

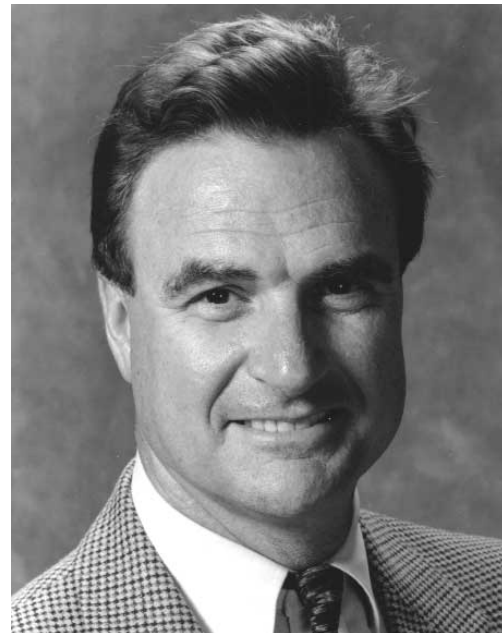
*Enhancing the value of orthodontic treatment:
Incorporating effective preventive dentistry
into treatment*

100
years

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During the past 30 years, my clinical research and patient treatment efforts have been directed at preventing damage to periodontal tissues during orthodontic treatment. In 1989, our research team at UCSF published in the *AJO/DO* the first prospective longitudinal study¹ of comprehensive orthodontic treatment in adults who had received periodontal treatment versus periodontal healthy adults and adolescents. The results of that study showed that no significant damage to periodontal tissues occurred in adult periodontal patients if they were provided adequate preventive dental measures, which included successful initial control of active disease and 3-month periodontal maintenance visits throughout orthodontic treatment. Six-month examinations and prophylaxis were performed for healthy adults and adolescents. All adult and adolescent patients were also instructed and reinforced at each monthly orthodontic visit for plaque removal effectiveness. The results showed that adults, in general, had significantly less plaque accumulation and healthier gingival tissues than adolescents during treatment. The results also showed that healthy adults could be treated without significant periodontal breakdown. However, approximately 20% to 30% of the adolescents had inadequate plaque removal during treatment and lost significant periodontal bone support during treatment.

A later prospective longitudinal study² reported in the *Journal of Clinical Dentistry* in 1992 showed that adolescents who had ineffective plaque removal during treatment would also develop significant decalcification. This was an important finding because the adolescents in that study were raised primarily in an environment where fluoride was present in the water and had a very low incidence of smooth surface caries before treatment. When our team at UCSF and later at the



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University of the Pacific investigated different methods of enhancing the effectiveness of plaque removal in adolescent patients in other similar prospective longitudinal studies, the results showed a number of significant findings including the following:

1. If a small amount of fluoride is added to the saliva on a daily basis by having patients use twice daily over-the-counter (0.05%) neutral sodium fluoride rinses or twice daily 0.4% stannous fluoride gels, decalcification was very minimal and clinically insignificant.³
2. Our studies and those of other investigators have shown that the 4 major types of powered toothbrushes on the market today (Braun-Oral B, Rotadent, Interplak, and Sonicare) all remove plaque more effectively than conventional tooth-

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- brushes on the buccal and lingual surfaces. Our own studies further showed that the Rotadent powered toothbrush was the most effective powered toothbrush at interproximal plaque removal in orthodontic patients.⁴ Because the interproximal site is considered the most important site for initiation of periodontal disease, the Rotadent is the powered toothbrush of choice for orthodontic patients and patients in periodontal maintenance.^{5,6}
3. Because several recent studies have shown that the Sonicare powered toothbrush was associated with 30% to 40% weakening of bracket bond strength, this powered brush is not recommended for orthodontic patients.^{7,8}
 4. Twice daily use of stannous fluoride (0.4%) gels has also been shown to be effective against gingivitis in several longitudinal studies^{9,10} we recently published, provided they contain greater than 90% available stannous ions. The ADA Seal ensures that the gel has the proper stannous ion concentration. The main disadvantages of using stannous fluoride gels are that 15% to 20% of patients develop mild staining after 3 to 6 months of use and additional compliance is needed for adolescents to perform a twice-daily application of the gel after toothbrushing.
 5. Listerine rinses and their generic counterparts have active ingredients that are essential oils. These rinses are FDA approved for control of gingivitis. They can be useful adjuncts for adults undergoing orthodontic treatment but are not recommended for children or adolescents because the high (26%) alcohol content is usually not acceptable and because there is no fluoride in these rinses.
 6. A large number of recent studies have shown that toothpaste that contains tryclocan with copolymers is also effective against gingivitis. (For a review, see reference 11.) At present, this formulation has a patent with Colgate and thus is only available as Colgate Total toothpaste. Total is also the only over-the-counter toothpaste to have both ADA and FDA approval as an anti-gingivitis agent. Other important advantages of Colgate Total are that it has a pleasant taste and also controls supragingival calculus formation to an equivalent level to that of tarter-control toothpastes. Our studies of compliance have shown that the best compliance with anti-gingivitis products is achieved with a pleasant tasting toothpaste. It is for these reasons that Colgate Total is our standard recommended toothpaste for all orthodontic patients with fixed appliances.
 7. Recent studies have shown a significant additional reduction in smooth surface carious lesions from subjects who used a fluoride toothpaste but did not rinse with water after its use. (For a review, see reference 12.) This has led to a recommendation for orthodontic patients to use Colgate Total fluoride toothpaste without rinsing with water after use. In this way a small amount of fluoride is left in the saliva that aids in remineralization of the tooth surface.
 8. The best product for optimum management of severe gingivitis in adolescent orthodontic patients are chlorhexadine rinses. Many studies have shown that 3 to 6 months of use of 0.12% chlorhexadine will control even severe gingivitis. One of the main problems with chlorhexadine rinses is that they stain teeth and can potentially stain composite restorations. Chlorhexadine rinses are also useful for patients after orthognathic surgery, especially if intermaxillary fixation is used. If standard efforts at motivating patients with conventional toothbrushes or electric toothbrushes and Colgate Total fail, the chlorhexadine rinse program should be the last resort. If a patient fails to comply with the chlorhexadine rinse program, then treatment should be terminated.
 9. Another effective method for controlling gingival inflammation in orthodontic patients with fixed appliances is the use of an oral irrigator. Our longitudinal studies^{13,14} and studies of others have shown that if the water pressure is set at a higher setting, the oral irrigator effectively removes loosely adherent supragingival and subgingival plaque. It is the loosely adherent plaque that has been found to be the most pathogenic for periodontal disease. It is important to point out that oral irrigators have only been shown to be effective against gingivitis when used on a daily basis.
 10. Several suggestions that clinicians can use to improve plaque removal efficiency during orthodontic treatment with fixed appliances include:
 - Bonding of molars has been shown to have better periodontal health than banding¹⁵ because of less plaque accumulation. This is especially important in adults who are in periodontal maintenance and who have recall visits every 2 to 3 months for subgingival debridement. This is most likely due to the improved access for interproximal instrumentation with bonded molars that do not have overhanging margins as is generally found at the gingival portion of bands.
 - Use of single arch wires and avoiding lingual appliances whenever possible for adults in periodontal maintenance also leads to easier plaque removal and control of gingival inflammation.
 - Removing excess composite material around

brackets, especially at the gingival margin also helps to reduce plaque accumulation.

- Minimizing the length of the second phase of treatment with fixed appliances in 2-phase treatment plans for moderate to severe malocclusions can be achieved by correcting significant skeletal and alignment problems in the mixed dentition. The shorter time in fixed appliances in the second phase helps to prevent damage to periodontal tissues.
- Our studies of root resorption with Drs Shelly Baumrind, Vicki Vlaskalic, Roger Boero, and Steve Dugoni also showed an additional advantage of using a 2-phase treatment plan. Our data¹⁶ showed that there was not any measurable root resorption found in treatment of permanent incisors with open apices as is generally found in the mixed dentition.
- Recent technological advances in the development of progressive, computer-generated 3D models of simulated tooth movement have allowed the time-tested principle of using removable, elastic appliances to move teeth, an exciting new application brought about by the recent introduction of the Invisalign Appliance.¹⁷ The potential lack of hygiene problems with this appliance, the data of previous studies that show a lack of root resorption with other types of removable appliances, and the obvious esthetic advantage of clear, removable appliances led to our research team at UOP to do a clinical trial during the past 2 years involving the Invisalign System. We can now report that we have successfully tested the Invisalign Appliance in collaboration with my colleges, Drs Vicki Vlaskalic, Jae Ahn, and Ross Miller.¹⁷ Our clinical studies showed that this appliance could effectively correct minor to moderate malocclusions including selected extraction and expansion cases.⁵ In addition, patient compliance and motivation toward treatment have been much better than we had previously experienced with conventional fixed appliances.

In summary, my career as an orthodontist has been an incredibly positive experience. My dental students, residents, and fellow faculty members have enriched my life. I know of no other profession more rewarding than orthodontics. What more positive and uplifting goal

could anyone possibly have that is more wonderful than giving those we care so much for a beautiful smile.

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