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Contemporary Soft Tissue Management of Peri-Implantitis: Current Concepts for Long-Term Implant Care

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Abstract

Peri-implantitis is a biofilm-associated inflammatory disease characterized by progressive loss of supporting bone and late implant failure. Soft-tissue dimensions and prosthetic cleansability are relevant to tissue stability and maintainability, but increasing keratinized mucosal width or thickness has not been consistently shown to independently reduce the recurrence of peri-implantitis. This narrative review discusses peri-implant soft tissue biology, augmentation, prosthetic contours, and maintenance. Literature was selected purposively, with targeted supplementary literature checks. The selection was not exhaustive; the original search log was incomplete, and the certainty of the evidence was not formally assessed. Much of the augmentation evidence concerns healthy or newly placed implants rather than implants with established peri-implantitis.

Connective tissue grafts, free gingival grafts, and collagen matrices address different tissue deficiencies. Selection depends on implant position, tissue support, patient preferences, and hygiene access. Augmentation is an adjunct to disease control, implant-surface and osseous-defect management, prosthetic correction, and supportive care. Improved tissue dimensions should not be interpreted as evidence of improved peri-implantitis resolution or implant survival; the independent long-term benefit of augmentation remains uncertain.

Categories: Dentistry
Keywords: connective tissue graft, dental implants, keratinized mucosa, peri-implantitis, peri-implant soft tissue, soft tissue augmentation

Introduction And Background

Dental implants are widely used to replace missing teeth, but favorable survival does not eliminate the risk of biologic complications. Peri-implantitis remains a major cause of progressive bone loss and late implant failure, highlighting the need to assess both the supporting bone and surrounding soft tissues [1,2,3,4,5]. Peri-implantitis is a biofilm-associated inflammatory disease characterized by peri-implant mucosal inflammation, bleeding and/or suppuration on gentle probing, and progressive supporting bone loss beyond initial remodeling. Peri-implant mucositis involves inflammation without additional supporting bone loss and is generally reversible with effective plaque control and biofilm management. Early peri-implantitis management frequently includes oral-hygiene instruction, risk-factor assessment, correction of plaque-retentive factors, and non-surgical instrumentation. Surgery is considered when adequate resolution is not achieved or when defect characteristics and access requirements support surgical treatment [1,3,4,5,6].

Historically, treatment has focused on implant surface decontamination and reconstruction of lost bone. These approaches remain important, but the soft tissue environment and accessibility for plaque control also require attention. Figure *1* illustrates the distinction between healthy peri-implant tissues and peri-implantitis [1,2,3,4,5].

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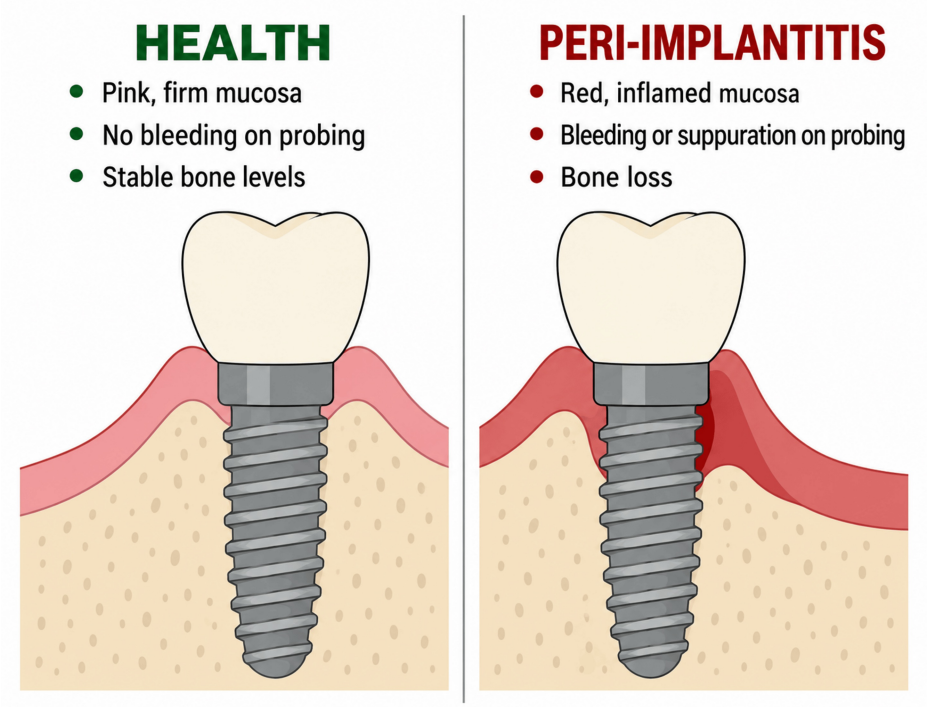


FIGURE 1: Conceptual illustration comparing a platform-switched implant with tissue-supporting abutment contours and a diseased site with a pocket and supporting bone loss*

*[1,4,6]

Biofilm and possible calculus deposits are shown as plaque-retentive factors, not necessary or exclusive causes of disease

The illustration was created with Adobe Photoshop (Adobe Inc., Mountain View, CA) and Microsoft Paint (Microsoft, Redmond, WA) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI, San Francisco, CA)

The Osteology Foundation consensus and systematic review support the assessment and management of peri-implant conditions [7,8]. The EFP S3 guideline also emphasizes plaque biofilm control, management of risk factors, stepwise therapy, and supportive care [6]. The 2025 AO/AAP consensus similarly integrates patient, implant, prosthetic, and soft-tissue considerations into prevention and management [9]. These sources support individualized planning; they do not establish that augmentation alone resolves established peri-implantitis.

For the treating dentist, the goal is to establish a site the patient can keep clean, and the clinician can maintain. Soft-tissue needs should be assessed from the planning stage. Augmentation may be considered when a deficiency causes brushing discomfort, limits cleaning, compromises contour, or creates an esthetic concern. The approach should reflect the patient's systemic condition, preferences, tolerance of donor-site surgery, and local anatomy, alongside infection control and correction of plaque-retentive factors [8,6,9].

This article reviews peri-implant soft-tissue biology and clinically relevant management options while distinguishing tissue augmentation outcomes around healthy or newly placed implants from direct evidence supporting its use in established peri-implantitis. The recommendations represent an ungraded narrative clinical synthesis rather than proof of improved treatment predictability.

Review

Review type and literature selection

This article was a narrative review rather than a systematic review or meta-analysis. The original bibliography was selected purposively by the authors for relevance. The source manuscript documented targeted checks of PubMed and journal sources on October 2, 2026, but a complete original search strategy, publication-date limits, and screening log were not retained. The supplementary checks described below did not reconstruct a reproducible systematic search. On October 8, 2026, supplementary web searches

restricted to PubMed-indexed records were performed using the following exact queries: [1] site: pubmed.ncbi.nlm.nih.gov (https://pubmed.ncbi.nlm.nih.gov) peri-implantitis "soft tissue" augmentation systematic review; [2] site: pubmed.ncbi.nlm.nih.gov (https://pubmed.ncbi.nlm.nih.gov) dental implants keratinized mucosa connective tissue graft collagen matrix systematic review; and [3] site: pubmed.ncbi.nlm.nih.gov (https://pubmed.ncbi.nlm.nih.gov) peri-implant soft tissue dehiscence coronally advanced flap guideline.

These searches used a web search interface to retrieve PubMed records, rather than the native PubMed advanced-search interface. No additional database, such as Embase, Scopus, Web of Science, or the Cochrane Library, was searched during this supplementary check. The key concepts were peri-implantitis, soft tissue augmentation, keratinized mucosa, connective tissue grafts, collagen matrices, peri-implant soft tissue dehiscence, and coronally advanced flaps. This was a targeted web-based literature check, not a native PubMed database search. The retained record did not document why this interface was chosen. Search-engine indexing and ranking may have affected retrieval, and completeness could not be assured.

No lower publication-date limit or language filter was applied to the supplementary searches; records available on the search date were considered. For the narrative synthesis, eligible sources addressed peri-implant soft tissue biology, diagnosis, augmentation, graft substitutes, prosthetic cleansability, or supportive care. Consensus statements, clinical guidelines, systematic reviews, and comparative human clinical studies were prioritized. Foundational experimental histologic studies were retained to explain the tissue seal, with their experimental origin distinguished from clinical evidence. Sources unrelated to these topics, promotional material without clinical evidence, and duplicate records were not used to support the synthesis. Studies involving healthy or newly placed implants were considered for tissue management but were not treated as direct evidence of disease resolution in established peri-implantitis.

The supplementary records were assessed for topical relevance from their titles, available abstracts, and PubMed record information, and compared with the existing reference list. This check supported the relevance of the already-cited literature; it did not constitute an exhaustive full-text update or lead to a new pooled analysis. Literature was organized by clinical topic and interpreted according to implant health status, augmentation indication, tissue outcome, and follow-up where reported. Selection was purposive rather than exhaustive; independent duplicate screening, a registered protocol, formal risk-of-bias assessment, and quantitative pooling were not performed. The tables and illustrations summarize cited sources and do not contain new patient data. data. Evidence certainty was not formally assessed, and no predefined grading framework was applied [9,10,11].

Biology of the peri-implant soft tissue seal

Unlike natural teeth, implants lack a periodontal ligament and connective tissue fibers that insert into cementum. Around an implant, these fibers generally run parallel or circumferential to the surface. This difference helps explain why the peri-implant tissue seal must be considered when planning treatment [12,13,14]. The peri-implant mucosal seal includes an epithelial attachment and an underlying connective tissue zone. Experimental histologic studies describe differences in tissue organization and vascular supply between teeth and implants [12,13,14]. Figure *2* illustrates these compartments; connective tissue fibers do not insert into titanium.

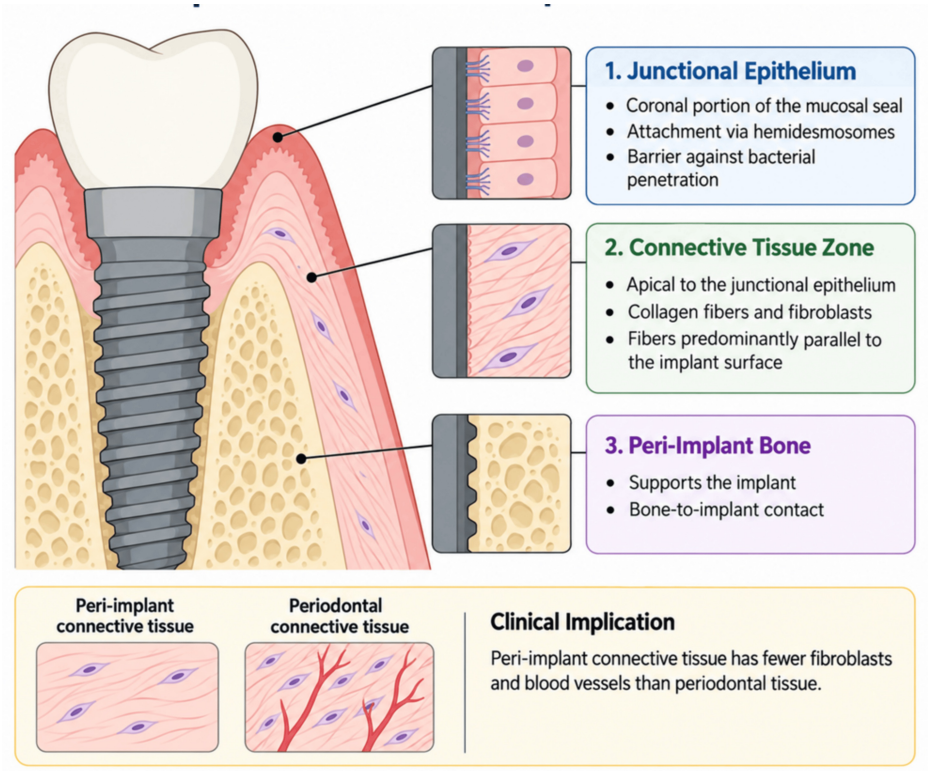


FIGURE 2: Conceptual illustration of a platform-switched implant, abutment, adjacent bone, and epithelial and connective-tissue compartments*

*[12,13,14]

Fibers are organized around the abutment and do not insert into titanium. The illustration is not a histologic section, and dimensions are not to scale

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

The mucosal seal does not make an implant resistant to persistent biofilm-associated inflammation. Peri-implantitis can involve a substantial inflammatory lesion and progressive supporting bone loss [4]. Three-dimensional implant position, available bone and mucosal support, and abutment and restoration contours influence the space available for tissues and hygiene access. These factors should be assessed together with plaque control [6,9,11].

Soft tissue phenotype

Keratinized mucosal width is the distance from the mucosal margin to the mucogingival junction; mucosal thickness is the buccolingual dimension of the tissue at a specified measurement site. These dimensions should be recorded separately because adequate width does not imply adequate thickness, or vice versa. Neither limited width nor a thin phenotype is itself a diagnostic criterion for peri-implantitis [1,5,15,16]. A narrow band of keratinized mucosa has been associated with plaque accumulation, bleeding, recession, and brushing discomfort; these associations do not establish an independent causal effect on peri-implant disease. Health can be maintained where plaque control and supportive care are effective. Grafting should follow an identified clinical problem rather than tissue width alone [15,17,18].

Thin mucosa may be associated with recession, titanium show-through, and esthetic concerns. Augmentation can improve tissue dimensions and contour in selected settings; these outcomes do not demonstrate prevention or resolution of peri-implantitis [8,16]. Figure *3* presents a conceptual schematic of tissue dimensions and the transmucosal emergence profile. The esthetic biological contour concept distinguishes esthetic (E), bounded (B), and crestal (C) zones; it is a restorative planning concept rather than a validated peri-implantitis treatment algorithm [11].

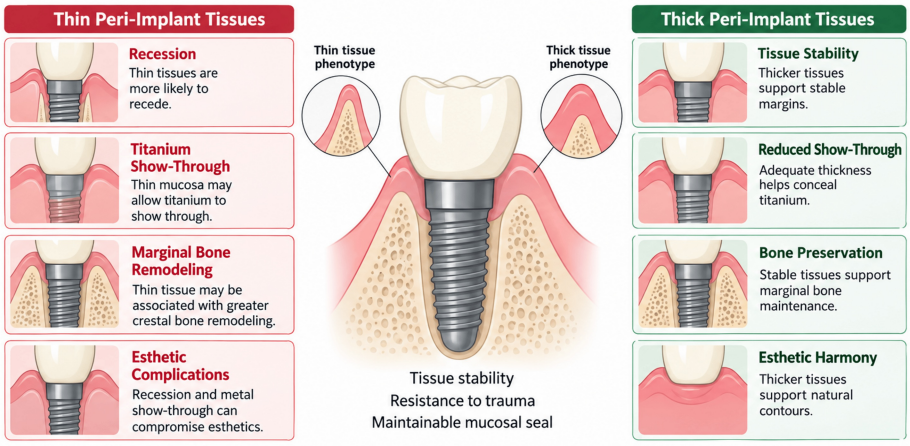


FIGURE 3: Conceptual illustration distinguishing mucosal width and thickness and the esthetic, bounded, and crestal emergence-profile zones*

*[8,15,16,11]

Tissue dimensions and contours are planning considerations, not deterministic predictors of bone preservation, recession, or disease prevention

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Clinical assessment of peri-implant soft tissues

Successful treatment begins with a comprehensive evaluation of the peri-implant soft tissues rather than focusing solely on radiographic bone loss. Clinical examination should document bleeding or suppuration on gentle probing, probing depths, plaque accumulation, and tissue color and consistency. Keratinized mucosal width, mucosal thickness, recession, vestibular depth, emergence profile, and access for oral hygiene should also be assessed. Findings should be compared with prior probing records and radiographs whenever available [1,5,15]. The examination should bring together the inflammatory findings, tissue dimensions, and access for cleaning. These findings guide the treatment plan shown in Figure *4*.

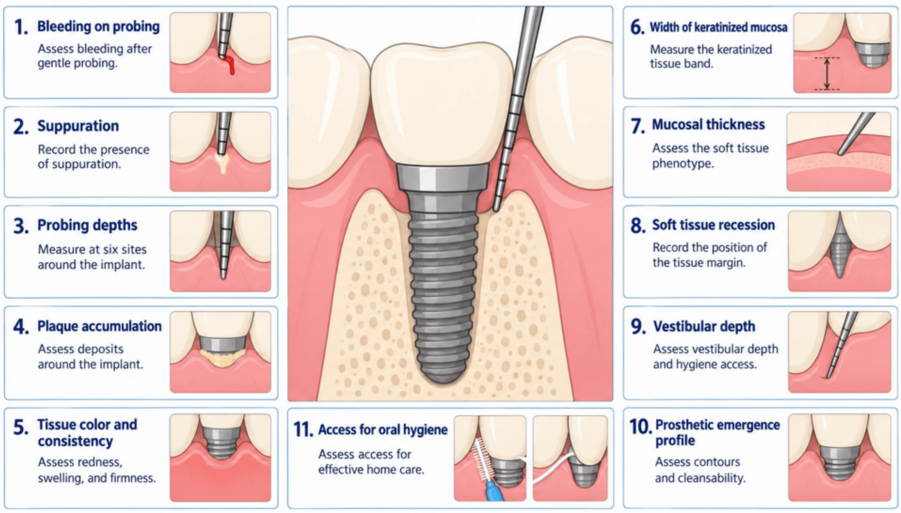


FIGURE 4: Key clinical parameters evaluated during examination of the peri-implant soft tissues*

*[1,5,15]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Bleeding on gentle probing indicates inflammation but does not, by itself, establish peri-implantitis. Increasing probing depth and radiographic bone loss, interpreted alongside baseline records and clinical findings, are needed to distinguish mucositis from peri-implantitis [1,2,3,4,5]. Equally important is evaluation of prosthetic design. Bulky emergence profiles, excessive convexity, deep margins, and restricted embrasures may impair plaque removal. Observational findings associate certain emergence profiles with peri-implantitis, but do not establish that all contour features are equivalent causes of inflammation [10]. Prosthetic modification should be considered where it can improve access and maintainability, coordinated with disease treatment [6,9,11]. Table *1* summarizes the assessment.

Parameter	Clinical significance
Bleeding on probing	Evidence of inflammation; alone does not diagnose peri-implantitis
Suppuration	Inflammatory finding requiring assessment
Keratinized mucosal width	Cleaning comfort and access
Mucosal thickness	Tissue volume, contour, and esthetic assessment
Recession	Tissue margin change and implant exposure
Emergence profile	Plaque retention and cleansability
Vestibular depth	Access for oral hygiene
Plaque	Microbial challenge and hygiene assessment
Probing depth	Interpret alongside baseline records and inflammation
Radiographic bone level	Assess bone loss alongside clinical findings and prior images

TABLE 1: Clinical assessment of peri-implant soft tissues*

*[1,2,3,4,5,15]

Soft tissue treatment planning and surgical management

Eliminating inflammation and treating the bone defect are important, but the result must also be maintainable. When thin tissues, inadequate keratinized mucosa, or restricted cleaning access remain, these deficiencies should be considered during treatment planning [1,2,3,4,5]. Thin tissues, recession, a shallow vestibule, limited keratinized mucosa, and unfavorable prosthetic contours often occur together. The treatment plan should address how each affects plaque control and tissue stability. Figure *5* illustrates the relationship between infection control, hard and soft tissue treatment, the restoration, and maintenance.

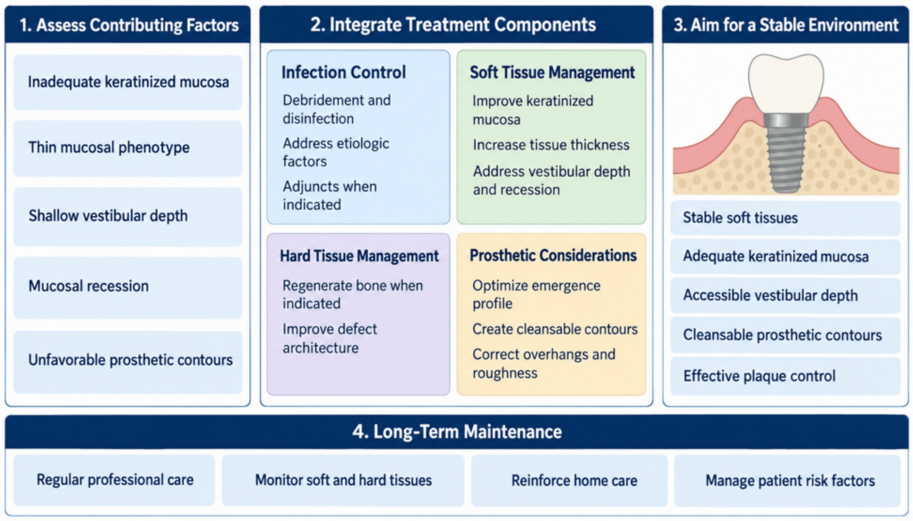


FIGURE 5: Comprehensive treatment planning integrating infection control, hard-and soft-tissue management, prosthetic considerations, and long-term maintenance*

*[4,6,9]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Plaque control, periodontal history, smoking, glycemic status, and attendance for maintenance should be assessed before surgery. Other factors that should be taken into account before surgery would be the patient's systemic condition, use of medications such as antihypertensives, oral anticoagulants, corticosteroids, proton pump inhibitors, antidepressants, antiresorptives, or bisphosphonates. Their supporting evidence and effects on outcomes are not equivalent; systemic and behavioral findings require individualized interpretation [4,6,9]. The medical and medication history should include antihypertensives, anticoagulants, corticosteroids, proton pump inhibitors, antidepressants, and antiresorptives, including bisphosphonates. These medications are relevant to bleeding, healing, tissue changes, or surgical planning according to the agent and patient; they should not be presented as equally established causes of peri-implantitis. Coordination with the treating physician may be appropriate [6,9]. Occlusal and mechanical concerns also warrant assessment, although excessive loading is not established as an independent cause of biofilm-associated peri-implantitis [4].

Surgical objectives

Surgery aims to control inflammation, provide access for implant surface decontamination, reduce residual pockets, and establish tissues that permit effective cleaning. When indicated, increasing mucosal thickness or keratinized tissue width can address deficiencies that compromise tissue stability or patient comfort. Several procedures may be combined, but selection should follow the needs of the individual site [4,8,15,16].

Flap design

Flap design influences both surgical access and postoperative management. Incisions should account for the vascular supply, defect architecture, available tissue, and support required for flap and graft stabilization during closure [6,9]. Where feasible, incisions should preserve blood supply while providing access appropriate to debridement, reconstruction, or resective objectives. The plan must reflect implant position, defect morphology, esthetic demands, and tissue availability [6,9].

Midcrestal incisions, with releasing incisions only where needed, are options rather than universal recommendations. Incision placement and extension should reflect the required access, vascular

preservation, and closure objective. Sulcular involvement should be limited to the access needed [6,9]. Full-thickness elevation may be appropriate for implant-surface and osseous access, while split- or partial-thickness components may be needed for advancement or mucogingival augmentation. Following debridement, flap mobility, vascularity, and stabilization must be reassessed. Excessive tension may compromise closure or expose a graft. Figure *6* provides a conceptual example, not a universal flap prescription [6,19,9].

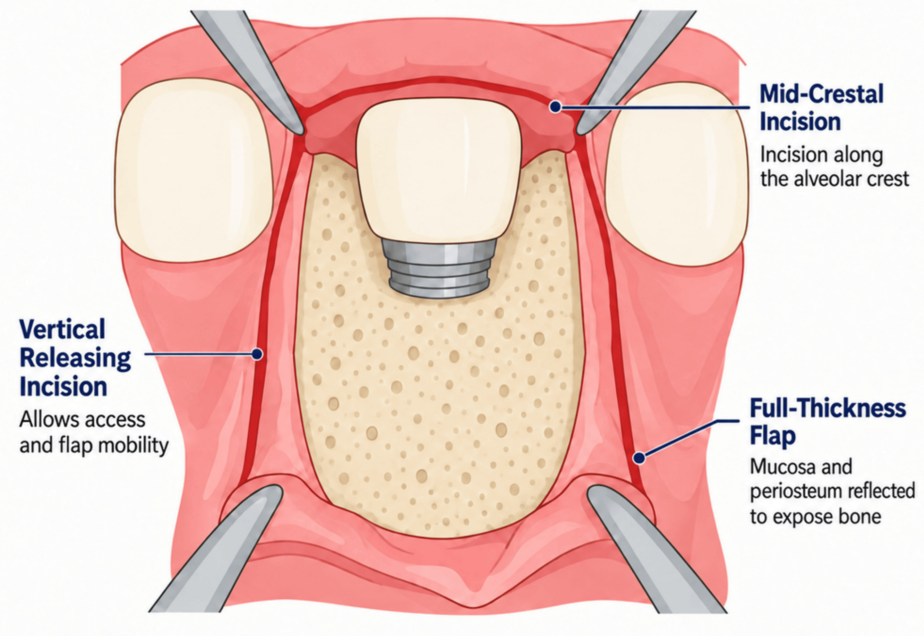


FIGURE 6: Conceptual illustration of a full-thickness flap design providing surgical access while preserving vascularity and tissue for stable closure*

*[6,19,9]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

When coronal advancement is needed, partial-thickness dissection may help the flap adapt without tension. The flap must provide adequate mobility and vascular support while allowing stable closure. Peri-implant dehiscence procedures require modifications suited to the implant and surrounding tissues [19].

Implant surface decontamination

Implant-surface decontamination remains part of peri-implantitis treatment. Implant-compatible instruments, brushes, and air-abrasive devices may be selected according to access, implant-surface characteristics, and potential for surface alteration. Comparative evidence has not established a universally superior method; selection should follow the clinical setting and current guidance [4,6,9]. Figure *7* summarizes approaches rather than a required sequence.

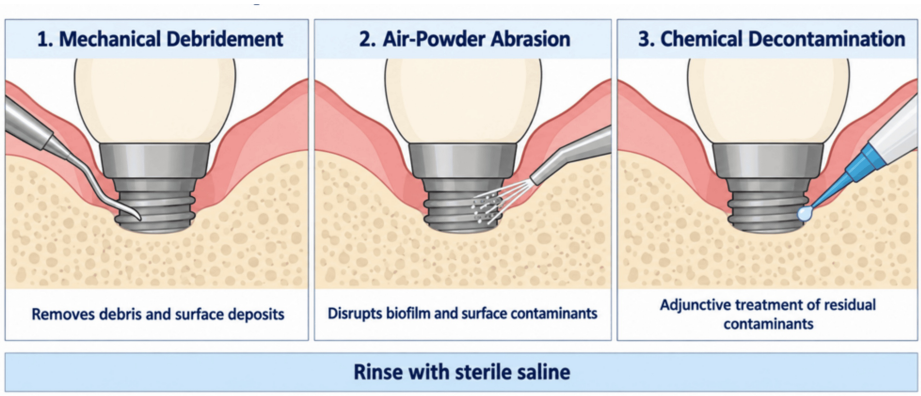


FIGURE 7: Conceptual illustration of mechanical, air-abrasive, and chemical approaches used for implant surface decontamination*

*[4,6,9]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Laser and photodynamic approaches should not be assumed to confer additional clinical benefit or to replace thorough debridement. Their use requires consideration of intervention-specific evidence and guideline recommendations [6,9].

Keratinized mucosa

The need for keratinized mucosa depends partly on the ability to maintain plaque control. Widths below approximately 2 mm have been associated with less favorable clinical parameters in some studies, but this is not a universal diagnostic threshold or an automatic indication for grafting [15,17,18]. Augmentation may be considered when inadequate keratinized mucosa compromises comfort or effective hygiene [20,21,22]. The aim is correction of a tissue or access deficiency. Increasing width is not an independent treatment for the underlying biofilm-associated disease, and an improvement in tissue dimensions does not establish reduced peri-implantitis recurrence.

Connective tissue grafts

Connective tissue grafting is commonly used to increase mucosal thickness and improve contour. Palatal harvesting provides autogenous tissue but adds a second surgical site and postoperative discomfort. Much of the supporting evidence concerns implant placement, second-stage procedures, or dehiscence coverage at otherwise healthy implants; applicability to established peri-implantitis is indirect [16,23,24]. Connective tissue grafts are useful when a thin phenotype, facial volume deficiency, recession, or esthetic concern requires correction. When grafting is combined with regenerative surgery, the graft should address an identified tissue deficiency and be positioned where it can receive vascular support.

Much of the augmentation literature concerns healthy or newly placed implants. Increased thickness or keratinized tissue in those settings cannot automatically be extrapolated to improved disease resolution, reduced recurrence, or implant retention in established peri-implantitis [8,16,24]. A graft requires stabilization and a vascularized recipient environment. Figure *8* presents a schematic of connective tissue grafting with adapted coronal advancement for selected soft-tissue deficiencies [16,19].

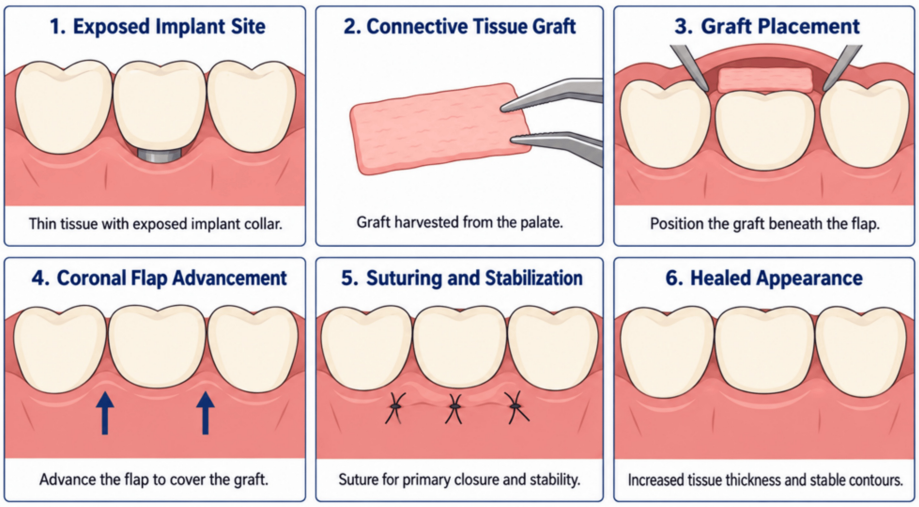


FIGURE 8: Conceptual schematic of connective tissue graft positioned beneath a coronally advanced flap to increase peri-implant tissue thickness and support vascularity*

*[16,19]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Free gingival grafts

Unlike connective tissue grafts, free gingival grafts are primarily indicated to increase the width of keratinized mucosa rather than tissue thickness. These grafts are especially useful when patients experience discomfort during brushing because of movable alveolar mucosa or when vestibular depth limits effective plaque control. Free gingival grafts can increase keratinized mucosal width, although color or texture mismatch may limit their esthetic acceptance. Studies have reported improvements in selected hygiene, bleeding, and patient-comfort outcomes; the magnitude and consistency vary. Much of this evidence concerns inadequate keratinized mucosa around functioning implants without active peri-implantitis and does not establish disease resolution or prevention of recurrence [15,17,18,16,21,25]. Figure *9* illustrates the tissue-width objective.

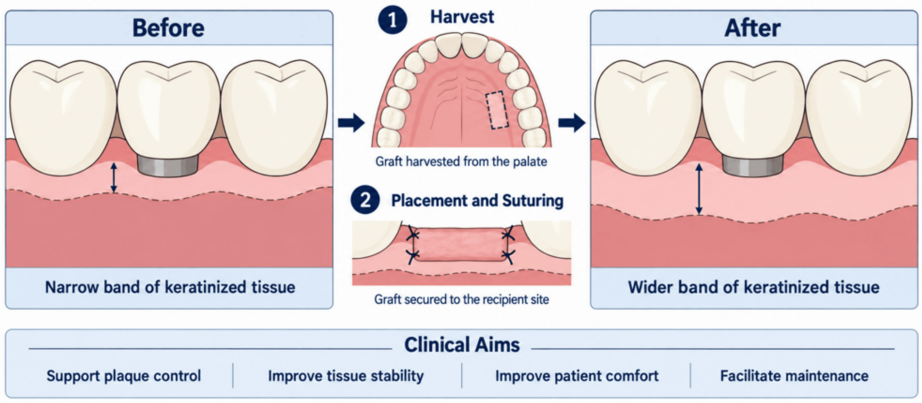


FIGURE 9: Conceptual schematic of free gingival graft augmentation to increase the width of keratinized mucosa and improve peri-implant tissue stability*

*[15,21,25]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Collagen matrices

Collagen matrices offer an alternative when avoiding palatal harvesting is important. They can increase keratinized mucosa or tissue volume, although the amount gained varies with the material, indication, and surgical technique [22,25,26]. Comparative reviews report differences in tissue gain and stability between collagen matrices and autogenous grafts [27,28,29]. These differences should be discussed when a patient wishes to avoid a donor site. Maintenance must also be considered when evaluating the result [30]. Table *2* summarizes the principal treatment options. Comparisons of acellular dermal matrix and connective tissue grafts at immediate implant placement provide additional information, but involve a different clinical setting from established peri-implantitis [31].

Clinical situation	Procedure to consider	Evidence and qualification
Thin phenotype or volume deficiency	Consider connective tissue graft	Primarily healthy/new implant augmentation; tissue endpoint [16,23,24]
Selected facial dehiscence	Consider graft and modified coronally advanced flap	Selected dehiscence evidence; implant position, papillae, interproximal support, contour, and exposure determine feasibility [19]
Insufficient keratinized mucosa with discomfort	Consider free gingival graft	Functioning implant augmentation; width and comfort outcomes, not proof of peri-implantitis resolution [15,21,25]
Shallow vestibule impairing hygiene	Consider vestibular management with augmentation	Individualized access objective; not independent disease therapy [15,25]
Multiple implants requiring augmentation	Consider connective tissue graft or appropriate collagen matrix	Choice depends on required tissue gain and recipient conditions [16,27,28,29]
Patient wishes to avoid donor site	Consider appropriate tissue substitute	Comparative tissue gain and stability vary [25,27,28,29]
Esthetic site with volume deficiency	Consider connective tissue graft	Predominantly healthy implant/placement evidence [16,24]
Posterior site with limited keratinized tissue	Consider free gingival graft or appropriate collagen matrix if clinically indicated	Dimension/comfort objective; width alone is not an indication [15,25,26,27]

TABLE 2: Selection of soft tissue augmentation procedures*

*[15,16,19,21,23,24,25,26,27,28,29]

Soft tissue augmentation combined with regenerative peri-implant surgery

Peri-implantitis may require management of the osseous defect and surrounding soft tissues. Augmentation is an adjunct for an identified tissue deficiency, not a substitute for biofilm control, implant-surface management, appropriate defect treatment, prosthetic correction, or supportive care [4,6,9].

Combined hard and soft tissue therapy

After flap elevation and decontamination, the defect is assessed with implant position, surface characteristics, esthetic demands, cleansability, and patient factors. Contained intrabony configurations may favor reconstruction, but morphology alone does not determine treatment. Access, resective, reconstructive, or combined approaches should be selected according to the whole clinical situation [6,9]. After the defect has been treated and managed, the flap should adapt without excessive tension. A connective tissue graft may be considered for a defined thickness or contour deficiency if it can be stabilized in a vascularized recipient environment [8,16]. This indication is distinct from treatment of the inflammatory lesion or bone defect; an independent benefit for peri-implantitis resolution is unproven. Figure *10* presents the planning principles without prescribing donor-site harvesting or suturing.

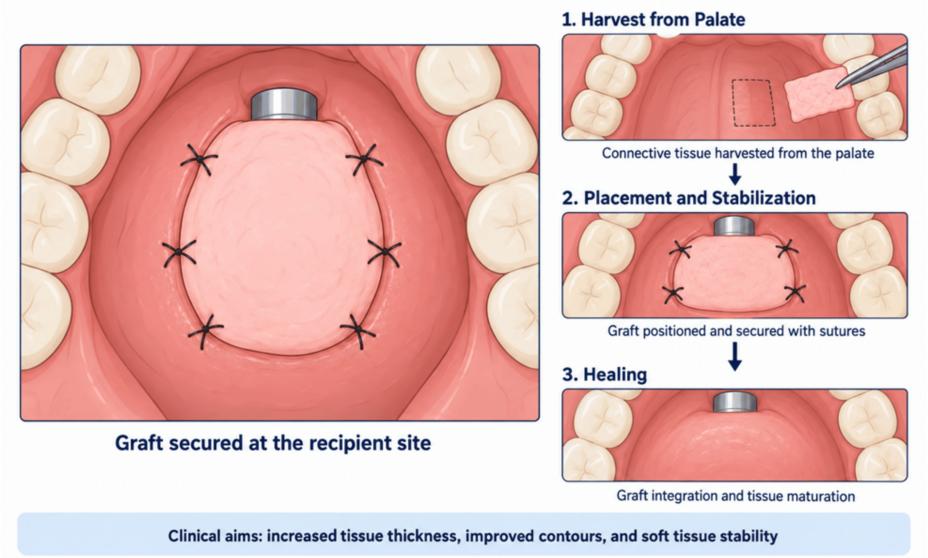


FIGURE 10: Conceptual planning schematic for adjunctive soft-tissue augmentation in peri-implantitis care*

*[8,6,16,9]

It separates disease control from correction of a tissue deficiency and does not depict donor-site harvesting, a suturing protocol, or a demonstrated improvement in regeneration, disease resolution, or implant survival

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

The available studies cover different implant settings and grafting indications [8,16,23,24,29]. They support using augmentation to improve tissue dimensions, but do not show that adding a connective tissue graft consistently improves peri-implantitis resolution or implant survival. The timing of augmentation should follow the tissue conditions and overall treatment plan [32].

Coronally advanced flaps

Coronally advanced flaps with connective tissue grafts are supported primarily for selected peri-implant soft-tissue dehiscences or recession. This evidence should be distinguished from evidence for active peri-implantitis treatment. In disease management, coronal advancement may be used to facilitate closure where appropriate, but does not independently establish disease resolution [6,19]. Coronal advancement allows the flap to cover the augmented site with less tension. The amount of advancement depends on the defect and available tissue. Figure *11* illustrates this movement. Advancement alone does not necessarily increase keratinized mucosal width [19].

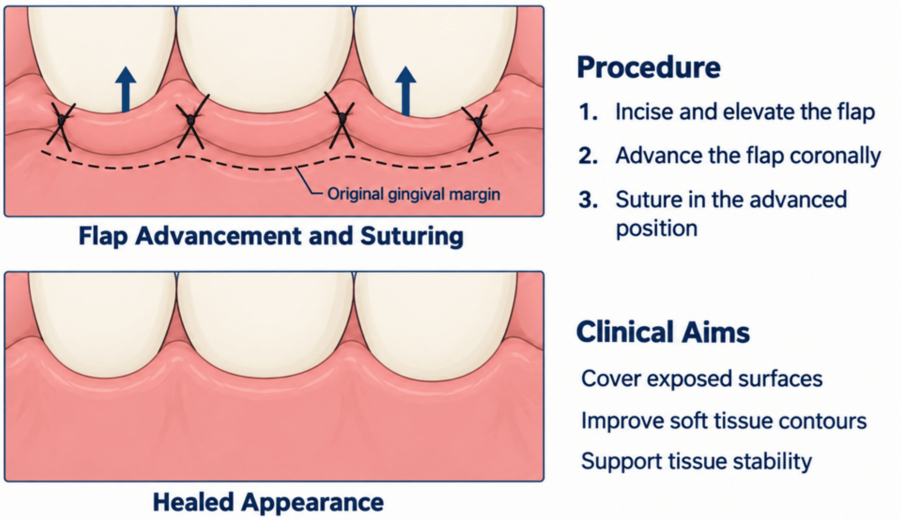


FIGURE 11: Conceptual schematic of coronal advancement for selected peri-implant dehiscence cases, without a prescribed suturing pattern*

*[19]

Complete implant-surface coverage is not predictable in all cases and depends on implant position, interproximal support, prosthetic anatomy, phenotype, and defect characteristics

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Coverage of exposed implant surfaces may be possible in selected dehiscence cases, but results depend on anatomy, prosthetic management, and tissue support [19].

Management of peri-implant recession

Facial recession around an implant requires evaluation of implant position, prosthetic contours, interproximal support, and tissue dimensions. Coverage is technically different from root coverage around natural teeth because the anatomy and tissue attachment differ [19]. Treatment should aim to improve tissue thickness, contour, color, and cleaning access while reducing recession where feasible. Expectations should reflect the remaining tissue support and the extent of implant exposure.

A modified coronally advanced flap with a connective tissue graft may be considered for selected peri-implant dehiscences. Feasibility and expected coverage depend on three-dimensional implant position, interproximal bone and papillary support, mucosal phenotype, prosthetic contour, and the extent and configuration of exposure. Active inflammation should be assessed and managed separately [19]. Complete coverage of the exposed implant surface should not be expected in every case, particularly with unfavorable implant position or substantial interproximal bone and soft-tissue loss [19].

Prosthetic contour modification

Soft-tissue surgery should be coordinated with assessment of plaque-retentive prosthetic features; grafting alone may not overcome persistently restricted cleaning access [6,9,10]. Bulky emergence profiles, excessive cervical convexity, deep margins, and restricted embrasures may impair plaque removal. Residual cement is a distinct plaque-retentive finding that warrants evaluation; the evidence linking each prosthetic feature to disease differs. Observational contour associations should not be interpreted as proof of equal causal effects [6,9,10]. Modification may improve hygiene access where feasible (Figure *12*).

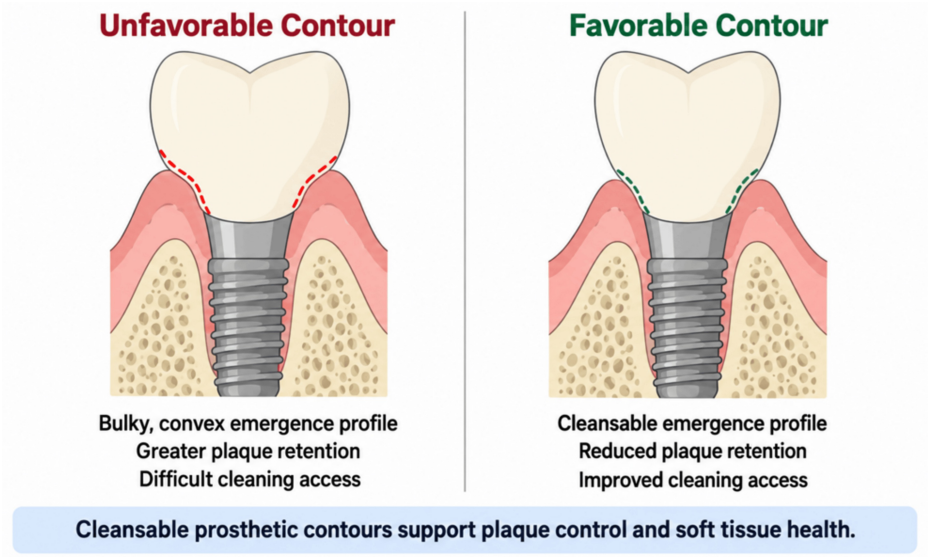


FIGURE 12: Conceptual comparison of unfavorable and favorable prosthetic contours and their potential influence on plaque control and peri-implant tissue health*

*[6,9,10,11]

The illustration was created with Adobe Photoshop (Adobe Inc.) and Microsoft Paint (Microsoft) and enhanced (sharpened and increased resolution) using ChatGPT (OpenAI)

Whenever peri-implant surgery is planned, the restoration should be critically evaluated. As a clinical consideration, temporary prosthesis removal may improve access for surgery or permit contour modification. Feasibility depends on restoration type, retrievability, implant position, and the planned intervention; removal is not required or beneficial in every case [6,9]. The restoration should permit access for hygiene devices, minimize plaque retention, and support the mucosal contour without excessive compression. Where removal or modification is feasible, the surgical and restorative plans should be coordinated [19]. This prosthetically driven approach recognizes that successful peri-implant therapy depends on both biologic and restorative principles.

Maintenance following soft tissue augmentation

Supportive care is essential for maintaining the result after treatment. Surgery should produce a site that the patient and clinician can keep clean. Recall intervals should be individualized according to disease history, previous disease, plaque control, systemic health, smoking, and tissue stability. No single interval applies to all treated peri-implantitis patients. Close review after treatment should be adjusted to findings and guideline-based risk assessment [6,9].

Maintenance visits should reassess plaque, bleeding, suppuration, probing depths, soft tissue stability, and restorative or occlusal concerns. Oral hygiene should be reinforced, with radiographic reassessment when clinical findings or monitoring needs indicate it. Professional debridement should use implant-compatible instruments while minimizing unnecessary surface alteration. Patients should understand the ongoing susceptibility to recurrence and need for long-term supportive care after treatment [6,9]. Table *3* presents conditional management considerations.

Finding	Management consideration
Healthy tissues	Supportive care and monitoring
Mucositis	Biofilm control and correction of plaque-retentive factors
Thin phenotype with clinical concern	Consider connective tissue graft for the identified deficiency
Limited keratinized tissue with hygiene difficulty	Consider free gingival graft for width or comfort
Thin phenotype with selected dehiscence	Consider graft and modified coronal advancement only where implant position, tissue support, contour, and defect anatomy are favorable
Potentially reconstructable peri-implant osseous defect	Consider reconstruction based on defect configuration, implant position/surface, cleansability, esthetics, and patient factors; add soft-tissue graft only for a separate indication
Poor restorative contours	Modify or replace restoration where feasible
Persistent inflammation	Reassess local/systemic factors, access, prognosis, and implant position; consider explantation if a maintainable result cannot be achieved

TABLE 3: Clinical decision framework for soft tissue management*

*[1,3,4,5,6,15,16,19,9]

Summary of reviewed evidence

The reviewed literature supports evaluating keratinized mucosa, tissue thickness, and cleaning access together. Limited keratinized tissue was associated with plaque, bleeding, brushing discomfort, and recession, but health could still be maintained where plaque control was effective [15,17,18,25]. Autogenous connective tissue grafts have generally demonstrated increases in mucosal thickness and improvements in contour in selected implant settings. Free gingival grafts primarily increase keratinized mucosal width; this endpoint does not establish prevention or resolution of peri-implantitis. Collagen matrices avoid donor-site surgery, but tissue gain and stability vary. Much of this evidence derives from healthy or newly placed implants [16,24,26,27,28,29,30].

For recession, grafting with an appropriately modified flap can improve tissue contour and coverage in selected cases, but complete coverage should not be assumed [19]. Across the reviewed literature, anatomy, prosthetic access, plaque control, and follow-up affect interpretation of treatment outcomes. Successful treatment requires attention to the entire implant site. The affected implant surface and osseous defect require appropriate management. Tissue deficiencies and restricted restorative access should be addressed according to an identified need, such as brushing discomfort, limited cleaning access, or insufficient tissue volume [8,6,15,16].

A tissue measurement alone should not determine treatment. A healthy, cleanable site may not need grafting. Mobile mucosa, brushing discomfort, or poor access may justify augmentation to manage a tissue or hygiene deficiency; this should not be described as proven preventive treatment against subsequent peri-implantitis [15,17,18]. The procedure should match the deficiency. Connective tissue grafts increase thickness, while free gingival grafts are used primarily to increase keratinized mucosal width. Collagen matrices are an option when avoiding a donor site is important, with the expected tissue gain explained to the patient [16,25,27,28,29]. Augmentation may be staged or combined with other treatment according to the tissue conditions and clinical priorities [32]. Selection depends on the therapeutic objective and site anatomy; these procedures are not interchangeable treatments for peri-implantitis itself.

Limitations

This narrative review is limited by purposive literature selection, an incomplete original search log, and supplementary searches confined to web-retrieved PubMed records. Relevant studies may have been missed, and selection and publication bias cannot be excluded. There was no independent duplicate screening, formal risk-of-bias assessment, or quantitative synthesis. Differences in patient characteristics, implant health status, graft materials, surgical techniques, outcome definitions, and follow-up restrict direct comparisons. Much of the augmentation evidence concerns healthy or newly placed implants; its application to established peri-implantitis is therefore indirect. Improved mucosal width, thickness, or contour should not be assumed to demonstrate better disease resolution or long-term implant retention. These constraints limit conclusions about comparative efficacy and the additional benefit of soft tissue

grafting during peri-implantitis treatment.

Conclusions

Peri-implantitis treatment requires infection and biofilm control, management of the affected implant surface and osseous defect, correction of plaque-retentive conditions, and continued supportive care. Implant position and abutment and restoration contours should allow adequate space for soft tissues and provide access for effective cleaning. If severe malposition prevents a maintainable result despite feasible restorative or surgical correction, explantation should be considered after an individualized assessment of the prognosis. Soft-tissue augmentation may address clinically relevant deficiencies affecting comfort, hygiene, contour, or esthetics; however, it should not be presented as a stand-alone treatment for peri-implantitis or as an intervention proven to improve disease resolution.

Connective tissue grafts, free gingival grafts, and collagen matrices are commonly used to address different soft-tissue objectives in selected implant-related clinical situations. Procedure selection should be guided by the deficiency, local anatomy, and patient preferences. Because this narrative review used purposive selection without formal evidence grading, and much of the augmentation evidence concerns healthy or newly placed implants, improvements in soft-tissue dimensions should not be interpreted as evidence of improved disease resolution or implant survival. The independent contribution of augmentation to long-term peri-implantitis resolution remains uncertain. Long-term care continues to require plaque control, maintainable prosthetic contours, risk-factor management, and individualized supportive care.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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