

The Orthodontic Periodontal Interface: Rationale and Case Report

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INTRODUCTION

Recent advances in orthodontics as well as dentistry has encouraged an increasing number of adult patients seeking orthodontic treatment, the problems of a dentition affected by chronic periodontitis are more likely to be encountered in such cases. The localized loss of periodontal attachment can result in these patients presenting with varying degrees of over-eruption, tipping, drifting, and rotations predominantly seen in the upper labial segment.

The main objective of periodontal therapy is to restore and maintain the health and integrity of the attachment apparatus of teeth. Orthodontic treatment can often correct these problems, or at least prevent them from progressing. Additionally, orthodontic therapy can facilitate management of several restorative and aesthetic problems relating to fractured teeth, tipped abutment teeth, excess spacing, inadequate pontic space, malformed teeth, and diastema. Orthodontic treatment may improve periodontal health in these circumstances, but it also holds some potential for harm to the periodontal tissues. Thus, orthodontic treatment can be referred to as a two-edge sword, 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. However, this issue seems to be debatable.¹

Tooth movement during orthodontic therapy is the result of placing controlled forces on teeth.^{2,3} Bone surrounding a tooth subjected to a force responds in the following manner: resorption occurs where there is pressure and new bone forms where there is tension.^{3,4}

How orthodontic treatment may help in improving periodontal health?

It has been shown that the number of periodontal pathogens in the anterior sites of crowded teeth is much greater than that in the sites of aligned teeth.⁵ This definitely supports the concept that orthodontic treatment can positively affect the periodontal health, prevent the development of periodontal diseases and offer a possible action to enhance the bone formation within the bony defects.⁶

In addition, there have been reported cases of localized periodontitis in which eruption of teeth reduced probing depths.⁷ Others have also described the benefits of forced vertical eruption in the exposure of tooth structure to facilitate prosthetic treatment in healthy periodontium.⁸

Studies have also shown that moving teeth into adjacent osseous defects, orthodontic extrusion with and without fibrotomy and labial tipping of anterior teeth can be successfully accomplished without jeopardizing the periodontal support in the presence of adequate plaque control.⁹

ADVERSE EFFECTS OF ORTHODONTIC PROCEDURES ON PERIODONTAL TISSUE

Short-term and long-term effects of orthodontic treatment on the periodontium. Plaque is a major etiologic factor in the development of gingivitis.¹⁰ Clinical studies have demonstrated that with plaque control, teeth with reduced periodontal support can undergo successful tooth movement without compromising their periodontal situation.¹¹

The orthodontic patient's inability to clean adequately should be expected to contribute to the development of gingival inflammation. Gingivitis and gingival enlargement appear to be the main short-term effects of orthodontic treatments on the periodontium. It has been noted that gingival enlargement occurs after placement of a fixed appliance.¹² 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.¹³

A generalized increase in salivary bacterial counts, especially *Lactobacillus*, has been shown after orthodontic band placement.¹⁴ Early increase in anaerobes and *Prevotella intermedia* and a decrease in facultative anaerobes were also reported.¹⁵

Intrusive movements can change the relationship between the cemento-enamel junction and the alveolar crest which may produce an epithelial attachment along the root. An increase of subgingival pathogens was also noted after teeth intrusion.¹⁶

In 1999, Sanders¹⁷ conducted a review

➡ clinical section

of the evidence-based literature showed that proper orthodontic treatment in patients with excellent oral hygiene and the absence of significant periodontal disorders should not pose any significant periodontal risk. In the presence of poor oral hygiene, however, and under circumstances of certain types of periodontal disorders, fixed orthodontic appliances and tooth movement can contribute to significant deleterious periodontal consequences.

MUCOGINGIVAL CONSIDERATIONS

An adequate amount of attached gingiva is necessary for gingival health¹⁸ and, therefore, to allow appliances (functional or orthopedic) to deliver orthodontic treatment without causing periodontal complications. With labial bodily movement, incisors showed apical displacement of the gingival margin. Loss of connective tissue occurred where inflammation was present.¹⁹ Therefore, if the tooth movement is expected to result in a reduction of soft tissue thickness and an alveolar bone dehiscence may have occurred in the presence of inflammation, gingival recession is a risk.

If a minimal zone of attached gingiva or thin tissue exists, a free gingival graft that enhances the type of tissue around the tooth helps control inflammation. This should be done before any orthodontic movement is begun.²⁰

The gingival recession has been shown to be a common adverse effect during and/or after the orthodontic treatment. This effect has been noted more frequently while using buccal orthodontic movements.²¹ If teeth that have thin tissue are going to be moved lingually, there is a potential for the tissue to move coronally and become thicker.²² If no orthodontic treatment is planned for children adolescents, areas of thin gingival tissues should be monitored only periodically as the width of the attached gingiva generally increases with normal growth from the mixed to the permanent dentition.²³

It has been shown that most cases of gingival recession which occur during an orthodontic treatment occurred in the



regions of the anterior upper and lower teeth.²⁴

An expected relationship could be established between (Tipping) orthodontic movements and gingival recession. However, this relationship is still, to date, controversial. Batenhorst supported this in his study on monkeys. In other studies, no real cases of gingival recession or mucogingival defects had been recorded after orthodontic tipping of the incisors.²²

RECENT ASPECTS IN PERIODONTIC-ORTHODONTIC INTERRELATIONSHIPS

Ngom and co-workers²⁵ found significant correlations between malocclusions and periodontal condition and suggested that

malocclusions are risk markers for periodontal diseases. However, a real inference about a cause/effect relationship between malocclusions and periodontal condition in this study was not possible.

In 2008, Bollen²⁶ conducted two systematic reviews to address the following questions: does a malocclusion affect periodontal health, and does orthodontic treatment affect periodontal health? The first review found a correlation between the presence of a malocclusion and periodontal disease. Subjects with greater malocclusion have more severe periodontal disease. The second review identified an absence of reliable evidence on the effects of orthodontic treatment on periodontal

health. The existing low-quality evidence suggests that orthodontic therapy results in small detrimental effects to the periodontium. It has been suggested that the results of both reviews do not warrant orthodontic treatment to prevent future periodontal problems, except for specific unusual malocclusions.

A recent study of Thornberg and co-workers²⁷ aimed to document and investigate changes in periodontal pathogen levels before, during, and after orthodontic treatment in adolescents, eight pathogens were examined; *Actinobacillus actinomycetemcomitans* (AA), *Porphyromonas gingivalis* (PG), *Prevotella intermedia* (PI), *Tannerella forsythia* (TF), *Eikenella corrodens* (EC), *Fusobacterium nucleatum* (FN), *Treponema denticola* (TD), and *Campylobacter rectus* (CR). It has been shown that for six (PI, TF, EC, FN, TD, CR) of the eight pathogens, the percentages of subjects with high pathogen counts increased significantly after six months of fixed appliance treatment, but these returned to pretreatment levels by 12 months of orthodontic treatment. No pathogen level was significantly higher after 12 months of orthodontic treatment, and orthodontic treatment was found to be significantly protective for half of the pathogens (EC, FN, TD, and CR) post-treatment. It was concluded that orthodontic treatment with fixed appliances does not increase the risk of high levels of these periodontal pathogens.

The existing evidence, in general, does not seem to support the claim that orthodontic therapy results in overall improvement in periodontal health.

CASE REPORT 1

A 28 years old periodontically compromised female patient **Figure 1** reported with class I skeletal and dental relationship with traumatic occlusion and pathologic migration of teeth was treated with fixed orthodontic mechanotherapy and completed in 18 months.

After inter departmental discussion on the treatment plan, it was decided to proceed with following steps in this case:

1. Phase I therapy comprising of scaling

and root planing before orthodontic treatment.

2. Alignment of the teeth with light forces using copper NITI wires

After the initial prophylactic treatment, we started with the orthodontic treatment. 022 slot MBT was used in this case. Special attention was taken in using light forces to achieve leveling and aligning. Finishing and detailing was done using 0.017" x 0.025" TMA wires and the same was achieved. **Figure 2**

CASE REPORT 2

A 26years old periodontically compromised female patient **Figure 3** reported with class I skeletal and bimaxillary protrusion with convex profile and incompe-

tent lips. Periodontal pockets with traumatic occlusion and pathologic migration was seen and treated with fixed orthodontic mechanotherapy and completed in 22 months.

After inter departmental discussion on the treatment plan, it was decided to proceed with following steps in this case:

1. Phase I therapy comprising of scaling and root planing before orthodontic treatment.

2. Alignment of the teeth with light forces using copper NITI wires after extraction of upper and lower first premolars.

After the initial prophylactic treatment, we started with the orthodontic treatment. 022 slot MBT was used in this case.



➤ clinical section

Special attention was taken in using light forces to achieve leveling and aligning. For the next phase of retraction and space closure 0.019" × 0.025" SS wires were used. Finishing and detailing was done using 0.017" × 0.025" TMA wires and the same was achieved. Figure 4

Continuous monitoring of periodontal health with periodic scaling and root planing and administration of Rexitidine (0.12% chlorhexidine) to improve the attachment was coordinated by the periodontist.

CONCLUSION

Orthodontic procedures in periodontally compromised patients require extensive periodontal care/consideration to maintain the periodontium in a healthy condition during and after treatment. Minor periodontal surgery may be required to prevent relapse after orthodontic treatment in addition to the lingual bonded retainers on a long term basis. Interdisciplinary approach complimented by patient education and continued care of good oral hygiene will transform patients with unattractive dentition due to migrated teeth secondary to periodontal breakdown and inflamed periodontium into individuals with attractive dentition and radiant smile.

Since there is a close relationship between orthodontic treatment and periodontal health and vice versa, an understanding of the ortho-perio relationship will help in bringing the best possible results in needy patients.

If careful orthodontic treatment planning in patients with periodontically compromised dentition and proper plaque control is made throughout treatment, then such complex cases can be successfully treated.

REFERENCES

1. Dannan A. An update on periodontic-orthodontic interrelationships. *J Indian Soc Periodontol.* 2010 Jan-Mar; 14(1): 66-71.
2. Lindhe J. 2nd ed. Copenhagen: Munksgaard; 1989. Textbook of clinical periodontology.
3. Proffit WR, Fields HW. 2nd ed. St Louis: CV Mosby; 1993. Contemporary orthodontics.
4. Reitan K. Biomechanical principles and reactions. In: Graber X, Swain BF, editors. Current orthodontic concepts and techniques. St Louis: CV Mosby; 1985. pp. 101-92.
5. Lindhe J, Svanberg G. Influence of trauma from occlusion on progression of experimental periodontitis in the beagle dog. *J Clin Periodontol.* 1974;1:3-14.
6. Brown IS. The effect of orthodontic therapy on certain types of periodontal defects. I. Clinical findings. *J Periodontol.* 1973;44:742-56.
7. Everett FG, Baer PN. A preliminary report on the treatment of the osseous defect in periodontosis. *J Periodontol.* 1964;35:429-35.
8. Guilford HJ, Grubb TA, Pence DL. Vertical extrusion: A standardized technique. *Compend Contin Educ Dent.* 1984;5:562-7.
9. Batenhorst KF, Bowers GM, Williams JE, Jr. Tissue changes resulting from facial tipping and extrusion of incisors in monkeys. *J Periodontol.* 1974;45:660-8.
10. Loe H, Theilade E, Jensen SB. Experimental gingivitis in man. *J Periodontol.* 1965;36:177-87.
11. Boyd RL, Leggott PJ, Quinn RS, Eakle WS, Chambers D. Periodontal implications of orthodontic treatment in adults with reduced or normal periodontal tissues versus those of adolescents. *Am J Orthod Dentofacial Orthop.* 1989;96:191-8.
12. Baer PN, Coccato PJ. Gingival enlargement coincident with orthodontic therapy. *J Periodontol.* 1964;35:436-9.
13. Alexander SA. Effects of orthodontic attachments on the gingival health of permanent second molars. *Am J Orthod Dentofacial Orthop.* 1991;100:337-40.
14. Bloom RH, Brown LR, Jr. A study of the effects of orthodontic appliances on the oral microbial flora. *Oral Surg Oral Med Oral Pathol.* 1964;17:658-67.
15. Diamanti-Kipioti A, Gusberti FA, Lang NP. Clinical and microbiological effects of fixed orthodontic appliances. *J Clin Periodontol.* 1987;14:326-33.
16. Folio J, Rams TE, Keyes PH. Orthodontic therapy in patients with juvenile periodontitis: clinical and microbiologic effects. *Am J Orthod.* 1985;87:421-31.
17. Sanders NL. Evidence-based care in orthodontics and periodontics: A review of the literature. *J Am Dent Assoc.* 1999;130:521-7.
18. Lang NP, Loe H. The relationship between the width of keratinized gingiva and gingival health. *J Periodontol.* 1972;43:623-7.
19. Wennstrom J, Lindhe J, Nyman S. Role of keratinized gingiva for gingival health. Clinical and histologic study of normal and regenerated gingival tissue in dogs. *J Clin Periodontol.* 1981;8:311-28.
20. Foushee DG, Moriarty JD, Simpson DM. Effects of mandibular orthognathic treatment on mucogingival tissues. *J Periodontol.* 1985;56:727-33.
21. Wennstrom JL, Lindhe J, Sinclair F, Thilander B. Some periodontal tissue reactions to orthodontic tooth movement in monkeys. *J Clin Periodontol.* 1987;14:121-9.
22. Boyd RL. Mucogingival considerations and their relationship to orthodontics. *J Periodontol.* 1978;49:67-76.
23. Sperry TP, Speidel TM, Isaacson RJ, Worms FW. The role of dental compensations in the orthodontic treatment of mandibular prognathism. *Angle Orthod.* 1977;47:293-9.
24. Polson AM, Reed BE. Long-term effect of orthodontic treatment on crestal alveolar bone levels. *J Periodontol.* 1984;55:28-34.
25. Ngom PI, Benoist HM, Thiam F, Diagne F, Diallo PD. Influence of orthodontic anomalies on periodontal condition. *Odontostomatol Trop.* 2007;301:9-16.
26. Bollen AM. Effects of malocclusions and orthodontics on periodontal health: Evidence from a systematic review. *J Dent Educ.* 2008;72:912-8.
27. Thornberg MJ, Riolo CS, Bayirli B, Riolo ML, Van Tubergen EA, Kulbersh R. Periodontal pathogen levels in adolescents before, during, and after fixed orthodontic appliance therapy. *Am J Orthod Dentofacial Orthop.* 2009;135:95-8.