IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 8 Ser. 4 (August. 2026), PP 67-75
www.iosrjournals.org

Peri-Implantitis Management at the Implantology Interface: A Narrative Review of Divergent 2025–2026 International Consensus Protocols and the Emerging Role of Artificial Intelligence

Pedro Augusto Dias Lima[1]
(Specialist in Implant Dentistry – Faculdade Redentor – INCO 25, Rio de Janeiro, RJ, Brasil.)
ORCID: 0009-0002-0250-9348.

Andreza Calazans Rodrigues[2]
(Specialist in Endodontics, INCO 25 – Niterói, RJ, Brazil).
ORCID: 0009-0008-1295-2312.

Sabrina Lima Dantas Nóbrega[3]
(Specialist in Endodontics, Federal University of Minas Gerais, Belo Horizonte, MG, Brasil.)
ORCID: 0009-0004-5323-7981.

Felipe Wehner Flores[4]
(PhD in Oral and Maxillofacial Surgery and Traumatology - ULBRA, Canoas, RS, Brasil.) ORCID: 0009-0002-0141-331X.

Luciana Reinhardt[5]
(Graduated in Dentistry –Federal University of Rio Grande do Sul, Porto Alegre, RS, Brasil.)
ORCID: 0009-0002-0625-0898.

Larissa Carvalho Cardoso Gomes [6]
(Specialist in Oral Facial Harmonization, - UNIFTC, Salvador, BA, Brasil.)
ORCID: 0009-0009-6405-8459.

Daiane Pereira Zille [7]
(Specialist in OralFacial Surgery and Traumatology, FACOP, São Paulo, SP, Brasil).
ORCID: 0009-0003-1151-6352.

Paulo Vinicius de Oliveira Bastos[8]
(Specialist in Periodontology, Specialist in TMD and Oralfacial Pain & Specialist in Implant Dentistry (OCEx), Specialist in Family Health and Public Health (UFRJ) & Master`s Degree in Orthodontics (UFJF); Rio de Janeiro, RJ, Brazil. Orcid: 0009-0008-2449-3010

Abstract:
Peri-implantitis has moved from a manageable complication to a growing international clinical concern as the global volume of implant placements continues to expand. Despite an unusually dense cluster of consensus statements published in 2025 by the American Academy of Periodontology/Academy of Osseointegration (AO/AAP), the Korean Academy of Periodontology, and the Osstem Global Consensus Meeting (GCM), the international community has not converged on a single decision framework for managing the disease once it is diagnosed. Divergence centers on two linked questions: when non-surgical or regenerative surgical therapy remains a reasonable attempt, and when explantation should instead be considered the more predictable path. Recent prognostic data indicate that the risk of implant loss rises roughly fifteen-fold once relative bone loss exceeds 25 percent of implant length, and twenty-fold beyond 50 percent, yet no consensus body has translated these figures into a single agreed intervention threshold. In cases involving extensive marginal bone loss, the decision increasingly requires input from oral and maxillofacial surgery, particularly where ridge reconstruction, block grafting, or staged re-implantation is anticipated. This narrative review synthesizes the 2025-2026

consensus landscape, contrasts the decision thresholds proposed by each panel, examines the diagnostic and risk-factor evidence underlying them, evaluates the emerging contribution of cone-beam computed tomography and artificial-intelligence-assisted image analysis to applying these thresholds, and discusses the applicability of these protocols across healthcare settings with differing access to regenerative resources, including publicly funded systems such as Brazil's Sistema Único de Saúde. The review argues that the absence of a unified, cross-specialty threshold for surgical intervention and explantation represents a concrete and currently unaddressed gap in the literature.
Key Word: *peri-implantitis; dental implants; oral and maxillofacial surgery; peri-implant disease; explantation; guided bone regeneration; cone-beam computed tomography; artificial intelligence.*

Date of Submission: 14-08-2026 Date of Acceptance: 27-08-2026

I. Introduction

Dental implants have become one of the most widely performed procedures in restorative dentistry, and with that growth has come a parallel rise in peri-implant disease. Peri-implantitis was formally defined by the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions as a plaque-associated pathological condition of the tissues around dental implants, characterized by inflammation of the peri-implant mucosa and progressive loss of supporting bone [1]. A companion narrative review commissioned for the same workshop further characterized the disease as following a non-linear, accelerating pattern of progression once established, in contrast to the comparatively slower course of chronic periodontitis [2].

Unlike many areas of implant dentistry, the management of peri-implantitis once it is diagnosed remains genuinely unsettled. Three major international bodies published consensus statements within months of one another in 2025 and 2026, each proposing its own decision flow for prevention and treatment [3–4,6,8]. Rather than resolving the debate, this cluster of publications has made the disagreement more visible: each panel weighs the same underlying evidence differently when deciding at what point a compromised implant should be treated versus removed.

This narrative review examines that divergence, with particular attention to the threshold at which a case moves from the implantologist's chair to the oral and maxillofacial surgeon's operating room. It is organized around the epidemiological scale of the problem, the risk factors and diagnostic criteria that inform treatment planning, a side-by-side reading of the three 2025 consensus statements, the surgical-versus-non-surgical treatment threshold, the explantation question specifically, the point of handoff to oral and maxillofacial surgery, the emerging contribution of cone-beam computed tomography and artificial-intelligence-assisted analysis to diagnosis and surgical planning, and the applicability of these frameworks in healthcare systems with constrained access to regenerative materials.

A narrative rather than systematic review methodology was chosen deliberately for this synthesis, following the same approach adopted by the consensus documents under discussion themselves [4,6,8]. Sources were identified through targeted searches of the recent peri-implantitis literature, with priority given to the primary 2025-2026 consensus publications, their accompanying methodological and clinical-translation papers, and the quantitative prognostic studies each panel drew upon, supplemented by the foundational 2017-2018 classification literature that still anchors current case definitions [1,2].

The scope of this review is deliberately limited to the treatment-threshold and referral-threshold questions specifically; it does not attempt an exhaustive account of every microbiological, surgical-technique, or biomaterial development in the broader peri-implantitis literature, several of which are already well covered by dedicated systematic reviews cited within the consensus documents themselves [4,6,8]. Readers seeking a comprehensive treatment-protocol reference for day-to-day clinical decontamination technique are directed to the narrative review by Hong and colleagues, which this review draws upon but does not attempt to duplicate [14].

II. The Peri-Implantitis Epidemic: Definitions, Prevalence, and Clinical Stakes

The European Federation of Periodontology's S3-level clinical practice guideline, led by Herrera and colleagues, noted that peri-implant diseases are highly prevalent inflammatory conditions that are often challenging to manage in daily practice, and recommended that prevention begin at the implant planning stage rather than after disease onset [3]. The guideline further emphasized that once implants are loaded and in function, a structured supportive peri-implant care programme, including periodic assessment of peri-implant tissue health, is essential to reduce disease incidence [3].

Long-term outcome data published in 2025 show why the stakes of getting this management right are so high: surgical treatment resolves disease in roughly 60 percent of cases under supportive care, with bone loss stabilized in around 70 percent, but predictability declines sharply as baseline severity increases [10]. A separate prognostic analysis of 267 implants followed for an average of seven years found that relative bone loss between

25 and 50 percent of implant length increased the risk of implant removal roughly fifteenfold compared with bone loss under 25 percent, while bone loss beyond 50 percent increased that risk approximately twentyfold [11]. This single dose-response relationship underlies much of the current disagreement about when to treat and when to explant.

As the global volume of implant placements continues to rise, even a modest per-implant incidence of peri-implantitis translates into a large and growing absolute caseload, a point emphasized repeatedly by every 2025-2026 consensus statement reviewed here as the underlying justification for convening a dedicated panel on the subject [4,6,8].

Beyond the biological burden, peri-implantitis carries a direct economic cost, since every explanted implant typically implies a second surgical episode, additional imaging, and, where reconstruction is required, a second course of regenerative materials, whether the payer is a private insurer, the patient directly, or a publicly funded health system absorbing the cost across its population.

This economic dimension is rarely quantified in the consensus literature itself, which tends to report clinical outcomes such as bleeding on probing, probing depth, and radiographic bone level rather than cost per resolved case or cost per implant retained. A fuller accounting of these costs, ideally disaggregated by whether the treatment pathway followed was non-surgical, regenerative surgical, or explantation with staged reconstruction, would strengthen the practical, health-systems relevance of any future unified consensus.

III. Risk Factors and Diagnostic Considerations

Peri-implantitis is now understood as a multifactorial disease rather than a purely plaque-driven one. Patient-related factors (history of periodontitis, smoking, poor plaque control, uncontrolled diabetes), surgical- and implant-related factors (malposition, inadequate keratinized mucosa, surface characteristics), and prosthetic factors (excess cement, ill-fitting restorations, occlusal overload) each contribute to onset and progression, and the AO/AAP consensus process commissioned separate systematic reviews for each of these domains before attempting to synthesize a unified framework [4].

Diagnosis itself is not always straightforward. Case definitions rely on bleeding or suppuration on probing together with radiographic evidence of bone loss beyond expected remodeling, but the absence of a reliable baseline radiograph in many patients referred from other practices complicates the distinction between pre-existing remodeling and true disease progression, a limitation acknowledged across recent narrative reviews of the topic [14].

A comprehensive narrative review of treatment protocols published by the Korean Academy of Periodontology's research group similarly stressed that peri-implantitis progresses more aggressively and less predictably than periodontitis, and recommended closer-interval recall for implants once any sign of disease is detected, rather than waiting for radiographic confirmation of advanced bone loss [7].

The Osstem GCM prosthetic panel added a further diagnostic dimension by linking specific prosthetic design features, such as a convex emergence profile at the subcritical contour and excess residual cement at the implant-abutment interface, to a measurably higher prevalence of marginal bone loss and peri-implantitis, arguing that prosthetic risk factors deserve equal diagnostic weight alongside plaque-related and surgical risk factors rather than being treated as a secondary consideration [8].

Implant surface characteristics, one of the surgical- and implant-related risk factors named above, are themselves the target of a rapidly evolving line of preventive research that sits upstream of the treatment-threshold debate this review addresses. A 2026 narrative review by Bastos and colleagues traced sixteen years of nanoscale titanium surface engineering, from the earliest anodized nanotube arrays and silver-nanoparticle coatings of the early 2010s through the current generation of stimuli-responsive, photothermal, and osteoinductive nanocomposites, and found that multifunctional nanocoatings consistently reduce bacterial colonization by one to two orders of magnitude while preserving or enhancing osteoblastic differentiation, including in compromised host environments such as diabetes [23]. Because none of these nanocoating strategies has yet reached large-scale human trials or routine commercial availability, they remain a preventive research frontier rather than a present-day clinical option, but they point toward implant surfaces engineered from the outset to resist the bacterial colonization that all three 2025-2026 consensus statements otherwise treat as a risk to be managed only after it has already occurred.

IV. Divergent 2025–2026 International Consensus Statements

The AO/AAP Consensus

The 2024 AO/AAP Consensus on Prevention and Management of Peri-implant Diseases and Conditions, summarized by Wang and colleagues, produced an evidence-based flow diagram combined with expert opinion, drawing on eight commissioned systematic reviews grouped into risk-factor identification and therapeutic strategy [4]. A subsequent clinical translation of that same consensus, led by Fiorellini and colleagues, converted the summary report into practice-ready recommendations, explicitly listing non-surgical, non-reconstructive,

reconstructive, and explantation procedures as the four points on a single management continuum, without specifying a universal numeric threshold for moving between them [5].

The Korean Academy of Periodontology Consensus

The Korean Academy of Periodontology issued its own consensus statement the same year, its first official position on peri-implant disease, framed around South Korea's rapidly aging population and the associated rise in peri-implant disease burden in an increasingly implant-dependent population [6]. The accompanying narrative review underpinning that consensus again emphasized the aggressive and unpredictable progression of the disease relative to periodontitis, and proposed a more conservative, earlier-intervention posture than either the AO/AAP or Osstem frameworks [7].

The Osstem Global Consensus Meeting

The Osstem Global Consensus Meeting convened a ten-member international panel of prosthodontists and surgeons and reached its own set of recommendations on prosthetic risk factors for peri-implantitis and implant fracture, including implant positioning, emergence-profile design, and occlusal scheme [8]. Notably, this panel approached the disease primarily from a prevention and prosthetic-design standpoint rather than from a treatment-threshold standpoint, leaving the surgical decision framework largely unaddressed and, by omission, not fully aligned with either the AO/AAP or Korean Academy positions.

Why the Frameworks Diverge

None of these three documents was designed to reconcile its recommendations against the other two, and each drew on a different balance of systematic evidence, expert opinion, and regional clinical experience. A January 2026 editorial in Frontiers in Dental Medicine, introducing a dedicated research topic on peri-implantitis management, underscored that multifactorial etiology and novel treatment modalities for the disease remain an active and unsettled research area rather than a closed question, explicitly naming residual bone level, explantation criteria, and adjunctive therapies such as photodynamic therapy and platelet-rich fibrin as open fronts of investigation [9].

Points of Convergence Amid the Divergence

It is worth noting explicitly what the three panels do agree on, since the areas of convergence are themselves instructive. All three frameworks treat prevention, meaning early risk-factor identification and structured supportive maintenance, as more valuable than any treatment strategy applied after disease onset [3,4,6,8]. All three also treat peri-implant mucositis and peri-implantitis as points on a single continuum rather than as unrelated conditions, consistent with the original 2017 World Workshop classification [1,2]. The divergence begins specifically at the question this review is built around: once mucositis has progressed to peri-implantitis with measurable bone loss, which combination of severity, defect morphology, and patient factors should trigger a shift from attempted salvage to explantation, and at what point should that decision formally involve oral and maxillofacial surgery rather than remain within general implant dentistry.

V. The Treatment Threshold: Surgical versus Non-Surgical Management

The central clinical dilemma is not whether peri-implantitis should be treated, but which patients are better served by an attempt at regenerative or resective surgical therapy versus early surgical removal of the implant. Roccuzzo and colleagues, reviewing peri-implantitis as a consequence of errors in implant therapy, argued that many cases reaching the severe end of this spectrum trace back to preventable surgical or prosthetic planning errors, reframing part of the treatment-threshold debate as a downstream consequence of upstream decisions made years earlier [16].

Fu and Wang, in a widely cited review titled “Breaking the wave of peri-implantitis,” argued that early, aggressive, and repeated non-surgical intervention at the mucositis stage is the single highest-leverage point for preventing progression to the surgical-threshold discussion altogether, a position that shifts emphasis toward supportive care programmes of the kind recommended in the EFP S3 guideline [3,15].

Once a case has progressed beyond the point where non-surgical or purely regenerative measures are likely to succeed, the literature offers no universally accepted severity threshold at which regenerative therapy should be abandoned in favor of a resective approach or explantation, and the 2025 consensus statements reviewed here each hedge this decision toward clinical judgment rather than a fixed rule [4,6,8].

Defect morphology further complicates any single numeric threshold: a contained, three- or four-wall intrabony defect retains a far more favorable prognosis for regenerative therapy than a supra-crestal, non-contained defect at an equivalent depth of bone loss, meaning that two implants with identical percentage bone loss can reasonably receive opposite treatment recommendations depending on defect geometry alone.

VI. The Explantation Question: Where Is the Line?

Explantation carries its own costs: loss of osseointegrated bone, additional surgical morbidity, and the need for staged reconstruction before a new implant can be placed. A dedicated review by Zimmer and colleagues on thresholds for implant removal concluded that removal of severely compromised implants is supported once bone loss exceeds 50 percent of implant length, while also stressing that the number of affected implants, defect morphology, restoration type, and patient-specific factors must all be weighed alongside that single number [12].

Martin-Cabezas and Giannopoulou reached a similar conclusion in their narrative review of residual bone level as a prognostic factor, noting that once bone loss exceeds roughly half the implant length, access for adequate decontamination becomes mechanically difficult and explantation is increasingly favored on purely biomechanical grounds, independent of any inflammatory considerations [13].

Even where the 50-percent figure is broadly accepted as a reference point, none of the three 2025-2026 consensus statements adopts it as a formal, binding threshold; each instead frames it as one input among several into an individualized clinical decision, which leaves considerable room for inter-clinician and inter-institution variability in how similar cases are managed [4,6,8].

Clinical sequelae of explantation itself, including transient discomfort, temporary loss of function during the healing interval, and the psychological impact of losing a previously successful restoration, add a patient-reported dimension to the decision that is acknowledged in the literature but rarely incorporated into any of the numeric thresholds discussed above, despite being highly relevant to shared decision-making with the patient.

VII. Where Implantology Meets Oral and Maxillofacial Surgery

This is the point at which the debate stops being a periodontal or prosthodontic question alone. When the defect is extensive, post-explantation reconstruction routinely exceeds the surgical scope of general implant dentistry and moves the case into oral and maxillofacial surgery, particularly where vertical ridge augmentation, block grafting, or guided bone regeneration of a compromised alveolar ridge is required before a new implant can reasonably be placed.

Timing of re-implantation after explantation is itself an open question in the literature: staged protocols involving explantation, guided bone regeneration, a healing interval, and delayed re-implantation have been described as a viable strategy in selected advanced cases, but the optimal healing interval and the criteria for judging a reconstructed site ready for a new implant are not standardized across the consensus documents reviewed here [4,6,8].

Any narrative review of this topic that aims for genuine originality should therefore treat the implantology-to-OMFS handoff as its central organizing question, rather than treating peri-implantitis management as a periodontal topic with an occasional surgical footnote. Framing the literature this way also clarifies why the three 2025 consensus statements, none of which was authored primarily by oral and maxillofacial surgeons, may under-specify exactly this transition point.

In practical terms, a referral pathway that defines explicit criteria for OMFS involvement, such as defect volume exceeding a specified threshold, involvement of the maxillary sinus or inferior alveolar canal, or need for block grafting rather than particulate guided bone regeneration, would give implantologists and periodontists a clearer, earlier trigger for referral than the current consensus documents provide, potentially shortening the time between diagnosis of an unsalvageable case and definitive surgical management.

Recent literature on guided bone regeneration (GBR) in implant dentistry, relevant more broadly to this reconstructive stage, indicates that resorbable collagen membranes remain favored for their biocompatibility and the resulting elimination of a second removal surgery, while non-resorbable membranes and customized titanium mesh offer superior space maintenance in extensive vertical defects at the cost of a higher rate of exposure and infection, a trade-off directly relevant to the block-grafting and staged re-implantation scenarios discussed above [25]. The same literature describes platelet-rich fibrin (PRF) and related autologous platelet concentrates as adjuncts that promote angiogenesis and accelerate soft- and hard-tissue healing when combined with GBR, and identifies digital planning, guided surgery, and three-dimensional printing of patient-specific titanium mesh as increasingly integrated into the reconstructive workflow that follows explantation of a severely compromised implant [25]. None of the three 2025-2026 consensus statements addresses this GBR-specific evidence base directly, even though it underlies much of the reconstructive care that follows an explantation decision made under their frameworks.

VIII. Computed Tomography Imaging and Artificial Intelligence in Diagnostic and Surgical Planning

Diagnostic imaging underlies every threshold discussed in this review, yet none of the three 2025-2026 consensus statements addresses in depth how the imaging modality itself, and specifically the shift from two-dimensional periapical or panoramic radiography to cone-beam computed tomography (CBCT), affects the bone-loss measurements on which those thresholds are built. An integrative review of 18 studies by Costa and colleagues found that CBCT is superior to intraoral radiography for detecting virtually every category of peri-implant bone defect, with the exception of defects confined to the interproximal zone, and is uniquely able to visualize buccal and lingual dehiscence and fenestration defects that periapical films cannot capture at all [17]. Because the defect-morphology distinction identified in Section V as complicating any single numeric threshold, a contained three- or four-wall defect versus a non-contained supra-crestal one, depends on three-dimensional visualization of all bone walls, three-dimensional imaging functions less as an optional adjunct and more as a precondition for applying any of the three consensus frameworks with clinical accuracy.

This diagnostic advantage carries a documented caveat. A histologically controlled ex vivo study by Insua and colleagues found that CBCT classified peri-implant defect morphology with complete accuracy against the histological gold standard, but consistently underestimated defect depth and length relative to direct clinical probing and histological measurement, concluding that CBCT is a reliable tool for peri-implantitis diagnosis and treatment planning while cautioning that clinicians should remain flexible when translating CBCT-derived measurements into prognosis [18]. Applied to the bone-loss percentages discussed in Section VI, a systematic underestimation of this kind means that a defect measured just below the 50-percent explantation reference point on CBCT could, in reality, already exceed it, a source of imprecision that none of the three panels' proposed thresholds explicitly accounts for.

Artificial intelligence is beginning to be applied directly to this diagnostic layer. A 2026 study trained a YOLOv8-based deep-learning model to automatically detect and grade peri-implant marginal bone loss on CBCT sections across four severity classes, reporting an overall accuracy of 0.90, though performance declined markedly for moderate and severe defects, the very range in which the treatment-threshold and explantation debate is concentrated [19]. A separate pilot study evaluated an AI model against periodontal surgeon assessment for diagnosing and classifying peri-implantitis-related bone defects on panoramic radiographs, focusing specifically on defect morphology and severity grading rather than binary detection alone [20]. Taken together, these studies suggest that AI-assisted image analysis could eventually help standardize how severity is graded across institutions, addressing part of the inter-clinician variability noted in Section VI, but the reduced accuracy at exactly the moderate-to-severe range where the explantation decision is made means these tools are not yet reliable enough to substitute for surgeon judgment at the threshold that matters most clinically.

Beyond diagnosis, artificial intelligence is also entering the surgical-planning stage relevant to Section VII's discussion of the implantology-to-OMFS handoff. A narrative review of AI applications across implant dentistry described machine-learning and computer-vision tools increasingly used for digital implant planning, automated segmentation of anatomical structures such as the mandibular canal, surgical navigation, and prediction of complications including peri-implantitis and implant failure, while noting that interpretability and external validation remain limiting factors for routine clinical adoption [21]. A scoping review of AI-enhanced implant navigation systems similarly found that AI-assisted planning on three-dimensional scans reduces reliance on subjective judgment and that AI-enhanced navigation systems improve surgical precision compared with static guides, a capability directly relevant to the staged explantation, guided bone regeneration, and delayed re-implantation protocols discussed in Section VII, since accurate three-dimensional planning of the reconstructed site is itself a precondition for a well-positioned replacement implant [22].

A broader narrative review of artificial intelligence applications across the full implant-dentistry workflow, from tomographic analysis to peri-implantitis prediction, situates the diagnostic and navigation applications discussed above within a larger continuum. It describes deep-learning models applied to CBCT that segment critical anatomical structures such as the mandibular canal and maxillary sinuses and mitigate metallic-artifact interference, improving visualization of the peri-implant bone at precisely the stage where the severity grading discussed above is performed, while separate models applied to periapical radiographs automatically measure the distance between the implant platform and the crestal bone level for earlier detection of marginal bone loss [24]. The same review describes multifactorial risk-classification models that integrate smoking, systemic conditions, periodontitis history, and prosthetic design variables into a single peri-implant disease risk category, a computational counterpart to the qualitative risk-factor synthesis discussed in Section III, and it reiterates that clinical responsibility should remain with the treating professional even as these decision-support tools mature [24].

This diagnostic limitation is not confined to peri-implant defects. A recent case report describing immediate reimplantation of an avulsed permanent premolar illustrates an analogous pattern in an adjacent clinical setting: seven months after treatment, the tooth showed no pain, mobility, fistula, or exudate on clinical examination, yet cone-beam computed tomography still revealed loss of the vestibular bone plate that periapical radiography and clinical probing alone had not identified [26]. The parallel is instructive for peri-implant assessment: a site meeting clinical success criteria on probing and periapical film cannot be assumed free of buccal bone-plate compromise without CBCT confirmation, reinforcing the point made above with respect to Insua and colleagues' findings, that three-dimensional imaging functions as a precondition rather than an optional adjunct to applying any bone-loss threshold with confidence.

None of the three 2025-2026 consensus statements incorporates CBCT-based severity grading or AI-assisted image analysis into its decision framework, which represents a further, imaging-specific gap alongside the resource-access gap discussed in Section IX. In publicly funded systems such as Brazil's SUS, this gap has a distributional dimension of its own: CBCT equipment and AI-assisted diagnostic software remain concentrated in private and academic referral centers, meaning that the diagnostic precision a defect-morphology-based threshold actually requires is, in practice, as unevenly distributed as the regenerative materials discussed in Section IX.

IX. Applicability Across Healthcare Systems: The Case of Publicly Funded Care

Every decision framework reviewed here assumes ready access to regenerative materials, imaging, and specialist referral. That assumption does not hold uniformly across healthcare systems. In Brazil's Sistema Único de Saúde (SUS), regenerative materials such as bone substitutes and barrier membranes are not routinely available at the primary and secondary care levels where most implant maintenance and early peri-implant disease management occurs, and referral pathways to oral and maxillofacial surgery for complex reconstruction can involve substantial waiting times.

None of the consensus statements discussed in this review addresses this resource gradient directly, despite explicitly acknowledging that the global rise in implant placement is not confined to high-resource settings [4,6,8]. A decision framework that assumes unconstrained access to regenerative therapy will, in a resource-constrained public system, functionally default toward earlier explantation simply because the alternative is unavailable in practice rather than because it was judged clinically inferior for that patient.

This is precisely the applicability gap this review is positioned to address: a side-by-side reading of the AO/AAP, Korean Academy, and Osstem GCM frameworks against the resource realities of publicly funded systems, using the author's own clinical experience delivering oral health care within the SUS as a lens for identifying where these international protocols would need local adaptation.

Field experience delivering oral health care in school-based public health units and community settings within Rio de Janeiro suggests that a simplified, resource-tiered version of the existing consensus flowcharts, one that specifies a fallback pathway for settings without ready access to regenerative materials rather than assuming their availability by default, would have more direct clinical utility for publicly funded practitioners than the current frameworks as published.

The contrast with private practice is instructive: a patient treated in a well-resourced private clinic and a patient with an equivalent defect treated within a publicly funded system may, under the same published consensus recommendations, receive different treatment simply because one setting can offer reconstructive surgery as a realistic option and the other cannot. Making this gradient explicit, rather than leaving it implicit in each clinician's individual workaround, is itself a contribution toward more equitable and transparent application of these international guidelines.

X. Research Gap and Rationale for This Review

No published source to date offers a side-by-side comparison of the AO/AAP, Korean Academy, and Osstem GCM decision frameworks, nor discusses their applicability in healthcare settings where access to regenerative materials and specialist referral is constrained. This review is positioned to fill that gap by synthesizing the three frameworks against a common set of clinical questions: when to treat non-surgically, when to attempt regenerative surgery, when to explant, and when to involve oral and maxillofacial surgery.

A secondary contribution of this review is to bring together, in one place, the quantitative prognostic evidence on bone-loss thresholds [11,12,13] that underlies all three qualitative consensus statements, since none of the three documents cites all of this evidence together or reconciles it into a single recommended cutoff.

A tertiary contribution, and one with direct relevance to clinicians practicing in publicly funded systems, is to make explicit an assumption that runs quietly through all three 2025-2026 documents: that a full range of non-surgical, regenerative, and reconstructive options is available to the treating clinician at the moment the treatment decision is made. Where that assumption does not hold, as discussed in Section IX, the same diagnostic findings can lead to a different real-world outcome even when every clinician involved is following the same published consensus in good faith.

XI. Limitations of the Current Evidence Base and Future Research Directions

The evidence underlying all three 2025-2026 consensus statements is drawn predominantly from retrospective cohorts and expert panel opinion rather than from prospective, randomized comparisons of surgical against non-surgical management at defined bone-loss thresholds. The Osstem GCM report explicitly acknowledged this limitation for its own prosthetic recommendations, noting reliance on retrospective data and expert opinion as an inherent constraint of narrative consensus methodology rather than systematic review with meta-analysis [8].

Long-term follow-up beyond ten years is also scarce across the surgical-outcomes literature, which limits confidence in extrapolating five- and seven-year resolution and stabilization rates to a patient's full remaining implant lifespan [10]. Prospective, multi-center studies that track patients from initial diagnosis through a pre-specified treatment-threshold decision rule, ideally replicated across at least one high-resource and one publicly funded healthcare setting, would meaningfully advance this literature beyond its current reliance on retrospective cohorts and consensus panels.

Future work arising from this review's own comparative approach could include a formal Delphi exercise inviting representatives of the AO/AAP, Korean Academy, and Osstem GCM panels to reconcile their respective thresholds into a single cross-specialty decision tree, explicitly incorporating input from oral and maxillofacial surgery at the reconstruction-planning stage rather than only at the point of referral.

XII. Conclusion

Peri-implantitis management remains one of the most genuinely unresolved debates in contemporary implant dentistry. Three major consensus statements published within months of each other in 2025, together with a fourth editorial framing in early 2026, confirm both the urgency of the problem and the absence of a unified international decision framework, particularly regarding the threshold for explantation and the point at which a case requires oral and maxillofacial surgical involvement. The quantitative prognostic literature converges on bone loss in the range of 25 to 50 percent of implant length as the zone in which predictability of surgical treatment falls sharply, yet no consensus body has adopted this as a formal, cross-specialty threshold.

A narrative review that synthesizes these divergent protocols, grounds them against the quantitative bone-loss evidence, and examines their applicability across healthcare systems with differing resource levels, including publicly funded systems such as Brazil's SUS, offers a timely and original contribution to a literature that, at present, has more consensus statements than consensus.

Until such reconciliation occurs, clinicians, and particularly those working outside high-resource referral centers, are best served by treating the 25-50 percent bone-loss range not as a rule but as the point at which oral and maxillofacial surgical consultation should be actively considered rather than deferred.

Acknowledgment
The author thanks the prospective co-authors invited to contribute their clinical and academic perspective to this review.

References

[1]. Berglundh T, Armitage G, Araujo MG, et al. Peri-implant diseases and conditions: consensus report of workgroup 4 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol. 2018;45(Suppl 20):S286-S291. doi:10.1111/jcpe.12957
[2]. Schwarz F, Derks J, Monje A, Wang HL. Peri-implantitis. J Clin Periodontol. 2018;45(Suppl 20):S246-S266. doi:10.1111/jcpe.12954
[3]. Herrera D, Berglundh T, Schwarz F, et al. Prevention and treatment of peri-implant diseases—the EFP S3 level clinical practice guideline. J Clin Periodontol. 2023;50(Suppl 26):4-76. doi:10.1111/jcpe.13823
[4]. Wang HL, Avila-Ortiz G, Monje A, et al.; AO/AAP Consensus Participants; Rosen PS. AO/AAP consensus on prevention and management of peri-implant diseases and conditions: summary report. J Periodontol. 2025;96(6):519-541. doi:10.1002/JPER.25-0270
[5]. Fiorellini JP, Mojaver S, Sarmiento H, Aghaloo T, et al. Clinical translation of the 2024 AO/AAP consensus on prevention and management of peri-implant diseases and conditions. Int J Periodontics Restorative Dent. 2025;45(4):1-23. doi:10.11607/prd.7658
[6]. Song YW, Kim YJ, Park SY, Cha JK, Lee HJ, Yang SM, Park JB, Koo KT. Consensus statement on peri-implant disease from the Korean Academy of Periodontology. J Periodontal Implant Sci. 2025. doi:10.5051/jpis.2501920096
[7]. Kim YJ, Song YW, et al. Current understanding of the etiology, diagnosis, treatment, and management of peri-implant diseases: a narrative review for the consensus report of the Korean Academy of Periodontology. J Periodontal Implant Sci. 2024. PMCID: PMC11729241
[8]. Tallarico M, Lee S, Cho Y, Noh K, Chikahiro O, Aguirre F, Uzgur R, Noë G, Cervino G, Cicciù M. Prosthetic guidelines to prevent implant fracture and peri-implantitis: a consensus statement from the Osstem Implant Community. Prosthesis. 2025;7(3):65. doi:10.3390/prosthesis7030065
[9]. Giannopoulou C, Toma S, Lasserre JF. Editorial: peri-implantitis management: exploring multifactorial etiology and novel treatment modalities. Front Dent Med. 2026. doi:10.3389/fdmed.2025.1754247
[10]. Monje A, Pons R, Ramanauskaite A, Castro A, Schwarz F, Chambrone L. Long-term surgical treatment outcomes of peri-implantitis. Periodontology 2000. 2025;00:1-16. doi:10.1111/prd.12643
[11]. Ravidà A, Siqueira R, Di Gianfilippo R, Kaur G, Giannobile A, Galindo-Moreno P, Wang CW, Wang HL. Prognostic factors associated with implant loss, disease progression or favorable outcomes after peri-implantitis surgical therapy. Clin Implant Dent Relat Res. 2022;24(2):222-232. doi:10.1111/cid.13074
[12]. Zimmer JM, Misch JE, Nava P, Sabri H, Calatrava J, Wang HL. Threshold for implant removal in peri-implantitis defects. Is there any? J Oral Implantol. 2025;51(2):210-217. doi:10.1563/aaid-joi-D-24-00098
[13]. Martin-Cabezas R, Giannopoulou C. Residual bone level as a prognostic factor in the surgical treatment of peri-implantitis. Front Dent Med. 2024;5:1532094. doi:10.3389/fdmed.2024.1532094
[14]. Hong I, Koo KT, Oh SY, Park HW, Sanz-Martín I, Cha JK. Comprehensive treatment protocol for peri-implantitis: an up-to-date narrative review of the literature. J Periodontal Implant Sci. 2024;54(5):295-308. doi:10.5051/jpis.2303360168
[15]. Fu JH, Wang HL. Breaking the wave of peri-implantitis. Periodontology 2000. 2020;84:145-160. doi:10.1111/prd.12335
[16]. Roccuzzo A, Imber JC, Salvi GE, Roccuzzo M. Peri-implantitis as the consequence of errors in implant therapy. Periodontology 2000. 2023;92:350-361. doi:10.1111/prd.12482

[17]. Costa JA, Mendes JM, Salazar F, Pacheco JJ, Rompante P, Câmara MI. Analysis of peri-implant bone defects by using cone beam computed tomography (CBCT): an integrative review. Oral Radiol. 2023;39(3):455-466. doi:10.1007/s11282-023-00683-w

[18]. Insua A, Gañán Y, Macías Y, Garcia JA, Rakic M, Monje A. Diagnostic accuracy of cone beam computed tomography in identifying peri-implantitis-like bone defects ex vivo. Int J Periodontics Restorative Dent. 2021;41(6):e223-e231. doi:10.11607/prd.5201

[19]. Madani Z, Bashizadeh Fakhar H. Detection and classification of peri-implant marginal bone loss in cone-beam computed tomography using a deep learning approach. Clin Exp Dent Res. 2026. doi:10.1002/cre2.70308 (article number/pages to be confirmed by the author)

[20]. Lee JH, Kim YT, Schwendicke F. Performance of artificial intelligence-based diagnosis and classification of peri-implantitis compared with periodontal surgeon assessment: a pilot study of panoramic radiograph analysis. J Periodontal Implant Sci. 2025;55(6):436-446. doi:10.5051/jpis.2500280014

[21]. Neji G, Gasparro R, Tlili M, Dhahri A, Khanfir F, Sammartino G, Aliberti A, Campana MD, Ben Amor F. AI-powered predictive models in implant dentistry: planning, risk assessment, and outcomes. J Clin Med. 2026;15(1):228. doi:10.3390/jcm15010228

[22]. Menon SS, Jacob SA, Paul AE, Vasudevan AK, Balakrishnan B, Peter MR, Suresh R. Use of artificial intelligence in dental implant navigation systems: a scoping review. Cureus. 2026. doi:10.7759/cureus.100776 (volume/pages to be confirmed by the author)

[23]. Bastos PVO, Oliveira JAP, Marçal CW, Lima PAD, Apolinário VC, Loiola SF, Lauxen KRM, Calazans A. Antimicrobial and osteoinductive nanocoatings in titanium dental implants: a narrative review of advances from 2010 to 2026. IOSR J Dent Med Sci. 2026;25(7):26-35. doi:10.9790/0853-2507032635

[24]. Silva ALC, Gumert JVS, Caumo LS, Nunes CS, Pereira LCC, Alves JLFM, Ferreira NFL, Nóbrega SLD, Moreira MV, Rodrigues AC. Machine learning in implant dentistry: from tomographic analysis to perio-implantitis prediction. Periódicos Brasil Pesq Cient. 2026;5(1):3118-3125. doi:10.36557/2674-9432.2026v5n1p3118-3125

[25]. Santos SA, Militão VHP, Finger EE, Schussler EC, Domingues Júnior D, Castro Júnior UA, Bastos PVO, Silva SCR, Belchior JS, Santos MP, Molina ILV. Avanços recentes na regeneração óssea guiada em implantodontia: revisão de literatura. Braz J Implantol Health Sci. 2026;8(2):858-868. doi:10.36557/2674-8169.2026v8n2p858-868

[26]. Ferreira GFL, Ferreira NFL, Nóbrega SLD, Dias JRS, Reis RAS, Costa GS. Reimplante imediato de dente permanente após exodontia iatrogênica: relato de caso. Periódicos Brasil Pesq Cient. 2026;5(3):1611-1622. doi:10.36557/2674-9432.2026v5n2p1611-1622