Oral Health in Orthodontic treatment: Preventive and Innovative approach

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Introduction

The objectives of orthodontic therapy are to establish a good occlusion, enhance the health of the periodontium, and improve dental and facial esthetics. In today’s aesthetic world patients seeking orthodontic treatment is considerably increasing. Outcome of the success of treatment largely depends on the periodontal status of patients. Orthodontic treatment with fixed appliances alters the oral environment, increases plaque amount, changes the composition of the flora, and complicates the cleaning for the patient. Gingivitis and enamel decalcification around fixed appliances are frequent side effects when the preventive programs have not been implemented. Oral cleaning becomes more difficult with the presence of the orthodontic appliances and their components. Thus, the elimination of plaque is the main target to prevent and/or overcome the problems listed above.

Orthodontic appliances contribute to environmental changes that can result in greater concentrations of acid-producing bacteria. This increase in acid production is the predominant cause of hyperplastic gingivitis. Gingivitis is so prevalent in orthodontic patients that it is viewed by many orthodontist as an inevitable by-product of their therapy. The appliances usually contribute periodontal disease in that they collect microorganisms. Caries risk is related to appliances which increase the number of sites where plaque can accumulate, as well as to changes in the bacterial flora and the age of the patient. A more recent study showed the incidence of white spot lesions in patients treated with comprehensive orthodontics was significantly high, and the preventive therapy provided appeared to be ineffective. We can elevate our goals and realize that much can be done to reduce gingivitis, periodontitis and caries that our patients may experience during treatment. If young people are first motivated, then given comprehensive home-care instruction, their chance of maintaining good oral health throughout life is excellent. Since we see patients regularly over an extended period,
orthodontists are in a unique position to initiate and follow up this important learning process. Orthodontists customarily explain to their patients the importance of oral hygiene during treatment. However, it has been emphasized that the orthodontist has the opportunity as well as the obligation to play an even greater role in preventive dentistry and, specifically, disease control.

The purpose of this article is to evaluate the information available on oral hygiene to support the development of oral hygiene programs for orthodontic patients.

**Periodontal Tissues in Orthodontic Treatment**

Fixed orthodontic appliances would make brushing procedure difficult hence inability to completely remove plaque initiates the potential to cause gingivitis and progress to periodontitis during tipping and extrusive movements(Figure 1).

![Fig.1 Gingivitis Due to Crowding](image)

The gingival pocket deepens and results in development of pseudo pockets. This pseudo pockets provides an opportunity for colonization to subgingival bacteria leading to periodontal breakdown. This periodontal destruction over time undergoes some degree of degeneration in PDL. Force applied on such teeth can result in more periodontal breakdown and regeneration of periodontal ligament tissues with periodontal inflammation present are defenseless to bacterial infection.

Removable appliances have however not been shown to cause such periodontal liability because of ease of cleansing with the appliances. Trauma from occlusion, one of the major factors causing periodontal problems should be relieved to avoid any further progress of the disease. These gingival problems and periodontal breakdown once occurred may present themselves in extension or increments.

However, if effective preventive measures are taken by the operator and patients during treatment, no clinically significant damage to the periodontium will occur.

**The importance of good oral hygiene**

Effective plaque removal is the prime consideration for good oral hygiene. This is important to the patient from both a periodontal and a caries standpoint. The detrimental influence of plaque on the periodontal tissues is becoming more and more evident. Previously more attention was given to apical root resorption during orthodontic treatment. However root resorption involves limited root surface areas and is not usually progressive once appliances are removed. Today more attention is directed to the marginal periodontal damage from neglected or improper oral hygiene which not only manifests itself during orthodontic treatment but continues beyond the time of appliance removal.

The relationship between plaque and caries activity has been demonstrated by studies indicating the interplay between carbohydrate consumption and microorganisms in the dental plaque. Therefore, if the amount of plaque in a patient’s mouth can be eliminated or at least controlled, much tissue pathosis can be prevented. This thrusts a challenge to the orthodontist and his auxiliary personnel to increase the patient’s oral hygiene awareness. By so doing, they can not only reduce the prevalence and severity of iatrogenic damage but also increase the long-term benefits of the orthodontic therapy.

**Motivation of the patients and oral hygienic training; control of oral hygiene**

Before the orthodontic treatment it is very important to inform the patients about the importance of the improved oral hygiene concerning orthodontic treatment with fixed appliance and to explain the causes of caries and periodontal disease. The dentist can use any
gingival indices and disclosure of the plaque for the patient to be motivated. The patients need proper information about the preventive possibilities concerning fixed orthodontic appliance after its application. It could be very useful to check the oral hygiene throughout the complete orthodontic therapy. Beside of the use of fluoride containing toothpaste and brushing with conventional brushes also during the treatment at least twice a day, additional methods could be suggested helping to improve oral hygiene. Recording and documentation of the improvement in oral hygiene in the patient’s chart is also necessary. Although motivation and oral hygiene training represent the most important points before the orthodontic treatment, it can be repeated as frequently as it is needed not only before but during the active orthodontic treatment as well. After finishing the orthodontic treatment the orthodontist also has to advice the patients to maintain proper oral hygienic habits. Few studies in the literature evaluated the oral hygiene motivation methods (OHMM) in orthodontic patients using various methods. These methods are generally classified as verbal, written, or visual based (videotapes).

Treatment Program

Every patient should be properly screened and after initial diagnosis, referral for treatment to control active periodontal disease and caries should be done. Patients should be explained about the treatment, their responsibilities and risk during orthodontic treatment. Proper instructions and positive reinforcement about management of new oral environment and its maintenance must be emphasized.

Plaque Removal

Toothbrushing

Methods of Toothbrushing: Toothbrushing is the most common method of removing deposit of oral debris and plaque from the teeth. Only a few well documented and controlled clinical experiments have been made to compare the effectiveness of the different techniques employed, and controversy still exists as to the efficiency of the various methods. Previously, the roll method was the one method most often advocated. However, a number of new investigation comparing the roll technique with the horizontal scrub, vibratory (Bass, Charter’s), and circulatory (Fone’s) methods indicate that the roll method is inferior to, or no better than, the other methods with respect to plaque control. The aforementioned studies clearly clearly showed the difficulties in cleansing the interproximal tooth surfaces by toothbrushing, and none of the methods cleaned these surfaces to a satisfactory degree.

No reports have been made concerning the clinical effectiveness of the various recommended methods or toothbrushing in orthodontic patients. However, (i) good cleansing along the gingival margins is of paramount importance in orthodontic patients to prevent gingivitis and demineralizations and vertical brushing has been found inadequate along the gingival tooth areas; (ii) horizontal brushing methods imply active brushing all the time, as no time is lost for replacement of toothbrush position. On the basis of available evidence, it seems justifiable, therefore, to recommend horizontal brushing with either the scrub or the Bass technique as the method of choice for patients wearing orthodontic appliance. A modified bass method with bristles at 45 degrees to sulcus would be more beneficial in patients with deepened pockets. Patients should be made to demonstrate the method of brushing and must be made aware when appliances are shiny are clean. A clinician should properly train the patient in brushing habits (Figure 2).

Fig. 2A: Placing bristles where gums and teeth meet.

Fig 2B: Circular and gentle vibratory motions around gum lines on each tooth.
Frequency of toothbrushing: The optimal frequency of plaque removal depends upon a number of individual factors, such as the physical and chemical properties of the diet, eating habits, individual resistance, and the composition of the microflora. Since there exists no evidence that proper, frequent toothbrushing is harmful to the teeth or gingivae, it seems unnecessary to place an upper limit on the frequency of toothbrushing. It should be stressed, however, that the quality of the toothbrushing is as important as is the quantity.

Brush at least three times a day. It is best to brush after meals to make sure there's no food trapped in or around braces. If patients are not able to brush after lunch, ask them at least rinse their mouth with water very thoroughly.

Toothbrushes: Both manual and electronic brushes are available in the market.

A) Manual toothbrushes: Some companies make toothbrushes especially for people with braces. Known as bi-level brushes, they have longer bristles on the edges and shorter ones in the middle. This type of brush allows you to clean the area above and below the brackets and the brackets as well.

B) Electric toothbrushes: The Rotadent electric toothbrush with short pointed bristles was found to be more effective than conventional toothbrushes in orthodontic patients. It was seen to remove the interproximal plaque more effectively with least abrasion because of smaller diameter bristles. However due to cost effectiveness it was often neglected by the patients (Figure 3).

It is important to brush the braces and all the surfaces of the teeth, that is, the inside and outside surface and the chewing surfaces, too. Pay special attention to the areas between your brackets and your gums.

Tools to Help Patients

A) Rubber-tipped and end-tuft or single-tuft brushes – These are special brushes that help patients to get into those nooks and crannies, as well as between their teeth. The end-tuft or single-tuft brushes look something like pipe cleaners.

B) Oral irrigators – These instruments shoot small streams of water onto the teeth at high pressure to remove bits of food. "They can be used as an aid in your oral hygiene practice, but not in place of brushing and flossing." Oral irrigator with regular tap water at high pressure with a conventional irrigator tip can aid as a very effective method in periodontal maintenance. Use of chlorhexidine with specially modified irrigating tips called as 'Pik Pocket (Teledyne Corporation)' can be used to directly to irrigate the pockets with medium pressure if gingival bleeding on probing persists (Figure 4).

C) Flossing: It might difficult to floss while having braces, but one can and one should. Special flossing products can help to get into the space between the wires and gumline. These include
floss threaders and a special kind of floss. When braces are first put on, orthodontist’s should review flossing techniques. (Figure 5) Flossing should be done least once a day.

**Fig. 5: Flossing Technique**

**Fig 5A**: Thread unwaxed floss between braces & wire.

**Fig 5B**: Floss around braces.

**Fig 5C**: Floss around gum areas.

D) **Disclosing solutions or tablets**: The home use of plaque disclosants has been recommended as a helpful adjunct to improve oral hygiene. Disclosing tablets and solutions use vegetable dye to highlight plaque or debris in the mouth.

E) **Chemical Cleaning**:  

a) **Chlorhexidine**: Chlorhexidine remains one of the most effective antimicrobial mouthwashes because it acts not only against gram-negative bacteria, but also against yeasts and gram-positive bacteria. It is particularly suitable for the inhibition of plaque formation as it has the ability to maintain effective concentrations for prolonged periods of time, by way of binding to soft and hard tissues, a process known as substantivity. Repeated studies have shown that a 0.1 to 0.2 per cent solution of chlorhexidinegluconate used as a one minute rinse (10 ml) twice daily inhibits the development of gingivitis. A three month use of 0.12% chlorhexidine approximately reduced 65% plaque, 77% gingival bleeding. (26) One of the main problems with its use was potential staining.

b) **Anti-Plaque Agents**: In addition to toothbrushes and chlorhexidine number of agents as Stannous fluoride, Tryclosan, and Listerine help to maintain the hygiene. Stannous fluoride gels are found to be more effective against gingivitis. It is found to be very useful to prevent decalcification in orthodontic patients by using daily, topical and in low concentration of 0.05% or 0.4% in gel form. Continued use for 6 months after appliance removal helps to remineralize areas of decalcification that may have occurred during treatment. It was found 15-20% patients develop mild staining with its use in 3-6 months of use, but yet its effectiveness largely depends on patient’s compliance.

Listerine rinse contain 26% alcohol and should be rinsed twice daily for one minute for anti-gingivitis effect without dilution. Tryclosan toothpastes have good anti-gingivitis effect, good taste and good control against supragingival calculus. They should be the standard toothpastes for all orthodontic patients with fixed appliances.

Few products such as baking soda toothpastes which might also contain peroxides are marketed as antiplaque agents. If fluoride content is present, they too can be used for orthodontic patients. Sanguinaria, baking soda and peroxide used as antiplaque agents are not FDA or ADA approved.

**Decalcification Treatment**

Decalcification is evident in form of white or yellow stains clinically with possible roughness. Best method to prevent is use of fluoride toothpaste without rinsing with water or by using a topical fluoride rinse or gel twice daily during orthodontic treatment. Fluoride increases the initial rate of remineralization of early enamel lesions and slows down the progress of carious process by reacting with the minerals present in the surface of the lesion. Enamel can be remineralized with meticulous toothbrushing twice per day, with fluoridated dentifrice. Additional fluoride application can further enhance the remineralization process. This regime helps in 50% reduction in discoloration. Enamel can also be remineralized with Casein Phosphopeptide-Amorphus Calcium Phosphate preparations. CPP-ACP is capable to be absorbed through the enamel surface and could affect the carious process.
Post orthodontic treatment, moderate decalcified areas may present as larger areas of color changes in yellow-brown form with definite roughness [Figure 6]. But when a severe decalcified area is present, patient might have to have a restoration placed.

Fig 6: Decalcification post orthodontic treatment

To prevent these problems few steps by the clinicians, as bonding of molars than banding, in periodontal compromised patients can be helpful. Use of single archwires whenever possible and removal of excess composite around brackets, especially at gingival margins can aid in additional maintenance.

Gingival Recession

Gingival recession is found to be more in periodontally compromised patients undergoing orthodontic treatment [Figure 7]. A clinician should be aware of this fact and have an interdisciplinary treatment plan. Force applied on periodontally compromised teeth can result in more periodontal breakdown and regeneration of such periodontal ligament tissues is difficult. As a result, with loss of bone support, center of resistance of the involved tooth moves more apically resulting in teeth being more prone to tipping movements than required bodily movements. Supra gingival plaque can shift to subgingival position in a plaque infected tipped/tilted teeth inducing an apical shift of the connective tissue attachment and formation of pockets and further loss of attachment. Due to risk of having more PDL attachment loss, very light forces must be applied.16

Areas of thin gingiva are usually noted as having washboard appearance of prominent roots and a narrow width of attached gingiva. Tooth movement if in labial direction, may require soft tissue graft. If teeth having thin tissue are going to be moved lingually, there is potential for the tissue to move coronally and become thicker. In this case any grafting of soft tissue should be postponed until active tooth movement is completed. In cases of bony defects, teeth can be moved orthodontically provided the remaining bone and periodontium are brought to healthy states.29,30

Fig 7: Gingival recession during orthodontic treatment.

Retention

Post orthodontic treatment removable or fixed retainers are necessary to prevent any relapse of the treatment and allow time for reorganization of the gingival and periodontal tissues.31 As instructed by the clinician, patients should be made aware of its importance and motivated for proper use of retainers to avoid any possible damage to the tissues. If patient have a retainer or other removable orthodontic appliance, it needs to be cleaned regularly, too. After all, it spends a lot of time in your mouth. It is very difficult to keep the removable appliance totally free of plaque. Different cleaning methods are recommended mainly for home care. The orthodontist can suggest to clean with toothbrush and toothpaste (or soap) under running water or to clean the appliance in water bath containing a cleanser tablet.

Conclusion

The number of orthodontic treatments among them the frequency of treatments with fixed appliances is increasing nowadays. In some cases orthodontic treatments mean caries preventive interventions when tooth movements may relieve crowding or other anomalies thus can contribute the effectiveness of proper oral hygiene. On the
other hand these treatments may have causative effect on plaque induced oral diseases. For these patients effective preventive oral health care is needed and orthodontists have to be responsible for helping to keep proper oral hygiene in their patients. Increase of motivation among orthodontic patients regarding sustainable oral hygiene regime might result in better oral health outcomes and prevent complications. Because of the increasing number of patients in need of orthodontic appliances, this is important and useful not only for orthodontists, but general dentists or periodontists and as well.

References:


