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Ortho Perio Relation: A Multidisciplinary Consideration

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Abstract---Interaction between different specialties in dentistry are extremely important in establishing diagnosis and treatment planning. The interrelationship between orthodontics and periodontics often resembles symbiosis. In many cases, periodontal health is improved by orthodontic tooth movement, whereas orthodontic tooth movement is often facilitated by periodontal therapy. The orthodontic treatment is a double-action procedure, regarding the periodontal tissues. So it is of utmost importance to assess the need and outcome of interdisciplinary approach in different physiological, pathological or deliberate alterations in tooth positions to maintain harmonious periodontal and orthodontic relation. This is a review paper of information on the relationship regarding, periodontics and orthodontics during treatment planning decisions. This relationship ranges from the effect of orthodontic tooth movement on the successful of periodontically treated teeth and the potential for resorption during tooth movement.

Keywords---dentistry, multidisciplinary, periodontics, resorption.

Introduction

The interrelationship between orthodontics and periodontics often resembles symbiosis. In many cases, periodontal health is improved by orthodontic tooth

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movement, whereas orthodontic tooth movement is often facilitated by periodontal therapy. Orthodontic-periodontic interactions are mutually beneficial.¹ 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.² These movements are strongly related to the interactions of teeth with their supportive periodontal tissues. Orthodontic treatment can be justified as a part of periodontal therapy if it is used to reduce plaque accumulation, correct abnormal gingival and osseous forms, improve aesthetics, and facilitate prosthetic replacement. The most common periodontal problems that can be solved by minor orthodontic procedures are mainly the correction of crowding, pathologic tooth migration, mesially tilted molar, closure of midline diastema, etc.³

Periodontal and bone response to normal function

Response to normal function⁴

During masticatory function, the teeth and periodontal structures are subjected to intermittent heavy forces. Tooth contacts last for 1 second or less; forces are quite heavy, ranging from 1 or 2 kg while soft substances are chewed up to as much as 50 kg against a more resistant object. When a tooth is subjected to heavy loads of this type, quick displacement of the tooth within the PDL space is prevented by the incompressible tissue fluid. Instead, the force is transmitted to the alveolar bone, which bends in response.

Phenomenon behind the physiology of duet (Ortho Perio)

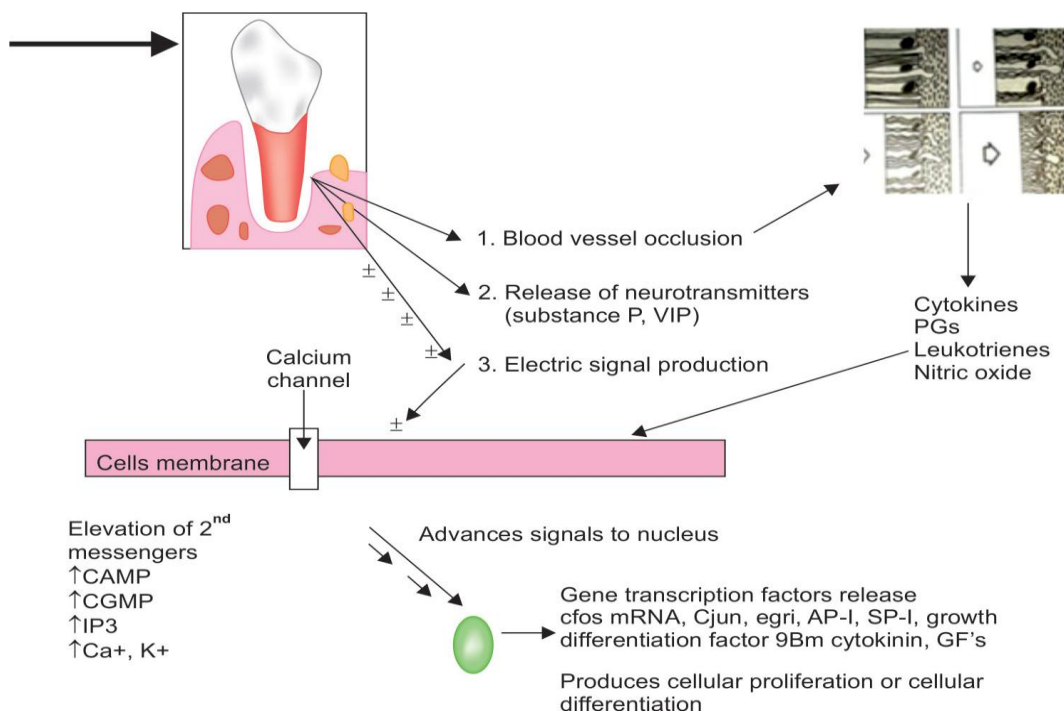
The cascade of events that follow after application of orthodontic force: The Role of inflammation in orthodontic tissue remodeling⁵

As we apply orthodontic force on the tooth, various events at the microscopic level occur, based on the current understanding (Fig):

The sequence of events after the application of mechanical forces with the help of orthodontic appliances can thus be outlined as:

- Movement of PDL fluids from areas of compression into areas of tension.
- A gradual development of strain in cells and ECM in the paradental tissues involved.
- Release of phospholipase A2 and cleavage of phospholipids leading to release of PGE2 and leukotrienes.
- ECM remodeling and signal transduction through integrin transmembrane channels.
- Cytoplasmic alterations and release of 2nd messengers of tooth movement—cAMP and cGMP, inositol phosphates, and calcium and tyrosine kinases.
- Release of kinases, such as protein kinase A, kinase C, and Mitogen-activated protein MAP kinases.
- Direct transduction of mechanical forces to the nucleus of strained cells through the cytoskeleton, leading to activation of specific genes.

- Release of neuropeptides (nociceptive and vasoactive) from parodontal afferent nerve endings.
- Interaction of vasoactive neuropeptides with endothelial cells in strained parodontal tissue.
- Migration by diapedesis of leukocytes into the extravascular space.
- Synthesis and release of signaling molecules by leukocytes that have migrated into the strained parodontal tissues.
- Interaction of various types of parodontal cells with the signal molecules released by the migratory leukocytes.
- Activation of the cells to participate in the modelling and remodeling of the parodontal tissues.



Some Ortho perio treatment modalities are as;

Orthodontic treatment as an adjunct to periodontal therapy

In many situations, orthodontic treatment can serve as an adjunct to periodontal therapy. Various orthodontic treatments such as uprighting, intrusion, and rotation are performed to correct the pathologically migrated teeth that control further periodontal breakdown, improve oral function, and provide acceptable aesthetics. These procedures should be performed only after controlling the periodontal disease. Although there is no consistent relation between malocclusion and periodontal disease, certain characteristics of malocclusion can promote a pathologic environment and hinder periodontal therapy.³ Correction of crowded or malposed teeth permit the patient better access to clean all the

surfaces of his/her teeth. Food impactions are also reduced or eliminated by the creation of proper arch form and proximal contact.⁵

Orthodontic uprighting of the tilted molars has several advantages:

The distal movement tooth allows the deposition of alveolar bone on the mesial defect. This also eliminates the gingival folding and plaque retentive area on the mesial side.⁶ Orthodontic extrusion of teeth may be indicated for shallowing out intraosseous defects and for increasing the clinical crown length of single teeth. Extrusion results in coronal positioning of intact connective tissue attachment along the tooth and also the bone deposition. Orthodontic intrusion has been recommended for teeth with horizontal bone defect or infrabony pockets, and for increasing the crown length of a single tooth. The intrusion of plaque-infected teeth may lead to apical displacement of supragingival plaque, which results in periodontal destruction. Professional supragingival and subgingival scalings are important during the active phase of intrusion. Furcation defects require special attention during orthodontic treatment.⁷ They are difficult to maintain and can worsen during orthodontic treatment. In Class III furcation cases, a possible method for treating the furcation is by hemisecting the crown and root and pushing the roots apart may be advantageous.³ The hemiseptal defects can be eliminated using uprighting, extrusion, and leveling of the bone defect. Bodily movement of the tooth into an intrabony defect has been believed to "carry the bone," along with the tooth, that results in improvement of the defect. This could improve adjacent tooth position before placement of implant or tooth replacement.⁵

Periodontal treatment as an adjunct to orthodontic therapy

Properly delivered orthodontic forces do not induce any damage to the periodontium. However, it is widely believed that insufficient width of the attached gingiva predisposes the development of recession. To maintain proper gingival health, a 2-mm width of keratinized gingiva is adequate.⁸ Tension on the gingival margin during orthodontic force application also results in gingival recession.⁹

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.¹ Forced eruption of an impacted tooth is a common orthodontic treatment procedure. Proper exposure of the impacted tooth and preservation of the keratinized tissue are important to avoid loss of attachment after orthodontic treatment. Apically or laterally positioned pedicle graft is usually advised in this situation.¹⁰

Fiberotomy:¹¹ The problem of relapse of orthodontically treated teeth, in general, and rotated teeth, in particular, has been well recognized for years. Methods to reduce the occurrence of rotational relapse may include:

- Complete correction, or overcorrection, of rotated teeth,

- long-term retention with bonded lingual retainers, and (3) the use of fiberotomy.

Mucogingival Surgery: The lack of keratinized gingiva is one of the most common complications following orthodontic movement. Preorthodontic mucogingival surgery is indicated for teeth with an inadequate zone of keratinized gingiva, to prevent mucogingival involvement post-orthodontically, which is more difficult to treat.¹¹

Orthodontic treatment in adults

Adult bone is less reactive to orthodontic force. Compared to the elderly, there is a greater risk of marginal bone loss and loss of attachment with mild gingival infection. Loss of attachment results in apical shift of the center of resistance, thereby increasing the distance from the point of force application to the center of resistance, which in turn increases the tipping moment produced by the given force than that of the healthy tooth. Hence, the absolute magnitude of force should be reduced.⁶

Orthodontic treatment of gingival discrepancies

Uneven gingival margins

These discrepancies could be caused by abrasion of the incisal edges or delayed migration of the gingival margins, when gingival margin discrepancies are present, the proper solution for the problem must be determined: Orthodontic tooth movement to reposition the gingival margins or surgical correction of gingival margin discrepancies.¹²

Open gingival embrasures

The presence of a papilla between the maxillary central incisors is a key esthetic factor in any individual. This open space is usually due to one of three causes: Tooth shape, root angulation, or periodontal bone loss. In some situations, a deficient papilla can be improved with orthodontic treatment. By closing open contacts, the interproximal gingiva can be squeezed and moved incisally.¹²

Corticotomy assisted orthodontics

Corticotomy-assisted orthodontics has been employed in various forms to accelerate orthodontic treatment. Rapid tooth movement associated with corticotomy was first introduced by Henry Krole in 1959. 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.¹³

The biology behind corticotomy-assisted orthodontics is the regional acceleratory phenomenon (RAP). It is a local response of the tissue to noxious stimuli, through which the tissue regenerates at a faster rate than normal (without corticotomy). The areas around the cuts are associated with intensified bone response, i.e.,

increased osteoblastic-osteoclastic activity and increased level of inflammatory mediators, which accelerate the bone turnover and facilitate rapid orthodontic tooth movement.¹³

Periodontally accelerated osteogenic orthodontics/distraction osteogenesis of the periodontal ligament

Distraction osteogenesis is the process of growing new bone by mechanical stretching of preexisting bone tissue. A new concept of distracting the PDL is proposed to elicit canine retraction in 3 weeks. This is called dental distraction. The PDL acts as a suture between the bone and the tooth. Periodontally accelerated osteogenic orthodontics (PAOO), also termed Wilckodontics, was introduced by Wilcko et al. in 2001. It is a revised corticotomy-facilitated technique, which involves a full-thickness labial and lingual flap elevation accompanied by selective surgical scarring of the labial and lingual cortical bones (corticotomy) followed by placement of the graft material, surgical closure, and orthodontic force application.

Wilcko et al. and Nazarow et al.¹⁸ demonstrated that adding periodontal regenerative surgery to the orthodontic protocol increased the quality of care in terms of clinical outcome and long-term stability. Surgically accelerated modalities like selective alveolar decortication (SAD) and periodontally accelerated osteogenesis orthodontics can be used as an adjunct to conventional approaches to accelerate OTM with fewer adverse effects.¹⁴

Orthodontic treatment of osseous defects

Hemiseptal defects

Hemiseptal defects are one- or two-wall osseous defects that often are found around mesially tipped teeth or teeth that have supraerupted. Usually, these defects can be eliminated with the appropriate orthodontic treatment. In the case of the tipped tooth, uprighting and eruption of the tooth levels the bony defect. If the tooth is supraerupted, intrusion and leveling of the adjacent cemento-enamel junctions can help level the osseous defect.¹⁵

Advanced horizontal bone loss

In a patient with advanced horizontal bone loss, the bone level may have receded several millimeters from the CEJ. As this occurs, the crown-to-root ratio becomes less favorable. This could require periodontal surgery to ameliorate the discrepancies. Many of these problems can be corrected by using the bone level as a guide to position the brackets on the teeth. In these situations, the crowns of the teeth may require considerable equilibration. The bone level as a guide to position the brackets on the teeth. In these situations, the crowns of the teeth may require considerable equilibration.¹⁵

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