J Periodontal Implant Sci. 2025 Aug;55(4):247-254
https://doi.org/10.5051/jpis.2501920096
pISSN 2093-2278·eISSN 2093-2286

JPIS
Journal of Periodontal & Implant Science

Review
Implant Science

Consensus statement on peri-implant disease from the Korean Academy of Periodontology

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Received: May 9, 2025
Revised: Aug 3, 2025
Accepted: Aug 20, 2025
Published online: Aug 26, 2025

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ABSTRACT

This consensus report presents the first official position statement of the Korean Academy of Periodontology on peri-implant diseases, issued in response to South Korea's rapidly aging population and the associated rise in peri-implant disease management. It reviews the prevalence, classification, and definition of peri-implant diseases, emphasizing that these conditions progress more aggressively and unpredictably than periodontal diseases. The report also identifies systemic and local risk indicators, diagnostic criteria, and evidence-based treatment protocols for peri-implant mucositis and peri-implantitis, integrating international standards with Korea-specific clinical data. Clinical recommendations include structured maintenance programs, risk-based recall intervals, and patient education, with the goal of reducing disease recurrence and improving long-term implant success.

Keywords: Consensus; Maintenance; Peri-implantitis; Republic of Korea; Treatment

INTRODUCTION

As of December 2024, South Korea has officially become a super-aged society, with more than 20% of its population aged 65 years and older. This demographic shift has created a growing demand for dental implants among older adults. Although implants are highly effective in restoring oral function, they require continuous maintenance to prevent complications such as peri-implant diseases. In 2023, 935,303 implants were placed in elderly patients under the national health insurance program, which covers up to 2 implants per individual. When privately funded procedures across all age groups are considered, several million implants are placed annually in Korea. However, implant removal remains common, with 223,879 cases reported in 2023, underscoring the importance of long-term management [1].

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Conflict of Interest
No potential conflict of interest relevant to this article was reported.

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Figure 1. Participants of the Korean Academy of Periodontology Workshop for the consensus report.

Successful implant outcomes depend on osseointegration and soft tissue compatibility, but these processes are challenged by the complexity of the oral microbiota. Peri-implantitis typically progresses more aggressively than periodontitis and shows less predictable treatment outcomes [2]. Moreover, implant surface characteristics make decontamination difficult, further reducing treatment success.

This consensus report summarizes the risk factors, diagnostic criteria, and treatment strategies for peri-implant diseases, focusing on their biological complications (**Figure 1**). It integrates international perspectives with Korea-specific clinical considerations to provide evidence-based guidance for best practices in implant maintenance and management.

PREVALENCE, CLASSIFICATION, AND DEFINITION OF PERI-IMPLANT DISEASES

How can implant complications be classified?

Implant complications are categorized as either early or late. Early failures are primarily associated with impaired osseointegration due to surgical trauma, poor bone quality, or infection. Late complications are divided into biological, which are mainly peri-implant diseases caused by bacterial biofilms, and mechanical, which include failures of prosthetic components.

What is the definition of peri-implantitis?

Peri-implantitis is a pathological condition caused by dental plaque accumulation, leading to soft tissue inflammation and subsequent progressive alveolar bone loss [3]. Unlike peri-implant mucositis, the bone loss seen in peri-implantitis is irreversible.

What is the current prevalence of peri-implantitis?

A systematic review estimated the weighted mean prevalence of peri-implant mucositis and peri-implantitis at 43% and 22%, respectively, based on meta-analysis data [4].

https://doi.org/10.5051/jpis.2501920096

Meta-regression analysis further demonstrated a positive correlation between peri-implantitis prevalence and implant function time, highlighting the time-dependent risk and the importance of long-term monitoring and preventive strategies. In Korea, a study reported an implant survival rate of 95.87%, with peri-implant mucositis and peri-implantitis occurring in 39.7% and 16.7% of cases, respectively [5]. Another domestic dataset indicated that the prevalence of peri-implantitis ranged from 13.2% to 19.7% at the patient level and from 6.7% to 10.3% at the implant level [6]. Collectively, these findings underscore the necessity of early intervention and proactive preventive measures in clinical practice.

SYSTEMIC AND LOCAL RISK INDICATORS FOR PERI-IMPLANTITIS

In this section, all factors that may predispose to peri-implantitis are referred to as risk indicators and are classified into patient-related and implant-related factors (**Table 1**).

DIAGNOSIS AND CLINICAL CHARACTERISTICS OF PERI-IMPLANTITIS

How can peri-implant tissue health be defined?

Peri-implant health is characterized by the absence of bleeding and suppuration on probing, no increase in probing depth compared with prior examinations, and no marginal bone loss beyond the initial remodeling that occurs following implant placement [3,31].

How can peri-implant mucositis be defined?

Peri-implant mucositis is an inflammatory condition of the soft tissue surrounding an implant, manifested as bleeding and/or suppuration upon probing. It may present with or without increased probing depth. Unlike peri-implantitis, it does not involve bone loss beyond the initial marginal bone remodeling [3,31].

Table 1. Risk indicators for peri-implantitis

Primary etiologic factor	Bacterial biofilms [7]	
Risk indicators	**Patient-related**	**Implant-related**
	Prior history of chronic periodontitis · Patients with periodontitis had a 2.29 higher risk of peri-implantitis than patients without periodontitis [8] · Periodontitis increased the risk of peri-implantitis by 4.7 to 9-fold [9] · Grade C periodontitis is associated with an increased risk of implant failure and more extensive marginal bone loss [10] Poor oral hygiene and lack of maintenance · A high plaque index was strongly associated with an approximately fourfold increase in the risk of secondary implant failure due to peri-implantitis [14] Systemic and behavioral risk indicators · Uncontrolled diabetes [9,19] · Smoking [20–22] · Prolonged bisphosphonate therapy [23] · High-dose antiresorptive therapy [24] · Exposure to head and neck radiation [23] · Excessive alcohol intake [23]	Design of the implant prosthesis · Emergence angle (≥30°) [11] · Convex profile [12,13] · Overcontouring and impaired access to oral hygiene [7] Submucosal cement residue [15–18] · Cements that tend to leave more undetected excess are associated with a higher incidence of peri-implant inflammation and cause a more severe peri-implant bone loss [15] · Gram-negative enteric rods/Pseudomonas exhibited an association with cemented restored implants [17] Implant positioning affecting hygiene access [11,25,26] Tissue phenotype [27] · The presence of <2 mm of keratinized mucosa width around dental implants in erratic maintenance compliers seems to be associated with peri-implant diseases [28] · Thin soft-tissue phenotype (<3 mm) increases bone resorption risk [29,30]

https://doi.org/10.5051/jpis.2501920096

How can peri-implantitis be defined?

Peri-implantitis is a pathological condition characterized by inflammation of the peri-implant mucosa and bone. Clinical features include increased probing depth relative to previous measurements, bleeding and/or suppuration on probing, and progressive bone loss beyond initial marginal bone remodeling.

When baseline data are unavailable, peri-implantitis may be diagnosed by a probing depth of ≥6 mm and bone loss of ≥3 mm relative to the most coronal intra-osseous portion of the implant [3,31].

TREATMENT PROTOCOL AND CLINICAL RECOMMENDATIONS

How can peri-implant tissue health be maintained?

- Periodic recall every 3–6 months
- Clinical evaluation: visual inspection of peri-implant mucosal condition and measurement of clinical parameters (i.e., probing depth and bleeding/suppuration on probing)
- Regular plaque control performed by dental professionals
- Optimization of patient adherence to oral hygiene practices
- Adequate keratinized mucosa and placement of a properly designed prosthesis
- Ongoing risk evaluation using the Implant Disease Risk Assessment (IDRA) tool [32-34]

How can peri-implant mucositis be treated and maintained?

- Non-surgical surface decontamination by mechanical (titanium curettes or ultrasonic scaler) and chemical (citric acid or ethylenediaminetetraacetic acid [EDTA]) debridement
- Systemic/local antibiotic application after treatment
- Adjustment (re-contouring or surface polishing) or re-fabrication of pre-existing prosthesis if possible
- Re-evaluation including IDRA after the treatment, followed by re-entering the maintenance phase if the affected implant meets all the following conditions:
  - Probing depth of less than 5 mm
  - No bleeding/suppuration on probing
  - No progressive bone loss
- If any of the conditions above are not achieved, either repeated non-surgical treatment or subsequent surgical treatment should be considered [33,35].

How can peri-implantitis be treated and maintained?

- Preliminary non-surgical surface decontamination and debridement using mechanical (titanium curettes or ultrasonic scalers) and chemical (citric acid or EDTA) methods
- Radiographic assessment of peri-implant bony defects before surgery
- Open flap debridement and surface decontamination using mechanical (titanium brush, titanium curettes, or ultrasonic scaler), chemical (citric acid or EDTA), pharmacological (tetracycline or chlorhexidine), and adjunctive methods (air abrasion, laser, or photodynamic therapy), followed by 1 of the following modalities depending on defect configuration:
  - Access surgery: flap closure after debridement, preserving both the soft and hard tissue around the affected implant

https://doi.org/10.5051/jpis.2501920096

  - Resective surgery: implantoplasty of the supracrestally exposed threads accompanying bone contouring to convert the intrabony defect to a suprabony defect and eliminate pathologic pockets (used for supracrestal or 1- to 2-wall bony defects)
  - Regenerative surgery: grafting a bone substitute covered by a barrier membrane in order to promote bone regeneration and re-osseointegration at the affected fixture surface (used for circumferential or 2- to 3-wall bony defects)
  - Combined surgery: combination of resective and regenerative procedures, respectively applied to the suprabony and intrabony components coexisting within a single peri-implant defect.
- Soft tissue augmentation or vestibuloplasty if the affected implant lacks keratinized mucosa or has a shallow vestibule.
- Systemic/local antibiotic application after treatment
- Adjustment (re-contouring or surface polishing) or re-fabrication of pre-existing prosthesis if possible
- Re-evaluation including IDRA after the treatment, followed by re-entering the maintenance phase if the affected implant meets all the following conditions:
  - Probing depth of less than 5 mm
  - No bleeding/suppuration on probing
  - No progressive bone loss [33,36-42]

What should be done after fixture removal?

- If any of the following findings are present, the removal of affected fixture must be considered:
  - Fixture mobility due to complete loss of osseointegration
  - Fixture fracture or tearing
  - Severe peri-implant bone resorption (i.e., ≥50% of the fixture length)
- After removal, causative factors must be identified and controlled. Re-implantation may then proceed using 1 of 2 approaches, depending on the defect configuration:
  - Contained configuration
    - If possible, immediate re-implantation along with simultaneous guided bone regeneration or placing wider fixture without guided bone regeneration
    - Re-implantation along with or without simultaneous guided bone regeneration in the healed ridge
  - Non-contained configuration: staged re-implantation, beginning with guided bone regeneration performed several months before implant placement
- Soft tissue augmentation or vestibuloplasty may also be planned if the site lacks keratinized mucosa or has a shallow vestibule [33,43,44].

How can peri-implantitis be maintained after treatment?

After treatment, long-term maintenance is essential to prevent recurrence. Maintenance protocols should include regular professional cleaning, risk-based recall intervals determined by the IDRA tool, and reinforcement of patient compliance. In general, follow-up every 3–6 months is recommended. Structured maintenance programs are associated with improved clinical outcomes and reduced prevalence of peri-implantitis, whereas poor compliance significantly increases the risk of recurrence [45-47].

Based on the current understanding of peri-implantitis, a treatment flowchart has been developed as a consensus recommendation (**Figure 2**).

https://doi.org/10.5051/jpis.2501920096

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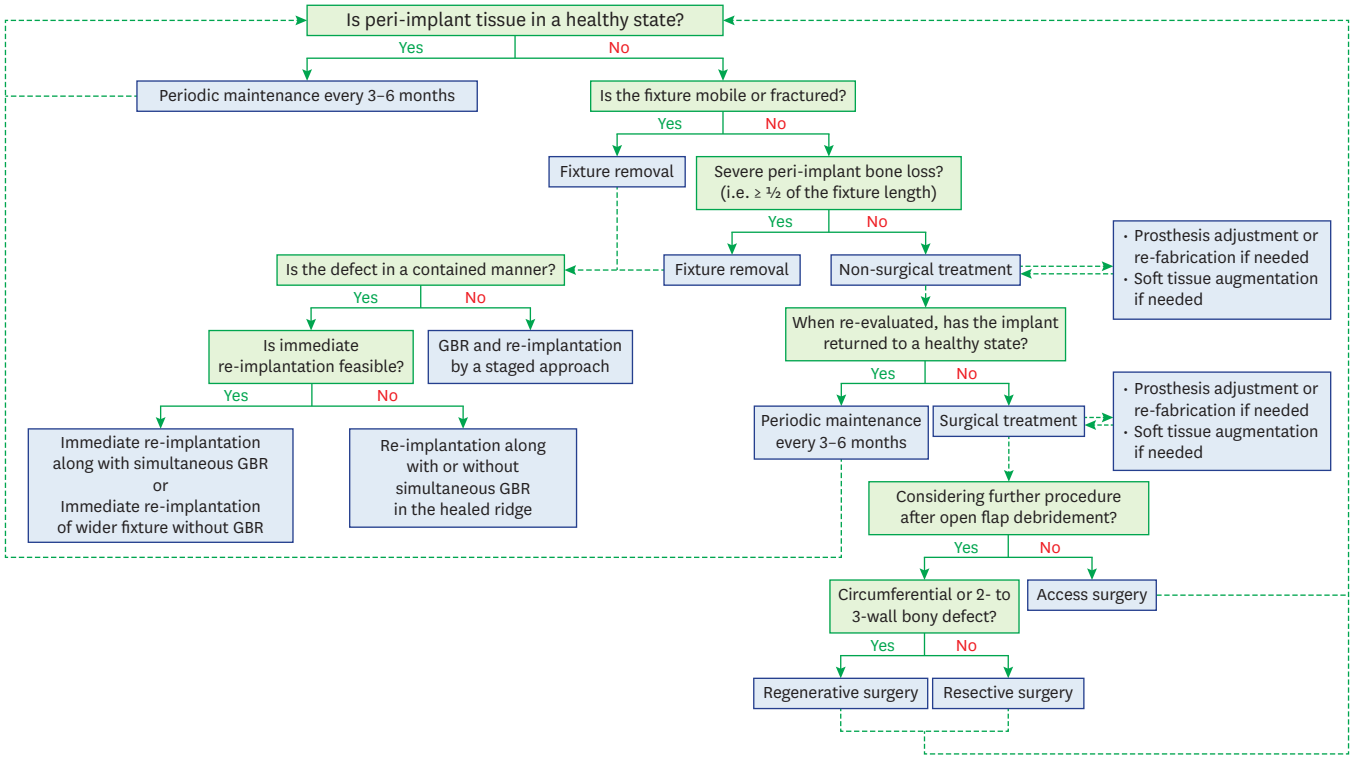

Figure 2. Clinical decision tree for managing peri-implantitis.
GBR: guided bone regeneration.

CONCLUSION

The management of peri-implant diseases requires a comprehensive approach that combines risk assessment, individualized treatment planning, and rigorous maintenance protocols. Regular follow-up visits and patient education are critical for preventing recurrence and ensuring the long-term success of implant therapy.

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