

Interdental Papilla: A Narrative Review of the Techniques for Preservation

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ABSTRACT

The terrain of periodontics in dentistry has been constantly evolving with recent innovations in regenerative biomaterials. The prediction of the result of a certain procedure should not be limited to the science of these inventories, but the art of surgical skills should also be practised and mastered. Various techniques in papilla preservation have been proposed. It is of utmost importance for the periodontists to refine themselves with the redefined approaches. In the recent context, the paradigm of periodontal papilla preservation is shifting to minimally invasive techniques. The use of microscopes and microsurgical instruments has rendered the field of periodontology to multiple benefits, ranging from reduced time and cost to optimal gain in attachment and soft tissue preservation. Thus, the introduction and selection of different procedures has provided convenience, comfort and superior outcomes to both the dental practitioner and the patient. In the era of this booming dentistry, it is in fact a blessing for the field of periodontics to be instigated to novel approaches focusing on the preservation of native tissues. This paper focuses on describing different surgical approaches to preserve the interdental papilla. The periodontist must be well acquainted with all the techniques and guide the patient in the decision making process.

Keywords: Interdental papilla; microsurgery; papilla preservation; recession.

INTRODUCTION

The interdental papilla is the part of the gingiva which occupies the interdental space below the contact area of two adjacent teeth. It was first described by Cohen in 1959.¹ It is pyramidal in the anterior region and forms the col in the posterior region.¹ The interdental papilla plays an indispensable role in the maintenance of form, function and esthetics of the gingiva.

Recession in the papillary region results in the formation of the black triangles. Besides being

unesthetics, they create problems of root sensitivity, food impaction, plaque accumulation and its sequelae, root caries and phonetics.^{2,3} Interdental papillary recession and loss may arise due to alteration in the shape and contour of the crown, the height of the contact point, angulation of the root,

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the height of the bone, iatrogenic factors, aging, periodontal phenotype and gingival biotype.⁴⁻⁸ Due to its distinct cellular and molecular pattern, inadequate blood supply and a variety of dependable variables, the regeneration of the papilla is limited and creates a serious nuisance to the clinician.⁹⁻¹²

The measurement of the papilla can be done by Nordland and Tarnow's index, Jemt index, PR system by Chang, Papilla Index Score by Nemcovsky and Papilla Presence Index (PPI) by Cardaropoli et. al. in 2004.¹³⁻¹⁷ The PPI allows easy classification of papilla in situations with the absence or loss of contact point and is denoted as:¹⁶

PP1: Papilla is completely present

PP2: Papilla is no longer completely present, but interproximal Cementoenamel Junction(CEJ) is not visible

PP3: Papilla is no longer completely present and interproximal CEJ is visible

PP4: Papilla is no longer completely present and both interproximal and buccal CEJs are visible.

Due to the crucial role of the interdental papilla and the difficulty in its regeneration, many procedures

have been implemented in its preservation. This review aims to discuss different papilla preservation techniques to help the clinicians in selecting and implementing the correct procedure while gaining maximum patient benefit with minimal trauma.

TECHNIQUES FOR PAPILLA PRESERVATION

The first attempt in the papilla preservation was made by Kromer in 1956, for the retention of osseous implants.¹⁸ The intact papilla flap or the App technique which was advocated by App in 1973, in which the interproximal tissue was incorporated in the buccal flap.¹⁹ Other significant techniques have been described below (Figure 1).

1. Curtain procedure

The technique was developed by Frisch et. al. in 1967.²⁰ The procedure was employed to maintain the esthetics in the maxillary anterior region. The labial one-third of the papillary region or the curtain is retained intact along with the labial mucosa. Gingivectomy or a palatal repositioned flap is done in the palatal part, including the interproximal-lingual two-thirds of the papilla. Newell and Brunsvold in 1985 modified the curtain procedure

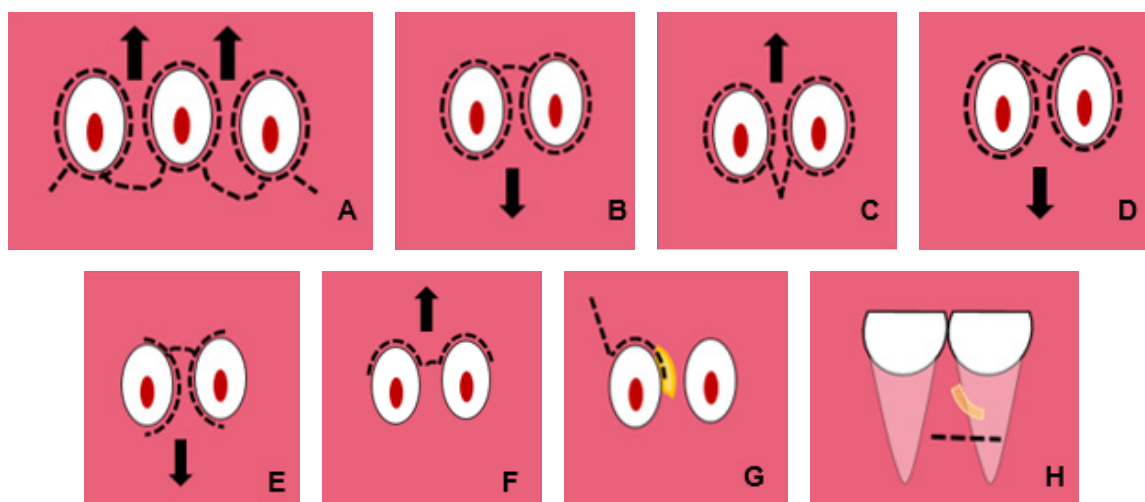


Figure 1: Papilla preservation techniques (a) Conventional papilla preservation technique (b) Modified papilla preservation technique (c) Interproximal Tissue Maintenance (d) Simplified papilla preservation flap (e) Minimally invasive surgical technique (MIST) (f) Single flap approach (g) Entire papilla preservation flap (h) Non Incised Papilla Surgical Approach.

with the incorporation of an internal mattress suture.²¹

2. Conventional papilla preservation flap

The technique had been reported earlier by Genon and Bender in 1984.²² Interdental papillary preservation was also attempted by Evian in 1985.²³ This technique of preservation of the interdental papilla was described in detail by Takei et. al. in 1985.²⁴ In this technique, sulcular incisions are given around each tooth without the involvement of the interdental papilla. Sulcular incisions are continued with a semilunar incision across the interdental papilla on the palatal or the lingual side. The incision is given at a distance of 5 mm from the line angle of the gingival margin. The papilla is included in the buccal/labial flap or lingual/palatal flap. The flap is elevated with the interdental papilla through the interdental space.

Thus, a wide embrasure with the presence of adequate width of the interdental space (>2 mm interdental papilla or 2.0 mm inter-radicular width at the bone crest) and absence of tight contact is a prerequisite for the procedure.²⁵⁻²⁷ This technique reduced the possibility of crater formation in the interdental area unlike regular flap technique. During guided tissue regeneration (GTR) procedures, this technique allows the graft and the membrane to be completely covered by the interdental papilla and aids in the coronal positioning of the flap.²⁸

3. Modified papilla preservation technique (MPPT)

The modification of the conventional papilla preservation flap was done by Checchi and Sconfeld in 1988.²⁹ The term modified papilla preservation flap was introduced by Cortellini et. al. in 1995.³⁰ The technique is employed in interproximal spaces which are wide (≥ 2 mm). In this technique, sulcular incisions are given in the buccal surface till the mid buccal line angles and till the line angles in the palatal aspect. There is involvement of two teeth neighbouring the defect.

A semi-lunar incision is avoided, and a horizontal incision is given buccally in the interproximal area continuing with the prior incisions which is placed at the site opposite to that of the defect area. The interdental papilla is incorporated in the palatal flap and a full thickness flap is raised till the bone crest. This technique helps in the stability of the regenerated defect.²⁸ Besides aiding in primary closure, the MPPT also allows coronal displacement of the flap.²⁸ In such cases, a vertical releasing incision may be given with reflection of full and split thickness of the flap.

4. Interproximal Tissue Maintenance (ITM)

The Interproximal Tissue Maintenance (ITM) was introduced by Murphy KG in 1996.²⁶ It involves buccal sulcular incision from line angles of the teeth in the palatal side to form a triangular-shaped flap, also called the “papillar triangle”, which is incorporated in the buccal flap. Vertical releasing incisions may be given on the buccal side, if needed. It was mainly used for maxillary teeth, with thick palatal bulk and a minimal inter-radicular width of 2.0 mm.²⁷

5. Simplified papilla preservation flap(SPPF)

This technique was advocated by Cortellini, Pini Prato and Tonetti in 1999.³¹ The technique is indicated for narrow interdental spaces less than 2 mm. This technique utilises oblique incisions which are given at the gingival margin of mesial buccal line angle of the concerned tooth and ends at the mid point of the distal surface of the neighbouring tooth below the contact point. The incision continues intrasulcularly in the buccal aspect of the teeth. Both the buccal and palatal sides of the flap are reflected, and the reflection area only exposes the surrounding bone crest 1 to 2 mm away from the bony defect.

The two modifications of the PPF technique, MPPT and SPPF require mattress sutures. This supports in the coronal positioning of the flap, relief from pull and passive closure of the flap.^{28,30,31}

6. Minimally invasive surgical technique (MIST)

The technique was introduced by Cortellini and Tonetti in 2007.³² It is used in regenerative surgical technique with the use of microsurgical and magnifying instruments. Either SPPF or MPPT is used to access the defect area. The mesiodistal extension of flap is minimised till the mid-buccal and mid-lingual sides of the defect-associated teeth. A small mucoperiosteal flap is elevated to provide proper access with the elevation of the interproximal attachment. It is closed with a modified internal mattress suture.

The essential aspects in the success of the surgery such as the stability of the blood clot and primary wound closure have been addressed through this procedure. The technique is useful in isolated, interproximal bone defect without involvement of the interproximal site, defects outlining an edentulous area and periodontal defect that extend from buccal/lingual from interproximal site

Later, the concept of Single MIST was also given by Cortellini et. al. in 2008.³³ In this process, multiple adjacent defects were treated in a single visit. In addition to this, the domain of space provision for regeneration which is of absolute importance in GTR, was fulfilled with the introduction of Modified Minimally Invasive surgical technique (M-MIST) by Cortellini and Tonetti in 2009.³⁴ In this technique, the interdental tissue is not mobilised and only a small buccal flap is elevated with a buccal intrasulcular incision and a buccal horizontal incision close to the papilla tip. The palatal flap is not involved. This technique is however limited in terms of accessibility to the root surface and to the lingual/ palatal side.

7. Whale's tail technique

The technique was introduced by Bianchi and Basetti in 2009.³⁵ The name was suggested due to the resemblance of the elevated flap with the tail of a whale. It is used in the treatment of a wide

intrabony defect in the aesthetic region. A large flap is elevated with a horizontal incision and two vertical relieving incisions from the mucogingival line to the distal margin of the teeth neighbouring the defect in the form of a whale's tail. The entire flap is incorporated from the buccal to the palatal site. This requires the presence of a large interdental space. The technique allows direct visibility and easy accessibility to the intrabony defect. It is also indicated during a guided tissue regeneration procedure so that the interdental tissue remains intact over the grafted area.

It has been used in maxillary incisors in which dense coverage of the interdental defects was observed during GTR. Distant incisions from the surgical sites reduce the possibility of flap dehiscence. Suturing at a distant area also decreases the chances of graft contamination and the wicking effect of the suture. The technique was later modified by Kuriakose et. al. in 2015, in which two semilunar incisions were used instead of the vertical incisions.³⁶

8. Single flap approach

This approach was introduced by Trombelli et. al. in 2009.^{37,38} This method is indicated when the defect is present on the buccal or oral side. Only the buccal or oral flap is elevated without involving the opposite flap. Hence, the name single flap approach has been introduced.

The flap raised is an envelope flap with sulcular incisions on the buccal side and limited mesiodistal extension. An oblique or horizontal incision was given in the interdental area with the buccal incision being given with due consideration of the measurement relative to the tip of the papilla and the underlying bone defect. This technique ensures the preservation of the supracrestal soft tissues attached to the oral papilla, facilitates flap adaptation and suturing, minimises postoperative shrinkage and also provides adequate accessibility. The limited extension of the flap may, however, limit accessibility and result in inadequate debridement.

9. Entire papilla preservation flap

The entire papilla preservation flap was introduced by Aslan et. al. in 2017.³⁹ It is used in deep and wide intrabony defects under magnifying loupes. The technique utilises one intrasulcular incision towards the defect area which is continued with a short bevelled buccal vertical releasing incision on the buccal side of the concerned tooth away from the defect area. The vertical incision extends just beyond the mucogingival line. In cases of malaligned tooth, the vertical incision is given one tooth away from the actual intended incision line. In this way, a tunnel is created that preserves the intactness of the interproximal papilla.

This method provides accessibility, stabilises the blood clot and hence aids in the wound healing process with 100% wound closure⁴⁰. The process prevents the possible exposure of bone regeneration biomaterials. The technique, when combined with biomaterials, revealed stable pocket reduction without increase in gingival recession.⁴¹ However, it is not indicated for large intrabony defects on the lingual or palatal side. Also, specially designed microsurgical instruments are required for the procedure.

The technique was modified by Rasperini et. al. in 2024 as the coronally advanced entire papilla preservation (CA-EPP) technique, in which EPP is combined with coronally advanced flap and connective tissue graft to treat cases of infrabony defects with a thin or medium gingival profile.⁴² To overcome the limitation of access to the lingual side, Ogawa et. al. introduced the Double-sided (buccal-palatal) EPP (DEPP) technique in 2023, along with regenerative therapy.⁴³ A palatal vertical incision was added for the proper visibility and accessibility of intrabony defects with buccolingual extensions.

10. Non Incised Papilla Surgical Approach (NIPSA)

It was introduced by Rodriguez and Caffesse in 2018.⁴⁴ A horizontal incision is given on the alveolar mucosa apical from the periodontal defect. Reflection is done apicocoronally. The lingual tissues, the papilla and the marginal tissues are left

intact. Instrumentation is avoided in 1 mm of the root coronal to the bottom of the defect and in 2-3 mm of the coronal marginal tissues.

The technique is contraindicated in cases of intrabony defects with intact buccal bone. There are also concerns regarding the blood supply from the apex which may be cut off during the procedure. The bony defect also has to be well defined prior to the procedure with the cone beam computed tomography. It gives promising periodontal results with soft tissue preservation.⁴⁵

Besides the above techniques, there are a variety of other significant techniques designed to address the preservation of the interdental papilla. These include Papilla Amplification flap (PAF), Minimally Invasive Non-Surgical Therapy (MINST), Videoscope-assisted minimally invasive periodontal surgery (V-MIS), modified Vestibular Incision Subperiosteal Tunnel Access (m-VISTA) and triangle papilla access approach (T-PAA).⁴⁶⁻⁵⁰

SUMMARY

The interdental papilla is a delicate tissue for the clinician to manipulate. The complexity in the decision of the papillary management is elevated due to limitation in its regeneration, and due to the profound effect it creates in the esthetics of the oral cavity and the individual personality as a whole. Dental practitioners must bear in mind the intricacies associated with papillary augmentation procedures and emphasize in the preservation of the papilla during flap procedures. Clinicians must have detailed knowledge and certainty in the selection of the papilla preservation technique. With novel approaches being introduced dynamically, the dental clinicians currently have the benefit of choosing from a wide variety of designs, corresponding to their requirements. Future researches must focus on systematic reviews to provide evidence of superior outcomes among different techniques.

Conflict of interest: None.

REFERENCES

1. Cohen B. Pathology of the interdental tissues. *Dent Pract.* 1959; 9:167–73.
2. Lee WP, Kim HJ, Yu SJ, et. al. Six month clinical evaluation of inter dental papilla reconstruction with injectable hyaluronic acid gel using an image analysis system. *J Esthet Restor Dent.* 2016; 28(4):221–30. [[PubMed](#)]
3. Fu Y, Zhang Z, Tang X, et. al. A narrative review of papilla preservation techniques in clinical dentistry. *Medicine.* 2025 Jan 17; 104(3):e41033. [[PubMed](#)]
4. Singh VP, Uppoor AS, Nayak DG, et. al. Black triangle dilemma and its management in esthetic dentistry. *Dent Res J.* 2013; 10:296–301. [[PubMed](#)]
5. Afshari Z, Khazaei Y, Ahmadishadmehri M. Efficacy of platelet-rich fibrin in papilla reconstruction: A systematic review and meta-analysis. *Dental Research Journal.* 2024 Apr 1; 21(1):27. [[PubMed](#)]
6. Khaireddine H, Mohamed T, Arij R, et. al. Factors impacting the height of the interproximal papilla: a cross-sectional study. *Clin Exp Dent Res.* 2023; 9:449–54. [[PubMed](#)]
7. Ahmed AJ, Nichani AS, Venugopal R. An evaluation of the effect of periodontal biotype on inter-dental papilla proportions, distances between facial and palatal papillae in the maxillary anterior dentition. *J Prosthodont.* 2018; 27:517–22. [[PubMed](#)]
8. Kshirsagar JT, Monika A, Nithiyaraj S, et. al. Demystifying the pink enigma: A succinct overview on the interdental papilla. *Journal of Integrative Medicine and Research.* 2024 Apr 1; 2(2):60-5. [[DOI](#)]
9. Chow YC, Eber RM, Tsao YP, et. al. Factors associated with the appearance of gingival papillae. *J Clin Periodontol.* 2010; 37:719–27. [[PubMed](#)]
10. Gonzalez MK, de Almeida AL, Gregghi SL, et. al. Interdental papillary house: a new concept and guide for clinicians. *Int J Periodontics Restor Dent.* 2011 Nov 1; 31(6): e87-93. [[PubMed](#)]
11. Csiszar A, Wiebe C, Larjava H, et. al. Distinctive molecular composition of human gingival interdental papilla. *J Periodontol.* 2007 Feb; 78(2):304-14. [[PubMed](#)]
12. Vela OC, Boariu MI, Iorio-Siciliano V, et. al. Histologic Evaluation of Early Papilla Healing after Augmentation with Injectable Hyaluronic Acid—A Proof of Concept. *J Clin Med.* 2024; 13(14):4102. [[PubMed](#)]
13. Nordland WP, Tarnow DP. A classification system for loss of papillary height. *J Periodontol.* 1998 Oct 1; 69(10):1124-6. [[PubMed](#)]
14. Jemt T. Regeneration of gingival papillae after single-implant treatment. *Int J Periodontics Restorative Dent.* 1997; 17:326–33. [[PubMed](#)]
15. Chang LC. Comparison between different papillary recession classification systems. *J Dent Sci.* 2012 Dec 1; 7(4):373-8. [[DOI](#)]
16. Cardaropoli D, Re S, Corrente G. The Papilla Presence Index (PPI): a new system to assess interproximal papillary levels. *Int J Periodontics Restorative Dent.* 2004 Oct 1; 24(5):489-92. [[PubMed](#)]
17. Nemcovsky CE. Interproximal papilla augmentation procedure: A novel surgical approach and clinical evaluation of 10 consecutive procedures. *Int J Periodontics Restorative Dent.* 2001; 21:553-9. [[PubMed](#)]
18. Checchi L, Schonfeld SE. A technique for esthetic treatment of maxillary anterior infrabony lesions. *Quintessence Int.* 1988; 19: 209-13. [[PubMed](#)]
19. App GR. Periodontal treatment for the removable partial prosthesis patient. *Dent Clin North America.* 1973; 17: 601-10. [[PubMed](#)]
20. Frisch J, Jones RA, Bhaskar SN. Conservation of maxillary anterior esthetics: A modified surgical approach. *J Periodontol.* 1967 Jan; 38(1):11-7. [[PubMed](#)]
21. Newell DH, Brunsvold MA. A modification of the “curtain technique” incorporating an internal mattress suture. *J Periodontol.* 1985 Aug; 56(8):484-7. [[PubMed](#)]
22. Chacko LN, Abraham S, Landge N, et. al. Papilla preservation flap: Revisited. *JDS.* 2013; 2(4):45-8. [[Full Text](#)]
23. Evian CI, Corn H, Rosenberg ES. Retained interdental papilla procedure for maintaining anterior esthetics. *Compend Contin Educ Dent.* 1985; 6:58-64. [[PubMed](#)]
24. Takei HH, Han TJ, Carranza Jr FA, et. al. Flap technique for periodontal bone implants: Papilla preservation technique. *J of Periodontol.* 1985 Apr; 56(4):204-10. [[PubMed](#)]
25. Cortellini P, Tonetti MS. Microsurgical approach to periodontal regeneration. Initial evaluation in a case cohort. *J Periodontol.* 2001; 72: 559–69. [[PubMed](#)]
26. Murphy KG. Interproximal tissue maintenance in GTR procedures: description of a surgical technique and 1-year reentry results. *Int J Periodontics Restorative Dent.* 1996; 16: 463–77. [[PubMed](#)]
27. Trombelli L, Farina R. Flap designs for periodontal healing. *Endodontic Topics.* 2011 Sep; 25(1):4-15. [[DOI](#)]

28. Georgieva I, Tsoneva Z. Papilla preservation flaps–types and indications: A review. In Varna Medical Forum. 2025; 14(1): 34-8 . [\[Full Text\]](#)
29. Checchi L, Montevecchi M, Checchi V, et. al. A modified papilla preservation technique, 22 years later. Quintessence Int. 2009 Apr 1; 40(4):303-11. [\[PubMed\]](#)
30. Cortellini P, Prato GP, Tonetti MS. The modified papilla preservation technique. A new surgical approach for interproximal regenerative procedures. J Periodontol. 1995; 66:261-6. [\[PubMed\]](#)
31. Cortellini P, Prato GP, Tonetti MS. The simplified papilla preservation flap. A novel surgical approach for the management of soft tissues in regenerative procedures. Int J Periodontics Restorative Dent. 1999; 19:589-99. [\[PubMed\]](#)
32. Cortellini P, Tonetti MS. Improved wound stability with a modified minimally invasive surgical technique in the regenerative treatment of isolated interdental intra bony defects. J Clin Periodontol. 2009; 36: 157-63. [\[PubMed\]](#)
33. Cortellini P, Nieri M, Prato GP, et. al. Single minimally invasive surgical technique with an enamel matrix derivative to treat multiple adjacent intra-bony defects: clinical outcomes and patient morbidity. J Clin Periodontol. 2008 Jul; 35(7):605-13. [\[PubMed\]](#)
34. Cortellini P, Tonetti MS. Improved wound stability with a modified minimally invasive surgical technique in the regenerative treatment of isolated interdental intrabony defects. J Clin Periodontol. 2009 Feb; 36(2):157-63. [\[PubMed\]](#)
35. Bianchi AE, Bassetti A. Flap design for guided tissue regeneration surgery in the esthetic zone: The “whale’s tail” technique. Int J Periodontics Restorative Dent. 2009; 29:153-9. [\[PubMed\]](#)
36. Kuriakose A, Ambooken M, Jacob J, et. al. Modified Whale's tail technique for the management of bone-defect in anterior teeth. J Indian Soc Periodontol. 2015;19(1):103-6. [\[Full text\]](#)
37. Trombelli L, Farina R, Franceschetti G, et. al. Single Flap Approach in periodontal reconstructive surgery [in Italian]. Dental Cadmos. 2007; 75(8): 15–25.
38. Trombelli L, Farina R, Franceschetti G, et. al. Management of the soft tissues according to the principles of the Single Flap Approach in the treatment of periodontal intraosseous defects [in Italian]. Dental Clinics. 2008; 3: 1–8.
39. Aslan S, Buduneli N, Cortellini P. Entire Papilla Preservation Technique: A Novel Surgical Approach for Regenerative Treatment of Deep and Wide Intrabony Defects. Int J Periodontics Restorative Dent. 2017 Mar/Apr; 37(2):227-33. [\[PubMed\]](#)
40. Aslan S, Buduneli N, Cortellini P. Entire papilla preservation technique in the regenerative treatment of deep intrabony defects: 1-Year results. J Clin Periodontol. 2017 Sep; 44(9):926-32. [\[PubMed\]](#)
41. Nara Y, Ogawa Y. Entire Papilla Preservation Technique with Recombinant Human Fibroblast Growth Factor-2 and Autogenous Bone Grafting in the Treatment of Isolated, Noncontained Intrabony Defects: Case Report with a 5-Year Follow-up Int J Periodontics Restorative Dent. 2025 Mar 1; 45(2):165-71. [\[PubMed\]](#)
42. Rasperini G, Kazarian E, Aslan S. Coronally Advanced Entire Papilla Preservation (CA-EPP) Flap in the Treatment of an Isolated Intrabony Defect to Promote Buccal and Interproximal Soft Tissue Stability. Int J Periodontics Restorative Dent. 2024 Jan 1; 44(1):9-16. [\[PubMed\]](#)
43. Ogawa Y, Yoshikawa K, Ishikawa T, et. al. Double-sided entire papilla preservation technique in the combination periodontal regenerative therapy: a case report. Clin Adv Periodontics. 2024 Jun; 14(2):100-7. [\[PubMed\]](#)
44. Rodriguez JA, Caffesse RG. Nonincised Papillae Surgical Approach (NIPSA) in Periodontal Regeneration: Preliminary Results of a Case Series. Int J Periodontics Restorative Dent. 2018; 38(Suppl):s105-11. [\[PubMed\]](#)
45. Moreno Rodríguez JA, Ortiz Ruiz AJ, Caffesse RG. Periodontal reconstructive surgery of deep intraosseous defects using an apical approach. Non-incised papillae surgical approach (NIPSA): A retrospective cohort study. J Periodontol. 2019 May; 90(5):454-64. [\[PubMed\]](#)
46. Zucchelli G, Mele M, Checchi L. The papilla amplification flap for the treatment of a localized periodontal defect associated with a palatal groove. J Periodontol. 2006 Oct; 77(10):1788-96. [\[PubMed\]](#)
47. Ribeiro FV, Casarin RCV, Palma MAG, et. al. Clinical and patient-centered outcomes after minimally invasive non-surgical or surgical approaches for the treatment of intrabony defects: a randomized clinical trial. J Periodontol. 2011; 82(9): 1256-66. [\[PubMed\]](#)
48. Harrel SK, Abraham CM, Rivera-Hidalgo F, et. al. Videoscope-assisted minimally invasive periodontal surgery (V-MIS). J Clin Periodontol. 2014 Sep; 41(9):900-7. [\[PubMed\]](#)
49. Najafi B, Kheirieh P, Torabi A, et. al. Periodontal regenerative treatment of intrabony defects in the esthetic zone using modified vestibular incision subperiosteal tunnel access (M-VISTA). Int J Periodontics Restorative Dent. 2018 Jan 1; 38(Suppl):e9-16. [\[PubMed\]](#)
50. Ihara Y, Shibazaki S, Morikawa S, et. al. Novel triangle papilla access approach for interdental bone defect regeneration: A case study. Clin Adv Periodontics. 2025 Jan 15. [\[PubMed\]](#)