Heal Talk

Periodontal Procedures - An adjunct to orthodontic treatment

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Introduction

Orthodontic-periodontic interactions are mutually beneficial. The combined approach can greatly enhance the periodontal health and dentofacial aesthetics in many situations. The main aim of periodontal therapy is to restore and maintain the health and integrity of the attachment apparatus of teeth. Orthodontic treatment aims at providing acceptable functional occlusion and aesthetic occlusion with appropriate tooth movements. These movements are strongly related to the interactions of teeth with their supportive periodontal tissues[1].

An increasing number of adult patients are seeking orthodontic treatment. Finally, adult patients are more prone to periodontal complications since their teeth are confined in non-flexible alveolar bone. Cell mobilization and conversion of collagen fibers is much slower in adults than in children. These considerations make orthodontic treatment of adults different and challenging as well as necessitate special concepts and procedures, shorter periods of treatment, the use of lighter forces and more precise tooth movements[2].

Pre-orthodontic periodontal therapy

It is an initial phase of periodontal therapy where periodontal infection is controlled by oral hygiene instruction, professional plaque control and root planing. Initial periodontal debridement is done by non-surgical, subgingival root instrumentation to minimize the inflammation and to repair the tissue which is aimed for gingival health improvement.

Periodontal procedures during/after orthodontic therapy:

Osseous craters: It is an interproximal, two-wall defect composed of the facial and lingual cortical plates that does not improve with orthodontic treatment. Generally, resective osseous surgery is required which involves reshaping of the defect and reducing the pocket depth that enhances the ability to maintain these areas during orthodontic treatment.

Three-wall intra-bony defects: The bony support of the periodontium is lost; which requires bone grafts along with resorbable or non-resorbable membranes in filling of the three-wall defects.If the result of periodontal therapy is stable, orthodontic treatment can be initiated 3-6 months after periodontal surgery[3].

Furcation defects: Furcation involvement is a condition in which bifurcation and trifurcations of multi-rooted teeth are invaded by periodontal disease process. Furcation defects can worsen during orthodontic therapy, hence orthodontists should take care while treating the case and rule out any furcation involvement[4].

Pre-orthodontic gingival surgery

Gingival recession and root coverage: Alveolar bone dehiscence is a localized defect of the cortical bone which covers the teeth. When the denuded areas extend through the marginal bone, the defect is called as 'dehiscence'.It is a predisposing factor for the development of gingival recession. If the patient shows a minimal zone of attached gingiva or thin tissue, a free gingival graft is used. It controls the inflammation and should be done before the initiation of orthodontic tooth movement.

Crown lengthening: In some orthodontic cases, where clinical crown height is short; the crown lengthening should be done using 'gingivectomy' prior to orthodontic bonding procedures. In case of patients with shorter clinical crowns in the mandibular arch, apically repositioned flap in combination with gingivectomy can be done for crown lengthening. Apically displaced flap along with gingivectomy increases the width of the attached gingiva providing better results for crown lengthening in case of mandibular teeth[5].

Fiberotomy: Orthodontic tooth movement results in reorganization of collagenous fibers, elastic fibers, and the periodontal ligament to accommodate the new tooth positions. Circumferential supracrestal fiberotomy (CSF) is used to correct the relapse of severely rotated teeth that occurs due to rebound of elastic fibres in the supracrestal tissues. This technique consists of the insertion of a surgical blade into the gingival sulcus and sectioning the epithelial attachment surrounding the involved teeth. The transseptal fibers are transected interdentally by blade.

Frenotomy / Frenectomy: High frenal attachment is considered to be one of the causes for midline diastema. The abnormal frenum prevents mesial migration of the central incisor and the aberrant fiber increases the relapse tendency after orthodontic space closure. Surgical removal of the frenum is usually advised in these situations and it should be performed after the completion of orthodontic treatment unless the frenum prevents space closure or become painful or traumatized[7].

Gingivectomy/Gingivoplasty: Gingivoplasty is defined as surgical recontouring of the gingiva in order to achieve a physiologic contour. It is used to treat gingival enlargements in orthodontic patients. In this procedure, the reshaping of attached gingiva is done to provide more esthetic and functional contours[8].

Periodontal treatment as an accelerator to orthodontic therapy

Biological basis of surgically facilitated orthodontics: Regional Acceleratory Phenomenon (RAP)

The cortical plates of the bone are believed to be the main resistance to orthodontic tooth movement. In corticotomy-assisted orthodontics, rapid tooth movement is achieved by disrupting the continuity of the cortical bone by a selective cut and preserving the vitality of the teeth and marginal periodontium.

Frost[9] found a direct correlation between the severity of bone corticotomy and/or osteotomy and the intensity of the healing response, leading to accelerated bone turnover at the surgical site. This was designated "Regional Acceleratory Phenomenon" (RAP). RAP was explained as a temporary stage of localized soft and hard-tissue remodeling that resulted in rebuilding of the injured sites to a normal state through recruitment of osteoclasts and osteoblasts via local intercellular mediator mechanisms involving precursors, supporting cells, blood capillaries and lymph .This accelerated remodeling is influenced by bone density and the hyalinization of the periodontal ligament[10,11].

1. Corticotomy assisted orthodontics

Alveolar corticotomies (ACS) are defined as a surgical intervention limited to the cortical portion of the alveolar bone. Whereas in osteotomies both cortical and trabecular bone material is removed in considerable quantities, in ACS the incision must pierce the cortical layer, and at the same time, penetrate into the bone barrow only minimally

Kole[12] explained that the reduced resistance enhances an en bloc movement of the entire alveolar cortical segment, which is connected by softer medullary bone, including the confined teeth, when exposed to orthodontic forces.

Technique:

CFOT (corticotomy facilitated orthodontic

treatment) can be grouped into:

A) Selective Alveolar Decortication (SAD)

B) Periodontally Accelerated Osteogenic Orthodontics(PAOO)/Wilckodontics

Selective Alveolar Decortication

The technique is performed under local anesthesia as a routine outpatient procedure. A full thickness mucoperiosteal flap is reflected beyond the apices of the teeth to allow adequate decortication. Selective circumscribing corticotomy cuts are performed both labially and lingually around the teeth to be moved. Flaps are then repositioned and sutured.

Periodontally Accelerated Osteogenic Orthodontics

Wilcko[13, 14] developed a patented technique called Accelerated Osteogenic Orthodontics (AOO) or Periodontally Accelerated Osteogenic Orthodontics (PAOO). This technique is similar to conventional corticotomy except that selective decortication in a linear or punctate pattern upto 0.5 mm in depth is performed over all of the teeth that are to be moved. In addition, a resorbable bone graft is placed over the surgical sites to augment the confining bone during tooth movement. After a healing period of one or two weeks, orthodontic tooth movement is started and then followed up using a faster rate of activation at two week intervals.

Using this technique, Wilcko reported rapid tooth movement at a rate of 3 to 4 times greater than conventional orthodontic movement. After corticotomy, demineralization occurs in the alveolar bone and the remaining collagenous matrix of the bone is transported with the tooth during its movement. The matrix then remineralizes after the orthodontic movement.

Inter-dental / Periodontal distraction osteogenesis

In a premolar extraction case, the canine can rapidly be distalized using a distraction force once the interdental osteotomy is done[15]. In the rapid canine distraction of PDL, the interseptal bone distal to the canine is undermined surgically at the same time of extraction of the first premolars, thus, this will reduce the resistance on the pressure site. In this concept the compact bone is replaced by the woven bone, and tooth movement is easier and quicker due to reduced resistance of the bone

In this technique the interseptal bone is undermined 1 to 1.5 mm in thickness distal to the canine after the extraction of the first premolar, and the socket is deepened by a round bur to the length of the canine. The retraction of the canine is done by the activation of an intraoral device directly after the surgery. It has been shown that it took 3 weeks to achieve 6 to 7 mm of full retraction of the canine to the socket of the extracted first premolars.

3.Piezocision Technique

Piezosurgery assisted orthodontics is a new minimally invasive surgical procedure[16]. In this technique microincision is performed on the buccal gingiva that allows the piezoelectric knife to give osseous cuts to the buccal cortical plates and initiate RAP. This procedure provides rapid tooth movement without an extensive traumatic surgical approach. This procedure also maintains the clinical benefit of the bone or soft tissue grafting, along with tunnel approach. Compared to the classic decortication procedure, piezosurgery has added advantages such as being minimally invasive, safe, and less traumatic to the patients.

Conclusion

- Periodontal health is essential for any form of dental treatment, especially for orthodontic treatment. The orthodontic treatment has two ways of action on the periodontal tissues; it provides some degree of protection to the periodontium and keeps the gingiva, the bone, and the periodontal ligament in a healthy status but on the other hand, it produces negative effects on the periodontium, mainly gingivitis, gingival recessions, and bone dehiscences,etc.
- In the recent years, because of the increased number of adults seeking orthodontic treatment, orthodontists frequently face patients with periodontal disease. The combined orthodontic-periodontic interdisciplinary approach could be effective in these situations.
- The development of new methods to accelerate orthodontic tooth movement through periodontal surgical procedures, especially PAOO has shortened the treatment time and increased the quality of treatment.
- The harmonious cooperation of the periodontist and the orthodontist offers great possibilities for the treatment of combined orthodontic-periodontal problems.

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