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### RESEARCH ARTICLE

#### MINIMALLY INVASIVE TECHNIQUES FOR REGENERATIVE THERAPY.

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#### Abstract

Periodontal regeneration remains the corner stone of periodontal therapy. Newer techniques have emerged to overcome the pitfalls in conventional surgical techniques. Minimally invasive surgery (MIS) is a method of surgical access that minimizes flap reflection and tissue trauma, resulting in maintenance of critical blood supply, stability of the blood clot within the wound site, and better esthetic outcome. These techniques have evolved from magnification devices to advanced surgical instruments and modified procedures. This review summarizes the rationale, indications, contraindications, technique and future prospects of minimal invasive periodontal surgery.

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#### Introduction:-

For the past 150 years, mortality & morbidity for all surgical procedures have been accepted as unavoidable parts of the therapeutic process. However since the early 1980s, it has become evident that less invasive methods of interventional treatment in some areas have produced far fewer complications with a reduced risk of cell death and morbidity. This rationalised the need for minimally invasive treatment with its general aim to minimize the trauma of any interventional process & still achieve satisfactory therapeutic result.

In the last decade, some clinical investigators have focused their interest on the development of minimally invasive surgical approaches in periodontal surgery. Harrel & Rees (1995) proposed the minimally invasive surgery (MIS) with the aim to produce minimal wounds, minimal flap reflection and gentle handling of the soft and hard tissues in periodontal surgery (Harrel & Nunn 2001, Harrel et al. 2005). Cortellini & Tonetti (2001, 2002, 2004) and Wachtel et al. (2003) tested the use of operative microscopes and microsurgical instruments to increase visual acuity and accuracy in the application of papilla preservation flaps in periodontal regeneration.

Microsurgery has become an indispensable asset in medicine in the recent years and the application of its principle to periodontal surgery has been extremely valuable. Periodontal microsurgery is a natural transition and extension of surgical principles and techniques by which exceedingly accurate and precise preparation, atraumatic handling of soft and hard tissue enhances primary wound closure through optical magnification. Improvements in flap designs & soft tissue manipulation are considered key elements in improving the outcomes of regenerative periodontal surgery..

**Periodontal Regeneration:-**

Periodontal regeneration is defined histologically as regeneration of the tooth's supporting tissues, including alveolar bone, periodontal ligament, & cementum over a previously diseased root surface. Materials being used for regeneration include bone grafts, membranes & growth factors.

The purpose of periodontal surgery is to reconstruct the attachment apparatus with retention or enhancement of the pre-surgical soft tissue contour and height. However, the results generated by traditional surgeries seemed unsatisfactory due to limited regenerated periodontal tissue. It appears that functional periodontal tissue regeneration remains a challenge.

This led the way towards a technique called as minimally invasive periodontal surgery.

**Minimally Invasive Periodontal Therapy:-**

Minimally invasive periodontal surgery (MIS) for periodontal regeneration is based on the concept of using

1. very small split thickness incisions
2. loupes for better access
3. sharp dissection of the tissue overlying the area of bone loss
4. preservation of the periosteum to the greatest extent possible in order to preserve blood supply to periodontal tissue,
5. replacement of the soft tissue flap at or coronal to the pre-surgical height,
6. the closure of the flap using minimal suturing.

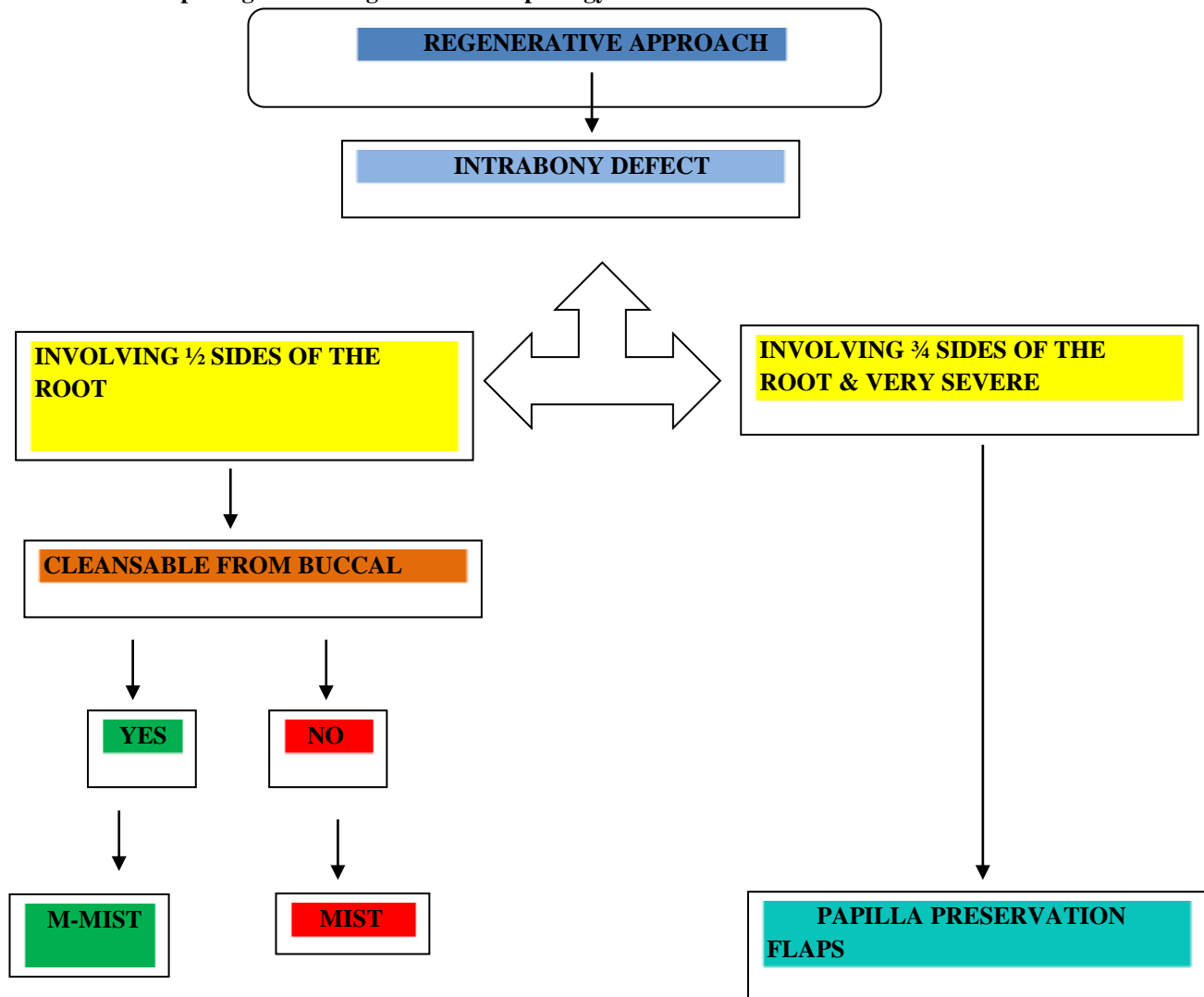
A prospective study of MIS using an enamel matrix derivative (EMD) was performed in two centres with results reported from 160 surgical sites. Results were reported at 1 and 6 years post-operative (**Harrel et al. 2005, 2010**). At 1 year post-operative, there was a statistically significant mean improvement in all clinical measures with a mean pocket probing depth of 3.09 mm and a mean improvement in CAL of 3.33 mm. This improvement was maintained at the 6-year post-surgical evaluation. Great clinical significance can be attributed to the fact that all postsurgical pocket probing depths were less than 4 mm and these were maintained at 6 years with no sign of periodontal breakdown or indication of a return of deeper pocket probing depths. Also of clinical significance was that a clinically undetectable mean recession of 0.01 mm was noted at 1 year and 0.08 mm at 6 years.

In 2007, a similar minimally invasive surgical approach based on the concepts of MIS and incorporating elements of the papilla preservation technique was introduced. This technique was described as the Minimally Invasive Surgical Technique (MIST) and a later modification was termed the Modified Minimally Invasive Surgical Technique (MMIST) (**Cortellini & Tonetti 2007, 2011**). The initial MIST approach used somewhat larger incisions and flaps than the later M-MIST approach. A major factor in both MIST and M-MIST was the moderately complex suturing technique originally developed for the papilla preservation technique. This complex suturing technique is markedly different from that used with MIS which consists of a single suture at the base of the papilla. One year data for the MIST approach reported statistically significant improvements of all clinical measures with mean pocket probing depths of 3 mm, mean improvement in CAL of 4.9 mm, and mean recession of 0.4 mm. The clinical improvements were also significant with all pockets at 1 year being less than 4 mm.

Positive results from these approaches to regeneration have been reported by **Rabeiro et al. in 2011, Mishra et al. in 2013**.

The improvement in pocket probing depth and CAL reported for both MIS and MIST appear equal to or greater than most past results reported for other types of regenerative periodontal surgery. Also, both minimally invasive approaches have resulted in less post-surgical recession than reported with other regenerative periodontal surgical modalities. The report of a mean recession following MIS of 0.01 mm appears to be less than the recession reported following any other periodontal regenerative surgery. In addition to these improvements in clinical measures, patients reported minimal post-surgical pain or morbidity following both MISs and MIST (**Harrel 2005, Cortellini & Tonetti 2007**).

How to select flap design according to defect morphology & extension:-



#### Advantages Of Minimally Invasive Regenerative Therapy:-

1. Increased precision in delivery of surgical skills, which results in more accurate incisions via smaller instrumentation, less trauma, and quicker postoperative healing.
2. Gentle handling of soft and hard tissues with the same universally accepted surgical principles.
3. Precise and accurate wound closure.
4. Minimal tissue damage.
5. Healing by primary intention.
6. Clinical horizons will continue to improve with operator experience and willingness to employ previously unused basic optic magnification and ergonomic techniques and technology.
7. Significant reduction in pain and morbidity.
8. Increased acceptance by the patients compared to conventional surgery.

#### Disadvantages Of Minimally Invasive Regenerative Therapy:-

According to Jaffray (2005) disadvantages of minimally invasive regenerative therapy are related to the fact that it requires

1. special equipment,
2. specialist training ,
3. some additional equipments which could be more expensive, and
4. some procedures that may take longer than usual, compared to conventional surgeries.

**Future Trends:-****Robotic microsurgery:-**

Shrinking robots and growing processors are taking minimally invasive techniques where they have never gone before. The delicate steps of operation are performed with the system that controls instruments inserted through small incisions, or “ports”. The movements of the tools are least 20 feet away. The surgeon manipulates the telerobo, watches the operation through a three dimensional video, through a port in the skin and is able to complete each step of the complex operation which was previously considered impossible.

**Videoscope assisted minimally invasive periodontal surgery (V-MIS):-**

In the study conducted by Harrel S K et al (2014); a 6 month re-evaluation post- surgery, showed a statistically significant improvement ( $p < .001$ ) in mean Probing Pocket Depth (PPD) & mean Clinical Attachment Level (CAL) [PPD  $3.88 \pm 1.02$  mm, CAL  $4.04 \pm 1.38$  mm] in 1, 2, and 3 walled defects. All PPD at re-evaluation were 3 mm or less. There was a mean post-surgical increase in soft tissue height ( $0.13 \pm 0.61$  mm,  $p = 0.168$ ) with a decrease in recession. The improvement in PPD and CAL from V-MIS, in the authors’ opinion, appears to be favourable when compared to previously reported results of periodontal regenerative surgery. The lack of post-surgical recession following V-MIS has not been reported with traditional regenerative surgery.

**Conclusion:-**

Minimally invasive periodontal therapy allows a higher quality of work to be undertaken and has opened a new avenue for periodontal regeneration. The cardinal essentials of access & visibility, gentle tissue handling, accurate approximation, meticulous hemostasis, and minimal tissue destruction are the hallmarks of this approach. They play a vital role in attaining the elusive goal of periodontal regeneration. Presently with the wide array of equipments & surgical techniques present today a better attempt can be made to achieve periodontal regeneration.

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