

PERI-IMPLANTITIS UNDER THE LENS: THE SILENT THREAT TO IMPLANT SUCCESS

Anuradha S¹, Lakshmi Priya K^{2*}, Saranya M³, Sathish R⁴, Prashanthi P⁵, Uma Mageswari T⁶, Jaideep Mahendra⁷

- 1 Undergraduate student, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India
2. Assistant Professor, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.
3. Postgraduate student, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.
- 4 Associate Professor, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.
5. Assistant Professor, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.
6. Undergraduate student, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.
7. Professor and Head, Department of Periodontics, Meenakshi Ammal Dental College and Hospital, Chennai, Tamil Nadu, India.

Corresponding Author:

Name: Dr Lakshmi Priya K

Address: Meenakshi Ammal Dental College and Hospital, Maduravoyal, Chennai-95

Affiliation: Meenakshi Academy of Higher Education and Research (MAHER)

Source(s) of support: Self

ABSTRACT

Despite the success rates of dental implants, peri-implantitis is the most common complication in implant dentistry. With the increase in placement of dental implants, an increase in the frequency of peri-implant conditions has also been reported extensively. Two entities are described in the conception of peri-implant conditions: peri-implant mucositis and peri-implantitis. Several etiological factors contribute to the development of peri-implantitis, with bacterial biofilm playing a major role. This

review discusses many factors associated with peri-implantitis and different available treatments, with their advantages and disadvantages. Peri-implantitis can affect the life of successfully integrated implants. Implant success is dependent on reducing the peri-implantitis threat or successfully managing peri-implantitis. Further understanding of peri-implantitis can be gained from its frequency, microbial and individual findings, its curative nature, and the benefits of addressing systemic health issues with medication.

KEYWORDS: peri-implantitis, implant complications, regeneration, dental implants

INTRODUCTION

The use of modern treatment protocols to rehabilitate edentulous patients, including those with severe bone loss, is on the rise, which has led to an increase in the occurrence of peri-implant diseases. Multiple strategies exist for managing these conditions; the treatment approaches remain complex, and further research into new techniques is still needed. To aid clinicians and surgeons in clinical decision-making, this narrative review summarizes the latest disease definitions from the World Workshop on the Classification of Periodontal and Peri-implant Diseases (2017).¹

Peri-implant tissues refer to the structures surrounding osseointegrated dental implants and consist of both soft and hard tissue. The soft tissue, termed peri-implant mucosa, develops during wound healing following implant or abutment placement, whereas the hard tissue directly contacts the implant surface to provide stability. Based on these distinctions, the updated classification categorizes peri-implant conditions into peri-implant health (the optimal state), peri-implant mucositis (affecting soft tissue), and peri-implantitis (affecting hard tissue).¹

Peri-implant mucositis is characterized by a reversible inflammatory reaction confined to the soft tissues surrounding the dental implant. In this condition, inflammation is limited to the peri-implant mucosa without any associated marginal bone loss.² In contrast, peri-implantitis is an irreversible inflammatory condition that affects both the soft and hard supporting tissues around the implant.³ It leads to progressive bone loss, formation of periodontal pockets, and eventual loss of osseointegration.⁴ Epidemiological data suggest that the mean implant-based and subject-based prevalence of peri-implant mucositis are 29.48% and 46.83%, respectively, while the mean implant-based and subject-based prevalence of peri-implantitis are 9.25% and 19.83%, respectively.⁵

Both these conditions are precipitated by a condition that is primarily associated with plaque accumulation, which acts as a key etiological factor. However, timely intervention through meticulous oral hygiene can effectively reverse the inflammatory changes, restoring both clinical signs and biochemical markers in the peri-implant crevicular fluid to normal levels. Interestingly, even when plaque levels around implants are lower than those around natural teeth, implants often display a higher prevalence of inflammation and increased bleeding sites, highlighting their unique tissue response.⁶

CLASSIFICATION

A. As per the World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions (2018), the diagnosis of peri-implant mucositis and implantitis is based on the following criteria.⁶

PERI-IMPLANT MUCOSITIS

Presence of peri-implant inflammatory signs, including redness, swelling, and bleeding occurring within 30 seconds after probing, and Absence of any additional bone loss following the initial healing period

PERI-IMPLANTITIS

The diagnosis of peri-implantitis is established clinically when the following criteria are met; Presence of peri-implant inflammatory signs, Radiographic evidence of bone loss after the initial healing phase, and Increased probing depth compared to the measurements recorded after prosthetic placement. In situations where previous radiographs are not available, a radiographic bone level of ≥ 3 mm, in combination with bleeding on probing (BOP) and a probing depth (PD) of ≥ 6 mm, is considered diagnostic of peri-implantitis

B. Froum and Rosen 2012 classification. This classification of peri-implantitis was based on distinct clinical stages.⁷

Stage	Probing Depth (PD)	Clinical Signs	Radiographic Bone Loss
Early	≥ 4 mm	Bleeding and/or suppuration on probing	$< 25\%$ of implant length
Moderate	≥ 6 mm	Bleeding and/or suppuration on probing	25–50% of implant length
Advanced	≥ 8 mm	Bleeding and/or suppuration on probing	$> 50\%$ of implant length

C. Sarmiento et al (2016) classified peri-implantitis based on the etiology.⁸

Cause/Origin	Examples
Bacterial/Biofilm-Induced	Plaque, calculus, biofilm, or history of periodontitis
Exogenous Irritants	Residual cement, smoking, trapped food debris
Iatrogenic Factors	Improper implant placement, overheating during surgery, inadequate spacing, poor restorations
Extrinsic Pathology	Nearby periapical infection, carcinoma, or latent endodontic lesion
Lack of Keratinized Tissue (AKT)	Absence or deficiency of attached gingiva or keratinized tissue

D. Passi D et al (2016) classified peri-implantitis based on bleeding on probing, probing depth, percentage of bone loss, and mobility, also known as BMP classification.⁹

Stage	Bleeding on Probing	Probing Depth	Bone Loss (% of Implant Length)	Mobility	Treatment & Prognosis
Stage 1	Negative	2–3 mm	10–25%	None	Oral hygiene maintenance; good prognosis
Stage 2	Positive	4–6 mm	25–50%	Grade 1	Guided bone regeneration or osteoplasty; fair prognosis
Stage 3	Positive	6–8 mm	>50%	Grade 2	Bone regeneration or augmentation; questionable prognosis
Stage 4	Positive	>8 mm	>50%	Grade 3	Implant removal; poor prognosis

E. Rucha Shah *et al* 2016, Retrograde Peri-implantitis.¹⁰

Class	Severity	Extent of Lesion
Class I	Mild	< 25% of the implant length from the apex
Class II	Moderate	25–50% of the implant length from the apex
Class III	Advanced	> 50% of the implant length from the apex

F. Comprehensive compilation of all the major classifications of peri-implantitis based on defect morphology, bone loss, and clinical parameters.

Author / Year	Class / Stage	Basis of Classification	Description / Features	Suggested Management
Jovanovic (1995)¹¹	Class 1	Bone defect morphology	Slight horizontal bone loss with minimal peri-implant defects	—
	Class 2		Moderate horizontal bone loss with isolated vertical defects	—
	Class 3		Moderate–advanced horizontal bone loss with broad, circular bony defects	—
	Class 4		Advanced horizontal bone loss with broad, circumferential vertical defects and loss of oral/vestibular wall	—
Nishimura et al. (1997)¹²	Class 1–4	Bone defect morphology	Similar to Jovanovic; graded from minimal horizontal loss to severe circumferential vertical defects	—
Vanden Bogaerde (2004)¹³	Closed Defect	Regenerative potential	Surrounding bone walls intact; favorable for regeneration	Guided bone regeneration

Author / Year	Class / Stage	Basis of Classification	Description / Features	Suggested Management
	Open Defect		One or more bone walls missing; limited regenerative potential	Bone grafting or resection
Lang et al. (2004)¹⁴	Stage 0	Clinical & radiographic features	PD < 3 mm, no plaque or bleeding	No treatment
	Stage A		PD < 3 mm, plaque and/or bleeding	Mechanical cleaning and oral hygiene maintenance
	Stage B		PD 4–5 mm, no bone loss	Local anti-infective therapy (e.g., chlorhexidine)
	Stage C		PD > 5 mm, bone loss < 2 mm	Mechanical cleaning, microbiological testing, local & systemic antibiotics
	Stage D		PD > 5 mm, bone loss > 2 mm	Resective or regenerative surgery
Schwarz et al. (2019)¹⁵	Class I Defect	Bone configuration	Intraosseous (within bone) defect	Regenerative therapy
	Class II Defect		Supra-alveolar defect at crestal implant area	Surgical correction

DIAGNOSIS

Clinical and radiographic evaluation is essential for the diagnosis of peri-implant health and disease. Hence, a clinical and radiographic record should be obtained at the time of implant placement. This baseline data serves as a reference point for assessing any physiological or pathological changes in peri-implant tissues over time. In general, healthy peri-implant tissues exhibit no signs of inflammation, bleeding on probing (BOP), or an increase in probing depth (PD) compared with the initial examination. The diagnostic criteria for peri-implant health include: Absence of soft tissue inflammation (such as redness, swelling, or bleeding on probing) and no additional bone loss following the initial healing period. An increase in probing depth may be indicative of attachment loss and

supporting bone loss. Establishing an accurate diagnosis is crucial for designing an appropriate treatment plan, which ensures the effective management of peri-implant diseases.¹⁶

PREVENTION OF PERI-IMPLANTITIS

With the increasing occurrence of peri-implantitis an irreversible condition with limited and costly treatment options emphasizing preventive strategies has become crucial to lowering its incidence and improving implant success rates. In response, the European Federation of Periodontology (EFP) proposed several recommendations to manage key risk factors of peri-implant diseases throughout the implant treatment process. The foundation of these preventive strategies is a comprehensive, individualized risk assessment aimed at identifying and modifying both local and systemic risk factors that may contribute to disease development.¹⁷

Preventive measures should begin before implant placement (primordial prevention) by addressing underlying causes that may predispose individuals to disease. This includes promoting healthy lifestyle choices to prevent systemic conditions such as type II diabetes through smoking cessation, increased physical activity, and balanced nutrition. Following implant placement, primary prevention focuses on maintaining peri-implant tissue health and reducing potential triggers such as biofilm accumulation. This involves regular monitoring and patient education on effective oral hygiene practices. Furthermore, early identification and management of peri-implant mucositis are essential to prevent its progression to peri-implantitis, referred to as secondary prevention. At present, there is no direct evidence demonstrating the impact of primordial or primary preventive interventions on the development and progression of peri-implant diseases.¹⁸

However, a meta-analysis by Carra et al. reported limited evidence that maintaining good glycaemic control in diabetic patients and engaging in regular supportive periodontal or peri-implant maintenance care can help reduce the risk of peri-implantitis. Additionally, performing soft-tissue augmentation procedures in areas lacking sufficient keratinized mucosa may contribute to lowering peri-implant inflammation and marginal bone loss.¹⁹

MANAGEMENT

Although multiple treatment protocols are available for the management of peri-implant diseases, they often differ considerably and lack standardization, with no clear agreement on the most effective therapeutic approach. This inconsistency results in uncertainty when choosing the optimal

treatment strategy.²⁰ Therefore, this review seeks to outline the current treatment approaches, assess the existing evidence regarding their effectiveness, and specify the appropriate clinical indications for each method. Depending on the severity and clinical presentation, peri-implant disease management may involve nonsurgical therapy, surgical intervention, or, in severe cases, implant removal. (Table 1 & 2).

TABLE 1: NONSURGICAL MANAGEMENT OF PERI-IMPLANT DISEASES

Therapy / Method	Mechanism / Key Points	Advantages	Limitations / Evidence Summary
Mechanical Debridement (Curettes) ²¹	Removes biofilm/manual cleaning	Plastic/carbon-fiber avoids implant damage	Limited access to threads; steel contraindicated
Ultrasonic Devices (PEEK, carbon, Teflon tips) ²¹	High-frequency removal of deposits	Faster & more effective than manual scaling	Must use implant-safe tips; potential surface alteration if incorrect
Air-Powder Abrasion (Glycine, erythritol, HAP, NaHCO ₃) ²²	Abrasive powder removes biofilm	Effective & minimally invasive	Care needed to avoid soft-tissue trauma/air emphysema
Laser Therapy ²³	Surface decontamination via energy emission	Bactericidal effect; useful adjunct	Over-exposure may alter titanium; no conclusive evidence vs other methods
Photodynamic Therapy (PDT) ²⁴	Photosensitizer + light generates ROS to kill bacteria	Selective antibacterial effect; supportive healing	Limited & inconclusive evidence as sole or adjunct therapy
Chemical Agents (CHX, H ₂ O ₂ , citric acid, EDTA, NaOCl) ²⁵	Antimicrobial surface decontamination	Broad antimicrobial action	Possible surface alteration; minimal added clinical benefit over mechanical alone
Electrochemical Disinfection ²⁶	Low-voltage electrolysis disrupts biofilm	Promising novel technique	Limited clinical data; research ongoing

Surgical intervention is commonly indicated for peri-implantitis with moderate bone loss (25–50% of implant height), as nonsurgical methods, while conservative, are associated with high recurrence rates and rarely provide complete disease resolution. The objectives of surgical therapy are to decontaminate the implant surface, restore healthy hard and soft peri-implant tissues for easier maintenance, and, when feasible, regenerate infrabony defects. The main surgical approaches include open flap debridement (OFD), apically positioned flap (APF), and guided bone regeneration (GBR). The selection of the surgical technique depends on the bone defect morphology: resective therapy with APF (with or without implantoplasty) is recommended for horizontal or one-wall defects, regenerative therapy for vertical two- or three-wall defects, and a combination of approaches for defects exhibiting mixed configurations.^{27,28}

TABLE 2: SURGICAL MANAGEMENT OF PERI-IMPLANT DISEASES

Surgical Approach	Indications	Procedure Highlights	Clinical Outcomes / Evidence
Open-Flap Debridement (OFD) ²⁹	Moderate peri-implantitis; access for decontamination	Flap elevation → degranulation → implant surface decontamination → flap closure	PD reduction & BOP improvement; ~53% complete resolution with systemic antibiotics; possible soft-tissue recession (~1.8 mm after 5 yrs)
Resective Surgery + Apically Positioned Flap (APF) ³⁰	Horizontal/suprabony or 1-wall defects; non-esthetics areas	Flap elevation → tissue removal → osteoplasty → optional implantoplasty (thread removal & polishing)	Higher success in early defects (2–4 mm bone loss); implantoplasty ↑ success vs Resective alone (100% vs 87.5% survival at 3 yrs); reduces future bone loss
Guided Bone Regeneration (GBR) /	Vertical 2- or 3-wall defects; defects suitable for regeneration	Implant decontamination → graft placement	Potential PD & BOP reduction, bone defect fill; autograft gold standard but

Surgical Approach	Indications	Procedure Highlights	Clinical Outcomes / Evidence
Regenerative Surgery ³¹		(autogenous or substitutes) ± membrane → flap closure for regeneration	resorbs ~40%; titanium granules show highest defect fill (~3.6 mm) and PD reduction (~2.8 mm)
Combination Therapy (Resective + Regenerative) ³²	Mixed-defect morphology	Tailored approach combining APF + GBR based on defect pattern	Improves access, maintenance, and regeneration where indicated
Implant Removal ³³	Severe bone loss (>50%), implant fracture, anatomical risk, failed osseointegration	Atraumatic implant explantation	Final option: indicated when structure, defect severity, or infection prevents salvage

CONCLUSION

The prevalence of peri-implant diseases is steadily increasing, largely due to the growing use of dental implants. Clinicians are advised to adopt the definitions provided by the latest World Workshop to ensure clearer communication and more accurate diagnosis. Utilizing these definitions in epidemiological research will also allow for more precise estimates of peri-implant disease incidence. Effective management requires first identifying and minimizing risk factors, along with early diagnosis, patient engagement in maintenance programs, and regular clinical and radiographic follow-ups as needed. Since multiple treatment protocols exist for peri-implantitis, clinical success depends on thorough case evaluation.

References:

1. Berglundh, T.; Armitage, G.; Araujo, M.G.; Avila-Ortiz, G.; Blanco, J.; Camargo, P.M.; Chen, S.; Cochran, D.; Derks, J.; Figuero, E.; 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. Periodontol.* **2018**, 89, S313–S318.
2. Figuero E, Graziani F, Sanz I, Herrera D, Sanz M. Management of peri-implant mucositis and peri-implantitis. *Periodontology*. 2000;66(1):255–73
 3. Berglundh T, Persson L, Klinge B. A systematic review of the incidence of biological and technical complications in implant dentistry reported in prospective longitudinal studies of at least 5 years. *J Clin Periodontol.* 2002;p. 197–212.
 4. Zitzmann N.U., Berglundh T. Definition and prevalence of peri-implant diseases. *J. Clin. Periodontol.* 2008;35((Suppl. S8)):286–291. doi: 10.1111/j.1600-051X.2008.01274.x.]
 5. Lee C T, Huang Y W, Zhu L, Weltman R. Prevalences of peri-implantitis and peri-implant mucositis: systematic review and meta-analysis. *J Dent.* 2017;62:1–12. doi: 10.1016/j.jdent.2017.04.011
 6. Renvert, S.; Persson, G.R.; Pirih, F.Q.; Camargo, P.M. Peri-Implant Health, Peri-Implant Mucositis, and Peri-Implantitis: Case Definitions and Diagnostic Considerations. *J. Clin. Periodontol.* **2018**, 45, S278–S285
 7. Stuart F, Paul F. A proposed classification for peri-implantitis. *Int J Periodontics Restorative Dent.* 2012;32:533–40.
 8. Fiorellini JP. A classification system for peri-implant diseases and conditions. *Int J Periodontics Restorative Dent.* 2016;36(5):699–705
 9. PassiD, SinghM, DuttaSR, SharmaS, AtriM, AhlawatJ, et al. Newer proposed classification of periimplant defects: A critical update. *J Oral Biol Craniofac Res.* 2017;7(1):58–61.
 10. Shah R, Raison T, Kumar ABT, Dhoom SM. A radiographic classification of retrograde periimplantitis. *J Contemp Dent Pract.* 2016;17(4):313–21.
 11. Bowen Antolín A, Pascua García MT, Nasimi A. Infections in implantology: from prophylaxis to treatment. *Medicina Oral, Patología Oral y Cirugía Bucal (Internet).* 2007 Aug;12(4):323-30. [PubMed]
 12. Fu JH. and Wang HL. Breaking the wave of peri-implantitis. *Periodontol 2000.* 2020;84(1):145-60
 13. Vanden Bogaerde L. A proposal for the classification of bony defects adjacent to dental implants. *Int J Periodontics Restorative Dent.* 2004;24:264–71
 14. Lang NP, Berglundh T, Heitz-Mayfield LJ, Pjetursson BE, Salvi GE, Sanz M. Consensus statements and recommended clinical procedures regarding implant survival and complications. *Int J Oral Maxillofac Implants.* 2004;19(Suppl):150–4
 15. Schwarz, N. Sahm, J. Becker, Aktuelle Aspekte zur Therapie periimplantärer Entzündungen. *Quintessenz* 2008, 59:00.
 16. Schwarz F, Derks J, Monje A, Wang HL. Peri-implantitis. *J Clin Periodontol* 2018;45(Suppl 20) :S246–S266
 17. Jepsen, S.; Berglundh, T.; Genco, R.; Aass, A.M.; Demirel, K.; Derks, J.; Figuero, E.; Giovannoli, J.L.; Goldstein, M.; Lambert, F.; et al. Primary Prevention of Peri-Implantitis: Managing Peri-Implant Mucositis. *J. Clin. Periodontol.* 2015, 42, S152–S157. [CrossRef]
 18. Tonetti, M.S.; Chapple, I.L.C.; Jepsen, S.; Sanz, M. Primary and Secondary Prevention of Periodontal and Peri-Implant Diseases: Introduction to, and Objectives of the 11 th European Workshop on Periodontology Consensus Conference. *J. Clin. Periodontol.* 2015, 42, S1–S4. [CrossRef]

19. Carra, M. C., Blanc-Sylvestre, N., Courtet, A., & Bouchard, P. (2023). Primordial and primary prevention of peri-implant diseases: A systematic review and meta-analysis. *Journal of clinical periodontology*, 50 Suppl 26, 77–112. <https://doi.org/10.1111/jcpe.13790>
20. Sinjab, K.; Garaicoa-Pazmino, C.; Wang, H.-L. Decision Making for Management of Periimplant Diseases. *Implant Dent.* 2018, 27, 276–281. [CrossRef]
21. Schmidt, K.E.; Ausschill, T.M.; Heumann, C.; Frankenberger, R.; Eick, S.; Sculean, A.; Arweiler, N.B. Influence of Different Instrumentation Modalities on the Surface Characteristics and Biofilm Formation on Dental Implant Neck, In Vitro. *Clin. Oral Implant. Res.* 2017, 28, 483–490. [CrossRef]
22. Schwarz, F.; Becker, K.; Renvert, S. Efficacy of Air Polishing for the Non-Surgical Treatment of Peri-Implant Diseases: A Systematic Review. *J. Clin. Periodontol.* 2015, 42, 951–959. [CrossRef]
23. Pisano, M.; Amato, A.; Sammartino, P.; Iandolo, A.; Martina, S.; Caggiano, M. Laser Therapy in the Treatment of Peri-Implantitis: State-of-the-Art, Literature Review and Meta-Analysis. *Appl. Sci.* 2021, 11, 5290. [CrossRef]
24. Sivaramakrishnan, G.; Sridharan, K. Photodynamic Therapy for the Treatment of Peri-Implant Diseases: A Network Meta Analysis of Randomized Controlled Trials. *Photodiagn. Photodyn. Ther.* 2018, 21, 1–9. [CrossRef] [PubMed]
25. Garaicoa-Pazmino, C.; Sinjab, K.; Wang, H.-L. Current Protocols for the Treatment of Peri-Implantitis. *Curr. Oral Health Rep.* 2019, 6, 209–217. [CrossRef]
26. Koch, F.P.; Kaemmerer, P.W.; Biesterfeld, S.; Kunkel, M.; Wagner, W. Effectiveness of Autofluorescence to Identify Suspicious Oral Lesions—A Prospective, Blinded Clinical Trial. *Clin. Oral Investig.* 2011, 15, 975–982. [CrossRef]
27. Subramani, K.; Wismeijer, D. Decontamination of Titanium Implant Surface and Re-Osseointegration to Treat Peri-Implantitis: A Literature Review. *Int. J. Oral Maxillofac. Implant.* 2012, 27, 1043–1054.
28. Ramanauskaite, A.; Fretwurst, T.; Schwarz, F. Efficacy of Alternative or Adjunctive Measures to Conventional Non-Surgical and Surgical Treatment of Peri-Implant Mucositis and Peri-Implantitis: A Systematic Review and Meta-Analysis. *Int. J. Implant Dent.* 2021, 7, 112. [CrossRef]
29. Heitz-Mayfield, L.J.A.; Salvi, G.E.; Mombelli, A.; Faddy, M.; Lang, N.P.; On behalf of the Implant Complication Research Group Anti-Infective Surgical Therapy of Peri-Implantitis. A 12-Month Prospective Clinical Study. *Clin. Oral Implant. Res.* 2012, 23, 205–210. [CrossRef] [PubMed]
30. Carcuac, O.; Derks, J.; Abrahamsson, I.; Wennström, J.L.; Berglundh, T. Risk for Recurrence of Disease Following Surgical Therapy of Peri-Implantitis—A Prospective Longitudinal Study. *Clin. Oral Implant. Res.* 2020, 31, 1072–1077. [CrossRef] [PubMed]
31. Jepsen, K.; Jepsen, S.; Laine, M.L.; Anssari Moin, D.; Pilloni, A.; Zeza, B.; Sanz, M.; Ortiz-Vigon, A.; Roos-Jansåker, A.M.; Renvert, S. Reconstruction of Peri-Implant Osseous Defects: A Multicenter Randomized Trial. *J. Dent. Res.* 2016, 95, 58–66. [CrossRef]
32. Aghazadeh, A.; Persson, R.G.; Renvert, S. Impact of Bone Defect Morphology on the Outcome of Reconstructive Treatment of Peri-Implantitis. *Int. J. Implant Dent.* 2020, 6, 33. [CrossRef]
33. Schwarz, F.; Ramanauskaite, A. It Is All about Peri-implant Tissue Health. *Periodontol.* 2000 2022, 88, 9–12. [CrossRef]