ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at:www.ijdsir.com

Volume – 8, Issue – 4, August – 2025, Page No. : 184 - 191

Post-Periodontal Surgery Complications: An Overview

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Citation of this Article: Dr. Grishmi Niswade, Dr. Kamlesh Singh, Dr. Rutuja Dani, Dr. Anup Pantawane, Dr. Sakshi Raut, "Post-Periodontal Surgery Complications: An Overview", IJDSIR- August – 2025, Volume – 8, Issue – 4, P. No. 184 – 191.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Periodontal surgery plays a critical role in the management of advanced periodontal disease, regenerative therapy, and aesthetic enhancement. While these procedures have been widely successful, they are not devoid of complications. This review article provides an in-depth analysis of the various complications associated with periodontal surgeries, including intraoperative and postoperative challenges. It highlights risk factors, classification, management strategies, and preventive measures, drawing from current literature and clinical experience.

Keywords: Complications, Periodontal Surgery, Flap, Regenerative, Aesthetic, Intraoperative, Postoperative

Introduction

Periodontal surgeries are integral to the management of moderate to advanced periodontal disease and to various aesthetic and functional dental requirements. These surgical interventions are aimed at halting the progression of periodontitis, restoring the architecture of lost periodontal tissues, and achieving optimal gingival

contour and aesthetics.[1] With the global burden of chronic periodontitis and gingival recession on the rise, surgical periodontal therapy remains a cornerstone of comprehensive dental care. These procedures have evolved significantly over the past few decades, with continual advances in surgical techniques, regenerative materials, biomimetics, and patient management protocols.[2] However, despite these advances, periodontal surgeries are not without potential complications. The success of such interventions depends not only on technical precision but also on appropriate case selection, patient cooperation, and post-operative care. Following surgery, any deviation from the expected course of normal healing is known as a postoperative complication.[3]

The main objectives of periodontal surgery can be broadly categorized into three domains: (1) arresting disease progression by eliminating or reducing periodontal pockets and controlling inflammation; (2) regenerating or reconstructing lost periodontal support, including alveolar bone, periodontal ligament, and cementum; and (3) improving esthetic outcomes, particularly in cases involving anterior teeth, gingival recession, or asymmetrical gingival contours. These objectives are fulfilled through various surgical modalities, including open flap debridement, osseous resective surgeries, guided tissue regeneration (GTR), guided bone regeneration (GBR), connective tissue grafting, free gingival grafts, frenectomies, and crown lengthening procedures.[4]

Flap surgeries are among the most commonly performed periodontal procedures and serve multiple purposes. In patients with deep periodontal pockets and significant plaque accumulation, flap surgery facilitates access to subgingival calculus and granulation tissue, allowing for thorough debridement and root planing. This improves healing and allows the tissue to reattach to previously diseased root surfaces. When indicated, flap surgeries can also be combined with resective or regenerative approaches depending on the defect morphology.[5]

Regenerative periodontal procedures aim to replace lost periodontal structures using a variety of biomaterials, including bone grafts, barrier membranes, growth factors, and tissue-engineered constructs. The biological complexity of the periodontium necessitates a highly coordinated healing response, and the regeneration of lost tissues is a complex and technique-sensitive process. When successful, regenerative surgeries can significantly improve clinical attachment levels and reduce probing depths, translating into long-term tooth stability and patient satisfaction.[6]

Crown lengthening, another critical periodontal intervention, is commonly performed to expose adequate tooth structure for restorative purposes or to improve esthetic harmony in cases of altered passive eruption or "gummy smile." This procedure involves careful planning and execution to maintain biologic width, ensure soft tissue stability, and prevent post-operative recession or sensitivity.[7]

Mucogingival surgeries are primarily aimed at correcting defects in the quantity and quality of attached gingiva, improving the coverage of exposed root surfaces, and enhancing tissue aesthetics and comfort during oral hygiene practices. These include procedures such as laterally positioned flaps, coronally advanced flaps, subepithelial connective tissue grafts, and acellular dermal matrix grafting. In addition to esthetic benefits, these interventions can prevent further gingival recession, reduce root sensitivity, and promote better plaque control.[8]

Although these surgeries are routinely performed and generally have predictable outcomes, complications can

occur at any stage—from preoperative assessment and planning to intraoperative execution and postoperative healing. These complications may be minor and self-limiting or may significantly compromise the surgical outcome and patient satisfaction.

Common complications encountered in periodontal surgeries include persistent postoperative bleeding, flap dehiscence, infection, excessive swelling, delayed healing, hypersensitivity, and esthetic dissatisfaction. More severe complications may involve bone exposure, membrane or graft rejection in regenerative procedures, and even irreversible damage to adjacent structures such as roots, nerves, or sinus membranes. In certain cases, surgical misjudgement in flap design or tissue handling can result in gingival recession, papillary loss, or scarring—particularly problematic in the esthetic zone.[9]

In addition to technical issues, patient-related factors such as poor oral hygiene, smoking, systemic conditions like diabetes, or genetic predispositions can adversely impact surgical outcomes. Furthermore, medication interactions—particularly with anticoagulants, corticosteroids, or immunosuppressive drugs—can increase the risk of perioperative complications. As such, comprehensive preoperative assessment, including medical and dental history, radiographic analysis, and risk profiling, is essential.[10]

The success of periodontal surgery also hinges heavily on patient compliance with post-operative instructions and maintenance therapy. Failure to adhere to recommended plaque control regimens, antimicrobial protocols, or follow-up appointments can lead to reinfection, recurrence of disease, and surgical failure. This emphasizes the need for patient education and motivation as a continuous process from treatment planning through the maintenance phase.

Modern innovations such as microsurgical techniques, the use of magnification, minimally invasive approaches, laser-assisted procedures, and piezosurgery have contributed to reduced complication rates and enhanced healing. Additionally, advances in biomaterials, including the development of bioactive scaffolds, slow-release antimicrobial carriers, and platelet concentrates like PRF (platelet-rich fibrin), have further optimized surgical outcomes. Nevertheless, these advances do not eliminate the possibility of complications and may themselves introduce new sets of challenges requiring practitioner expertise and vigilance.[11]

Understanding the nature and incidence of complications associated with various periodontal surgical procedures is vital for clinicians to improve their clinical protocols, refine their surgical techniques, and provide realistic expectations to patients. It also allows for the development of preventive strategies and early intervention frameworks to mitigate complications and enhance long-term treatment success.

This review aims to comprehensively examine the types, causes, and management of complications encountered in periodontal surgical procedures. Emphasis will be placed on categorizing complications based on the type of procedure, timing (intraoperative vs. postoperative), severity, and contributing factors. Additionally, preventive strategies and evidence-based recommendations will be highlighted to aid clinicians in minimizing risks and optimizing patient outcomes. By recognizing potential complications early and adopting a proactive and systematic approach to their management, periodontists can significantly improve the predictability and success of periodontal surgeries.[12]

Classification of complications after periodontal surgeries

Complications can be classified based on the timing (intraoperative vs. postoperative), severity (minor vs. major), and origin (iatrogenic, anatomical, systemic). Understanding these classifications aids in early diagnosis and appropriate management.[13]

Retarded/delayed epithelialization

Delayed epithelialization can lead to persistent ulceration or erosion. Several factors contribute to this complication:

1. Irregular wound surfaces or tissue remnants may obstruct the normal migration of epithelial cells, preventing smooth reepithelialization.
2. Presence of foreign materials within the wound, such as calculus, tooth debris, bacterial plaque, food particles, toothbrush bristles, hair, or remnants of periodontal dressing, can impede healing.
3. A distant source of epithelial cells—when the donor epithelium is far from the surgical site—can result in a time lag before the wound is covered.
4. Overgrowth of connective tissue, often due to excessive granulation tissue or secondary infection, can create an uneven base that hinders epithelial repair.

Clinically, these issues may present as: ongoing bleeding, discharge, areas of necrotic connective tissue or exposed bone covered by a fibrin layer, and soft tissues that appear swollen, inflamed, or abnormally thickened—often causing patient discomfort.[14]

Failure of epithelial keratinization

Keratinization of the epithelium—whether parakeratinized or orthokeratinized—may not occur when the incision's connective tissue margin lies within alveolar mucosa or similar soft, flexible, and movable tissues, regardless of the presence of embedded muscle fibers. Clinical and histological evidence suggests a clear correlation between the characteristics of the underlying connective tissue—such as its density, rigidity, and firm attachment to bone—and the keratinizing potential of the overlying epithelium. Tissues that are densely packed with collagen, well structured, and exhibit reduced vascularity and hydration are more likely to support the development of a keratinized epithelial surface.

The original gingival margin may have consisted of alveolar mucosal epithelium, or the keratinizing epithelial source might have been removed during surgical procedures. In some cases, the progenitor epithelium capable of keratinization may be located too far from the wound site to exert its effect. Furthermore, keratinizing epithelium does not express its full potential when adjacent to dental surfaces or restorations. Additional factors that may hinder keratinization include the presence of bacterial plaque, residual debris, ongoing inflammation, delayed epithelial healing, and certain systemic conditions such as hormonal imbalances (e.g., hyperestrogenism, hypoestrogenism, pregnancy) or nutritional deficiencies like those involving B-complex vitamins or pernicious anemia.[15]

Flap displacement and evulsion

Displacement or evulsion of a tissue flap can occur when the flap fails to reattach adequately to the underlying bone, tooth surface, or the marginal region of the periodontal ligament. For instance, a mucoperiosteal flap positioned over dense cortical bone, or one whose coronal portion rests on enamel or cementum far from the periodontal ligament and crestal marrow spaces, may not re-establish stable integration. It is important to note that regenerative tissue from the periodontal ligament or crestal bone typically proliferates only within a limited range of approximately 1–1.5 mm. Attachment of a flap

or graft beyond this distance tends to be unpredictable and structurally weak.

Several additional factors may contribute to improper or ectopic flap positioning. These include poor adaptation of the flap to the recipient site due to inadequate suturing, incorrect suture placement, breakage of sutures, or dislodgement of periodontal dressings. Accumulation of hematoma or excessive exudate between the flap and the tooth, bone, or periosteum—particularly in partial-thickness flaps—can also lead to separation of the flap from its intended location.

Clinically, such complications may manifest as irregular or defective tissue contours, the presence of unepithelialized granulation tissue at marginal or interdental areas, reduced vestibular depth, insufficient attached gingiva, delayed wound healing, persistent inflammation, continued periodontal pocketing, and in severe cases, exposure of bone or periosteum accompanied by resorption or necrosis.[16]

Bone exposure

Following surgery, exposed bone may suffer from the loss of essential hydration and nourishment typically provided by the vascular supply from the overlying soft tissue flap and adjacent periosteum. This deficiency can lead to bone resorption, necrosis, or even sequestration. The risk is particularly high in areas where the bone is thin and overlays prominent tooth roots, as such bone is predominantly cortical and contains few marrow spaces, resulting in limited internal vascularity. When the periosteum is removed or compromised, the only remaining blood supply may come from the adjacent periodontal ligament — which is often insufficient to maintain the viability of bone cells or to support the hydration of the bone's mineral matrix.

As a result, resorption may begin either from the periodontal ligament side or, in regions where cortical bone overlies marrow, from the endosteal tissues. In certain cases, this can progress to the sequestration of thin cortical plates or interseptal bone, potentially leading to the loss of important structural support for the affected tooth.[17]

Infection

Postoperative infection is a relatively rare complication following periodontal surgery. However, when it does occur, it is often associated with specific risk factors such as exposed bone, displaced tissue flaps, or periodontal lesions originating from pulpal pathology. Infection is also more likely in areas where sutures or embedded debris, including plaque or calculus, are inadvertently trapped within the tissues. Additional risk factors include tissue injury, compromised blood supply, and poor wound adaptation.

Emerging, though not yet fully conclusive, evidence suggests that certain systemic conditions may increase susceptibility to postoperative infections. These include diabetes mellitus, atherosclerosis, and various forms of cancer. Furthermore, patients undergoing treatment with immunosuppressive agents, corticosteroids, or chemotherapy drugs may experience impaired wound healing and a heightened risk of infection.[12]

Pyogenic granuloma

A localized overgrowth of granulation tissue, pyogenic granuloma may arise at the surgical site due to chronic irritation, poor plaque control, or trauma from sutures. It presents as a soft, red, vascular lesion that may bleed easily and often requires excision.[18]

Periodontal abscess

This acute localized purulent infection can develop post-surgery due to incomplete debridement, entrapment of foreign material, or plaque accumulation. Patients may present with swelling, pain, pus discharge, and rapid

periodontal breakdown requiring drainage and antimicrobial therapy.[19]

Giant cell reparative granuloma

Though rare, this reactive lesion can occasionally develop in surgical areas of the jaw, especially in response to trauma or bone injury. It is characterized by the presence of multinucleated giant cells and may require biopsy and surgical removal.[20]

Increased tooth mobility

Tooth mobility post-surgery can result from temporary bone loss, flap reflection, or trauma during instrumentation. While often reversible with healing and adequate plaque control, persistent mobility may indicate attachment loss or compromised periodontal support.[21]

Management and Prevention of Common Complications

Effective management of post-periodontal surgery complications begins with prevention. Clinicians must adopt a comprehensive, patient-specific approach that involves:

- Thorough preoperative evaluation, including medical history, oral hygiene status, and risk factors (e.g., smoking, diabetes).
- Aseptic surgical technique with minimal trauma to soft and hard tissues.
- Adequate hemostasis and tension-free suturing using appropriate materials.
- Use of magnification or microsurgical techniques to improve visibility and precision.
- Postoperative antibiotics and analgesics, as required, especially in high-risk cases or regenerative procedures.
- Clear post-surgical instructions, including dietary modifications, oral hygiene protocols, and activity restrictions.
- Close follow-up for early identification and management of complications such as infection, bleeding, or flap displacement.

When complications occur:

- Persistent bleeding should be managed with local hemostatic agents or resuturing if necessary.
- Infections require drainage, antiseptic rinses (chlorhexidine), and systemic antibiotics.
- Flap dehiscence or tissue necrosis may require surgical correction, grafting, or longer-term healing monitoring.
- Bone exposure should be assessed for vitality—minor cases can be managed conservatively, but necrotic bone may need surgical removal.

Clinical Recommendations

- Patient education is vital: Explain expected healing timelines, possible complications, and red flag symptoms.
- Avoid unnecessary trauma or over-manipulation of tissues, especially in the esthetic zone.
- Choose regenerative materials with proven biocompatibility and follow protocol-specific guidelines strictly.
- Customize surgical approach based on anatomical site, defect type, and patient-specific factors.
- Reinforce the importance of supportive periodontal therapy (SPT) after surgery to maintain outcomes and monitor for recurrence or delayed healing.[22]

Conclusion

Periodontal surgical procedures are essential for treating moderate to advanced periodontal conditions and improving both functional and aesthetic outcomes. However, complications—ranging from minor inflammation to significant tissue or bone loss—can occur due to anatomic, systemic, technical, or patient-related factors.

This review emphasizes the importance of understanding the types, causes, and management of complications, as well as the critical role of preventive strategies, surgical precision, and patient cooperation. By applying an evidence-based, patient-centered approach, periodontists can minimize complications, enhance healing, and improve long-term treatment success.

References

1. Boehm TK, Kim CS. Overview of Periodontal Surgical Procedures. [Updated 2024 Jan 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/sites/books/NBK599507/.
2. Hashim NT, Babiker R, Padmanabhan V, Ahmed AT, Chaitanya NCSK, Mohammed R, Priya SP, Ahmed A, El Bahra S, Islam MS, Gismalla BG, Rahman MM. The Global Burden of Periodontal Disease: A Narrative Review on Unveiling Socioeconomic and Health Challenges. Int J Environ Res Public Health. 2025 Apr 16;22(4):624. doi: 10.3390/ijerph22040624. PMID: 40283848; PMCID: PMC12027323.
3. Jepsen K, Sculean A, Jepsen S. Complications and treatment errors related to regenerative periodontal surgery. Periodontol 2000. 2023;92(1):233–250. doi:10.1111/prd.12504.
4. Cho YD, Kim KH, Lee YM, Ku Y, Seol YJ. Periodontal Wound Healing and Tissue Regeneration: A Narrative Review. Pharmaceuticals (Basel). 2021 May 12;14(5):456. doi: 10.3390/ph14050456. PMID: 34065862; PMCID: PMC8151433.
5. Archana AB, Ramesh R, Varghese J, Anoop S. Comparison of Conventional and Microsurgical Access Flap Procedure in Managing Chronic Periodontitis: A Randomized Controlled Trial. Contemp Clin Dent. 2024 Apr-Jun;15(2):118-123. doi: 10.4103/ccd.ccd_151_23. Epub 2024 Jul 10. PMID: 39206244; PMCID: PMC11349071.
6. Siaili M, Chatzopoulou D, Gillam DG. An overview of periodontal regenerative procedures for the general dental practitioner. Saudi Dent J. 2018 Jan;30(1):26-37. doi: 10.1016/j.sdentj.2017.11.001. Epub 2017 Nov 14. PMID: 30166868; PMCID: PMC6112342.
7. Qali M, Alsaegh H, Alsaraf S. Clinical Considerations for Crown Lengthening: A Comprehensive Review. Cureus. 2024 Nov 3;16(11):e72934. doi: 10.7759/cureus.72934. PMID: 39628744; PMCID: PMC11614317.
8. Gallagher SI, Matthews DC. Acellular dermal matrix and subepithelial connective tissue grafts for root coverage: A systematic review. J Indian Soc Periodontol. 2017 Nov-Dec;21(6):439-448. doi: 10.4103/jisp.jisp_222_17. PMID: 29551861; PMCID: PMC5846239.
9. Javed H, Olanrewaju OA, Ansah Owusu F, Saleem A, Pavani P, Tariq H, Vasquez Ortiz BS, Ram R, Varrassi G. Challenges and Solutions in Postoperative Complications: A Narrative Review in General Surgery. Cureus. 2023 Dec 22;15(12):e50942. doi: 10.7759/cureus.50942. PMID: 38264378; PMCID: PMC10803891.
10. Salhi L, Albert A, Seidel L, Lambert F. Respective Effects of Oral Hygiene Instructions and Periodontal Nonsurgical Treatment (Debridement) on Clinical Parameters and Patient-Reported Outcome Measures with Respect to Smoking. J Clin Med. 2020 Aug 3;9(8):2491. doi: 10.3390/jcm9082491. PMID: 32756385; PMCID: PMC7464916.
11. P SM, Rajasekar A. Effectiveness of Surgical Periodontal Therapy in Oral Health-Related Quality

of Life. Cureus. 2024 Apr 22;16(4):e58792. doi: 10.7759/cureus.58792. PMID: 38784346; PMCID: PMC11112134.

12. Cueto Urbina A, Guzmán Opazo J, Sagredo Ramírez K, Parra Parra M, López De Blanc S. Association between periodontitis and postoperative complications in hospital medical surgical procedures: a systematic review. Rev Cient Odontol (Lima). 2023 Dec 28;11(4):e177. doi: 10.21142/2523-2754-1104-2023-177. PMID: 38312471; PMCID: PMC10831989.
13. Manekk RS, Gharde P, Gattani R, Lamture Y. Surgical Complications and Its Grading: A Literature Review. Cureus. 2022 May 13;14(5):e24963. doi: 10.7759/cureus.24963. PMID: 35706751; PMCID: PMC9187255.
14. Pippi R. Post-Surgical Clinical Monitoring of Soft Tissue Wound Healing in Periodontal and Implant Surgery. Int J Med Sci. 2017 Jul 18;14(8):721-728. doi: 10.7150/ijms.19727. PMID: 28824306; PMCID: PMC5562125.
15. Srivastava V, Dwivedi S, Sharma S. Periodontal wound healing- An absolute literature review. J Clin Images Med Case Rep. 2022; 3(3): 1726.
16. Miller TJ, Lavin CV, Momeni A, Wan DC. Prevention and Management of Complications of Tissue Flaps. Surg Clin North Am. 2021 Oct;101 (5):813-829. doi: 10.1016/j.suc.2021.06.009. Epub 2021 Aug 7. PMID: 34537145.
17. Wilderman MN. Exposure of bone in periodontal surgery. Dent Clin North Am. 1964 Mar;8(1):23–36. doi:10.1016/S0011-8532(22)01997-8.
18. Panseriya BJ, Hungund S. Pyogenic granuloma associated with periodontal abscess and bone loss - A rare case report. Contemp Clin Dent. 2011 Jul;2(3):240-4. doi: 10.4103/0976-237X.86478. PMID: 22090773; PMCID: PMC3214537.
19. Zabaglo M, Leslie SW, Sharman T. Postoperative Wound Infections. [Updated 2024 Mar 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https:// www.ncbi.nlm.nih.gov/books/NBK560533/.
20. Jeyaraj P. Management of Central Giant Cell Granulomas of the Jaws: An Unusual Case Report with Critical Appraisal of Existing Literature. Ann Maxillofac Surg. 2019 Jan-Jun;9(1):37-47. doi: 10.4103/ams.ams_232_18. PMID: 31293928; PMCID: PMC6585231.
21. Feller L, Lemmer J. Tooth mobility after periodontal surgery. SADJ. 2004 Nov;59(10):407, 409-11. PMID: 15696734.
22. Bhattad PB, Pacifico L. Empowering Patients: Promoting Patient Education and Health Literacy. Cureus. 2022 Jul 27;14(7):e27336. doi: 10.7759/cureus.27336. PMID: 36043002; PMCID: PMC9411825.