

Clinical Considerations for the Dental Hygienist in Orthodontic Therapy

This continuing education feature will overview the latest philosophy in tooth movement science as well as the integral role dental hygienists play in the successful outcome and long-term results of orthodontic therapy.

Learning Objectives

- Understand the role of the dental hygienist in recognizing patients who would benefit from orthodontic therapy
- Discuss the periodontic/orthodontic connection
- List current options in orthodontic therapies and related science
- Identify the advantages of bio-adaptive therapy and minimally invasive approaches
- Define the dental hygiene process of care for the orthodontic patient
- Identify unique challenges faced by the orthodontic patient and understand daily care options and opportunities

Introduction

There is very little published with respect to the role of the dental hygienist regarding the unique challenges and opportunities presented by the orthodontic patient. Most research and related articles date back to the 1970's and yet, orthodontics as a science has evolved dramatically over the past 20 years. From bio-adaptive minimally invasive treatment to 'invisible' aligner technology, tooth movement has become an important health and cosmetic option for most patients, regardless of age or occlusal status. Dental hygienists have an important role in patient identification, treatment options, the dental hygiene process of care from orthodontic pre-therapy through post-orthodontic therapy, as well as the daily adjuncts necessary to maintain optimal oral health during orthodontic therapy.

The American Association of Orthodontists (AAO) estimates that 50 – 75% of the population would benefit from orthodontic therapy¹ with up to 50% of U.S. children in some type of orthodontic care.² The number of individuals seeking orthodontic treatment has exponentially increased over the past 10 years with a growing number of adults entering into treatment. Treatment times range from 12 – 36 months with an average of 24 months and a variety of treatment options and philosophies continue to generate interest in this ever-evolving science and specialty of dentistry.

With the significantly high number of patients undergoing orthodontic treatment, it is imperative that dental hygienists understand their role, challenges and opportunities during all phases of therapy. The AAO

recommends assessment by an orthodontist no later than age seven to examine:

- The posterior occlusion is established when the first molars erupt. At that time, the clinician can evaluate the anteroposterior and transverse relationships of the occlusion, as well as discover any functional shifts or crossbites.
- Incisors have begun to erupt and problems can be detected such as crowding, habits, deep bites, open bites and some jaw discrepancies.
- For some, a timely evaluation will lead to significant treatment benefits; for others, the principal immediate benefit is a parent's peace of mind.

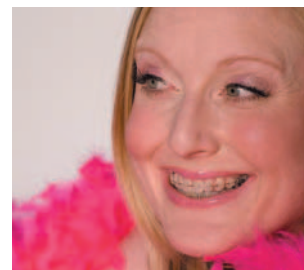
The AAO does not advocate comprehensive orthodontic treatment at age seven; however, interceptive treatment may be appropriate. The AAO has placed this information in a resource document along with photos online at the official AAO website at www.braces.org in the healthcare professional link.³

As the trend for adult therapy has increased, so has the number of men seeking care. The AAO lists the following rationale for adult orthodontic treatment:

- Can help prevent or improve periodontal problems
- Can help prevent or reduce further bone loss around teeth
- Improves ability of the dentist to restore missing teeth
- Improves aesthetics for a better smile and facial appearance
- Improves function of teeth
- Improves self-confidence and self-esteem
- Improves oral health

Like the recommendations for early examination, these recommendations for adult therapy, along with photos, can be accessed on the AAO website at www.braces.org under the healthcare professional link.⁴

The interrelationship between malocclusion and periodontal health is well researched and today adult patients are more open to this treatment option. Additionally, research is now focused on the benefits orthodontic therapy can provide in restoring periodontal status while enhancing the patient's ability to maintain health. The periodontal/orthodontic connection provides strong rationale for dental hygienists to be up-to-date on all aspects of orthodontic treatment.



Clinical experience and research have demonstrated that the orthodontic patient population has unique challenges, primarily related to the maintenance of optimal oral health of both the hard and soft tissues. As such, the dental hygienist has an important role in the orthodontic patient's short-term and long-term success.

The Periodontal Orthodontic Connection: Biological & Synergistic Tooth Movement

Regardless of age, the periodontal status is a central factor in successful tooth movement and relies upon healthy tissues. This combined with controlled orthodontic forces upon the teeth; allow the teeth to relocate through the alveolar bone. This gradual movement is aided by the regeneration of the supporting periodontal tissues and requires careful calculation on the part of the orthodontist.

Light, consistent, controlled forces over time result in regeneration of the bone in the direction of movement. Maintenance of the appropriate forces is essential to avoid necrosis which can lead to undermining resorption.⁵ This process produces osteoclasts which affect the lamina dura. Lighter forces will also be less uncomfortable for the orthodontic patient. Remodeling is the goal, without tissue destruction in the process. The detailed biomechanics of tooth movement requires that patients be under the care of an orthodontist to assure optimal treatment.

Periodontal health can benefit greatly through orthodontic treatment. Correction of crowding will lend to better plaque biofilm control and furthermore, research has indicated that orthodontic tooth movement may be able to reverse damage from past periodontal infections.⁶

Identifying the Orthodontic Patient

With each dental hygiene diagnosis, assessment of occlusion is necessary. The recently released 2nd edition of Mosby's Dental Hygiene Concepts, Cases and Competencies⁷ – recommends the following “Orthodontic Six-Point Quick Check System”:

Begin by examining each arch separately and evaluating the following categories:

1. Arch width (molar-to-molar transpalatal width of 36 mm is average)
2. Excessive spacing or crowding present
3. Missing or ankylosed teeth

Then note the relationship between the upper and lower teeth in occlusion. Evaluate the following:

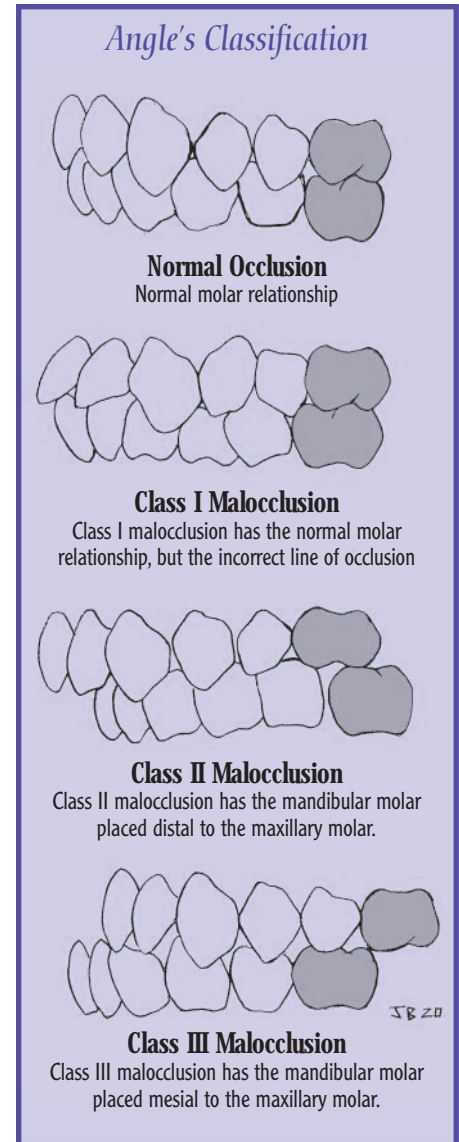
4. Angle's classification
5. The amount of overbite and overjet present
6. Any openbite or crossbite present

Facial aesthetics is also an important consideration for treatment goals, function and success. Correcting disproportions will be important as growth continues for adolescents and for adult aesthetics. Frontal evaluation would include symmetry, size proportions of the midline to lateral structures and vertical proportionality. Profile evaluation would include a determination of the jaw positioned proportionally, lip protrusion, vertical facial proportions and mandibular angle. These assessments and evaluations should be accompanied by a standard dental hygiene assessment of hard and periodontal tissues.

Complete assessment of hard tissues may include the use of caries detection technologies as well as saliva tests to determine caries risk. Chair-side tests today can assay for decay-associated bacteria, while new fluorescence technologies can assist in early detection of incipient lesions.

Evidence confirms the amount of *Mutans streptococcus* (MS) increases significantly after bracket bonding^{8,9} so it will be important for the clinician to know the potential risks for the patient to implement preventive strategies. Nutritional counseling is also warranted and should include education regarding caries associated diets and nutrient dense, soft foods.¹⁰ Avoidance of sugar or acid beverages, sticky/fermentable carbohydrates and known cariogenic foods will be important in preventing decalcification during orthodontic therapies.

A full periodontal assessment is essential for the adult patient, as active periodontal infection is a contraindication for any form of orthodontic treatment. Radiographs combined with full-mouth 6-point probing and clinical attachment assessments are critical in the pre-orthodontic phase. The periodontal examination should also include evaluation of plaque biofilm, bleeding and inflammation. Prior to orthodontic therapy, treatment of any form of periodontal infection, including gingivitis, is indicated and necessary.



Orthodontic Therapy Options:

One-Phase & Two-Phase Treatment Options -

One-phase fixed orthodontic appliances are used to move teeth successfully and generally require 24 – 36 months of active therapy. Systematic approaches move teeth sequentially and may include extraction. This treatment is generally initiated when the permanent teeth have erupted, thus providing a clear and concise understanding of growth, and treatment predictability.



Traditional Orthodontic Braces

This method often involves extraction therapy and may not address facial or profile concerns. A combination of brackets, elastics, bands, archwires and ligation make up this treatment regimen.

Indirect bonding of orthodontic brackets is gaining in popularity over the traditional direct bonding of brackets, where each bracket is placed individually. Indirect bonding was first described in the early 1970s,¹¹ but the introduction of better adhesive systems has increased the clinical success of this technique. Recent research has revealed that there is no significant difference in bond failure rates between indirect and direct bonding of brackets¹² and no difference between the accuracy of bracket placement between the two techniques¹³.

The technique involves both laboratory and clinical stages. First, a custom transparent plastic tray, similar to a whitening tray, must be fabricated from patient models. A small amount of orthodontic adhesive is used to position the orthodontic brackets on the tray for later application to the teeth. The clinical stage involves preparing the teeth in the same fashion that is used for direct bonding, typically involving polishing the teeth with a pumice and water slurry. The teeth and bracket bases are prepared with a thin layer of primer and a small amount of light cure orthodontic adhesive is applied to the bracket base. The tray is seated with even pressure and each bracket is cured from the most posterior tooth forward and the tray is carefully removed. Excess bonded adhesive (referred to as flash) is then carefully removed from around the brackets. Molar bands are placed after the indirect method, so as not to impinge on the seating of the tray. Generally, only a quadrant of brackets is seated at the same time, to minimize moisture contamination during bonding. Indirect bonding has several advantages over



Indirect Bonding

direct bonding, such as improved precision in positioning of brackets, reduced chair time and, therefore, less stress to the orthodontist.

Adult patients are demanding better aesthetics during orthodontic treatment and have driven the demand for tooth colored ceramic brackets and lingual orthodontics. Despite increased aesthetics, ceramic brackets can vary in fracture toughness and strength compared to traditional stainless steel brackets. Because ceramic brackets are second in hardness to diamond, severe enamel wear to the opposing dentition has been reported with these brackets placed on the mandibular arch.¹⁴ This is why orthodontists

generally place polycarbonate brackets in the lower arch. Enamel damage from debonding ceramic brackets is more likely than with the more pliable metal brackets.¹⁵ Finally, bonding ceramic brackets onto compromised teeth, such as endodontically treated teeth, presence of enamel hypoplasia and cracks, and those with large restorations, should be avoided due to the risk of tooth damage during debonding.¹⁶



Ceramic Brackets

Until recently, lingual orthodontic systems failed to catch on in the United States, since their introduction by a California orthodontist in the late 1970s. New advances in materials and design and the use of computer-aided manufacturing technology has increased the use of lingually place brackets.

Both the brackets and archwire are now customized for the patient. The new systems also feature reduced thickness of brackets, which aids in a reduction of speech problems and tongue irritation seen with the thicker traditional brackets.^{17, 18} Commercially available lingual orthodontic systems include iBraces (3M Unitek) and orthodontists must complete specialized training in order to become a certified provider. These systems are still a very small part of the orthodontic appliance treatment segment due to continuing issues with comfort and oral hygiene.



Lingual Braces

Two-phase treatment incorporates early intervention for those with moderate to severe malocclusion and is initiated in the mixed dentition phase with 'traditional' fixed appliances, and with active ligated brackets, in the second phase of treatment. The first phase generally lasts 6 – 14 months utilizing any variety of appliances designed to correct skeletal imbalances, oral neuromuscular problems, crowding or treat the effects of oral habits, such as digit sucking. Rapid maxillary expansion appliances to headgear, to lip bumpers to functional orthopedic appliances may all be used during this phase. These treatment approaches take advantage of growth and pave the way for traditional

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fixed appliances. Controversy surrounds some of these interceptive therapies as invasive and unnecessary with non-compliance as a possible issue.¹⁹

What is wrong with conventional ligation?⁸¹

- Failure to provide and to maintain full archwire engagement
- High friction
- Elastic ligation loses its elasticity over time (and therefore tooth control) and they are sometimes lost
- Potential impediment to oral hygiene
- Wire ligation is very slow

Both the one-phase and two-phase methods use fixed appliances and by the very nature of orthodontic brackets, bands, and archwire ligation, plaque control will be increasingly challenging and, as such, professional and daily care strategies should be modified accordingly. Active ligation has recently been looked at in terms of forces applied to teeth and unnecessary friction.

Aligner Technology

In 1999, Align Technology, Inc. (Santa Clara, CA) introduced the orthodontic profession to a series of removable aligners (Invisalign®) for tooth movement. This treatment is not new and the advent of computers has created an efficient system for designing and manufacturing (CAD/CAM) the aligners. This 'invisible' therapy option shows promise to those clients who would not consider fixed orthodontic appliances. Adults and teens with mild malocclusion, mild to moderate crowding and mild to moderate spacing issues, non-skeletal constricted arches and those who have experienced relapse from previous treatment are all candidates for aligner technology.²⁰ As with all orthodontic therapy, active periodontal infection is contraindicated for this treatment option.

With aligner treatment, restorative work should be completed and second molars partially or fully erupted. This treatment option is not generally recommended in treating more complicated malocclusions such as a severe, deep bite with, anteroposterior corrections greater than 2 mm, up righting severely tipped teeth or premolar extraction cases (unless extraction space is going to be treated with an implant or bridge).²⁰



Invisalign® Before



Invisalign® After – 9 months treatment time/19 aligner sets

Photo courtesy of Dr. R. Silberstein

Photo courtesy of Dr. R. Silberstein

A certification course is required to be completed for both orthodontists and general dentists to be able to offer this technology to their patients and to assure optimal success. The clinician submits the patient's dental records and a suggested treatment plan is generated by Align Technology orthodontists. The computer program fabricates the aligners based on the approved treatment plan. Aligners are worn 24-hours a day; must be removed for eating, drinking, and oral hygiene; and are distributed in four to six-week intervals with 2-3 aligner sets per appointment. Patients are instructed to change their aligners every 2 weeks returning for monitoring appointments that include an evaluation of the attachments, spacing, oral hygiene, periodontal status, of how the aligners are seating, and interproximal reduction (IPR) is often required throughout the treatment phase to allow teeth to align correctly.²¹ Products to reduce sensitivity may be necessary for patients receiving IPR treatment.

Invisalign patients do report less pain and fewer negative impacts on the quality of their life during the first weeks of orthodontics compared with those patients treated with fixed appliances.²² Aside from aesthetic advantages, there is data to suggest the improvement of periodontal tissues during this type of treatment.^{23,24} This makes sense due to the very nature of the system and the patient's ability to remove the appliance for optimal daily plaque biofilm removal.²⁵ Often resin buttons are added to facial surfaces of teeth, to assist in tooth movement; resulting in the need for the dental hygienist to be aware of their location to evaluate plaque control as well as to not remove those during scaling.

This technology has given rise to some controversy over the clinical research, as many of the published papers are case reports. Concerns over final outcomes to correct malocclusion and potential higher relapse with Invisalign have also been reported.^{26,27} In addition, because of the ease of removal, patient compliance with aligners must be carefully monitored. As with any system that relies upon the patient, non-compliance is an issue and can delay treatment.²⁶

Other commercially available aligner systems include NuBrace (www.nubrace.com) and the Red, White & Blue system (www.aolab.com) recommended for replacement of certain retainer devices. This technology has confirmed that adult patients are not only interested, but also willing to pursue orthodontic treatment, especially if it is aesthetically pleasing.



Invisalign® Aligner Placement

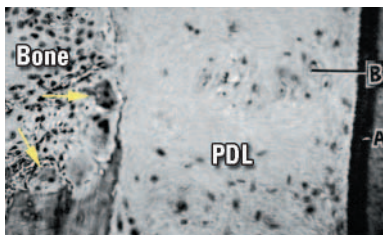
Photo courtesy of Align Technology

Bio-Adaptive Therapy

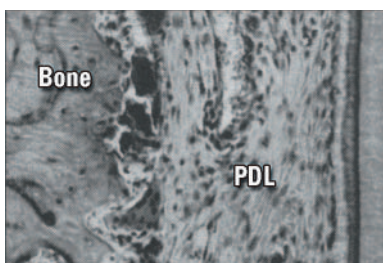
While fixed appliances have been readily available for decades, the use of appliances with lighter forces that work in natural harmony with the body – or bio-adaptive therapy – is growing in popularity. It has been well understood and accepted that light forces will effectively and quickly move teeth.²⁸ The challenge has been to develop a fixed appliance that will allow light force action with minimal friction and moderate force as seen when archwires are ligated to fixed appliances.

The premise of bio-adaptive therapy, as defined and facilitated through the Damon® System of brackets, archwires and treatment philosophy from Ormco Corp. (Orange, CA), takes into account this opportunity to achieve ideal

tooth position and facial harmony while keeping vascular integrity of the alveolar cortical plate. *“Optimum force levels for orthodontic tooth movements should be just high enough to stimulate cellular activity without completely occluding blood vessels in the periodontal ligament.”*²⁹



Conventional forces – Note how blood vessels are crushed in necrotic PDL and how much bone must be eroded to cause movement



Low forces – Note forces do not interrupt the vascular supply

Bio-adaptive therapy utilizes forces 100 times less than traditional mechanics while maximizing availability of oxygen for periodontal remodeling. The presence of oxygen is the trigger on the periodontium and thus tooth movement.³⁰

When forces exceed a certain threshold, it results in occlusion of the blood vessels, which forms a hyalinized avascular necrotic area. This area must ‘heal’ or revascularize before teeth start to move, a process that



*Adult Damon® System Before
Note periodontal condition*



*Adult Damon® System After
Note improved periodontal health after
20 months treatment time/12 appointments*

is slower in adults than adolescents. A review article on the effects of orthodontic therapy on periodontal health in adults confirms that when forces are kept within biologic limits gingival inflammation is avoided and further, that light forces are recommended to avoid root resorption for the periodontally healthy adult patient. Additionally, some case studies demonstrated that orthodontic treatment might enhance the possibilities of saving and restoring periodontal health.³¹

Dr. Dwight Damon, inventor of the Damon System, is credited as a pioneer in bio-adaptive therapy and is quoted as stating, *“Most extractions are done to make space to eliminate crowding. But what about the face, the roots of the teeth, and the soft tissue? With the Damon System, we use light forces to convert crowding into posterior arch width, yielding ideal tooth position, and better facial aesthetics. There is also a growing body of evidence that this approach yields less root resorption and a far better soft-tissue response.”*³² Taking into account a minimally invasive approach, avoiding extractions when possible, working with the body’s ability to move teeth with low force/low friction has also lead to shorter treatment time^{33,34}, less chair time³⁵ and higher patient acceptance during therapy.³⁶

There are three pillars to the Damon System: 1) Passive self-ligating brackets which negate the need for elastic ‘o’ rings or ligatures and result in low friction, improved comfort and better hygiene; 2) New wire technology which maintains lighter forces with fewer adjustments; and 3) Minimally invasive treatment mechanics which result in fewer extractions and near-elimination of headgear and rapid palatal expansion (RPE) appliances.³² Recent research has raised important issues regarding the use of RPE appliances and the negative impact this treatment has on the periodontal ligament and supporting teeth. One study demonstrated that these devices reduce buccal bone plate thickness of supporting teeth which could pose issues later in life especially with those prone to periodontal infection.³⁷ Another longitudinal study evaluated the periodontal response with one group of patients having been treated with RPE therapy and the other with traditional orthodontic appliances. Twenty percent of the first group had gingival recession 8–10 years post expansion, compared with 6% of the traditional group.³⁸ While most individuals experience orthodontic treatment



Non-extraction Damon® System Before

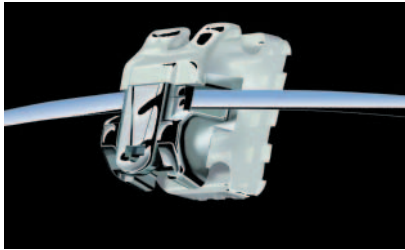


*Damon® System After
14.5 months treatment time /
7 appointments*

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during adolescence, it is vital to consider life-long periodontal impact and health and select treatments that will enhance long-term results.

Photo courtesy of Omco Corp.



Self-ligating brackets feature a slide mechanism, eliminating the friction and binding seen in traditional brackets allowing teeth to move more freely and comfortably.

The uniquely designed self-ligating bracket has also been said to serve as a 'mini lip-bumper' and as a result, the forces of the lips and cheeks help move the teeth into their physiologic positions.³⁹ Passive self-ligating brackets do not require elastics to hold the archwire in place and lend to better patient comfort,

improving the ability to minimize plaque biofilm accumulations around brackets because there are no elastic 'o' rings or wire ligatures. Most impressively, archwires are easily removed for hygiene appointments. Both adolescents and adult populations are appropriate for bio-adaptive orthodontic therapy.⁴⁰ Prospective research on self-ligating brackets is still limited and poses some unique research challenges because it is difficult to determine which component of the orthodontic system had the major effect, the bracket or the archwire; the Damon philosophy goes beyond any one component and Damon System orthodontists are specially trained in bio-adaptive therapy, which assures optimal treatment planning and success. Regardless of the treatment option, it is imperative to refer clients to those whose education and experience will lend the most appropriate treatment regime taking into account the numerous factors associated with the correction of malocclusion.

New Technology

New therapy options continue to be researched including use of Temporary Anchorage Devices (TADs) which are dental implants specifically for orthodontic treatment that will be removed after treatment for anchorage during therapy and range from surgical fixation plates to micro screw implants or pinplants⁴¹ to use of lasers to accelerate treatment time.⁴² New robotic technology (www.suresmile.com) eliminates the need for standard orthodontic models and replaces them with 3-D virtual, computer-generated models. This system reportedly allows for an exclusive digital approach which may decrease treatment time, enhance diagnostics and provide custom prescription archwires for more effective treatment. These technologies are gaining in popularity among some orthodontists. It should be noted that whenever new technology is introduced, much of the research comes from the manufacturers of these modalities. As these technologies continue to evolve, more scientific evidence will be ongoing to quantify treatment effects and long term outcomes.

Dental Hygiene Care Plan

The role of the dental hygienist in referral for correction of malocclusion is obvious and working with the practitioner providing orthodontic treatment is crucial to developing the dental hygiene process of care prior to, during, and post orthodontic therapy.

Pre-During-Post Orthodontic Therapy

Prior to orthodontic therapy, the periodontal and hard tissue status should be carefully evaluated and treated appropriately. Pre-therapy dental hygiene intervention will include full mouth instrumentation, evaluation of daily care strategies, planning for dental hygiene care during therapy and post therapy considerations. Patients' health, risk factors and current oral hygiene practices will dictate the care plan.

For periodontal cases, clinicians should consider implementing full-mouth disinfection (FMD) or accelerated instrumentation-phased appointments. This is a process of accelerated treatment, which includes full-mouth instrumentation within 24 hours, and use of chlorhexidine, that will fast track orthodontic treatment plans, health or healing and/or referral for further periodontal treatment. FMD research have shown this protocol to be more effective than traditional quadrant scaling and root planning over time (4 appointments with completion in 6 weeks), with a gain in clinical attachment, greater reduction in probing depths, eradication of *P. gingivalis*, greater reduction in spirochetes and motile organisms subgingivally, and greater reduction in oral malodor with the results being maintained 8 months post instrumentation.^{43,44} Suggested modifications to the protocol include use of powered instrumentation and simultaneous administration of antimicrobial agents; use of locally applied antimicrobial/antibacterial agents; prescription of sub-dose doxycycline; tongue scraping vs. brushing and treatment phases completed at least within one week vs. 24 hours.⁴⁵ This process of instrumentation will be important in arresting periodontal infection prior to orthodontic treatments. A minimum of 2 to 3 months post periodontal therapy is required before proceeding with an orthodontic treatment plan. Additionally, this patient type must have professional periodontal care every 3 months to maintain periodontal health.^{46,47}

Instrumentation during the orthodontic phase of therapy is a very important part of treatment and should include use of powered scalers to deplaque all areas around appliances and soft tissue. Research has demonstrated an increase in *Actinobacillus actinomycetemcomitans*⁴⁸ as well as *S. mutans*⁴⁹ when orthodontic appliances are present. Thorough instrumentation will assist in maintaining periodontal health. Working with the case orthodontist will allow the clinician to coordinate archwire removal and/or receive prior approval to remove archwires for optimal access. Self-ligating systems require a special tool to release the archwire and with all types of appliances, it is important that the archwire be replaced as soon as possible.

Regardless of periodontal status, all orthodontic cases should receive in-office fluoride treatments. The most effective and recognized in-office method is 5% sodium fluoride (NaF) varnish. Currently, the Food & Drug Administration (FDA) has approved varnish for the treatment of hypersensitivity; however, clinicians have been utilizing them in the treatment and management of dental caries in public health and other arenas. Interestingly, the American Dental Association (ADA) adopted policy encouraging the FDA to approve varnishes for the prevention and treatment of caries.⁵⁰

Even prior to this policy, professionals have justified using varnishes under an “off-label” use via professional judgment based on sound research and the current *ADA Professionally Applied Topical Fluoride: Evidence Based Clinical Recommendations re-state their support*.⁵¹ Fluoride varnishes have been utilized successfully outside of the United States for the treatment of caries for more than 25 years.⁵² A 40% or more caries reduction has been demonstrated with varnishes, which is comparable to acidulated phosphate fluoride (APF) tray treatments.⁵³

Fluoride varnish offers distinct advantages over tray systems such as ease of application to a multitude of individuals in any variety of settings. Dental hygienists need to know what type of brackets that are used by some orthodontists because APF has been known to affect the frictional forces of titanium brackets that are used by some orthodontists.⁵⁴ Varnish application does not require trays or expectoration and thus very little is needed with respect to materials or equipment, and is ideal for the orthodontic patient. Fluoride varnish has been shown to be a viable strategy to prevent enamel demineralization around orthodontic brackets.^{55,56}

Varnishes provide a “time-release” method to deliver fluoride directly to the areas needed and new formulations also include amorphous calcium phosphate (ACP) to enhance remineralization and decrease sensitivity (Enamel Pro® Varnish, Premier).⁵⁷

Opinions differ with respect to frequency of application of varnishes from every few months to twice a year. Wilkins reports that application every 3-6 months will reduce decay rates and research has indicated this as an important interval for those at high risk or disease activity.⁵⁸ Most manufacturers now offer unit dose for convenience and optimal product usage. Varnishes should not be applied immediately prior to bonding of brackets because research has indicated that at least a few weeks should have elapsed between application of varnish and bonding of brackets therefore, it is important to time dental hygiene care with the orthodontist.⁵⁹



Photo courtesy of Dr. Dan Jenkins

Enamel demineralization due to inadequate plaque control around orthodontic appliances

Along with professional therapies, a full discussion on nutrition and daily care strategies should take place. It is also imperative to establish a recare schedule based on the patients oral health status and needs. Many practices coordinate recare visits with the treating orthodontist so that archwires can be removed during hygiene instrumentation. This is important, as treatment should not be interrupted for any period of time than necessary and yet full access during hygiene instrumentation is equally essential to maintain soft tissue health and provide full evaluation of hard tissues.

Post-orthodontic treatment should include a periodontal and caries activity evaluation with the indicated dental hygiene instrumentation. Although the orthodontic office strives to remove excess bonding used to secure brackets and bands, the dental hygienist needs to evaluate for residual bonding following the debanding process. To determine whether residual bonding is present, the dental hygienist will need to use air to dry the tooth surface. In some cases, ultrasonic instrumentation or a high-speed handpiece will be needed to remove excess bonding. At this time, areas of decalcification can be addressed and many clients opt for tooth whitening to complete their smile enhancing process.

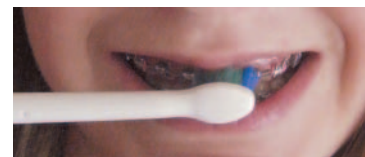
In addition, retention devices, fixed or removable, may be a life-long reality for these patients. Methods to maintain both fixed and removable appliances should be reviewed and can include cleaning removable appliances with powered toothbrushes, daily use of powered toothbrushes for fixed retention appliances, as well as use of products designed to clean and freshen. These recommendations can also be made to patients using aligners for tooth movement or retention. The dental hygienist will need to motivate the patient to follow the orthodontist’s recommendations for retention therapy.

Daily Care Strategies

The orthodontic patient represents unique challenges due to fixed appliances or in maintaining clean aligners/retainers. Pre-treatment education should include mechanical and chemotherapeutic means to control oral plaque biofilm from around appliances, the surface of the tongue, at the gingival margin and interproximally. The goal is to prevent caries, decalcification, oral malodor and periodontal infection.

Mechanical Considerations -

Mechanical methods for plaque biofilm control include use of powered toothbrushes, in particular, sonic frequency devices (such as FlexCare by Sonicare) have been researched in the orthodontic populations and shown to be effective while not compromising bracket bond strength⁶⁰, tongue scrapers for tongue biofilm removal and interproximal



FlexCare by Sonicare

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tools. Working with each patient individually to determine what they will use on a regular basis will increase the efficacy and lead to optimal plaque control. Manual toothbrushes should be replaced with powered devices as research has proven that these are not only safe for fixed appliances, but more effective in removing bracket retentive plaque and stain. In addition, powered brushes offer a highly effective means for applying fluorides or other agents throughout the oral cavity.

Daily tongue coating removal is the single most effective means to maintain fresh breath while removing a significant plaque biofilm containing periodontal and caries related flora.⁶¹ Patients should be instructed to use the tongue cleaner at least once a day and combine it with volatile sulfur compound (VSC) neutralizing sprays to maximize the results. Daily tongue cleaning may also be key in preventing staining chromogens from depositing on the teeth and/or around orthodontic brackets/bands.

The majority of the population does not perform flossing regularly⁶² and it is so important for the orthodontic population. While floss threaders have long been available, many clinicians report they pose a huge problem with respect to ease of use and thus compliance can be lacking. Alternatives for interdental hygiene include oral irrigators used at a higher setting⁶³, toothpicks, interdental brushes and mechanical flossers. One such device (Waterpik® Power Flosser, Waterpik®) has demonstrated equal effectiveness to traditional floss and is extremely easy for those with fixed appliances to use.



Interdental brushes are useful for keeping brackets clean

Chemotherapeutic Considerations –

Chemotherapeutics will go a long way in maintaining hard and soft tissue health during orthodontic treatment and it is well documented and accepted that fluoride is an important part of preventing decalcification and sensitivity in this patient population.⁶⁵ There are two types of fluoride options, neutral sodium fluoride (NaF) and stannous fluoride (SnF₂). At 5,000 ppm, prescription NaF products provide 5 times the concentration of fluoride than over-the-counter products. Twice a day application is recommended, either via a toothbrush or custom tray and 5,000 ppm NaF is safe to use on aesthetic restorations and has minimal to no side effects, such as staining or tissue irritation.⁶⁶

Stannous fluoride (SnF₂) products are now available over-the-counter and have been researched specifically with orthodontic patients due to its antimicrobial activity. Caries prevention with SnF₂ differs significantly from sodium preparations. This is due to the cation and anion reaction with enamel hydroxyapatite, without loss of phosphate ions, SnF₂ forms calcium fluoride,

stannous fluorophosphates and a hydrated tin oxide.⁶⁷ The stannous ion is responsible for this difference and this fluoride is often described as the ‘periodontal’ fluoride due to its ability to relieve dentin sensitivity,⁶⁸ by blocking exposed tubules, and provide mild antimicrobial activity, through the tin ion entering bacteria cell walls.^{69,70} The brush on type products include 1,000 ppm fluoride and 3,000 ppm stannous, available in both gel and toothpaste formulations. Lower concentration rinses are available. This multi-benefit fluoride may stain and therefore many clinicians opt for sodium-based products. The stain is a result of tin and bacteria trapped in acquired pellicle and in most cases can be easily removed with thorough brushing. SnF₂ should be considered for the orthodontic patient based upon research demonstrating high efficacy with this population, when used twice a day.⁷¹ Automatic toothbrush technology is ideal for reducing or minimizing stain associated with SnF₂. As a result, fluoride usage for the periodontal/orthodontic client will be an integral part of overall success.

Relatively new to the caries control armamentarium are calcium and phosphate which enhance remineralization while providing desensitization.^{72,73} Three systems are currently available: Amorphous calcium phosphate (ACP), which is an immediate release agent, found in numerous professional (Enamel Pro® 5% NaF Varnish and Enamel Pro® Prophy Paste, Premier Dental) and daily care products (Relief® ACP Oral Care Gel, Discus Dental and Enamel Care® Toothpaste, Arm & Hammer); Casein phosphopeptide amorphous calcium phosphate (CPP-ACP or Recaldent™) is a ‘time release’ formulation that will activate when the pH drops to an acidic level, found in professionally dispensed take-home products (PROSPC™ MI Paste and MI Paste Plus, GC America) and Calcium sodium phosphosilicate (CSP or Novamin®), a bioactive glass silicate found in numerous professionally applied products (NuCare™ Prophy Paste, Sunstar Americas) as well as take-home products (SoothRx™, 3M Omnii). All of these systems work best when combined with fluoride and as a result many formulations include fluoride. One ACP product also contains potassium nitrate for extra sensitivity control (Relief® ACP Oral Care Gel, Discus Dental).⁷⁴

Additional chemotherapeutic considerations include antimicrobial mouthrinses and/or toothpastes to assist in plaque biofilm control. Chlorhexidine gluconate (Peridex®, 3M Omnii; PerioRx®, Discus Dental; PerioGuard®, Colgate; & Gum® Alcohol-Free, Sunstar Americas) will certainly prevent gingivitis⁶³ and is being used to treat moderate to advanced caries, however the staining and taste make this a last choice. Alcohol-free rinses containing CPC (Crest®



Desensitizing gels in a syringe delivery system offer an easy way for orthodontic patients to apply the product



Sunstar Americas is the manufacturer of the first alcohol-free, FDA approved chlorhexidine rinse.

ProHealth™, Procter & Gamble & BreathRx®, Discus Dental) have gained in popularity, especially with adolescent populations and one such rinse also contains zinc, a known VSC neutralizing agent, that will combat oral malodor as well as provide antibacterial activity.⁷⁵ (BreathRx®, Discus Dental). Spray formulations also warrant consideration as they can be directed onto the tongue and back of the throat to control plaque biofilm accumulation on these surfaces and may lead to better compliance. Sprays are also ideal to use in combination with tongue cleaning practices. These agents can also be placed into oral irrigators to enhance access throughout the oral cavity, including niches around brackets and bands.

Additional daily care strategies should include avoidance of chewing gum or other foods that may dislodge the orthodontic appliances as well as review of methods to treat and prevent oral irritations (orthodontic wax over brackets, oral ulcerations and irritation treatment options, etc.). New research recommends use of xylitol containing chewing gum for this population as a means to control bacteria, buffer saliva and protect against the caries process.^{76,77,78} Careful review of oral hygiene practices and oral health status through the dental hygienist will be a significant and integral part of orthodontic treatment and success.

Conclusion

Little has been published regarding the role of the registered dental hygienist in the treatment of the orthodontic patient. Today, new methods for tooth movement, such as bio-adaptive therapy and aligner technology has made orthodontic treatment a viable option for adults. Minimally invasive approaches, such as bio-adaptive treatment are also gaining in popularity with all orthodontic populations. Additionally, malocclusion is not the only reason for orthodontic therapy; research is ongoing in the area of sleep apnea⁷⁹ and TMD⁸⁰ to name a few. As a result, it is crucial that dental hygienists be up to date on the latest modalities and treatment needs of this population.

The role of the dental hygienist starts with patient identification as well as referral to an orthodontic specialist. Once orthodontic therapy has been treatment planned, the dental hygienist's role will include pre-appliance therapies as well as review of daily care strategies. During therapy, routine professional care including evaluation and instrumentation will increase opportunities to reinforce optimal daily care practices and adjust as warranted. Finally, once orthodontic treatment has been completed, the dental hygienist will be an important part of maintaining and enhancing orthodontic results.

Online Resources

American Association of Orthodontists – www.braces.org

“Accelerating Instrumentation: Fast Tracking Clinical Success” – Overview of FMD instrumentation protocols, including product information/links located at:

http://www.dentalcompare.com/content_event.asp?contentid=5

“Stop the Pain, See the Gain” – Overview of calcium phosphate systems available and how they work located at:

http://www.dentalcompare.com/content_event.asp?contentid=5

Damon® System Braces – www.damonbraces.com

Invisalign® – www.invisalign.com

References available upon request and in the online version of this CE. Go to www.cdha.org – Education & Online CE section for a full reference list.

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Kristy Menage Bernie, RDH, BS, RYT, is a past president of the California Dental Hygienists' Association and owner of an industry consulting company, Educational Designs, whose clients include Ormco Corporation Company, the makers of the Damon® Orthodontic System. She is the current editor of dental hygiene for DentalCompare (www.Dentalcompare.com), a frequent contributor to national dental hygiene publications, and lectures throughout the country on a variety of topics. Kristy's latest seminar is on the role of the dental hygienist in orthodontic therapy. She can be contacted at info@EducationalDesigns.com



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Home Study Correspondence Course

“Clinical Considerations for the Dental Hygienist in Orthodontic Therapy”

Kristy Menage Bernie, RDH, BS, RYT

2 CE Units – Member \$20, Non-member \$35

Circle the correct answer for questions 1-10

1. The American Association of Orthodontists (AAO) estimates that 50 – 75% of population would benefit from orthodontic therapy with up to 50% of U.S. children in some type of orthodontic care.
 - a. True
 - b. False
2. Research studies have demonstrated that malocclusion is interrelated to periodontal status in that a patient’s ability to maintain optimal oral health is limited.
 - a. True
 - b. False
3. According to the “Orthodontic Six-Point Quick Check System”, which of the following is NOT included in the evaluation process?
 - a. Arch width
 - b. Facial profiling
 - c. Angle’s classification
 - d. Missing or ankylosed teeth
4. Complete assessment of hard tissues may include the use of caries detection technologies as well as _____ to determine caries risk.
 - a. saliva tests
 - b. bacteria tests
 - c. fungal tests
 - d. viral tests
5. For the adult patient, periodontal therapy is indicated and necessary prior to orthodontic treatment.
 - a. True
 - b. False
6. One-phase fixed orthodontic appliances are used to move teeth successfully and generally require 6-14 months of active therapy.
 - a. True
 - b. False
7. Tooth movement with aligners is typically indicated for mild to moderate crowding or spacing.
 - a. True
 - b. False
8. Bio-adaptive therapy involves ideal tooth positioning and facial harmony while keeping vascular integrity of the alveolar cortical plate
 - a. True
 - b. False
9. Research has demonstrated an increase in *A. actinomycetemcomitans* and *S. mutans* when orthodontic appliances are present. What should be used to deplaque?
 - a. Powered scalers
 - b. Hand instruments
10. Fluoride varnish is contraindicated for patients in orthodontic treatment.
 - a. True
 - b. False

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