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Soft-Tissue Maintenance During Orthodontic Treatment
A Peer-Reviewed Publication
Written by Michael Florman, DDS

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**Educational Objectives**
Upon completion of this course, the clinician will be able to do the following:

1. Understand oral-healthcare guidelines that need to be stressed and explained to an orthodontic patient, as well as practiced by the patient, to maintain oral health during treatment
2. Understand the sequelae of poor oral hygiene during orthodontic treatment, including plaque retention, bleeding, and pain
3. Understand methods for plaque removal during orthodontic treatment that encompass types of toothbrushes, interdental cleaning, oral irrigators, and mouthrinses
4. Understand the oral irritations that may be inflicted on an orthodontic patient during treatment and list types of products available that aid in combating, managing, and healing these oral reactions to ensure continual oral healthcare home maintenance by the patient

**Abstract**
Orthodontic treatment is widely recognized for its results. By accepting orthodontic treatment, patients usually commit to two to three years of active therapy. Increases in plaque retention in orthodontic patients lead to an increased incidence of decalcifications. Almost all fixed appliance orthodontic patients experience moderate gingivitis and, to varying degrees, oral irritations. Even with attention to oral hygiene procedures, patients are at risk. Consideration of the use of antibacterial mouthrinses may be warranted for these patients. Oral irritations cause pain and impede oral hygiene — medications in the form of pastes, gels, liquids, and rinses can help relieve pain and, depending upon the medication used, may also promote healing. Patient selection, education, and adherence to oral hygiene measures, together with adjunctive preventive, palliative, and curative care, will not only help patients have a more comfortable experience, but will also increase the likelihood of both functional and aesthetic success.

**Introduction**
Orthodontic treatment is widely recognized for its results. Through the use of fixed and removable appliances, clinicians have been able to offer patients great improvements in their appearance and oral health. Depending upon the specific type and severity, malocclusion is known to be associated with inadequate oral hygiene, periodontal issues, TMJ disease, speech problems, mouth breathing, and where appearance is an issue, poor self-esteem.

There are between 4 million and 6 million orthodontic cases at any given time. Orthodontic treatment may begin at an early age while the patient still has his primary dentition. Twenty percent to 25 percent of the total number of orthodontic cases are adults.\(^1\) Orthodontic treatment is provided to adults, partly due to an increased awareness by patients of the impact of malocclusion and crowding, an increased emphasis on appearance, and an increase in affluence in our society that has enabled adult patients to seek orthodontic treatment that was unaffordable for their parents when they were younger. Nonetheless, the majority of cases are still carried out on otherwise healthy adolescents,\(^2\) an age group renowned for noncompliance with oral hygiene.

Removable appliances have traditionally involved the use of an acrylic plate with combinations of clasps and wires in place to move the teeth. The introduction of full mouth resin coverage orthodontic aligners (Invisalign\(^8\), Align Technology; Essix Aligners, Dentsply Raintree) has influenced and changed removable orthodontic therapy.

Fixed appliances are the most common form of orthodontic treatment in the United States. They offer excellent and predictable results but require patient compliance and cooperation during active treatment.

**Oral Health During Orthodontic Treatment**
Patients need to understand and be aware of the implications for their oral health, whether they decline or accept recommended orthodontic treatment. By declining, patients may be exposing themselves to increased risk of future oral disease. On the other hand, accepting fixed appliance orthodontic therapy has important implications for patients’ home care. Acceptance of orthodontic treatment means patient commitment to a regimen of increased attention to oral hygiene and oral health to help avoid potential iatrogenic problems from arising during treatment.

**Duration of Treatment**
By choosing to accept orthodontic treatment, patients are usually committing to two to three years of active therapy.\(^3\) One study found an average of 23.5 months, with a range of between one and 37 months. Duration of treatment was found to be associated with three factors related to patient behavior and compliance, together with fixed characteristics of the particular case such as extraction or nonextraction treatments. A direct statistically significant correlation was found between poor oral hygiene and duration of treatment (Table 1).\(^4\)

Following completion of active orthodontic treatment, the patient must use a retainer to prevent relapse, potentially indefinitely.\(^5\)

**Microbial Environment**
Typically, patients experience gingival inflammation after a fixed appliance is placed. An increased number of microbes is present and the composition of the microbial load changes. One study of motivated patients undergoing fixed orthodontic therapy who were clinically healthy after their first six months of treatment revealed they had significant microbiological changes including a substantial increase in supragingival mobile rods and subgingival spirochetes. Control of the microbial load would reduce the risk for future periodontal disease.\(^6\)
Upon removal of fixed orthodontic appliances, over a 30-day period, improvements in gingival health are found and reductions in the presence and mix of microbes occur. One study specifically found reductions in Actinobacillus actinomycetemcomitans and Bacteroides forsythus, two organisms that have been identified as periodontal pathogenic bacteria, at the 30-day mark. With respect to Strep. mutans and caries risk, recolonization by Strep. mutans following antimicrobial therapy is significantly higher in teeth with brackets and bands. It has also been found that fixed appliances promote the intra-oral carriage and presence of Candida albicans and coliform bacteria.

The number of orthodontic cases in periodontally compromised patients has also increased. Orthodontic treatment may be indicated in these patients for a number of reasons, including the reduction of periodontally induced drifting or splaying of teeth. Even more vigilance by the patient and clinician is required with respect to oral hygiene and home care in these patients.

Gingival Hyperplasia

Gingival hyperplasia during orthodontic treatment can lead to pseudopocketing, where there is no attachment loss, but the hyperplasia results in an artificially deep “pocket” that resolves with resolution of the hyperplasia. No differences in gingival or plaque indices or pocket depth were found when comparing elastomeric rings and ligature wires in fixed orthodontic appliances. It has been suggested that a shift to more anaerobic flora occurs where pseudopockets are present. Gingival hyperplasia necessitates care on the part of the patient to ensure that plaque retention within these pseudopockets does not result in a deterioration of soft and hard tissues.

Sequelae of Poor Oral Hygiene During Orthodontic Treatment

Poor oral hygiene during orthodontic treatment leads to the development of incipient and frank carious lesions, and gingivitis of increasing severity with the potential for subsequent periodontal disease. Use of resin system aligners has been shown to result in a lower plaque index when compared to plaque indices of patients with fixed orthodontic appliances. Given that the aligner is removed prior to performing oral hygiene, this is not an unanticipated outcome since there are no orthodontic appliances in place while brushing and flossing.

Recent advancements in self-ligating brackets, as an alternative to elastic ligatures, show promise in their ability to reduce plaque retention and improve oral hygiene. Self-ligating brackets use a door mechanism or clip that slides over the wires to hold the archwire into the bracket slots. Their use reduces friction between the wire and the brackets, thereby reducing overall treatment time. Reductions in plaque build-up have been noted in preliminary investigations.

Plaque Retention, Bleeding, and Pain

Plaque retention during fixed appliance therapy is concentrated around brackets and gingival margins. Around brackets, this leads to increased caries experience. Decalcification around orthodontic banding has been shown to occur in as little as one month, and in the absence of any preventive program, up to 50 percent of orthodontic patients experience white spots.

Increased plaque retention around the gingival margin and in the sulcus leads to gingivitis of increasing severity, gingival bleeding, and pain. In some cases, it can also result in pocket formation and loss of attachment. Bourdillat et al. found that among 540 orthodontic patients surveyed concerning their orthodontic-related quality of life, almost all experienced some or considerable gingival bleeding while brushing under fixed orthodontic appliances. Patients regarded this and associated pain to be the most negative aspect of their treatment. Niederman and Ho found bleeding upon probing at 78 percent of sites in orthodontic patients aged 11–17 with gingival inflammation.
Plaque Removal During Orthodontic Treatment

Plaque removal and control during orthodontic treatment can be achieved mechanically and chemically. Even motivated patients will find it more difficult to perform good oral hygiene during fixed orthodontic treatment. The physical impositions of banding, brackets, and archwires result in brushing and flossing difficulties, and plaque and debris accumulation, all of which may require patients to learn new techniques.

Manual and Electric Toothbrushes

Manual and electric toothbrushes have been extensively studied in orthodontic patients. Results from these studies are mixed. While a study of 36 adolescent patients by Trimpeneer et al. found that a manual multitufted toothbrush was more effective than three different electric toothbrushes, other studies indicate that electric toothbrushes are as effective as manual toothbrushes in orthodontic patients with reasonable oral hygiene. One study concluded that the use of an electric toothbrush by orthodontic patients with preexisting gingival inflammation resulted in a 57 percent reduction in supra-gingival plaque (versus a 10 percent reduction using a manual toothbrush) and a 29 percent reduction in the gingival index. Bleeding sites were reduced to fewer than 25 percent from 78 percent.

Manual toothbrushes are available that are specially designed for orthodontic patients. These have soft bristles that are fashioned in a V-cut to enable the bristles to reach over the top of the brackets and make contact with the tooth surface and gingivae apical to the brackets.

For patients who do not spend enough time on oral hygiene, electric toothbrushes may be more effective due to their speedier plaque removal. One assessment of an ionic toothbrush found that there was no difference in plaque reduction or gingivitis between it and a nonionic toothbrush of the otherwise same design.

In my experience, the technique and time spent brushing are the most important factors in proper oral hygiene, especially when patients are wearing fixed orthodontic appliances.

Interdental Cleaning

Interdental cleaning presents more of a challenge for orthodontic patients. With clear instructions and education by dental professionals, and commitment on the part of the patient, effective flossing can be achieved using a floss threader (Eez-Thru® Floss Threaders, Sunstar Butler) adjacent to the area being flossed or using floss with a thickened end (Superfloss®). Manual interdental brushes are effective interproximally and, depending upon the interdental space, some patients may find this easier than using floss. Interdental brushes can have coated or uncoated wire. The wire coating on interdental brushes is intended to help prevent scratching the orthodontic appliance. A further type of coating used on some interdental brushes is an antibacterial coating intended to help reduce the microbial load remaining on the brush. Electric interdental cleaning is a further option, with devices that remove plaque through either physical motion or irrigation. Electric interdental cleaning devices have varying results, and one study found only a subjective improvement on the part of patients, without any clinically objective improvement in plaque indices or bleeding upon probing.

Comprehensive orthodontic kits offer convenience for patients and add value. They offer an opportunity to provide a better training experience to the patient. Providing a comprehensive kit ensures that the patient has all the oral hygiene supplies they will need.

Oral Irrigators

Some studies have found oral irrigators to be effective oral hygiene adjuncts. Significant reductions in plaque and gingivitis have been demonstrated in patients using oral irrigation devices. However, another study concluded that there is no difference in plaque and gingivitis levels between patients using a manual or an electric toothbrush, with or without irrigation. Use of a magnetized oral irrigation device in patients without orthodontic banding has been found to have no significant effect in gingival indices and causes only a 2.2 percent reduction in plaque (although there was a significant reduction in calculus). A recent study found oral irrigators to be effective for plaque reduction proximally, gingivally, and interproximally, and the study also found that they result in fewer gingival abrasions than using an electric toothbrush.
It can be concluded that results achieved will depend upon patient education and preference. Results from the research are not definitive regarding superiority of either manual or electric toothbrushes. Flossing and interdental brushes have both been shown to be effective, and use of an oral irrigator may be a helpful adjunct.

**Mouthrinses and Adjunctive Chemical Plaque Control**

Various pastes, gels, varnishes, and mouthrinses have been researched on orthodontic patients and used as chemical agents for plaque control.

The application of hydrophobic polymers every three months to the enamel to control plaque, Strep. mutans, and gingivitis was found to be ineffective by Fornell et al., and no statistically significant difference was found between coated and untreated teeth. Studies have found that the use of sustained released chlorhexidine varnish reduces total bacterial counts in orthodontic patients. Chlorhexidine varnishes have also been researched in combination with fluoride varnishes for their ability to reduce bacterial counts and for anti-caries efficacy.

A study by Boyd found 0.4 percent stannous fluoride to be an effective adjunct during orthodontic therapy to help reduce gingivitis, although its efficacy in this regard is controversial. A recent study found that the use of 0.4 percent stannous gel did not result in a decrease in Strep. mutans colonies in the biofilm, suggesting that any anti-caries efficacy is due to the fluoride in the gel (same fluoride level as regular toothpastes).

**Chlorhexidine Mouthrinses and Orthodontic Treatment**

Mouthrinses have been found to be effective in reducing plaque and gingival indices, alone and adjunctive to brushing and flossing, during fixed orthodontic treatment.

Chlorhexidine mouthwash effectively reduces plaque and gingival indices. It has also been shown to have a continued effect for up to five days on the gingival index following cessation of use in orthodontic patients. While some studies on orthodontic patients were carried out on 0.2 percent chlorhexidine (available in Europe) rather than the 0.12 percent chlorhexidine available in the United States, these are clinically equivalent when the dosage and rinsing time are taken into account. One 12-week study conducted on children aged 11-17 using 0.12 percent chlorhexidine (Peridex, Zila Pharmaceuticals) for 30 seconds morning and evening resulted in a reduction in plaque and gingival indices of 64.9 percent and 60 percent, respectively, and in gingival bleeding by 77 percent. A second study also demonstrated significant reductions in plaque and gingivitis. Gehlen et al. found that the use of 0.2 percent chlorhexidine (Corsodyl, SmithKline Beecham) is useful adjunctively with mechanical plaque control and recommended its use particularly in severe cases in which patients experience pain and bleeding upon brushing. The long-term use of chlorhexidine is associated with increased staining and temporary taste disturbances. One study recommended trimonthly prophylaxis and found that this controlled stain formation. Taste disturbances were not cited as an issue. A further consideration was to use chlorhexidine short term in patients during periods of exacerbated plaque levels and gingival inflammation.

Alcohol content in mouthrinses is an issue for some patients. The use of alcohol-containing rinses should be avoided in children and is also contraindicated in patients who have a sensitivity to alcohol, are immunocompromised (in some cases), or are undergoing head and neck radiation. Because of alcohol's drying effect, a relative contraindication would be xerostomia. With respect to oral mucosal irritations, alcohol is an irritant and may also cause stinging. The use of an alcohol-containing medicament or rinse should therefore be carefully assessed in these patients.

Typically, commercially available chlorhexidine contains 11.6 percent alcohol. In the United States, one alcohol-free 0.12 percent chlorhexidine rinse is available (Sunstar Butler). In addition, a non-CHX mouthrinse that is alcohol free and includes 0.07 percent CPC mouthwash (Crest Pro-Health Rinse), has been shown to reduce plaque over six months by 15.8 percent compared to placebo and to reduce gingival inflammation by 15.4 percent. In Europe, a comparative study between 0.12 percent alcohol-free chlorhexidine with 0.05 percent CPC (PerioAid) and 0.2 percent chlorhexidine (Corsodyl) found no difference in plaque reduction. One double-blind clinical study specifically addressed the issue of whether alcohol has an additive effect with chlorhexidine and found that the absence of alcohol in otherwise identical formulations of chlorhexidine had no effect on clinical efficacy. The chlorhexidine formulations with and without alcohol were clinically equivalent and found to be equally effective in reducing plaque and gingival inflammation. A further study found alcohol-free mouthrinses to be effective and the alcohol-free chlorhexidine to reduce plaque index over a four-day period by 40.4 percent.

**Oral Irritations**

**Oral Ulcerations and Irritations**

Oral irritations and ulcerations are common around brackets, clasps, and bands. These can be painful and further impede oral hygiene measures as the patient avoids the area when brushing and flossing. Oral ulcerations can be minimized with careful appliance design and care by the patient. Gentle brushing with a soft-bristled toothbrush is required, and care is needed using interdental brushes and floss. If an electric toothbrush is used, it should be used gently to help prevent gingival abrasions in areas of already inflamed tissue and to protect brackets.
The use of orthodontic wax as a physical barrier helps protect the mucosa around brackets, bands, and wire, and assists in the prevention of irritation and friction. Orthodontic wax helps relieve pain at an existing irritation or ulcer by acting as a mechanical barrier.

Pain Relief and Healing
Considerations for pain relief and healing include the use of locally applied oral medications and rinses. For isolated oral ulcerations, there are a number of locally applied medications proven to provide pain relief. Locally applied pastes, gels, and liquids are available, which contain 20 percent benzocaine to relieve intra-oral pain (Orajel®, Colgate®, Orabase®, Anbesol®). In a recent study, orthodontic wax combined with slow-release benzocaine for pain relief was found to reduce pain significantly more than wax alone, while still providing a physical barrier.

Oral irritation and discomfort can also be relieved by a rinse application. This is particularly useful when there are multiple irritations and may be easier for a patient to use. A nonprescription rinse is available (Rincinol®, Sunstar Butler), which creates a bio-adherent mucosal coating, is alcohol free, relieves pain, and promotes healing. It contains no alcohol (which can cause stinging) and does not cause numbness. A second alcohol free bio-adherent rinse (Gelclair®, OSI Pharmaceuticals) has also been shown to be effective in relieving pain and to promote healing. This requires mixing and is available by prescription only.

Allergic Reactions
Allergic reactions to orthodontic materials can occur. It has been found that 30 percent of the population has nickel hypersensitivity. Intra-orally, this may present as an area of erythema or gingivitis. In a review of patients, Ramadan et al. found that 15 percent had nickel-related allergic reactions in the form of gingivitis. While this resolved within a month of treatment, it was recommended that fluoride-free toothpaste be used together with mouthrinses for such patients. However, consideration needs to be given to the decalcification risk associated with banding. Recent research has found an interaction between 250ppm fluoride mouthrinses and orthodontic materials, resulting in corrosive products with the potential for local allergic reactions. The highest corrosion risk was found with the use of stannous fluoride in combination with nickel-titanium wires and commonly used metallic orthodontic brackets (titanium, iron-chromium-nickel, and cobalt–chromium). In patients with sensitivity to these metals, an alternative anti-caries therapy may be indicated.

Latex sensitivity has been reported to occur in up to 6 percent of the general population. Sometimes this is associated with elastomeric ligatures, and in patients with latex sensitivity, the use of these ligatures should be avoided.

Summary
Patients derive both functional and aesthetic benefits from orthodontic treatment. The majority of orthodontic cases are conducted on adolescents, an age at which patients tend to be less compliant with treatment and less attentive to home care. Increases in plaque retention result in an increased incidence of white spots or decalcifications, and almost all fixed orthodontic appliance patients experience moderate gingivitis and, to varying degrees, oral irritation. By careful patient selection, an emphasis on the need for patient commitment to scrupulous oral hygiene, and recommendation of and provision for adjunctive care as needed, these risks and sequelae can be managed and minimized.

Oral hygiene measures include brushing with a soft-bristled toothbrush or an electric toothbrush, both of which have been shown to be effective. While orthodontic brackets and archwire are physical impediments, interdental cleaning is essential for oral health, and adjunctive devices such as floss threaders and fine interdental brushes provide assistance. Even with attention to oral hygiene procedures, patients are still at risk. Consideration of the use of antibacterial mouthrinses may be warranted for these patients depending upon the level of oral hygiene and patient response, and has been shown to reduce the microbial load, gingival indices, and bleeding in orthodontic patients. The use of an alcohol-free mouthrinse should be considered. Oral irritations cause pain and impede oral hygiene, but medications in the form of pastes, gels, liquids, and rinses can help relieve pain and, depending upon the medication used, may also promote healing.

Patient selection, education, and adherence to oral hygiene measures, together with adjunctive preventive, palliative, and curative care, will not only help patients have a more comfortable experience, but also increase the certainty of both functional and aesthetic success.

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Author Profile

Michael Florman, DDS

Dr. Florman received his dental degree from the Ohio State University and completed his post graduate training in Orthodontics at New York University. Dr. Florman is a Diplomate of the American Board of Orthodontics, and has been practicing dentistry since 1991. He is highly respected as both an orthodontist and an educator. He has authored over forty scientific publications in the field of dentistry and medicine. Dr. Florman is the Executive Program Director for PennWell, a national dental continuing education organization. He is also an active clinical advisor to many pharmaceutical and dental companies.

He is a member of the American Dental Association, California Dental Association, and the American Association of Orthodontists. His hobbies include golf, running, hiking, bicycling, photography, and computer graphic design.

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1. Depending on the specific type and severity, malocclusion is known to be associated with:
   a. Speech problems and mouth breathing
   b. Poor self-esteem
   c. Inadequate oral hygiene
   d. All of the above

2. Orthodontic treatment is prescribed to patients of all ages. Nonetheless, the majority of cases are still carried out on ______, an age group renowned for noncompliance with oral hygiene.
   a. Juvenile delinquents
   b. Healthy adolescents
   c. Adults
   d. Geriatric patients

3. Acceptance of orthodontic treatment means:
   a. Patient commitment to a regimen of increased attention to oral hygiene
   b. Patients exposing themselves to increased risk of future oral disease
   c. Exclusive in-office oral healthcare
   d. a and b

4. A direct statistically significant correlation was found between poor oral hygiene and duration of treatment. Factors include:
   a. Planned or delayed extractions
   b. Poor elastic wear or the male gender
   c. A broken/loose bracket or maxillary crowding
   d. All of the above

5. Upon the completion of active orthodontic treatment, to prevent relapse, the patient should potentially use a retainer for:
   a. Five years
   b. Every other night for ten years
   c. Life
   d. One year

6. Orthodontic patients often experience a decrease in the number of microbes present in their mouth as well as a compositional change of the microbial load resulting in gingival inflammation.
   a. True
   b. False

7. With respect to Strep. mutans and caries risk, recolonization by Strep. mutans following antimicrobial therapy is:
   a. Significantly higher in teeth with brackets and bands
   b. Significantly lower in teeth with brackets and bands
   c. Nonexistent in teeth with brackets and bands
   d. Identified as periodontal pathogenic bacteria

8. The presence and intra-oral carriage of Candida albicans and coliform bacteria have been found to be promoted by fixed appliances.
   a. True
   b. False

9. Gingival hyperplasia necessitates care on the part of the patient to ensure:
   a. The occurrence of a shift to more anaerobic flora
   b. Pseudopockets are present
   c. No differences in gingival or plaque indices take place
   d. Plaque retention within pseudo pockets does not result in deterioration of soft and hard tissues

10. Poor oral hygiene during orthodontic treatment leads to:
    a. Potential for subsequent periodontal disease
    b. Development of incipient and frank carious lesions
    c. Gingivitis of increasing severity
    d. All of the above

11. The use of ______ has been shown to result in lower plaque index when compared to plaque indices of patients with
    a. Brackets and bands; permanent retainers
    b. Resin system aligners; fixed orthodontic appliances
    c. Removeable retainers; permanent retainers
    d. Fixed orthodontic appliances; resin system aligners

12. In as little as one month, decalcification around orthodontic banding has been shown to occur, and in the absence of any preventative program, up to ______ percent of orthodontic patients experience white spots.
    a. 25
    b. 35
    c. 50
    d. 65

13. What did patients regard— and associate with pain — to be the most negative aspect of their treatment?
    a. Gingival bleeding while brushing under fixed orthodontic appliances
    b. Increased plaque retention
    c. Tightening of brackets and addition of connective bands
    d. Pocket formation

14. If treatment is more damaging than discontinuation due to a patient’s unwillingness or inability to perform appropriate oral care, discontinuation can help manage and reduce the risks of litigation on the part of the patient or their parents.
    a. True
    b. False

15. Plaque removal and control during orthodontic treatment can be achieved:
    a. Mechanically
    b. Chemically
    c. By the clinician alone
    d. a and b

16. Due to their speedier plaque removal, what may be more effective for patients who do not spend enough time on oral hygiene?
    a. Frequent trips to the dentist
    b. Mouthrinses
    c. A water pik
    d. An electric toothbrush

17. Interdental cleaning can be effectively achieved through:
    a. A floss threader adjacent to the area being flossed
    b. A floss with a thickened end
    c. Clear instructions and education by dental professionals
    d. All of the above

18. Although various methods exist by which to successfully achieve plaque removal, it can be concluded that results attained will depend upon patient education and preference.
    a. True
    b. False

19. What are used as chemical agents for plaque control?
    a. Pastes
    b. Gels
    c. Varnishes and mouthrinses
    d. All of the above

20. Chlorhexidine mouthrinse effectively reduces plaque and gingival indices with a continued effect for up to ______ on the gingival index following cessation of use in orthodontic patients.
    a. Five minutes
    b. 50 minutes
    c. Five hours
    d. Five days

21. One study conducted on children aged 11–17 used 0.12 percent chlorhexidine for 30 seconds every morning and evening. This study resulted in a reduction in plaque and gingival indices of ______ and ______, respectively.
    a. 30 percent; 33 percent
    b. 58 percent; 60 percent
    c. 64.9 percent; 60 percent
    d. 75.6 percent; 77 percent

22. A short-term use of chlorhexidine is associated with increased staining and temporary taste disturbances.
    a. True
    b. False

23. The use of alcohol-containing rinses should be avoided in:
    a. Children
    b. Immunocompromised patients
    c. Patients undergoing head and neck radiation
    d. All of the above

24. Because of alcohol’s drying effect, a relative contraindication would be:
    a. Inflammation of the tongue
    b. Xerostomia
    c. Numbness in taste buds
    d. All of the above

25. Oral irritations and ulcerations are common:
    a. Around brackets, clasps, and bands
    b. As a result of brushing with a soft-bristled toothbrush
    c. With the use of an electric toothbrush
    d. When flossing occurs only periodically

26. What helps to protect the mucosa and assists in the prevention of irritation and friction in an orthodontic patient’s mouth?
    a. Saliva
    b. Orthodontic wax
    c. Chewing gum
    d. Mouthrinses

27. The use of ______ should be included when considering pain relief and healing for an orthodontic patient with fixed appliances.
    a. Locally applied pastes
    b. Rinses
    c. Locally applied gels
    d. All of the above

28. What percentage of the population has hypersensitivity to nickel?
    a. 25
    b. 30
    c. 35
    d. 40

29. Recent research has found an interaction between fluoride mouthrinses and orthodontic materials, resulting in corrosive products with the potential for local allergic reactions.
    a. True
    b. False

30. Allergic reactions by patients to orthodontic materials may include:
    a. Latex
    b. Titanium
    c. Cobalt-chromium
    d. All of the above
Survey included with the course. Please e-mail all questions to: macheleg@pennwell.com.

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Educational Objectives

1. Understand oral-healthcare guidelines that need to be stressed and explained to an orthodontic patient, as well as practiced by the patient, to maintain oral health during treatment
2. Understand the sequelae of poor oral hygiene during orthodontic treatment, including plaque retention, bleeding, and pain
3. Understand methods for plaque removal during orthodontic treatment that encompass types of toothbrushes, interdental cleaning, oral irrigators, and mouthrinses
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