone removes the biological risk.
Follow-up	Confirm mucosal closure, symptom control and continued oral maintenance.	Ending surveillance after early soft-tissue healing.

Local control remains central

Active periodontal or endodontic infection and traumatic prostheses can add local inflammation to systemic risk. Atraumatic surgery, primary closure when feasible and structured review support healing, but they cannot eliminate MRONJ risk.

The benefit of systemic therapy matters

Antiresorptive treatment prevents fragility fractures and skeletal complications of cancer. Dental fear should not drive patients to abandon effective therapy. The clinical task is to reduce oral risk while preserving the systemic benefit.

Do not use CTX as a clearance test: bone turnover markers have no validated threshold for implant or dentoalveolar decisions.

Anticoagulants and antiplatelet medicines

Bleeding risk must be balanced against thromboembolic risk. Most outpatient dental bleeding can be controlled locally, while unnecessary interruption can expose the patient to stroke, valve thrombosis, stent thrombosis or recurrent venous thromboembolism. Management depends on the medicine and procedural bleeding risk.

Medicine group	General dental principle	Key qualification
Warfarin or another vitamin K antagonist	Many invasive dental procedures can proceed when the INR is current and within the recommended range.	SDCEP recommends treatment without interruption when INR is below 4, with local measures and procedure-specific planning.
Direct oral anticoagulant	For procedures with low bleeding risk, continue treatment. For higher-risk procedures, SDCEP advises a medicine-specific missed or delayed morning dose.	Follow current local guidance and account for renal function, dose schedule and procedure extent.
Single or dual antiplatelet therapy	Treat without interrupting therapy and use local haemostasis.	Bleeding can be prolonged, especially with dual therapy, but thrombotic harm from interruption can be serious.
Low molecular weight heparin	Prophylactic doses often permit treatment without interruption.	Treatment doses or uncertainty require prescriber consultation.
Combination therapy	Use individualized assessment and staged care where appropriate.	Do not assume that rules for one medicine apply to combinations.

Local haemostasis

Plan early in the day and week, limit the initial surgical field when appropriate, use careful tissue handling, packing and suturing, and discharge only after haemostasis. Provide written postoperative instructions and an emergency contact pathway.

Critical distinction: a dentist may follow established drug-specific dental guidance. Complex cases, treatment-dose heparin, significant comorbidity or uncertain indication require direct coordination with the prescriber.

Cardiovascular disease and infective endocarditis

Cardiac diagnosis and current stability matter more than a generic history of heart disease. Elective implant surgery should be deferred when the patient has unstable symptoms, recent major cardiovascular events without medical clearance, decompensated heart failure or an unresolved arrhythmia that compromises procedural safety.

Question	Why it matters	Action
Is the condition stable?	Symptoms at rest, recent admission or medication escalation may signal active risk.	Obtain medical assessment before elective surgery.
What antithrombotic therapy is used?	Interruption can be hazardous after stenting, valve replacement or recent thrombosis.	Apply medicine-specific guidance and document the indication.
Is infective endocarditis prophylaxis indicated?	Prophylaxis applies only to selected patients at highest risk of an adverse outcome.	Verify the qualifying cardiac condition and whether the procedure manipulates gingiva, the periapical region or oral mucosa.
Can the patient tolerate the procedure?	Long appointments, pain and anxiety increase physiological burden.	Consider staging, stress reduction and monitored care when appropriate.
Is local infection controlled?	Everyday oral inflammation causes repeated bacteraemia.	Prioritize oral hygiene, periodontal control and regular dental care.

Antibiotic prophylaxis is selective

The American Heart Association emphasizes that maintenance of oral health is more important for prevention of viridans group streptococcal infective endocarditis than broad prophylaxis. Antibiotic prophylaxis is reserved for patients with the highest-risk cardiac conditions who undergo relevant dental procedures.

Do not equate a murmur or valve disease with automatic prophylaxis: confirm the exact cardiac diagnosis and current guideline category.

Oncology, radiotherapy and immunosuppression

Cancer treatment can alter blood counts, mucosal integrity, immunity and healing. The procedure should fit the treatment phase and the patient's current laboratory and clinical status. A generic rule based only on the word chemotherapy is inadequate.

Context	Principal concern	Planning approach
Active cytotoxic chemotherapy	Neutropenia, thrombocytopenia, mucositis, infection and delayed recovery.	Coordinate timing with the oncology team and use recent blood counts when clinically indicated.
Targeted or immune therapy	Adverse effects vary widely by agent and may involve immune, endocrine or vascular pathways.	Identify the exact medicine; do not generalize from conventional chemotherapy.
Post-transplant immunosuppression	Infection, drug interactions, organ function and wound healing.	Coordinate with the transplant team and preserve essential immunosuppression.
Head and neck radiotherapy	Dose and field can reduce vascularity and create lifelong osteoradionecrosis risk in irradiated bone.	Obtain the radiotherapy plan or jaw dose information when possible and involve the oncology or maxillofacial team.
Radiotherapy outside the jaws	Does not meet the MRONJ exclusion criterion solely by being radiotherapy.	Assess its systemic effects and cancer treatment context separately.

Osteoradionecrosis is a distinct condition

Implants can survive in selected irradiated patients, but evidence is heterogeneous and complications remain clinically important. Decision-making should consider the irradiated site, dose distribution, time since therapy, reconstructive anatomy, soft-tissue condition and oncological prognosis. No single dose cutoff guarantees safety.

Blood counts answer defined questions

A complete blood count can help assess neutrophils, haemoglobin and platelets when treatment may alter marrow function. It should be current enough for the treatment phase and interpreted with the oncology team rather than used as a universal implant screen.

Safe therapeutic window: the treating oncology team should confirm whether elective surgery fits the treatment cycle and recovery status.

Corticosteroids, SSRIs and focused consultation

Exposure	Potential relevance	Interpretation
Long-term systemic corticosteroids	Suppressed immunity, hyperglycaemia, osteoporosis and possible adrenal suppression.	Record drug, dose, duration and indication. Do not stop abruptly.
Recent corticosteroid withdrawal	Hypothalamic-pituitary-adrenal recovery may be incomplete.	Medical assessment may be needed when adrenal insufficiency has not been excluded.
SSRIs and related antidepressants	Observational studies report associations with bone outcomes and implant failure.	Association does not prove causation; depression, smoking and comorbidity may confound results.
Other psychotropic treatment	Sedation, xerostomia, bruxism, postural effects and interactions may affect care.	Assess the specific agent and functional status rather than using a psychiatric label.

Steroid coverage requires individualized assessment

Current endocrine guidance recognizes adrenal insufficiency risk after chronic glucocorticoid exposure. The need for peri-procedural stress dosing depends on the exposure, recovery of the hypothalamic-pituitary-adrenal axis and the magnitude of surgical stress. It should not be improvised by the dental team.

A useful consultation contains a focused question

- Describe the planned procedure, expected bleeding, surgical extent, anaesthesia and intended date.
- List the medicines that create concern and explain the proposed local haemostatic or surgical plan.
- Ask whether the underlying condition is stable and whether the timing fits the treatment cycle.
- Ask for a medicine modification only when guidance or clinical complexity makes it relevant.
- Document the response, the responsible clinician and the final shared plan.

Weak question: Is the patient fit for implants? Useful question: Does this planned two-site implant and minor augmentation procedure require modification of the current apixaban schedule, given renal function and thromboembolic indication?

Clinical synthesis and selected references

Clinical synthesis

- Record the exact medicine, indication, dose, route, schedule, duration and last administration.
- Separate osteoporosis dosing from cancer-related antiresorptive therapy.
- Use the full MRONJ case definition and distinguish MRONJ from osteoradionecrosis.
- Avoid elective implants during high-risk oncology antiresorptive or relevant antiangiogenic therapy.
- Do not use CTX or another unvalidated biomarker as a clearance test.
- Balance bleeding control against thromboembolic harm and follow medicine-specific guidance.
- Reserve infective endocarditis prophylaxis for qualifying highest-risk cardiac patients and relevant procedures.
- Coordinate implant care with oncology after jaw radiotherapy or during active chemotherapy.
- Treat SSRIs as a possible risk marker, not an automatic contraindication.
- Never independently interrupt denosumab, anticoagulants, corticosteroids or immunosuppression.

Selected references

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Educational use and limitations

This material supports clinical reasoning and interdisciplinary communication. It does not replace medicine-specific prescribing information, oncology planning, specialist oral surgery assessment or individualized medical care.

Funding statement

This work was co-funded by the European Union under grant agreement No. 2024-1-PL01-KA220-HED-000251208. Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or the Foundation for the Development of the Education System (FRSE). Neither the European Union nor FRSE can be held responsible for them.