

Improving Periodontal Health through Invisalign Treatment

By Robert L. Boyd, DDS, MEd

This article is the second in a series for *Access* that introduces dental hygienists to Invisalign, a new and innovative orthodontic system. An introduction to Invisalign was first published in the *Journal of Clinical Orthodontics* in 2000 by Boyd, Vlaskalic, and Miller.¹

The purpose of the first article in *Access* was to identify the dental hygienist's role in the Invisalign treatment process. In it, Dr. Shuman presents guidelines for the selection and treatment of Invisalign patients.² He concludes that, for patients who need orthodontic treatment, the dental hygienist is a trusted advisor and source of information. For patients already in treatment, the dental hygienist helps patients be compliant and educates them in maintaining and improving oral health during and after treatment.²

What Is the Periodontal Response to Invisalign?

Plaque and Gingivitis

Two recent clinical trials conducted at the University of Florida and the University of Washington indicated that periodontal response improves during orthodontic treatment.^{3,4} This evidence, including the clinical measurement of plaque accumulation, gingival inflammation, and gingival bleeding upon probing, appeared in the *American Journal of Orthodontics and Dentofacial Orthopedics* and the *Journal of Dental Research*.

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These measurements were especially noteworthy because most of the patients in the study had relatively healthy periodontal tissues at the beginning of treatment. Numerous other studies have shown a general tendency towards increased plaque accumulation, gingival inflammation, and bleeding during routine orthodontic treatment with fixed appliances.⁵ This is due to the increased difficulty of removing plaque from the rough surfaces and undercut areas associated with fixed appliances.

Improvements in periodontal status have also been shown following bonding of teeth during orthodontic treatment. Nevertheless, in many situations, conventional orthodontic bands are still the predominant fixed appliance for

molars. Orthodontic bands will always have open and overhanging gingival margins because they must accommodate the convexity of the crown, creating an overhang at the gingival margin of the band that may be difficult to clean. In particular, floss may shred when used to clean the interproximal gingival areas.⁶

Periodontal health can improve during orthodontic treatment using the Invisalign system because patients can remove the aligners to brush and floss normally. Patients who had Invisalign treatment expressed by means of questionnaires that they invariably spent more time cleaning and brushing the inside of their aligners to keep them invisible. Plaque accumulation can make the aligners cloudy and sometimes malodorous, and patients understood that they needed to remove plaque from inside the aligner as well as from their teeth.

Mobility

Mobility typically increases during fixed orthodontic treatment because the archwire is connected to all of the teeth, and force dissipates generally throughout its length. Invisalign is different because teeth that require no movement can be held stationary without receiving force. Thus, the aligner acts as a splint for mobile teeth that are not required to move during treatment. Teeth that have been moved to their correct position can also benefit from this splinting effect afterward.

Restorative Solutions versus Invisalign

A common solution for patients with spaces or crowded anterior teeth is to undergo significant reduction of tooth mass followed by placement of porcelain veneers. Frequently, the veneers are used for the entire upper and lower arches. Sufficient crown reduction occasionally leads to endodontic treatment, and periodontal conditions may worsen as a result of crown forms that do not match root positions. An alternative esthetic solution is orthodontic treatment and bleaching of the teeth, however, many patients refuse to have orthodontic treatment with fixed appliances due to concerns over esthetic and comfort during treatment.

Another use of conservative orthodontic therapy in place of traditional restorative solutions is aligning the teeth more favorably prior to restorative dentistry. This generally leads to removal of less tooth structure, which lessens the need for endodontic treatment and may help improve periodontal status. Nevertheless, patients may object to fixed appliances and miss out on the benefits that orthodontics can provide toward the success of their restorative treatment.

A significant advantage of the Invisalign system is high patient acceptance due to its near invisibility. Although plastic and ceramic brackets have been developed to improve device esthetics, these do not satisfactorily fulfill many patients' desire for truly invisible appliances. Fixed lingual appliances were also developed to improve esthetics during orthodontic treatment; however, their effect on speech and tongue position makes them difficult to get used to. Lingual appliances are also more difficult to remove plaque from because of their location in the challenging hard-to-reach lingual areas. Lingual appliances are also considerably more expensive than traditional fixed appliances or Invisalign because they are more difficult technically to place and adjust, given the limited working space that lingual areas offer compared to buccal areas. Invisalign treatment can overcome the potential esthetic, comfort, and cost barriers posed by these other options for orthodontic treatment.

Clinical Treatment with Invisalign

An examination of pretreatment status and posttreatment changes in three patients (patient 1—mild to moderate periodontitis, patient 2—moderate with localized advanced periodontitis, and patient 3—advanced periodontitis coupled with malocclusion) will demonstrate how Invisalign treatment can be useful to correct the malocclusion with an almost invisible appliance.

Patient #1 (Figures 1 A & B)

Patient #1 is a healthy 51-year-old female who had generalized mild to moderate periodontitis throughout her mouth and had periodontal surgery in all four quadrants prior to Invisalign treatment. This patient was in a three-month periodontal maintenance



Figure 1A: Pretreatment intraoral frontal view of 51-year-old patient with mild to moderate periodontitis. Note significantly longer clinical crown on lower left central incisor.

Figure 1B: Posttreatment intraoral frontal view showing patient after Invisalign treatment. Note improved tooth positions and decreased length of the clinical crown of the lower left central incisor. Also note that upper central incisal edges have been recontoured to remove chips present.

program. Her dental history shows full orthodontic treatment as an adolescent. Despite her chief complaint of “crooked front teeth,” she refused fixed appliances. Clinical photographs show a long clinical crown due to gingival recession with no attached gingiva in the lower left central incisor. This patient had 16 months of Invisalign treatment, which is comparable to the time required for fixed appliances. Posttreatment frontal intraoral photographs show improvement in the length of the clinical crown, achieved by moving the crown and root of this incisor lingually into the alveolar ridge. This procedure frequently improves clinical crown length.⁷ This patient continued her periodontal maintenance at regular three-month intervals during Invisalign treatment, which facilitated both plaque removal by the patient and instrumentation by the dental hygienist.

Patient #2 (Figures 2 A, B & C)

Patient #2 is a 48-year-old woman who had mild to moderate periodontitis and had undergone periodontal treatment, which included scaling and root planing followed by pocket reduction surgery in the upper posterior teeth prior to Invisalign treatment. She was on a three-month periodontal maintenance program, and she wanted to change the appearance of her “crowded front teeth.” Pretreatment radiographs reveal generalized mild to moderate bone loss with significant mobility (2+) and gingival recession on the upper right canine. She refused fixed appliances. Invisalign treatment required 26 months of appliances followed by retention. A posttreatment photograph shows that her tissues remained healthy throughout Invisalign treatment. A connective tissue graft was performed on the upper right canine after Invisalign treatment was complete and the tooth was positioned lingually into the alve-

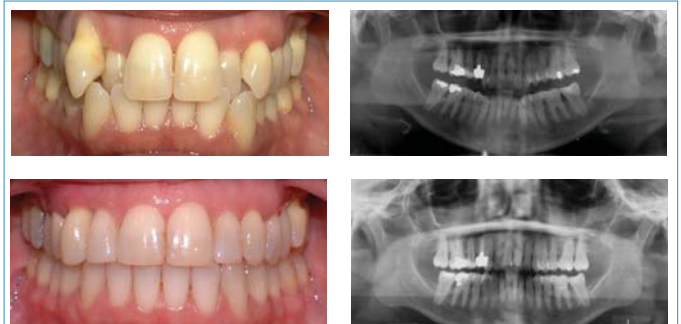


Figure 2A: Pretreatment intraoral frontal view of 54-year-old patient showing moderate upper arch crowding, anterior cross-bites of upper lateral incisors, and upper right canine in buccal version with a long clinical crown due to extensive gingival recession.

Figure 2B: Panoramic X ray showing generalized moderate horizontal bone loss prior to Invisalign treatment.

Figure 2C: Posttreatment view showing improved alignment and correction of long clinical crown of the upper right canine.

Figure 2D: Two year postorthodontic treatment panoramic X ray for the patient showing no further bone loss during the Invisalign treatment.

olar ridge, in a procedure like that used in case #1. In this case, however, the connective tissue provided additional root coverage for better esthetics.

Patient #3 (Figures 3 A, B, C, & D)

Patient #3 is a 53-year-old woman who had advanced periodontitis throughout her mouth. She had periodontal treatment in all four quadrants and was on a three-month periodontal maintenance program prior to Invisalign treatment. She had been in successful periodontal maintenance for several years. Her chief complaints were “crowding” of her teeth and an “overbite.” The patient had severe flaring of the upper and lower incisors. She required 26 months of active Invisalign treatment to resolve crowding, overjet, and protrusion. Treatment also required extraction of a lower left central incisor and upper right first premolar. This patient experienced minimal bone loss with no pockets increasing more than one millimeter over the past five years.

All three of these patients demonstrated varying degrees of periodontal involvement, prior to orthodontic treatment, which was treated successfully through periodontal therapy. These

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patients were in excellent compliance with scheduled three-month maintenance visits. As a result, they maintained periodontal health throughout Invisalign treatment. For retention, these three patients wore their final Invisalign appliance full-time for six months after active treatment and then at night indefinitely thereafter.

Summary

This article shows that the new Invisalign system offers advantages, which include

- easier and more effective removal of plaque and control of gingival inflammation during the active phase of treatment with full-time wear of the appliances
- easier instrumentation during periodontal maintenance by the dental hygienist in the absence of fixed appliances
- better control of increased mobility because of the appliance's splinting effect
- improved retention using the last Invisalign appliance as a retainer.

Other benefits of Invisalign for patients, dental hygienists, and dentists described in this article include readier acceptance of an orthodontic alternative to extensive porcelain veneers and less need for restorative dentistry to improve esthetics. In many cases, alignment, crown reshaping, conservative partial composite



Figure 3A: Pretreatment intraoral frontal view of 49-year-old patient showing significant crowding, flared anterior teeth and large overjet.

Figure 3B: Panoramic X ray showing generalized advanced bone loss prior to Invisalign treatment.

Figure 3C: Posttreatment intraoral photo showing correction of overbite, overjet, and crowding that resulted in the extraction of the lower left central incisor and upper right first premolar. Note appearance of healthy gingival tissue at the end of treatment.

Figure 3D: Posttreatment panoramic X ray showing no increase in bone loss during 26 months of Invisalign treatment.

restorations, and bleaching can also attain good esthetic results at a substantially lower cost than full-mouth porcelain veneers.

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