



Research Article

## A PIVOTAL CONFRONT IN PERIODONTICS: REGENERATION AT THE INTERDENTAL SITES

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### ABSTRACT

To decrease the severity of the periodontal destruction as well as to increase the longevity of the treated teeth, gaining attachment at the interdental sites are extremely necessary. There are a lot of treatment modalities which can be used to reconstruct the lost periodontium at the interdental sites. To achieve complete treatment outcome, there might be required of several combined techniques, for example, connective tissue graft along with coronally advanced flap technique. This review shares all those approaches which helps to repair challenging interproximal soft and hard tissue deficiencies.

#### Key words:

Deficient papillae, Papilla preservation technique, Microsurgical approaches, High precision debridement, Envelope coronally advanced flap.

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### INTRODUCTION

What should be perceived as a successful periodontal treatment? It's nothing but an effort towards maintaining the original sets of teeth along with the well-being of a patient.<sup>1</sup> The bone resorption pattern at the interdental area occurs in a horizontal/ in vertical pattern or in a combination of these two. It's then followed by the receding the soft tissues at those areas. This pattern of interdental bone and attachment loss has a major esthetic impact and it also influences the outcomes of regenerative treatments of the periodontium. Now-a-days, the aesthetic expectations of the patients are so high that, interdental recessions due to periodontal treatments have become quite unacceptable for them.<sup>2,3</sup>The presence of open interproximal spaces/black triangles has been considered one of the most troubling dilemmas in dentistry due to the negative impact on aesthetics, phonetics as well as in food impaction.<sup>4,5</sup> So, the main aim of this review is to search for all the possible ways for regenerating the lost periodontium at the interdental areas and thus making the patients more confident from the cosmetic aspects as well.

**Critical Factors Which Deermine The Height of The Papilla:** The factors which determine the height of the papilla around teeth are:

1. The distance between the crest of the bone and the interproximal CEJ,<sup>6</sup>

2. Thickness of the soft-tissue at that particular site,
3. The current status of the inflammation,
4. Pocket probing depth at the adjoining teeth,
5. Nature of the tissue (whether it's fibrous/ oedematous in nature),
6. Previously provided any treatment of surgical or non-surgical intervention.

The patient's desire to reconstruct the full papilla is one of the main reasons for the treatment of papillae loss or deficient papillae. But, when these scenarios are combined with a mid-facial gingival recession, the potential of achieving complete root coverage becomes significantly less. Zucchelli et al.<sup>7</sup> had identified four different clinical scenarios in relation to the presence of the papilla and the supporting periodontium, these are:

1. Partially missing papilla without clinical attachment/bone loss,
2. partially missing papilla associated with interdental attachment/bone loss,
3. intact papilla with clinical attachment/bone loss, and
4. intact papilla without clinical attachment/bone loss.

#### Treatment Modality of Papillary Deficiency in Healthy Periodontium

Deficient papillae may be

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- Surgically reconstructed where the periodontium in its best condition by using certain soft tissue grafts,
- The lost tissue can even be regenerated with required orthodontic tooth movements,
- This scenario of papillary deficiency might be improved by modifying the adjoining restorations if longer contact points are existing.

Papilla reconstruction is described with the use of soft tissue grafts or substitutes connective tissue graft or acellular dermal matrix,<sup>8,9</sup> hyaluronic acids,<sup>10</sup> platelet-rich fibrins,<sup>11, 12</sup> cultured and expanded autogenous fibroblast injections, as well as stem cell therapy<sup>13</sup>. The clinical trial which was conducted to treat interdental papilla insufficiency was advocated by McGuire and Scheyer.<sup>14</sup> They assessed the efficacy of autologous fibroblast injections versus placebo in combination with a minimally invasive papilla augmentation technique. The first injection occurred 5 to 7 days after the papilla priming procedure, the second treatment 7 to 14 days later, and the third 7 to 14 days after the second injection. A significant increase in papillary height was observed in the test group after 2 months, while no significant differences were noted between the two groups at the 3- or 4-months.

All the other studies which were describing the treatment modality of papillary reconstruction techniques, were largely case reports or case series with a limited number of patients. Therefore, more studies with long-term follow-ups are encouraged for evaluating the efficacy of this approach in the long run.

#### ***Treatment Modality of Papillary Deficiency In The Presence of Diseased Periodontium***

First phase of treatment plan involves the recognising the risk as well as the contributing factors which are responsible for this current status of the periodontium. Non-surgical treatment options like, instructing the patients for maintaining their oral hygiene, motivating the patients using disclosing solutions, plaque control measures aiming at the removal of etiologic as well as contributory factors such as, plaque, calculus inflammation while improving the patient compliance.<sup>15,16</sup> The importance of a strict oral hygiene regimen on tooth retention has largely been demonstrated by several studies. In particular, minimally invasive non-surgical therapy has been shown to be effective in removing the biofilm and reducing the pocket depth without causing a significant shrinkage of the soft tissues in periodontal intrabony defects. The minimally invasive procedures had suggested that, the soft tissue healing and the whole maturation phase may take up to 9 to 12 months after the non-surgical procedure<sup>17, 18</sup>. That's why it is advocated for allowing an adequate time period following non-surgical therapy prior to performing a periodontal regenerative surgery.

Retrieving information from the histological sections as well as clinical evidences<sup>19, 20, 21</sup> are sufficient enough to denote the potential of regenerative treatment options to restore the lost periodontal ligament over those ailing sites, with a significant clinical attachment level gain and probing depth reduction, which is able to swap the prognosis of a hopeless tooth. It has been well demonstrated in the cases of periodontal regeneration cases, undoubtedly, the assessment of the surgical techniques and biomaterials have granted to the predictability as well as success of the prospective procedure. Positive impacts on the stability of that injured tissue and by the

possibilities of achieving healing by primary intentions had been achieved by introducing the papilla preservation techniques. This surgical modality had been showing to be very decisive for having its effects on GTR treatment modalities.

***Microsurgical Approaches & Its Evaluation:*** In the later phase of evolving newer biomaterials, minimally invasive techniques were started to be used. The amazing fact about these microsurgical procedures are that, the flap extensions have been quite reduced compared to in those cases where classical periodontal flap surgeries have been administered. Enamel matrix derivatives, platelet-derived growth factor or fibroblast growth factor-2 are used in these approaches, instead of using barrier membranes. All these approaches are being directed because of the efficiency of these procedures to utilize the better illumination and enhanced magnification of the surgical field, minimally traumatic design of the flap, carrying out high precision debridement as well as meticulous placement of the biomimetic components<sup>22, 23</sup>.

Although, Graziani *et al.*<sup>24</sup> in their meta-analysis, had reported that an increase in recession depth of 1.15 mm at 12 months and of 1.78 mm for longer follow-ups should be expected after flap surgeries for the treatment of intrabony defects. In particular, bone defects with non-supporting anatomy and thin soft tissue phenotypes were found to be risk factors for an increased recession depth. Gingival recessions may also negatively impair patients' aesthetics and satisfaction of the treatment, especially if the treated tooth is in the anterior area.<sup>25</sup> This is why it's not at all shocking that some authors had proposed the use of periodontal plastic surgical methods while dealing with the intrabony defects to maintain.

An alternative approach was also provided by Zucchelli and De Sanctis<sup>2</sup>, to treat the intrabony defects using EMD named as "Envelope coronally advanced flap". In this technique, the buccal flap was released and then advanced it in a more coronal position and anchored to the defect's de-epithelialized adjacent papillae. They also asserted that, this treatment modality was able to lower the risk for soft tissue collapse at the supra crestal sites, inside the intrabony component & it raises the space for regeneration as well.

Rasperini *et al.* proposed<sup>3</sup> the "soft tissue wall technique" for the regenerative treatment of non-contained intrabony defects in which the papilla preservation technique was combined with the trapezoidal coronally advanced flap followed by sling sutures for its coronal stabilization, and an internal mattress suture for achieving primary intention healing and closure of the papilla. At 1-year appointment, the authors had observed a significant improvement in interdental attachment gain, with a reduction of the parameter mean recession of 1±0.4 mm.

There are certain treatment modalities, which try to avoid incisions at the level of the papilla, such as the "modified vestibular incision sub-periosteal tunnel access" (M-VISTA)<sup>26</sup> and the "non-incised papillae surgical approach" (NIPSA)<sup>27</sup>. Moreno Rodriguez *et al.* stated that, the NIPSA achieved similar outcomes to a traditional minimally invasive papilla preservation technique, with a significantly lower recession at the tip of the interdental papilla. In this study, the same authors found that NIPSA could provide not only a significant improvement in attachment gain but it also reduces significant recessions. And a coronal advancement of the tip of the

papillae was also recorded after 1 year of the therapy ( $0.40\pm 0.5$  mm).

Connective tissue grafts based techniques have also been proposed to deal with these scenarios. A connective tissue graft can be utilized as a 'biological filler'<sup>28</sup> materials to strengthen the stability of the flap as well as to the strength of the wound. Connective tissue graft adaptation to the exact area of the root surface can also promote a better coagulation cascade and protect the maturing fibrin clot as well. A connective tissue graft also results in a significant gain in the attached gingival thickness. The increase in creeping attachment associated with the CTG & total increased volume of the soft tissue also positively influence the cosmetic results of the procedure following regenerative treatments.

Trombelli<sup>29</sup> and co-workers had observed in one of their studies that, the addition of a CTG to the single flap approach had reduced recession depth, lowered the residual defects with a clinically detectable apical displacement of the gingival margin, and an increase in gingival tissue volume. Likewise, the addition of a CTG has also been described for the NIPSA as well, with an improvement in the marginal soft tissue and a significant periodontal attachment gain had observed in all those cases.

Horizontal bone loss in the labial area represents another challenge in the clinical scenario. The lack of a 3 mm infrabony part restricts the probable outcome of the periodontal regeneration and the requirement to preserve the aesthetics is a contraindication for osseous resective surgery. A conservative approach, combining palatal incisions in the interproximal area to get access to the bone defects with connective tissue graft sutured at the buccal aspect, may be used to treat those defects, in particular at sites with a thin phenotype.

## CONCLUSION

The two major challenging topics in clinical periodontics are attachment gain at the interdental sites and reconstructing the lost papilla. Some improvements in the predictability of the current treatment outcome might be expected by using some additional emerging tissue engineering techniques<sup>30</sup> like protein and peptide therapy, gene therapy or using scaffolds. Chances of customizing bioresorbable scaffolds to the required size of the defect, configuration as well as the construction of the bony defect in combination with a controlled growth factors delivery may dictate the future pathways for simultaneous regeneration of the hard and soft tissues at the interproximal sites.

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