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A Review On Minimally Invasive Periodontal Surgery In The Treatment Of Infrabony Defects

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ABSTRACT

Minimally invasive periodontal surgery (MIPS) has emerged as a promising approach for treating infrabony defects, offering advantages in clinical outcomes and patient comfort compared to traditional techniques. Therefore in our review we have access them whether they are good for the treatment of infrabony defect with the help of its history, biological aspect, advantage, disadvantage, decision making tree and prevalence.

Keywords: *MIPS, Infrabony Defect, Biological Aspect, Comfort, Decision Making Tree.*

1. INTRODUCTION

In recent decades, the development of less invasive surgical procedures aimed at facilitating a smoother postoperative recovery and minimizing patient morbidity has become the primary objective.[1,2] Thus, the concept of gentle tissue manipulation has been referred to as minimally invasive surgery (MIS).[3] Over time, its principles have been integrated into the practice.[4] When a lesion advances apically, it results in the destruction of the alveolar bone & its loss of the periodontal support. This process leads to the development of osseous defects. Their appearance is mostly determined by the presence of the microbial plaque as well as the anatomical features that are specific to the area.[4]

Infrabony lesions(IFB-L) which are vertical defects formed from the base of the pocket at the level of the crest.[5-7] It, on the other hand, have a tendency to exhibit a larger residual pocket depth (PD) following NSPT. This suggests that they may be associated with a higher risk of advancing periodontal disease.[8,9] Moreover, reseachers have created a wide range of surgical techniques and regenerative materials to repair the residual defects. [10] Studies have shown that using traditional flap surgery along with regenerative materials like membrane barriers, bone grafts works very well for repairing deep bone defects. [11–13]

In the past few years, the advancements that have been made in the area of magnification & have resulted in the creation of new approaches for periodontal surgery that involve less invasive procedures.[12] MISTs and new surgical methods for periodontal regeneration are characterized by small cuts, minimal lifting of tissue, and stitching for the first stage of healing. These novel surgical approaches is based on the notion of papilla preservation techniques(PPT). [14–19] Clinical results were shown to be positive in the repair of intrabony defects when less invasive surgical procedures were used, even in regions that were considered to be aesthetic. [16-20]

Therefore, these have led its more use to treat intrabony lesions when needed.

2. HISTORY

Harrel was the one who originally presented the concept of MIS procedures. [15 ,16] When performing the initial incision, the blade is oriented long axis of the root and intrasulcularly. Now, for complete intrasulcular incisions, (lingual portion & interdental papilla is carefully removed) and finally, flaps are reflected both buccally and lingually. Excision of the connective and granulation tissue that is present inside the osseous defect is the next step after the flap reflection procedure has been completed effectively. Ultrasonic scalers, blades, and small curettes are used to perform the initial root debridement. Using a mechanical device, the residual granulation tissue is removed, and finishing burs are used to painstakingly perfect the root planing process. We use a vertical mattress suture method to secure the flaps properly and complete the main closure of the wound.[15-20]

3. REGENERATION OF INTRABONY DEFECT USING MIST

Studies have shown that it includes mainly 2 factors which are as follows:-[23]

1. Surgical technique used
2. Biomaterials (EMD, bone grafts, membranes) selected to fill the defect.

4. BIOLOGY BEHIND REGENERATION

A deeper understanding of the cellular and molecular mechanisms underlying tissue regeneration has resulted in heightened interest in the isolation of specific proteins and cell signaling pathways.This is done in order to improve the effectiveness of these treatments. The specific mechanism of action of this therapy is not totally known due to the high number of proteins and growth factors in the material (both of which are present). Throughout the formation of the periodontal ligament (PDL), it is expected that the biomaterial will be able to duplicate the processes that take place throughout this process. The presence of enamel matrix proteins may actually promote the formation of cementum, which would ultimately result in complete regeneration.[24]

In another study, a significant clinical benefit has been shown in comparison to traditional periodontal surgical procedures. This advantage includes a 1.1mm increase in clinical attachment gain(CAG) and a 0.9mm decrease in pocket depth(PD) when compared to open flap debridement. [25,26] When one takes into account the important elements that play a role in successful regeneration, it becomes clear that a single solution, such as Emdogain(EMD), cannot accomplish effective regeneration under adverse circumstances by itself. [27] In less favorable defects, such as those with a single wall, the mechanical stability of grafts has been exploited to construct a combination strategy that employs a variety of tactics with the goal of improving the overall patient outcomes.[24] A review was conducted both individually and in combination. In a review, the studies that were included found that there was no significant difference. However, it should be highlighted that the data evaluation does not provide sufficient information about the morphology of the defect. As a result, it is not possible to conduct a subgroup analysis of the advantages that were seen in the control and test groups across a variety of defects that have varied anatomical morphologies (for example, defects with one or three walls). [28] In the surgical management of IFB-D study had demonstrated a significant clinical advantage over open flap debridement. This fibrin is derived from the patients' own blood and is processed through centrifugation to concentrate advantageous components. [29] Therefore, the major purpose is to improve regeneration techniques, with the intention of putting those that have shown promise in cellular research through further examination in vivo and clinical validation.[30] A separate study demonstrated that histological analysis of biopsies revealed consistent healing through the formation of long junctional epithelium along the root surfaces, with cementum exhibiting inserting collagen fibers primarily in the most apical regions of the defects when employing enamel matrix derivative (EMD). In contrast, root conditioning methods utilizing HA suspension alone, HA suspension combined with EDTA, and EDTA alone did not yield significant results. [31,32]

Consequently, it appears that the treatment of IFB-D is still dependent upon proper surgical access, even though periodontal regeneration has only been histologically observed after a combination of surgical access and various additional procedures .[30]

5. PREVALENCE

The frequency of intrabony defects around teeth has been reported in studies of human skulls to be between 4.1% and 9.4% [24], while in radiographic evaluations of an adult population in Sweden, the prevalence may reach 32% of folks. [24] These anatomical features can make it harder to treat deep pockets in traditional periodontal therapy, as intrabony defects reduce the likelihood of closing these pockets, along with other factors like plaque and furcation pockets. Due to difficulties in removing subgingival biofilm, the presence of such defects may prolong the disease.[24]

6. IDENTIFICTAION OF DEFECT [24]

1. Clinically
    a. PD
    b. CAL
    c. Bleeding on Probing
    d. Plaque Score
    e. Furcation Involvement
2. Radiographically
    a. Vertical bone loss
    b. Type of tooth
    c. Type of defect

7. ADVANTAGE [31]

1. Long term reduction of probing depth
2. Increase clinical attachment level
3. Minimal thermal hypersensitivity
4. No or minimal gingival recession
5. Increase patient acceptance & satisfaction
6. Improved retention of soft height and contour
7. Less postoperative pain
8. Improvement in rate of healing
9. Good patient acceptance

8. DISADVANTAGE [32]

1. Technique sensitive
2. Needs improved instruments for root and osseous defect debridement.
3. Expensive
4. Cannot be universally applied.

9. MANAGEMENT [24]

Figure 1 talks about the treatment planing aspect.

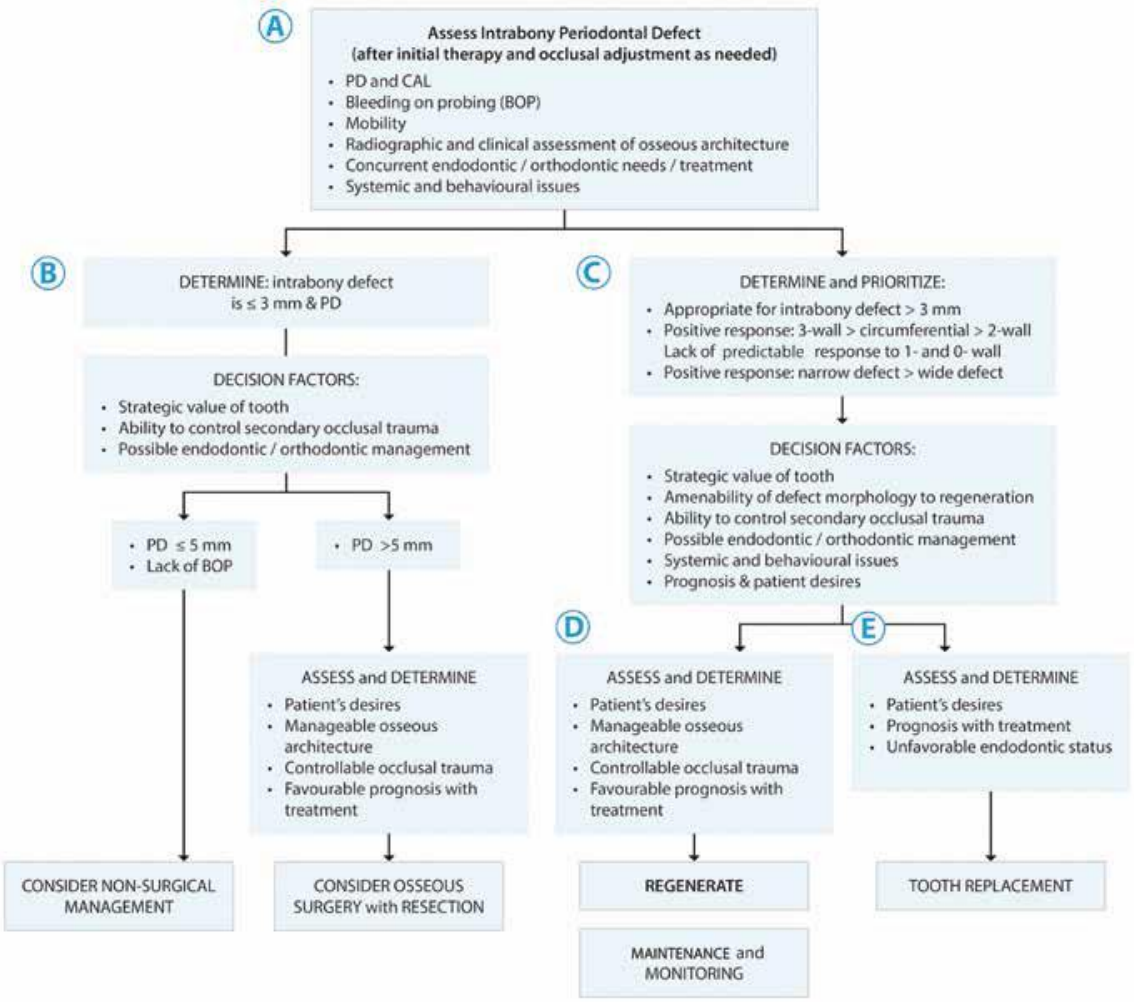

FIGURE 1: DECISION MAKING TREE [24]

10. CONCLUSION

While MIS shows significant short-term benefits for infrabony defects which includes improved periodontal parameters and patient comfort, the current evidence base is constrained by methodological limitations. High-quality RCTs with standardized protocols and extended follow-ups are needed to validate these findings and establish MIS as a gold-standard treatment. Thus, periodontist may consider MIPS for select cases, but its superiority over conventional methods remains partially unverified.

REFERENCES

[1] Daniel RK. Microsurgery: Through the looking glass. New England Journal of Medicine. 1979 May 31;300(22):1251-7.

[2] Shanelec DA, Tibbetts LS. A perspective on the future of periodontal microsurgery. Periodontology 2000. 1996 Jun;11(1):58-64.

[3] Fitzpatrick JM, Wickham JE. Minimally invasive surgery. Br J Surg. 1990 Jul;77(7):721-2.

[4] Tibbetts LS, Shanelec DA. An overview of periodontal microsurgery. Current opinion in Periodontology. 1994 Jan 1:187-93.

[5] Papapanou PN, Tonetti MS. Diagnosis and epidemiology of periodontal osseous lesions. Periodontology 2000. 2000 Feb;22(1):8-21.

[6] Sanz M, Marco del Castillo A, Jepsen S, Gonzalez-Juanatey JR, D'Aiuto F, Bouchard P, Chapple I, Dietrich T, Gotsman I, Graziani F, Herrera D. Periodontitis and cardiovascular diseases: Consensus report. Journal of clinical periodontology. 2020 Mar;47(3):268-88.

[7] Mahendra J, Mahendra L, Mugri MH, Sayed ME, Bhandi S, Alshahrani RT, Balaji TM, Varadarajan S,

Tanneeru S, P AN, Srinivasan S. Role of periodontal bacteria, viruses, and placental mir155 in chronic periodontitis and Preeclampsia. A genetic microbiological study. Current Issues in Molecular Biology. 2021 Jul 29;43(2):831-44.

[8] Balaji TM, Varadarajan S, Jagannathan R, Mahendra J, Fageeh HI, Fageeh HN, Mushtaq S, Baeshen HA, Bhandi S, Gupta AA, Raj AT. Melatonin as a topical/systemic formulation for the management of periodontitis: A systematic review. Materials. 2021 May 6;14(9):2417.

[9] Smiley CJ, Tracy SL, Abt E, Michalowicz BS, John MT, Gunsolley J, Cobb CM, Rossmann J, Harrel SK, Forrest JL, Hujoel PP. Systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. The Journal of the American Dental Association. 2015 Jul 1;146(7):508-24.

[10] Cortellini P, Tonetti MS. Clinical concepts for regenerative therapy in intrabony defects. Periodontology 2000. 2015 Jun;68(1):282-307.

[11] Needleman I, Tucker R, Giedrys-Leeper E, Worthington H. A systematic review of guided tissue regeneration for periodontal infrabony defects. Journal of periodontal research. 2002 Oct;37(5):380-8.

[12] Murphy KG, Gunsolley JC. Guided tissue regeneration for the treatment of periodontal intrabony and furcation defects. A systematic review. Annals of periodontology. 2003 Dec;8(1):266-302.

[13] Nibali L, Koidou VP, Nieri M, Barbato L, Pagliaro U, Cairo F. Regenerative surgery versus access flap for the treatment of intra-bony periodontal defects: A systematic review and meta-analysis. Journal of clinical periodontology. 2020 Jul;47:320-51.

[14] Takei HH, Han TJ, Carranza Jr FA, Kenney EB, Lekovic V. Flap technique for periodontal bone implants: Papilla preservation technique. Journal of Periodontology. 1985 Apr;56(4):204-10.

[15] Harrel SK, Rees TD. Granulation tissue removal in routine and minimally invasive procedures. Compendium of continuing education in dentistry (Jamesburg, NJ: 1995). 1995 Sep 1;16(9):960-2.

[16] Harrel SK. A minimally invasive surgical approach for periodontal bone grafting. International Journal of Periodontics & Restorative Dentistry. 1998 Apr 1;18(2).

[17] Harrel SK, Abraham CM, Rivera-Hidalgo F, Shulman JD, Nunn ME. Videoscope-assisted minimally invasive periodontal surgery (V-MIS). Journal of clinical periodontology. 2014 Sep;41(9):900-7.

[18] Cortellini P, Tonetti MS. A minimally invasive surgical technique with an enamel matrix derivative in the regenerative treatment of intra-bony defects: A novel approach to limit morbidity. Journal of clinical periodontology. 2007 Jan;34(1):87-93.

[19] Cortellini P, Tonetti MS. Improved wound stability with a modified minimally invasive surgical technique in the regenerative treatment of isolated interdental intrabony defects. Journal of Clinical Periodontology. 2009 Feb;36(2):157-63.

[20] Cortellini P. Minimally invasive surgical techniques in periodontal regeneration. Journal of Evidence Based Dental Practice. 2012 Sep 1;12(3):89-100.

[21] Cortellini P, Prato GP, Tonetti MS. The simplified papilla preservation flap. A novel surgical approach for the management of soft tissues in regenerative procedures. International Journal of Periodontics & Restorative Dentistry. 1999 Dec 1;19(6).

[22] Cortellini P, Tonetti MS. Minimally invasive surgical technique and enamel matrix derivative in intra-bony defects. I: Clinical outcomes and morbidity. Journal of Clinical Periodontology. 2007 Dec;34(12):1082-8.

[23] Kaddas C, Dereka X. Minimally invasive surgical techniques for the treatment of different types of isolated intrabony defects: a narrative review. Dental and Medical Problems. 2022;59(2):309-18.

[24] Anderson W, Pye A. Management of intrabony defects in periodontal disease. Dental Update. 2019 Mar 2;46(3):257-65.

[25] Esposito M, Grusovin MG, Papanikolaou N, Coulthard P, Worthington HV. Enamel matrix derivative (Emdogain®) for periodontal tissue regeneration in intrabony defects. Cochrane database of systematic reviews. 2009(4).

[26] Farina R, Simonelli A, Minenna L, Rasperini G, Trombelli L. Single-flap approach in combination with enamel matrix derivative in the treatment of periodontal intraosseous defects. International Journal of Periodontics & Restorative Dentistry. 2014 Jul 1;34(4).

[27] Needleman I, Worthington HV, Giedrys-Leeper E, Tucker R. Guided tissue regeneration for periodontal infra-bony defects. Cochrane Database of Systematic Reviews. 2006(2).

[28] Troiano G, Laino L, Zhurakivska K, Cicciù M, Lo Muzio L, Lo Russo L. Addition of enamel matrix derivatives to bone substitutes for the treatment of intrabony defects: A systematic review, meta-analysis and trial sequential analysis. Journal of Clinical Periodontology. 2017 Jul;44(7):729-38.

[29] Castro AB, Meschi N, Temmerman A, Pinto N, Lambrechts P, Teughels W, Quirynen M. Regenerative potential of leucocyte-and platelet-rich fibrin. Part B: sinus floor elevation, alveolar ridge preservation and implant therapy. A systematic review. Journal of clinical periodontology. 2017 Feb;44(2):225-34.

[30] Sculean A, Windisch P, Keglevich T, Gera I. Histologic evaluation of human intrabony defects following non-surgical periodontal therapy with and without application of an enamel matrix protein derivative. Journal of periodontology. 2003 Feb;74(2):153-60.

[31] Harrel SK, Wilson Jr TG. Minimally invasive periodontal therapy: clinical techniques and visualization technology. John Wiley & Sons; 2015 Feb 16.

[32] Nisha S, Shashikumar P, Samyuktha GS. Minimally invasive surgical techniques in periodontal regeneration. International Journal of Oral Health Sciences. 2017 Jan 1;7(1):24-9.