ORTHODONTIC-PERIODONTIC RELATIONSHIP: A REVIEW ARTICLE

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Abstract
It is well established that the patients who undergo orthodontic treatment have a high susceptibility to present plaque accumulation on their teeth because of the presence of brackets, wires and/or other orthodontic elements on the teeth surfaces with which the oral hygiene procedures might be more difficult. The considerable variance of the design and the material characteristics of orthodontic elements may also play an important role in this field. The orthodontic treatment is a double-action procedure, regarding the periodontal tissues, which may be sometimes very meaningful in increasing the periodontal health status, and may be sometimes a harmful procedure which can be followed by several types of periodontal complications, namely: gingival recessions, bone dehiscences, gingival invaginations and/or the formation of gingival pockets. In this review, some initial concepts and past documented basics concerning the periodontic orthodontic interrelationships were demonstrated.
Key Words: Oral hygiene, Orthodontic treatment, Periodontal tissues.

Introduction

Since orthodontic tooth movement may affect the surrounding periodontium, it is important to consider the interrelationships between orthodontic and periodontal therapy when such multidisciplinary treatment needs exist, Gryson (1965) presented a review of the orthodontic literature concerning the response of the periodontal ligament (PDL) to orthodontic forces of various magnitude. Strong Forces literally crush the PDL on the pressure side as a result of direct Contact between the root and bone. No movement occurs until adjacent bone is resorbed (undermining resorption) and the PDL regenerates. Moderate forces (in slight excess of capillary pressure) cause strangulation of the PDL and a delay in Bone resorption. Light forces (less than Capillary pressure [20 to 25 mm Hg]) merely cause Ischemia in the PDL and tooth movement proceeds continuously with concomitant bone resorption and formation. The author concludes that although intermittent forces seem to offer the best chance of complete physiologic tooth movement, continuous light forces provide a compromise that is more time efficient and results in No permanent tissue damage. Retention of orthodontically repositioned teeth is necessary to allow tissues to reorient to their new position. Rotations are the most difficult movement to retain and are most effectively managed by early correction, over-rotation, and transeptal fiberotomy.[1]

Orthodontic-Periodontic Relationships

Kessler (1976) presented another review of the interrelationships between periodontics and orthodontics, noting that with the possible exception of hypofunction and severe overbite with impingement, there is no evidence that orthodontic correction of malocclusion will enhance from periodontal health. Plaque retention and oral hygiene habits are the primary factors in periodontal disease with tooth position playing a minor role.

Orthodontic treatment in adults should be approached with the understanding that compared to young individuals, adults lack skeletal growth potential, have decreased osteoblastic-osteoclastic activity, and have increased potential for tooth mobility with orthodontic movement. Initial periodontal therapy should be accomplished prior to orthodontic movement. The author suggests waiting 6 to 9 months after tooth movement before proceeding with periodontal surgical procedures. Improvement in periodontal health may be achieved by moving (e.g., tipping) affected teeth into a greater volume of bone or adjacent osseous defects. The author suggests that uprighting of molars should be approached cautiously due to the potential for furcation exposure and that movement into recent extraction sites should be avoided.[2]

Periodontal Tissue Response to Orthodontic Forces

Tooth movement during orthodontic therapy is the result of placing controlled forces on teeth. Removable appliances place intermittent tipping forces on teeth while fixed appliances can create continuous Multidirectional forces to create torquing, intrusive, extrusive, rotational and bodily movement (Lindhe 1989, Profit 1993a).[3,4]

The tissue becomes richer in collagen (Reitan 1985). In the elderly, the tissue response to orthodontic forces including both cell mobilization and conversion of collagen fibers is much slower than in children and teenagers (Reitan 1985).[5]

In adults, hyalinized zones are formed more easily on the pressure side of an orthodontically moved tooth and these zones may temporarily prevent the tooth from moving in the intended direction (Reitan 1964).

Table 1 summarizes the response of the periodontal ligament (PDL) to various magnitudes of orthodontic forces as described by Gryson (1965).[6]

Strong forces	PDL crushed on pressure side-local ischaemia (>capillary blood pressure)	degeneration of PDL=hyalinization=delayed tooth movement
Moderate forces	(>capillary blood pressure)	strangulation of PDL-delay in bone resorption
Light force	(capillary blood pressure 20-25 mmHg)	ischaemia in PDL,tooth movement continuous with simultaneous bone resorption and formation

Table 1. Response of the PDL to orthodontic forces

Orthodontic Movement in The Presence of Plaque

Ericsson et al. (1977) compared the effects of orthodontic forces with tipping/intrusive components on healthy and plaque-infected periodontal tissues in dogs. Periodontal defects were created by placement of copper Bands and were surgically corrected prior to tooth movement. This resulted in a reduction of healthy periodontium. Orthodontic forces were applied bilaterally over 6 months with plaque accumulation allowed on one side and oral hygiene procedures accomplished on the other. Clinically, there was a slight gain of Attachment in plaque-free teeth and a slight loss in plaque-infected teeth. Histologically, while there was a trend for plaque-infected teeth to have a loss of attachment, there was no statistically significant difference in the level of attachment between the 2 groups of teeth. There was significantly more inflammation in the tissues adjacent to plaque-infected teeth and intrabony Pocket formation was frequently associated with these teeth. The authors suggest that intrusive forces may have shifted the supragingival plaque to a subgingival location, resulting in intrabony pocket formation and loss of attachment. However, the data from this study indicate no difference in the CT attachment levels between plaque-free and plaque -infected teeth.[7]

Impact of Circumferential Supra-Crestal Fiberotomy (CSF) In Preventing Orthodontic Relapse

Tooth rotation is simple to achieve but difficult to maintain. Reorganization of collagenous fibers, elastic fibers and the PDL occur after orthodontic tooth movement to accommodate the new tooth positions. In order to achieve proper rearrangement of the supporting tissues of the teeth and to prevent orthodontic relapse, the teeth must be retained for an extended period of time (Profit 1993b). It is suggested that patients who have had fixed orthodontic appliances to correct intraarch irregularities be on full-time retention for the first 3to 4 months.[8]

Effects of Orthodontic Bands On The Periodontium

Gingivitis and gingival enlargement appear to be the main short-term effects of orthodontic bands on the periodontium. Baer & Coccaro (1964) noted that gingival enlargement Occurs after placement of a fixed appliance.[9]

The Condition rapidly improves within 48 Hours of the appliance being removed. The Increase in probing depth during orthodontic treatment has been attributed by others to this enlargement (Zachrisson & Zachrisson 1972, Kloehn & Pfeifer 1974, Alexander 1991).[10, 11]

As this gingival enlargement is also seen in patients with good oral hygiene, mechanical irritation caused by the band or cement must be implicated, in addition to trapped plaque (Zachrisson & Zachrisson 1972, Boyd &Baumrind 1992). Where such iatrogenic irritations are inevitable, the risk of loss of attachment can be anticipated (Alexander 1991).[12, 13]

Mucogingival Considerations

The treatment of mucogingival defects may involve orthodontic and periodontal therapy. Boyd (1978) reviewed the indications for and sequence of mucogingival therapy with respect to orthodontic intervention. He suggested that mucogingival defects in the absence of malocclusion-malalignment Should be treated early to avoid further breakdown. However, he suggests that preoperative Orthodontic intervention may improve or even eliminate gingival recession when malocclusion is a contributing factor.

The author recommended that orthodontic consultation should be obtained when the:

1) Involved area is related to a shearing effect of one tooth on another (e.g., deep overbite/cross bite with tripping of gingival tissue);
2) Involved tooth may be elected for extraction due to tooth size discrepancy; and,
3) Tooth with the mucogingival defect is in labioversion (lingual movement of the tooth may correct the mucogingival defect without surgery).[14]

Orthodontic Rotation

The periodontist is frequently called on to assist in the retention of orthodontically repositioned teeth. Tooth rotation is generally simple to achieve but difficult to retain. It is theorized that stretching of the gingival fiber apparatus during rotation is followed by recoil of the fibers during the retention phase, with Resultant relapse of tooth malposition. Edwards (1970) tattooed the attached gingiva and alveolar mucosa around orthodontically rotated teeth in 12 patients. Following rotation and 8 weeks of mechanical retention, experimental teeth received a circumferential fiberotomy (number 11 blade placed into sulcus to and below the crest of bone). Control teeth received no surgical procedures. During tooth rotation, the tattooed fibers deviated in the direction of rotation. Upon release of mechanical retention, all control teeth Demonstrated relapse with deviation of fibers in the Direction of relapse. Conversely, teeth which received fiberotomy did not relapse. Within 20 to 40 hours post-fiberotomy,

tattooed fibers had returned to the original pre-rotation position. Thus, Edwards demon-stated that fiberotomy relieves post-rotation tensional forces in the fiber apparatus, allowing recoil of the fibers without relapse of tooth malposition.[15]

Orthognathic Surgery

As orthognathic surgical procedures have become more common place, interest has grown concerning the effect of such therapy on the periodontium. Foushee et al. (1985) evaluated 24 patients who had received advancement gingivoplasty with or without maxillary/mandibular osteotomy. Width of keratinized And attached gingiva was determined pre-and postoperatively. Following surgery, there was a significant Decrease in the width of keratinized and attached gingiva in mandibular incisors and premolars. The initial width of keratinized and attached gingiva was unrelated to the susceptibility for recession after surgery. Of the 24 patients, 10 had post-treatment recession:4 had slight localized recession (0.5 mm per site), and 6 had more severe and generalized recession(range of 0.5 to 3.0 mm). Since these patients received orthodontic treatment between the initial evaluation and surgery, it is difficult to determine if the recession resulted from the orthodontic or orthognathic treatment.[16]

Implants and Orthodontics

Higuchi and Slack (1991) reported the placement of 10-mm implant fixtures placed bilaterally in the third molar areas of 7 adult patients. The implants were allowed to integrate for 4 to 6 months, and were subsequently used as posterior anchorage (up to 400 g) for protraction and retraction. After completion of orthodontic treatment, the fixtures were placed in a non-functional state beneath the soft tissues. Measurements performed on the cephalometric radiographs revealed no movement of the implant fixtures. Fixture placement in the mandibular third molar area was described as difficult, and interference with the maxillary soft tissue and dentition was also reported.[17]

Conclusion

Orthodontic tooth movement is brought about by the prolonged application of force on the attachment apparatus. One should consider the fact the two disparate processes occur in gingival alter the transduction of orthodontic force. Thus, using the information along with well defined patient management protocol the inert-disciplinary team of periodontist and orthodontist can manage majority of inter related ortho-perio problem with minimal risk of predictably successful outcome.[3,4,8]

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