

Ortho 101 for the Dental Professional

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Intended Audience: Dentists, Dental Hygienists, Dental Assistants, Dental Students, Dental Hygiene Students, Dental Assistant Students

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Disclaimer: Participants must always be aware of the hazards of using limited knowledge in integrating new techniques or procedures into their practice. Only sound evidence-based dentistry should be used in patient therapy.

Introduction

This course will unveil helpful hints to utilize for the benefit of the orthodontic patient to prevent detrimental effects of inadequate homecare. Within the course there will be an overview of the types of braces and fixed appliances to increase the knowledge of the dental professional in regards to orthodontics. There will be information on different adjuncts to assist in accessing areas around braces and orthodontic appliances along with products to control or prevent disease progression. The increased knowledge of the dental provider focusing on orthodontic care contained within this course will improve patient outcomes in the creation and maintenance of a beautiful smile.

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Conflict of Interest Disclosure Statement

- The author reports no conflicts of interest associated with this course.

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Overview

Orthodontic treatment can create a challenge in plaque removal and, consequentially, an increased risk to dental disease. In order to develop recommendations, it is necessary for dental care providers to understand the challenge in maintaining proper oral hygiene when working around orthodontic appliances. By describing various components of orthodontic braces and appliances, devices developed to assist in homecare, and products available for caries prevention, the practitioner can formulate a customized home care regimen with modified techniques. Through the understanding of the areas within the mouth that are more at risk due to braces or fixed appliance placement, the dental provider can help patients improve the outcomes of their orthodontic treatment by minimizing or ultimately eliminating decalcifications, dental caries and periodontal disease.

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Identify the names of various components involved in orthodontic treatment.
- Understand the challenges created in maintaining good oral health.
- Be familiar with products available specifically geared towards the orthodontic patient to improve oral hygiene.
- Know the early signs of disease to assist in preventing carious lesions and/or periodontal conditions.
- Recognize the detrimental effects of specific bacterial biofilm and how to control its effects.
- Appreciate the before, during, and after treatment norms of hard and soft tissues.
- Establish a home care regimen to improve orthodontic outcomes.

Terminology

Glossary of Orthodontic Terms¹

appliances – Any device, attached to the teeth or removable, designed to move the teeth, change the position of the jaw, or hold the teeth in their finished positions after braces are removed.

archwire – The metal wire that is attached to the brackets and used to move the teeth. They are held in the brackets using small elastic o-rings, stainless steel wire ligatures, or self-ligating doors and clips. Wires are used to move the teeth.

band – The metal ring that is cemented around a tooth for strength and anchorage.

braces – A word commonly used to describe a fixed orthodontic appliance, usually comprised of brackets, bands and wires.

buccal tube – A small metal part of the bracket welded to the cheek side of the molar band. The tube may hold an archwire, lip bumper, headgear facebow or other appliances an orthodontist may use to move the teeth.

chain – A stretchable series of elastic o-rings connected together and placed around each bracket to hold the archwire in place and move the teeth.

demineralization – A loss of calcium from the hydroxyl-apatite crystals, which leaves the tooth more vulnerable to further bacterial attack.

elastics – Rubber bands. During certain stages of treatment, small elastics or rubber bands are worn to provide individual tooth movement or jaw alignment.

facebow – A wire appliance used with a nightbrace, or headgear. Primarily used to move the upper first molars back, creating room for crowded or protrusive front teeth. The facebow has an internal wire bow and an external wire bow. The internal bow attaches to the buccal tube on the upper molar bands inside the mouth and the outer bow attaches to the breakaway safety strap of the nightbrace.

fixed appliances – An orthodontic appliance that is bonded or cemented to the teeth and cannot be or should not be removed by the patient.

functional appliances – Appliances that utilize the muscle action produced when speaking, eating and swallowing to produce force to move the teeth and align the jaws. They are also known as orthopedic appliances with names such as orthopedic corrector, activator, bionator, Frankel, Herbst or twin block appliances.

headgear – An appliance worn outside of the mouth to provide traction for growth modification and tooth movement.

Herbst appliance – This appliance is used to move the lower jaw forward. It can be fixed or removable. When it is fixed, it is cemented to teeth in one or both arches using stainless steel crowns. An expansion screw may be used simultaneously to widen the upper jaw.

ligature ties – A small elastic o-ring or stainless steel tie used to hold the archwire in the bracket.

palatal expander – A fixed or removable device used to make the upper jaw wider.

removable appliance – An orthodontic appliance that can be removed from the mouth by the patient. Removable appliances are used to move teeth, align jaws and to keep teeth

in their new positions when the braces are removed (retainers).

retainer – A fixed or removable appliance worn after the braces are removed. A removable retainer attaches to your upper and/or lower teeth and holds them in their finished positions.

rubber bands – During certain stages of treatment, small elastics or rubber bands are worn to provide individual tooth movement or jaw alignment.

separators – An elastic o-ring or small wire loop placed between the teeth to create space for placement of bands. Separators are usually placed between the teeth a week before bands are scheduled to be cemented to the teeth.

space maintainer – A fixed appliance used to hold space for an unerupted permanent tooth after a primary (baby) tooth has been lost prematurely, due to accident or decay.

tongue crib – A fixed appliance used to help a patient stop habits or undesirable tongue forces exerted on the teeth and bone that supports the teeth.

wax – Wax is placed on the brackets or archwires to prevent them from irritating the lips or cheeks.

Introduction

Understanding the challenges orthodontic patients face in maintaining good oral hygiene is necessary for dental professionals to assist these patients in achieving optimal oral health. Many of us can relate to solving problems in our daily lives whether at work or home. Sometimes it is just a minor interference creating a slight change in our routine. However, on occasion there may be several obstacles in the path of our journey towards the goal and we need to redirect ourselves.

Orthodontic treatment could be considered a double-edged sword. On one hand the treatment will align the teeth and lead to a beautiful smile, but on the other hand the lack of easy access to perform good oral hygiene from orthodontic appliances can be a

causative factor in carious lesions and gingivitis. The creation of one or multiple obstacles in attaining an aesthetically pleasing smile without compromising the integrity of the enamel or the health of the gingiva is the challenge faced by orthodontic patients.

The key to prevention of disease within the orthodontic patient lies within the dental professionals' knowledge of the challenges faced by the patient and the patient's desire to be compliant to the recommendations set forth by the experts.

Orthodontic Braces & Appliances

The average length of time a patient undergoes orthodontic treatment is approximately two years with a six-month variable depending on the difficulty of the case. However, this does not include the retention phase, which could include removable or permanently cemented retainers. If the retainers are cemented on the lingual aspect of the anterior teeth, they can create a lifetime challenge to the patient in providing adequate plaque removal in this area. During active treatment, the patient should have 3-4 preventive visits every 6 months to include a caries exam, prophylaxis, and fluoride treatment. These visits are opportunities for the dental professional to educate, evaluate, and emphasize the importance of good oral hygiene as well as providing a home care regimen.

When the dental professional understands the purpose of orthodontic braces and appliances, it provides an appreciation for the process and motivation to assist with patient compliance in oral hygiene instruction and orthodontic recommendations. It is also necessary to know the names of the different parts of the braces and appliances to communicate consistently with the patient any areas needing extra attention.

Braces consist of several components. Brackets are small oval or square pieces made of either metal or ceramic material bonded directly to the buccal or sometimes lingual portion of a tooth. Typically, brackets are utilized in the anterior region. However, they may also be used in the posterior areas. They hold the archwire in place with a ligature tie. Ligature ties can be either a rubberized o-ring of

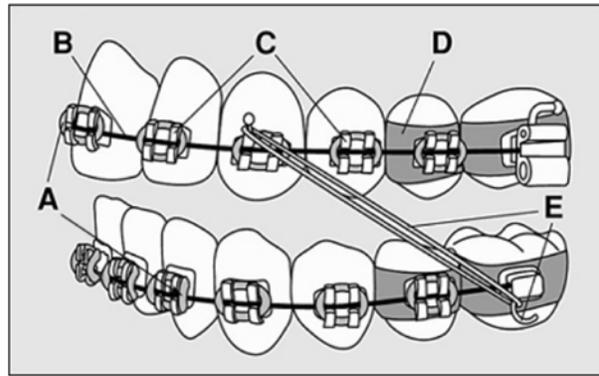


Figure 1.

- A. **Ligature** – Either a tiny elastic or twisted wire to hold the archwire to the bracket.
- B. **Archwire** – wire that is tied to the bracket creating force and proper alignment.
- C. **Brackets** – directly bonded to the tooth and holds the archwire.
- D. **Metal Band** – cemented ring of metal that wraps around the tooth.
- E. **Elastic Hooks & Rubber bands** – used for attaching rubber bands, which help teeth toward their final position.

different colors or a thin, metal wire. They are tightened around the wings of the bracket to hold the archwire in place (Figure 1). Also self-ligating brackets with doors or clips may be used to eliminate these ligature ties. In most instances, bands are utilized in the molar regions due to greater forces exhibited for movement in these areas.

Sometimes hooks are present on brackets and most often on orthodontic bands. Rubber bands are attached to the hooks to create additional force in specific areas. Rubber bands are changed at least daily and sometimes more frequently because they lose their elasticity over time. The bands contain tubes so wires and other appliances, such as headgear, can be inserted. These tubes tend to harbor food and bacteria, so it is important to clean these areas thoroughly.

There are a variety of orthodontic appliances. Some of them are fixed, while others are removable. Removable appliances are easy to clean using a denture brush or toothbrush, toothpaste and enzymatic tablets specifically designed for this purpose. Be sure the patient is performing daily removal of bacteria and plaque

from these appliances. Fixed appliances may also be functional in nature using the orofacial muscles of eating, swallowing, and speaking to create additional force for movement. These appliances tend to be bulky in nature and make access to adequate plaque removal very difficult. However, the fixed functional appliances eliminate the dependence on cooperation and deliver a constant force. This constant force results in quicker treatment results, therefore reducing the treatment time for the patient.

Accessibility

Given the fact orthodontic appliances increase the surface area within the mouth and subsequently cause the accumulation of plaque, it is no wonder the orthodontic patient struggles to maintain good oral hygiene. Studies have shown it is important to perform rigorous home care during orthodontic treatment to prevent excessive plaque accumulation creating caries and periodontal disease. The increased amount of retentive plaque surfaces from fixed appliances causes an acidic pH and increased bleeding of tissues.²

Considering orthodontic appliances consist of wires, hooks, and tubes positioned about 1-2 millimeters above the tooth surface creating just enough space to harbor thousands of species of bacteria within plaque, it is no wonder plaque removal is so difficult. Finding devices with the ability to reach into these tiny locations can be difficult, but not impossible. Sometimes modification of existing tools is necessary. This can be done by either changing the device to suit the need better or by redefining the use of a product. For instance, to change an existing device, one could heat up a toothbrush handle and bend it to create better angulation for placement in a specific area. In order to redefine the use of a product, the dental professional could recommend using a device in a way that was not part of the original intent of the product.

Prevention of Disease

Healthy oral cavities are free from disease. Disease-free gingival tissue appears flat, pink, and stippled. Healthy enamel appears free of cavitation with no white spot lesions (WSL). A quick assessment of these areas provides the dental professional with the foresight to

formulate home care recommendations as preventive treatment is being performed.

Before one can try to prevent disease from occurring, they must have an understanding of what is the cause of a particular disease. The biggest concerns for disease with an orthodontic patient are decalcifications, dental caries and periodontal disease. These are caused from the lack of comprehensive plaque removal. Over 700 microbial species of bacteria have been identified in dental plaque with some specific to dental disease.³

Within Dr. Esther Wilkins' dental hygiene textbook "*Clinical Practice of the Dental Hygienist*" there are four pages of information regarding care of dental appliances pertaining to orthodontic appliances. Quite frankly, this is a great overview, but in order to really help the orthodontic patient the dental practitioner needs to learn how to clean around these appliances hands-on. It is no secret the key to good oral health revolves around the reduction of harmful bacteria present within the mouth. This bacteria is contained within plaque and can cause destruction of the tooth enamel or the periodontium depending on the type of bacteria present. The prevention of dental disease is not just about brushing and flossing to remove plaque, but also through understanding the disease process and the products available to assist in arrestment of the progression.

Biofilm

Dental professionals are very familiar with the term "plaque." However, the new buzzword defining plaque is biofilm. Biofilm was first described in the late 17th century when the inventor of the microscope, Anton Von Leeuwenhoek, saw the aggregation of bacteria within his own dental plaque.⁴ It is understood plaque consists of a matrix of colonizing bacteria. This matrix of hundreds of bacterial species found within dental plaque is called biofilm. Biofilm consists of microbial societies with their own defense and communication systems. Infections created by these bacterial biofilms can be targeted with therapeutic agents geared towards their communication system and bacterial type.⁵ Some of these therapies include antimicrobial usage to eliminate bacteria or probiotics to

increase the amount of beneficial bacteria. The pathogenesis of dental biofilm creating dental disease either as decalcifications, caries or periodontal disease is the most common example of disease progression caused by biofilm within the human body. This pathogenic biofilm consists of gram (+) acidogenic cocci causing dental caries and gram (-) anaerobic bacteria causing periodontal disease.

The ability of the bacteria within the biofilm to adjust the environment to assist them in their mission to destroy tissue is typical.⁶ One example of this capability can be seen with *Streptococcus mutans* ability to create an acidic environment causing the enamel to demineralize and allowing *Lactobacillus* to proliferate and cause dental caries. In studies examining carious lesions, a complex blend of *Lactobacillus* species were found in the advancing front of this area.⁷ These bacteria communicate with one another within the biofilm to assist each other in a specific mission.

WSL are the result of demineralization around the brackets or under the bands. It's estimated between 45% and 68% of patients will develop WSL during the course of treatment. WSL can develop in as little as four weeks, although cavitation typically doesn't occur until 6 months. While most WSL can be found in the maxillary and mandibular incisors, banded teeth also have a high incidence of WSL.⁸

Toothbrushing

Manual Toothbrushes

When it comes to tooth brushing several studies have evaluated the efficacy of manual and power toothbrushes. They have been compared against each other in a variety of ways. When comparing conventional and orthodontic manual toothbrushes, studies have shown there is a difference in the effectiveness of plaque removal and gingival bleeding dependent upon the configuration of the bristles. Typically, orthodontic toothbrushes have central bristles set at a lower height than the outermost bristles. This arrangement allows space for the protrusion of the bracket and the outer bristles of the toothbrush to reach the tooth around the bracket. Utilizing an orthodontic toothbrush

decreases the amount of visible plaque around the bracket and also decreases the amount of gingival bleeding. However, the study also suggested that the oral hygiene improved from baseline data with both the conventional and orthodontic manual toothbrushes due to the study groups increased awareness of the importance of good oral hygiene.⁹ Therefore, the demonstration of a modified tooth brushing technique is important to all orthodontic patients and cannot be underestimated.

Power Toothbrushes

A Cochrane Collaboration study concluded oscillating power toothbrushes were more effective than manual brushes in plaque reduction and gingivitis by 11% and 6%, respectively, in the short-term. And after 3 months, gingivitis was reduced by 11%.¹⁰ Since orthodontic patients have more challenges with keeping their mouths free of harmful biofilms, it is important to provide information and training on methods to improve the patient's ability to reduce harmful bacteria. There are a variety of power brushes available to patients. A toothbrush head with the capability of reaching into interdental areas with a tip small enough to penetrate into tight areas around archwires, brackets, and bands is ideal (Figure 2).

Adjuncts

Flossing

Explaining how to floss using a floss threader is quite easy. Demonstrating the use of the threader on an anterior tooth is not too difficult. But, try to get in between the molars with the threader. Now, this is a challenge, especially



Figure 2.

if you are trying to perform this on your own mouth. This explanation gives some insight into the daily trials of an orthodontic patient. There have been floss handles and floss picks out on the market for years to help non-orthodontic patients floss and reach the posterior teeth. And, finally there have been some newer products released in the market for the orthodontic patient to use to make flossing easier without the use of a floss threader. The Platypus® Orthodontic Flosser may look like any disposable flosser, but when looked at closely it has a thin spatula end on one side of the floss bow. This thin area of the floss holder simply slides in between the archwire and tooth allowing floss to access the interproximal area (Figure 3).



Figure 3.

Gumchucks ORTHOgami is a flossing device that has handles similar to numchucks with a disposable end for flossing upon it that easily slips under the archwire (Figures 4 and 5).



Figure 4.

Oral Irrigation

When cleaning out the buccal tube, a thin proxbrush can be used to reach this area. This is one example of repurposing an oral hygiene adjunct for a use contrary to its original intent. The buccal tube is fairly large and tends to harbor food, so the use of an oral irrigator in this area is highly recommended. The pulsing pressure of water can also be very therapeutic for tissues by stimulating circulation and decreasing inflammation. Studies have shown significant reductions of plaque and bleeding in orthodontic patients after 4 weeks of use.¹¹



Figure 5.

Rubber Tip Stimulation

Recalling the properties of healthy tissue, a few terms should come to mind. Such as pink, knife-edged, and stippled. When interdental tissue is bulbous, it is necessary to stimulate the tissue to increase circulation and tighten up the tissue. The rubber tip stimulator is a great tool to succeed in performing this task. When placing the rubber tip stimulator into the interdental area, it is important to have the tip near the edge of the tissue and the proximal portion against the tissue. Imagine how the knife-edged tissue should look and lay the rubber tip parallel to the tissue to allow for blanching of the tissue when pressure is applied (Figure 6).



Figure 6.



Figure 7.

Sulcular & Interproximal Brushes

In order to reach into tight areas, one would need a smaller head of bristles. The sulcular toothbrush's original purpose was to brush the sulcular areas of the teeth. However, repurposing the brush because of its size to reach in smaller areas is an excellent alternative. Complete plaque removal cannot be accomplished with toothbrushing alone. It is recommended to utilize interdental brushes or monofted brush heads.¹² Using this tool to assist in reaching around brackets and in between the teeth and archwire is useful in plaque removal. However, using the brush for its original purpose is helpful to stimulate the gums interdentally. End tuft toothbrushes can also be used for this purpose although they are typically larger in diameter (Figure 7).

Products

Probiotics

People frequently say they wish they could just take a pill to fix something. The use of probiotics

has become more popular in increasing the supportive bacteria, while decreasing the harmful bacteria. Probiotics are live microorganisms, which are believed to be beneficial to the host in a symbiotic relationship that tends to identify with commensalism. Specific probiotic bacteria can assist in areas of dental caries prevention rather than the prevention of periodontal disease. For instance, studies have shown increasing the levels of *Lactobacillus paracasei* can inhibit the growth of *Streptococcus mutans*, which is responsible for dental caries. This process usually occurs after two weeks of routinely taking the probiotic designated for this purpose.¹³

When it comes to probiotic use for the prevention of periodontal disease, it becomes more complicated due to the different bacteria that attach to bone versus the soft tissues. For simplification in regards to orthodontic treatment and an increased probability of developing gingivitis, let's focus on the presence of *Streptococcus oralis* and *Streptococcus uberis*. If these bacteria are present, it indicates good periodontal health.¹⁴ While the use of probiotics is fairly new in the dental arena, the idea of utilizing them in situations where patients are at greater risk for dental disease is a great concept.

Xylitol

Xylitol is a five-carbon sugar alcohol sweetener found in the fibers of many fruits and vegetables as well as cornhusks and birch. Use of xylitol products have shown to decrease cariogenic *Streptococcus* levels while not affecting beneficial oral *Streptococcus* bacterial levels.¹⁵ As we know, the *Streptococcus* species responsible for the caries process is *Streptococcus mutans*. This bacteria has the ability to create an acidic environment aiding in the decalcification of enamel. While the enamel becomes weakened, the *Lactobacillus* proliferate and lead the caries process within the lesion development. Xylitol is available in chewing gum, mints, candies, and granulated sugar substitute form. While all of the forms are beneficial, patients in active treatment should avoid chewing gum to prevent loosening brackets and bands.

Remineralization

There is a plethora of products available to remineralize enamel. It is important to realize

the challenges orthodontic patients face with plaque removal while understanding the goals of *Streptococcus mutans* and *Lactobacillus paracasei* that destroy enamel, so appropriate measures can be taken to locate demineralized areas and recommend appropriate therapies to remineralize them.

Fluoride

The use of fluoride in caries prevention has been studied for over 100 years. Its safety and efficacy has been studied extensively over this time period, and water fluoridation became routine in many cities to reduce cavities. There have been a lot of studies and discussions on the use of fluoride for remineralization. When looking at the structure of enamel and understanding the crystalline structure is comprised of hydroxyapatite and fluorapatite crystals, helps one to appreciate the strength and beauty of this structure. Fluorapatite is more structurally and chemically sound than hydroxyapatite making it more resistant to decay.¹⁶ Knowing this piece of information naturally motivates us to recommend the use of fluoride.

Utilizing fluoride varnishes for the orthodontic patient is beneficial for a variety of reasons. Fluoride varnishes are considered easy to use and safe as well as having substantivity. Varnish was first available in Europe in 1960, and did not receive FDA approval in the United States until the late 1990's. This approval was originally for sensitivity in adults; although a lot of recent data has shown it more effective than older technologies in decay prevention.¹⁷ One of the wonderful benefits of fluoride varnish is its ability to have a longer contact time with the tooth due to its varnish effect. It has been discovered a high level of fluoride is released from fluoride varnishes during the first 24 hours after application.¹⁸ Several types of orthodontic cements are glass ionomer based and have the ability to release fluoride into the enamel. It is important to have fluoride applied to these areas to recharge the cement providing continual fluoride release in areas more prone to decay at the parameters of orthodontic brackets and bands. Obviously, providing a more flowable varnish is ideal. There are liquid varnishes available to provide flowability in these caries susceptible areas.

The apatite compound contains calcium and phosphate. Therefore, replacing these chemicals will assist in the process of remineralization and rebuild the apatite crystalline structure. Some remineralization products contain a combination of fluoride with calcium phosphate and have been found to be significantly more effective in remineralization than fluoride alone. In one particular study the remineralization depth of 1150 ppm F dentifrice was comparable to 500 ppm F plus functional tricalcium phosphate (ftcp) dentifrice. Respectively, the amount of fluoride was less, but with the addition of the ftcp, the remineralization depth was the same.¹⁹ The evidence of scientific studies should be taken into consideration when recommending products to provide the latest technologies for superior results.

Calcium Phosphate

There are many pastes available containing calcium phosphate and it is up to the dental professional to recommend the appropriate one. The decision may depend upon application method, frequency, or taste. Some calcium phosphate pastes are considered all-in-one toothpastes while others are tooth creams to be used very sparingly. There are a few that do not contain fluoride and some that contain fluoride within the formulation. They can be applied using a tray method or as easy as using one of your fingers to apply it onto the teeth. Considering all of these factors and the patient's preference will forecast compliance. It is important for the dental professional to always try products before making recommendations. This will help make the recommendation more valid from first-hand use.

Educating the Patient

When educating the patient on home care techniques, it is best to perform the "show and tell" method. Studies have proven better plaque removal when the patient received supervised home care instructions versus giving the patient the tools with no explanation.²⁰ When a technique is shown within the patient's mouth, a hand mirror should be provided for the patient to watch the dental professional's demonstration. The dental professional should explain how to position the toothbrush or adjunct and why it needs to be in this particular

position. The patient should then perform the technique while the dental professional checks and corrects, if needed. This method is used as an evaluation of the patient's understanding of the home care instructions. For younger patients, it is best to get the parents involved.

Be sure to provide home care instructions for each of the products recommended to the patient. It is helpful to show the patient where the directions are located on the packaging and to explain the directions step-by-step to avoid any confusion. Thorough researching and understanding of the product's effectiveness will make you more comfortable making recommendations to patients; also, you will be looked upon as "an expert in the field" by the patient.

Evaluation of Success

An opportunity for evaluation of success exists every time a patient is seen in the operatory. This achievement cannot lie within the patient alone, but is also an assessment of the dental professionals teaching skills. One cannot make someone perform a task they do not want to

do. A key component to success lies within the manner the patient is educated by creating desire to complete a task through the understanding of consequences.

Conclusion

Orthodontic patients face a difficult challenge in adequate plaque removal to prevent dental caries and periodontal disease. The dental professional can assist in the prevention of disease through education, demonstration, and a better understanding of orthodontic needs. The more knowledge about orthodontics the dental professional can apply to treatment and homecare recommendations, the better chance the patient has in attaining a beautiful smile free of unnecessary dental caries and gum disease manifested from lack of satisfactory plaque removal.

By making educated decisions regarding home care recommendations through the knowledge of the variety of toothbrushes, adjuncts, and products, the dental professional can make the difference in the orthodontic patient's achievement of optimal oral health.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/professional-education/ce-courses/ce413/start-test

- 1. Fixed orthodontic appliances _____.**
 - a. make plaque removal difficult
 - b. can be used to prevent relapse
 - c. create compliance of wear time
 - d. may be functional in nature through using orofacial muscles to add force for movement
 - e. All of the above.
- 2. Biofilm is _____.**
 - a. an orthodontic radiograph
 - b. a functional appliance that is cemented in the patient's mouth
 - c. used on brackets to prevent injury to the soft tissues
 - d. matrix of microbial societies, which communicate with one another
- 3. In the Cochrane Study, orthodontic patients had _____% reduction of gingivitis after 3 months of power toothbrush usage as compared to manual toothbrushing.**
 - a. 6
 - b. 11
 - c. 17
 - d. 50
- 4. _____ are living microorganisms used in dentistry to help decrease incidences of dental caries and periodontal disease.**
 - a. Fluoride lozenges
 - b. Probiotics
 - c. Chemotherapeutics
 - d. Ligatures
- 5. Fluorapatite is considered _____ as compared to hydroxyapatite.**
 - a. higher in calcium ions
 - b. higher in phosphate
 - c. more structurally and chemically sound
 - d. a stronger bonding agent
- 6. *Streptococcus mutans* assists *Lactobacillus* in the caries process by _____.**
 - a. creating a by-product to feed and energize it
 - b. increasing an acidic environment causing demineralization allowing easier penetration
 - c. eliminating competing bacteria
 - d. facilitating the amount of plaque present
- 7. The presence of _____ demonstrates good periodontal health.**
 - a. *Lactobacillus paracasei*
 - b. *Streptococcus mutans*
 - c. *Streptococcus oralis*
 - d. *Lactobacillus rhamnosus*

8. **Xylitol is _____.**
- a. used to kill all streptococcus bacteria
 - b. present in all toothpastes
 - c. a product used to prevent caries
 - d. All of the above.
9. **_____ was originally approved by the FDA for sensitivity use.**
- a. Xylitol
 - b. Probiotics
 - c. Chemotherapeutics
 - d. Fluoride varnish
10. **_____ is used as an orthodontic cement having the ability to release fluoride.**
- a. Glass ionomer
 - b. Xylitol
 - c. Varnish
 - d. All of the above.
11. **A(n) _____ appliance is one that utilizes the orofacial muscles of eating, speaking, and swallowing to produce additional forces.**
- a. functional
 - b. orthopedic
 - c. Herbst
 - d. All of the above.
12. **A five-carbon sweetener that is considered a sugar alcohol is _____.**
- a. xylitol
 - b. sorbitol
 - c. sucrose
 - d. fructose
13. **_____ has shown to decrease the amount of fluoride needed in the remineralization process.**
- a. Xylitol
 - b. *Streptococcus uberis*
 - c. Tricalcium phosphate
 - d. All of the above.
14. **A ligature is _____.**
- a. an orthodontic appliance
 - b. used to help improve pronunciation in orthodontic patients
 - c. another term for archwire
 - d. used to tie the wire to the bracket
15. **Oral irrigation has shown significant reductions in plaque and bleeding in as little as _____ weeks of use.**
- a. 2
 - b. 4
 - c. 6
 - d. 8

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