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Minimally invasive techniques for periodontal regeneration

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Abstract

Regeneration of lost periodontal tissues has been the ultimate goal of periodontal therapy. Minimally invasive dentistry is defined as a concept that preserves dentition and supporting structures. Minimally invasive techniques represent alternative approaches developed to allow less extensive manipulation of surrounding tissues than conventional procedures, while accomplishing the same objectives. They have a high potential to seal the healing wound from the contaminated oral environment by achieving and maintaining primary closure. Soft tissues are preserved and minimal gingival recession is observed, which is an important feature to meet the esthetic demands of the patient and the clinician.

Minimally invasive surgery (MIS) was first introduced into the periodontal field with the intent to treat multiple and isolated periodontal intra-bony defects. The procedure is performed under a microscope, with microsurgical instruments and materials. It has been improved to become a minimally invasive surgical technique (MIST) with the addition of the application of gingival papilla preservation techniques. Recently, a modified minimally invasive surgical technique (M-MIST) has been used as an extension of MIST, which only elevates a buccal triangular flap.

The various minimally invasive techniques for periodontal regeneration have been discussed in this review article.

Keywords: Esthetics, minimally invasive techniques, papilla preservation, periodontal regeneration

1. Introduction

The goals of periodontal therapy include not only the arrest of periodontal disease progression, but also the regeneration of structures lost to disease ^[1]. Conventional surgical approach offers access to root surfaces, reduces periodontal pocket depths and attains improved periodontal form or architecture. However this technique offers only limited potential towards recovering tissues destroyed during earlier disease phases.

Regeneration is defined as a reproduction or reconstitution of a lost or injured part ^[2]. Periodontal regeneration is regeneration of the tooth's supporting tissues, including alveolar bone, periodontal ligament and cementum ^[1].

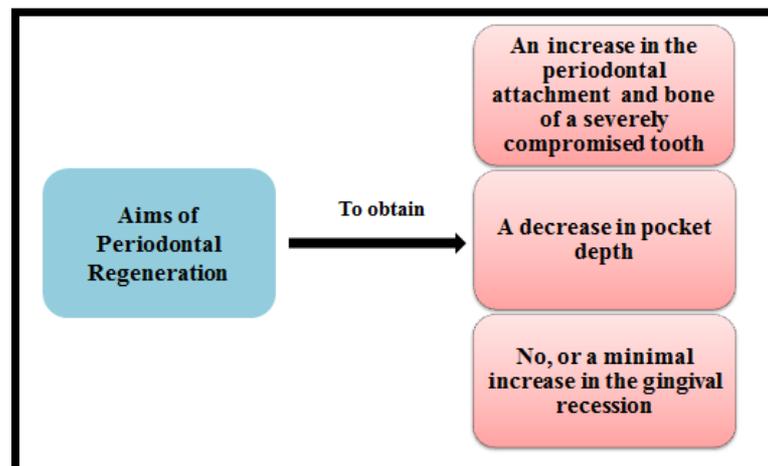


Fig 1: Aims of periodontal regeneration

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Bone can be regenerated with bone grafting procedures and guided tissue regeneration, [3, 4] while gingival tissue can be regenerated with soft tissue grafting procedures [5, 6]. However, the techniques used for regeneration of bone can sometimes result in the post-operative loss of gingival tissue [7]. This can lead to unwanted side effects of change in gingival contour and height resulting in a less than desirable esthetic result and potential root sensitivity.

The purpose of periodontal surgery is to alleviate or eliminate the degeneration associated with progressive periodontal disease. The ideal surgical approach for periodontal regeneration would be one that allowed access to the site to be regenerated without extending the surgical incision into adjacent healthy areas, in order to retain pre-surgical soft tissue contours.

2. History

A growing interest for more patient-friendly and patient-oriented surgical techniques resulted in clinical investigators focusing their interest in the development of less-invasive approaches. Recently, minimally invasive surgical

approaches have been proposed for periodontal regeneration.

Minimally invasive surgery is a surgical approach for performing a bone grafting procedure utilizing a much smaller incision than has been traditionally used.

- Harrel and Rees (1995) proposed the minimally invasive surgery (MIS) with the aim of producing minimal wounds, minimal flap reflection and gentle handling of the hard and soft tissues.
- Cortellini and Tonetti (2007) proposed a papilla preservation flap in the context of a minimally invasive, high-power, magnification-assisted surgical technique, in order to provide even greater wound stability and protection and to limit patient morbidity further.

The minimally invasive surgical technique (MIST) blended the concepts of minimally invasive surgery with the application of the papilla preservation techniques [8, 9] and the use of passive internal mattress sutures [10, 11].

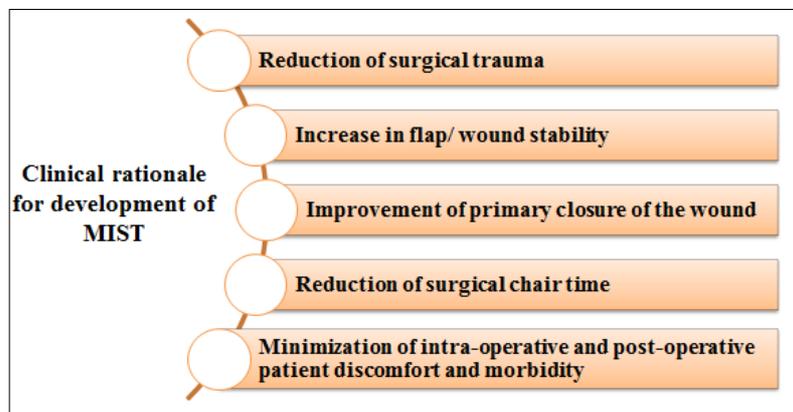


Fig 2: Rationale for development of MIST

3. Minimally Invasive Surgical Technique (Mist)

The difference between MIST and a more traditional periodontal surgical approach lies in the use of smaller incisions to gain access to the site of bone loss and the techniques used for the removal of granulation tissue.

- Ideal site for bone grafting using MIST is usually an isolated, interproximal defect that does not extend significantly beyond the interproximal site.

- A less ideal site for MIST is a defect that extends to the buccal and/or lingual from the interproximal area.

Generalized horizontal bone loss or multiple interconnected vertical defects are a contraindication for MIST and are best handled with more traditional surgical approaches.



Fig 3: Ideal site for use of MIST

The defect-associated interdental papilla is accessed either with the simplified papilla preservation flap when the width of the interdental space is 2 mm or narrower; ¹¹ or the modified papilla preservation technique at interdental sites wider than 2 mm ^[10].

- Incisions used for an interproximal defect are designed as intrasulcular incisions made on the teeth adjacent to the defect. These incisions are made as separate

incisions and not continuous across the interproximal tissue. By not making these incisions continuous, more of the interproximal papillary tissue and tissue height is preserved. These intrasulcular incisions are connected with a single horizontal incision that is placed 2–3 mm from the crest of the papilla. This helps to preserve the shape of the papilla as well as cover the grafted site with soft tissue.

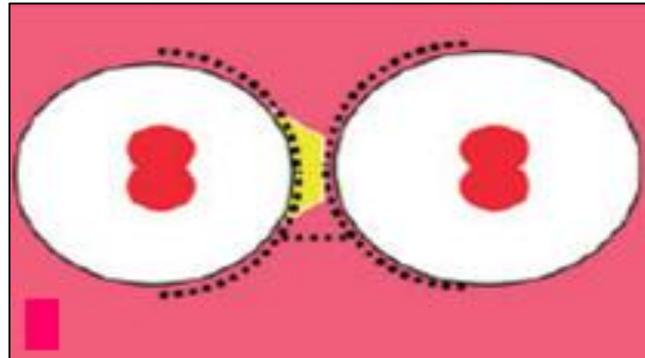


Fig 4: Application of MIST in isolated interdental three-wall defect

- Whenever possible, only the defect-associated papilla is accessed and vertical releasing incisions are avoided. Vertical releasing incisions are given only when flap reflection causes tension at the extremities of the flap.
- The shortest mesiodistal extension of the incision and the minimal flap reflection occurs when the intrabony defect is a pure three-wall, or has shallow two- and/or one-wall subcomponents allocated entirely in the interdental area. In these instances, the mesiodistal incision involves only the defect-associated papilla and part of the buccal and lingual aspects of the two teeth neighbouring the defect. The full-thickness flap is elevated minimally, just enough to expose the buccal and lingual bone crest delineating the defect in the interdental area. A larger coronal elevation of the full thickness flap is necessary when the coronal portion of the intrabony defect has a deep two-wall component. When a deep one-wall defect is approached, the full-thickness flap is elevated to the same extent on both the buccal and the lingual aspect. When the position of the residual buccal/lingual bony wall (s) is very deep and difficult or impossible to reach with the minimal incision of the defect-associated interdental space, the flap is further extended mesially or distally and one extra interdental space is involved to obtain a larger flap reflection.

- After the incisions are placed, the tissue is elevated using sharp dissection to minimize trauma to the flap and preserve much of the blood supply to the soft tissue. This leads to improved soft tissue healing and minimal postoperative soft tissue changes.
- Granulation tissue removal is significantly different than in traditional periodontal surgery. Following minimal flap reflection, the tip of the surgical curette is inserted vertically into the defect with the shank held parallel to the long axis of the tooth and the tip is used to remove the granulation tissue. After debridement, regeneration can be done using various grafting materials and membranes.
- From minimally invasive point of view, monofilament suturing materials are atraumatic, whereas polyfilament suturing materials may carry the “wicking-action” and therefore contribute to wound contamination from saliva. The suturing approach in most instances consists of a single modified internal mattress suture at the defect-associated interdental area to achieve primary closure of the papilla in the absence of any tension ^[12, 13]. Vertical releasing incisions are sutured with simple passing sutures. The buccal and lingual flaps are repositioned at their original level, without any coronal displacement to avoid any additional tension in the healing area.

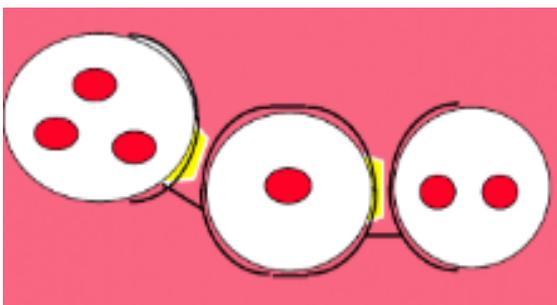


Fig 5: Application of MIST in intra-bony defects involving two adjacent teeth

All the surgical procedures can be performed with the aid of an operating microscope or magnifying loupes at a magnification of $\times 4$ to $\times 16$. ^[12, 13] Microsurgical instruments are utilized, whenever needed as a complement to the normal set of periodontal instruments.

- With microscopic magnification and use of microsurgical instruments, tissue trauma and bleeding can be minimized. For high-precision movement, these instruments must be approximately 15cm in length and circular in cross-section to allow for smooth rotation movement. The working tips are much smaller than regular instruments. These subtle design features help accomplish the desired surgical results.
- Loupes are the most common form of magnification used in dentistry. They are actually two monocular

microscopes with side-by-side lenses that are angled to focus on an object. The disadvantage of loupes is that the eyes must converge to view an image, which can

result in eyestrain, fatigue and even vision changes with prolonged use of poorly fitted loupes.

	Traditional Regenerative Surgery	Minimally Invasive Periodontal Surgery
Incisions	Extends at least one tooth on either side of the periodontal defect	Only involves the area immediately surrounding the periodontal defect
Flap reflection	Tissue is reflected from the underlying bone to expose all of the supporting bone, vertical releasing incisions at the edge of the flap may be used	Tissue is sharply dissected to the level of the bone, tissue is not elevated from the remaining bone and the periosteum is preserved
Surgical closure	Multiple interrupted sutures	A single mattress suture per surgical site
Results	Goal is bone regeneration; usually results in 2-4mm of gingival recession	Goal is bone regeneration; gingival recession of 0.05mm which is clinically undetectable

Fig 6: Difference between traditional and minimally invasive surgery

4. Modified Minimally Invasive Surgical Technique (M-Mist)

Cortellini and Tonetti (2009) [14] recently tested an enhancement of the minimally invasive surgical technique, the modified minimally invasive surgical technique. This was designed specifically to improve flap stability and to provide self-ability to maintain space for regeneration.

- The main difference in this technique from MIST is that incisions are made in the sulcus around the facial surfaces only and the lingual side of the papilla remains intact. The surgical approach consists of a tiny interdental access in which only a buccal triangular flap is elevated, while the papilla is left in place, connected to the root of the crest-associated tooth with its supracrestal fibres.

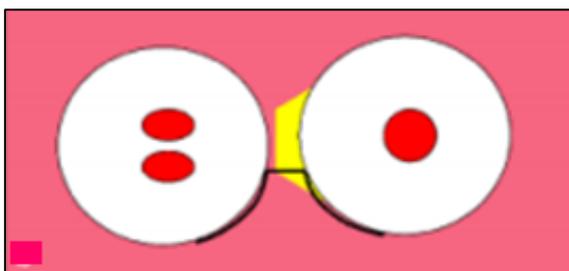


Fig 7: Placement of buccal incision in M-MIST to gain access to the defect without interdental and lingual incisions

- From this the buccal window, the granulation tissue filling the defect is sharply dissected from the papillary supracrestal connective tissue and from the bony walls with a microblade and removed with a mini curette. Then, the root surface is carefully debrided with hand and mechanical instruments.
- The supracrestal fibres of the defect-associated papilla and the palatal tissues are left untouched. The minimal wound and the minimal flap elevation allows for preservation of most of the vessels providing blood supply to the interdental tissues, which is advantageous for the healing process of the interdental wound. This

surgical approach, with its particular design, ensures self-support to the interdental soft tissues through the ‘hanging’ papilla, thereby enhancing space provision. The flap is extremely stable because most of the soft tissues around the bony defect are not incised or elevated, thereby enhancing blood-clot stability.

- Minimal flap trauma, integrity of the blood supply and absolute passivity in the suturing technique ensures primary closure of the interdental wound in, thereby preventing bacterial contamination. The suturing approach is based on the use of a single internal modified mattress suture.

However, the reduced buccal access means that this approach is not applicable to very deep defects that involve the lingual side of a tooth in which the diseased root surface cannot be reached easily for instrumentation from the small buccal window.

5. Conclusion

Periodontal regeneration with many different regenerative materials, including barrier membranes, grafts, active biological compounds and combinations of those, demonstrated significant clinical improvements in intrabony defects, far beyond those achieved with debridement only. Different surgical approaches have been proposed and tested in combination with the various regenerative materials. The minimally invasive surgical technique helps meet the goal of regeneration of periodontal bone support based on the clinically measurable parameters of decrease in probing depths, increase in attachment levels and the retention or improvement of soft tissue contours [15].

Patient acceptance of treatment plans that include MIST have also been positive. This has led to a better acceptance of periodontal surgical recommendations when MIST is the surgical approach to be used.

Future devices for performing minimally invasive periodontal surgical procedures need to be easier to use. Better devices to assist in visualizing small surgical fields, better devices to prepare surgical sites and better

instruments to aid in the placement of regenerative materials are all needed.

6. References

1. Garrett S. Periodontal regeneration around natural teeth. *Ann Periodontol.* 1996; 1(1):621-66.
2. The American Academy of Periodontology. *GPT*, 3rd ed. Chicago. AAP, 1992.
3. Bowers GM, Schallhorn RG, Mellonig JT. Histologic evaluation of new attachment in human intrabony defects: a literature review. *J Periodontol.* 1982; 53(8):509-14.
4. Tonetti MS, Pini-Prato G, Cortellini P. Periodontal regeneration of human intrabony defects. IV. Determinants of healing response. *J Periodontol.* 1993; 64(10):934-40.
5. Miller Jr PD. The Frenectomy Combined with a Laterally Positioned Pedicle Graft: Functional and Esthetic Considerations. *J Periodontol.* 1985; 56(2):102-6.
6. Cortellini P, Clauser C, Prato GP. Histologic assessment of new attachment following the treatment of a human buccal recession by means of a guided tissue regeneration procedure. *J Periodontol.* 1993; 64(5):387-91.
7. Anderegg CR, Metzler DG, Nicoll BK. Gingiva thickness in guided tissue regeneration and associated recession at facial furcation defects. *J Periodontol.* 1995; 66(5):397-402.
8. Harrel SK, Rees TD. Granulation tissue removal in routine and minimally invasive procedures. *Comp Cont Edu Dent.* 1995; 16(9):960-2.
9. Harrell AG, Heniford BT. Minimally invasive abdominal surgery: lux et veritas past, present, and future. *Am J Surg.* 2005; 190(2):239-43.
10. Cortellini P, Prato GP, Tonetti MS. The modified papilla preservation technique. A new surgical approach for interproximal regenerative procedures. *J Periodontol.* 1995; 66(4):261-6.
11. 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 Periodont Rest Dent.* 1999; 19(6):588-599.
12. Cortellini P, Tonetti MS, Lang NP, Suvan JE, Zucchelli G, Vangsted T *et al.* The simplified papilla preservation flap in the regenerative treatment of deep intrabony defects: clinical outcomes and postoperative morbidity. *J Periodontol.* 2001; 72(12):1702-12.
13. Cortellini P, Tonetti MS. Clinical performance of a regenerative strategy for intrabony defects: scientific evidence and clinical experience. *J Periodontol.* 2005; 76(3):341-50.
14. 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; 36(2):157-63.
15. Harrel SK, Nunn ME, Belling CM. Long-term results of a minimally invasive surgical approach for bone grafting. *J Periodontol.* 1999; 70(12):1558-63.