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Indefinite Orthodontic Retention

A Peer-Reviewed Publication
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Educational Objectives
Upon completion of this course, the clinician will be able to do the following:
1. Describe orthodontic relapse in detail and understand how and why it occurs
2. Discuss normal growth and development as it pertains to orthodontic relapse
3. Explain how the normal occlusal factors, muscle function, and soft-tissue forces keep teeth in their normal positions as well as move teeth out of position
4. Understand the changes that occur after orthodontic treatment, allowing the reader to grasp the importance of indefinite retention
5. Assess the proper solutions to orthodontic relapses and understand ideas on how all dentists can help their patients prevent orthodontic relapse
6. Implement an orthodontic retention program
7. Create an income source while providing an invaluable service to patients

Abstract
Many studies have been performed to ascertain if there is a better way to move teeth that will reduce post-orthodontic relapse. Relapse happens, and it may have very little to do with the treatment mechanics or plan. Permanent retention is the only reliable way to keep the dental arches in a position similar to the position they were in the day after the patient’s braces were removed. Prevention of dental relapse is possible if an interdisciplinary approach is developed. The responsibility for evaluating a patient’s post-orthodontic occlusion rests in the hands of the dentists and the hygienists who will care for them for the rest of their lives. The orthodontist is not in this chain of professionals until a problem returns, and the patient is being referred back for re-treatment. Most orthodontic patients graduate high school, move away to college, and lose touch with their orthodontist. The general dental practice is the only line of defense that exists to spread the message and provide the retention services needed indefinitely.

Introduction
As a practicing orthodontist, I see many adults whose chief complaint is crowding of the lower teeth. Many times, upper crowding is also present, but to a lesser degree. Many of the patients received orthodontic care when they were younger and did not wear their retainers. Others have never had any orthodontic treatment but complain that their lower teeth are suddenly becoming crowded.

What is being done to keep patients’ teeth straight after they finish orthodontic treatment? What is being done to keep teeth straight in patients who have never had orthodontic treatment? Whose responsibility is it to provide retention care to patients?

Vaden says that little is known about the changes in orthodontic treatment results exceeding a decade after treatment.1 Little states that no clinical findings seem to predict relapse and that post-retention crowding of the lower incisors is the first sign of the negative changes that will ensue.2

Development and Aging
Skeletal and dental differences exist between boys and girls. At ages 11 to 13, girls mature with a skeletal and dental pattern similar to women. Boys mature by age 15 but can experience maturation changes that occur even into their twenties.3 Latent mandibular growth can create problems in patients (usually boys) who have completed their orthodontic treatment or are currently in treatment. Many patients end up with sagittal (anterior-posterior) discrepancies requiring re-treatment, lengthened treatment times, or in some cases, the need for mandibular surgical setback. In post-treated patients, latent mandibular growth can cause lower crowding and uprighting of the lower incisors. Maxillary spacing can also occur due to the force of the lower incisors pushing on the maxillary teeth.

Studying adults may help to determine whether the post-orthodontic changes were caused primarily by orthodontic relapse or by the normal aging process. Akgul studied the natural craniofacial changes in the third decade of life:4

Skeletal Changes
Most changes occur in the vertical dimension, which are expected due to the effects of gravity. Sagittal changes were not significant. Anterior face height increased in both males and females. Increases in lower face height were only apparent in women. Total face height increases are caused by the increase in lower facial height, caused by the continued eruption of the teeth. Facial convexity and ANB angle increased significantly. Bishara concluded that the male skeletal profile increases in convexity because of increases in prominence of the maxilla. Female skeletal profiles increase in convexity due to a tendency for the mandible to rotate posteriorly.5

Soft-Tissue Changes
There were slight differences between males and females. Many investigators have noted that thickness of the upper lip in men and women decreases. Some found that the lower lip in females became thicker. Men show an increase in profile due to mandibular soft-tissue thickness. Increases in all nose dimensions were noted.

Dentoalveolar Changes
Mandibular incisor movement was basically vertical, resulting from continued dental eruption, alveolar growth, or both.
Increase in arch width is seen until the eruption of the permanent cuspids, after which a continued decrease in arch width is seen over time. \(^6,7\) The intermolar width remains stable through the ages of 13 to 20. Over time, there is a reduction of the anterior-posterior dimension of the mandibular arch. \(^6,8,9\) Incisor irregularity increases during the teenage years. \(^8,10\)

There is a decrease in interincisor and intercanine arch widths and total arch length during the adult stages of life. Sinclair and Little state that the increase in incisal crowding in untreated subjects is one-third of the total amount of crowding observed after orthodontic retention ceases. \(^11\)

Carter states that the oral musculature and dental attrition are responsible for the arch decrement and the increase in crowding. \(^12\)

**Muscle Balance/Soft-tissue Forces/Habits**
Researchers such as Strang, Weinstein, Reitan, and Mills all believe that mandibular intercuspidity stability correlates strongly with musculature. \(^13,14,15,16\) The tongue, lips, and cheeks create a zone of equilibrium, but during orthodontic treatment teeth are moved into unstable positions. \(^9\)

Soft tissues at rest and during function alter tooth positions based on the pressures they exert. It is well documented that tongue position, cheek position, and the forces created by speech, swallowing, and habits play a key role in maintaining tooth position. For example, children can develop constricted maxillae due to obstructed airways (tonsils and adenoids) caused by mouth breathing, which causes the cheek musculature to constrict the maxilla during development. Adults with similar adult open-mouth breathing patterns exert forces on the maxillary teeth which can alter arch form. Children with finger habits place forces on the upper and lower incisors and premaxilla, altering teeth positions. Patients out of orthodontic treatment may bite their nails, chew on pens, or develop similar habits which can also alter the positions of teeth. \(^17\)

**Occlusal Factors and Forces**
Tooth stability and occlusion have long been discussed by experts such as Angle and Okeson. It has been hypothesized and stated that an interdigitated occlusion may prevent drifting of teeth. Ideal orthodontic treatment goals try to achieve a Class I molar and canine relationship, with acceptable overbite and overjet. Studies have been conducted to better understand the occlusal forces at play that alter stability. Teeth that were once in crossbite and retained by the occlusion are stable and seldom relapse. \(^17\)

Stability of overbite reduction has been shown when the incisal angles are favorable. \(^18\) Beyron describes that multidirectional chewing patterns may minimize tooth migration. \(^19\) Dental malalignment has been associated with an anterior component of force which may contribute to lower crowding. \(^20,21\) Okeson states that the muscles of mastication attach to the skull and mandible in such a way that they deliver anterior forces to the dentition. \(^22\) Anterior occlusal forces have been demonstrated and may be associated with post-retention crowding. \(^23\)

Southard studied interproximal forces created by the periodontium and concluded that interproximal force exists that keeps the teeth in a state of compression, creating a contact. \(^24\) He found that occlusal loading from normal chewing increases these forces and may explain crowding between mandibular anterior teeth.

Akgul states that the postural changes that occur as we age alter the pressure of the oral musculature and affect the dental arches. \(^4\)

**Changes Occurring After Orthodontic Treatment**
Researchers have studied dental casts at varying intervals after orthodontic treatment, indicating changes that occurred after treatment and retention. Dental changes seen after orthodontic treatment may not be related to relapse but rather to normal changes that occur naturally with age. \(^25\)

Bishara speculates that increased mandibular crowding in adolescents treated to a well-aligned dentition can be expected. Various amounts of crowding occur in the anterior part of the dental arches as part of the normal maturation process. \(^5\)

**Periodontium**
After orthodontic treatment, reorganization of the periodontal ligament occurs over a three to four month period. Reorganization of the gingival collagen-fiber network typically occurs over a four to six month period. Supercrestal fibers remain deviated over seven months, applying forces that cause rotational relapse. \(^26\) Melrose found that after tooth movement, residual forces remain in the periodontal tissues surrounding teeth which have recently moved. \(^17\)

**Arch Length and Width**
Intercanine and intermolar widths decrease during the post-retention period. This is especially true if orthodontic expansion has been done. Some of the narrowing of the mandibular canines may be due to mesial drift as a function of aging. \(^1,7\) Moussa showed good post-orthodontic molar and canine widths after expansion but poor post-treatment mandibular changes, with intercanine widths approximating the pretreatment measurements. \(^27\)

De La Cruz’s ten-year post-retention study concluded that arch forms tend to return to their original form after expansion. \(^28\) Arch length and depth continued to decrease over time in both arches, mainly due to changes in the arch form. Though they were subtle, they were statistically significant. \(^1\) These changes seem to be a major cause of mandibular incisor change during the post-treatment period. \(^29\)
Curve of Spee
Curve of Spee was studied by Shannon, who found it to be relatively stable after treatment.³⁰ Varying degrees of relapse occurred in some patients. He determined that there were no significant differences in the degree of Curve of Spee relapse when comparing extraction and non-extraction cases. Increases in overbite were generally seen in patients that had had relapse. Patients with removable retainers had significantly more relapse than those with fixed retainers. Class II malocclusions had deeper pretreatment Curve of Spee measurements than did the Class I malocclusions.

Gender
Many studies have attempted to determine if relapse is more prevalent in males or females. A study published in November 2005 indicates that males show greater facial growth and increased instability.³¹ Other studies indicate there is no significant difference between males and females.

Severity of Malocclusion
Ormiston concluded that the initial severity of the malocclusion correlates with the post-retention instability: the more severe the initial malocclusion the greater the chance of relapse. This is a common belief among clinicians.

Mandibular Incisor Dimensions and Position
Shields and Houston studied initial incisor position and determined that it may be the best guide to long-term stability.³²,³³ Results showed that if advancement of the lower incisors occurs during orthodontic treatment, permanent retention is vital to maintain the results. The more crowding present prior to treatment, the more indefinite retention is needed.

Peck and Peck developed a ratio that described the proper dimension of the lower incisors relative to the rest of the dentition.³⁴ This analysis has been used in studies to aid researchers in determining tooth size discrepancies. Shah concluded that no clinical predictors based on lower incisor labial crown shape can be established for lower crowding.³⁵ Similarly, other studies support the idea that tooth structure (dimension) plays a minor role, if any, in late mandibular crowding.⁹,³⁶,³⁷,³⁸,³⁹,⁴⁰

Wisdom Teeth
Patients frequently state that their lower crowding is due to their wisdom teeth. However, the wisdom teeth theory has been studied by many researchers and the consensus is that they do not cause lower crowding. Time after time, studies show that lower crowding still occurs in patients who have had their wisdom teeth removed. Again, adult crowding is most likely due to the pre-programmed mesial drift of teeth, accentuated by occlusal forces, normal wear of interproximal contacts, and deepening of bites.⁹

Orthodontic Treatment Plans — Do They Make a Difference in Post-Retention Crowding?
I have summarized the literature in an attempt to describe the efforts of researchers who have been trying to find “better ways” to treat patients that would result in a shortening or elimination of long-term retention.

Serial Extractions with No Appliance Therapy
Kinne discussed his analysis of 55 patients who had been treated with serial extraction with no additional appliance therapy, and Person studied 42 patients 20 years after serial extraction.⁹ Both studies showed post-treatment irregularities that were not acceptable.

Serial Extractions with Appliance Therapy Afterwards
Little studied post-retention patients who had undergone serial extractions followed by appliance therapy.³⁴,⁴¹ Seventy-three percent of these patients had an unsatisfactory post-retention result with bicuspids extracted. When compared to a matched sample of 30 patients who had each had four bicuspids extracted, there was no difference in the relapse.

Non-Extraction Treatment with General Spacing
Little and Riedel studied 30 patients with generalized spacing of the anterior teeth prior to treatment.³² At ten years post-retention, there was a fifty percent success rate. Mandibular space did not re-open in any case. The most commonly recurring diastemas were at the maxillary midline.

Lower Incisor Extraction
Riedel studied patients who had undergone lower incisor extractions, including 24 patients with single-tooth extractions six and a half years post-retention, and 18 patients with two incisors extracted almost ten years post-retention.⁴³ Twenty-nine percent of the single-tooth extraction group and fifty-six percent of the double-tooth extraction group had unacceptable post-retention crowding.

Early Extractions vs. Late Extractions
McReynolds studied the records of 46 patients at least ten years post-retention, divided into two groups.⁴⁴ One group had had early removal of mandibular second premolars during the mixed dentition, and the other had had extractions performed when all the permanent teeth were present. No differences in long-term stability were found between the two groups.

Non-Extraction with Rapid Palatal Expansion Treatment
Results for patients undergoing palatal expansion without extraction show mixed results when looking at post-reten-
tion relapse of the lower incisors. Arch length was maintained in only a few of the patients studied by Amott. Moussa studied 55 patients with non-extraction and rapid palatal expansion, and reported only an 0.8mm irregularity. Elms demonstrated only a 0.4mm irregularity in his study of 42 patients.

Haas found that by expanding the maxillary arch, intermolar and interpremolar widths also increased (most likely due to changes in occlusion and changes in musculature balance), buccal forces diminished, and lingual forces increased, increasing lower arch width.

Non-Extraction Treatment
Little reviewed records for 26 patients with a mixture of removable and fixed appliances who had been treated orthodontically without extraction and who received treatment in the mixed dentition. Results showed that eighty-nine percent demonstrated unsatisfactory alignment of the lower incisors. Sadowsky showed similar results when he studied 22 non-extraction patients who had been out of retention for approximately five years.

Extraction Treatment
Little demonstrated in a study of 65 treated extraction patients ten years out of retention that the success rate of maintaining satisfactory lower incisor alignment was less than thirty percent, showing a mean post-retention relapse of 2.9mm.

Extraction vs. Non-Extraction Treatment
Many authors have compared samples of patients who have received extraction with those who have not. Again, there was no significant difference in the amount of lower mandibular crowding between the two groups. Luppnapornlarp reported irregularity indices post-retention of 2.6 for the extraction group and 3.1 for the non-extraction group. Artun showed irregularity indices post-retention as 3.1 for the extraction group and 2.5 for the non-extraction group.

Problems With Studies
Mandibular arch crowding occurs in most people who are not actively in retention regardless of whether or not they received orthodontic treatment. Studies themselves have inherent problems which make it difficult to pin down answers, such as:

1. Variations in the methods used to measure crowding exist.
2. Treatment ages vary among patient groups.
3. Retention times vary in subjects.
4. Not all cases studied are treated with the same appliances.
5. Different practitioners are treating the patients studied.

6. Different angle classifications exist in patient groups.
7. Different types of mechanics are being employed to straighten teeth.

What Is Being Taught to Orthodontists to Help Prevent Relapse?
The orthodontic specialty has devoted many hours researching the prevention of relapse based on the hundreds of papers published. Graber and Vanarsdall postulated the following theorems pertaining to orthodontic treatment and relapse. Keep in mind that this list represents ideals and may or may not actually help prevent relapse indefinitely.

1. Teeth that have been moved tend to return to their former positions.
2. Elimination of the cause of malocclusion will prevent recurrence.
3. Malocclusion should be overcorrected as a safety factor.
4. Proper occlusion is a potent factor in holding teeth in their corrected positions.
5. Bone and adjacent tissues must be allowed to reorganize around newly positioned teeth.
6. If the lower incisors are placed upright over basal bone, they are more likely to remain in good alignment.
7. Corrections carried out during periods of growth are less likely to relapse.
8. The further teeth have been moved, the lower the likelihood of relapse.
9. Arch form, particularly in the mandibular arch, cannot be permanently altered by appliance therapy.

Post-Orthodontic Procedures to Help Prevent Relapse
Circumferential Supracrestal Fiberotomy (CSF) is one of the few successful post-orthodontic treatments to show any long-term success in preventing rotational relapse. CSF is performed immediately after removal of the orthodontic appliance. By releasing the soft-tissue tension and allowing the reattachment of periodontal fibers, moderate long-term success has been shown in preventing rotational relapses. This treatment has been well studied. After CSF, little or no attachment loss has been described of any significance, nor any other negative sequelae. It is recommended that patients with moderate to severe pre-orthodontic rotations in the lower anteriors undergo CSF.

Discussion
Post-orthodontic retention is needed to allow for periodontal and gingival reorganization, to minimize changes of growth, to permit neuromuscular changes and adaptation to the new tooth positions, and to maintain unstable tooth positions which may have been established to meet treatment goals and esthetic considerations.
Orthodontic stability begins with the mandibular arch, especially the mandibular anterior teeth. The maxillary arch wraps around the mandibular arch, and changes that occur in the upper arch follow the lower teeth.\(^5\)

Nanda discussed retention concerns in young patients undergoing puberty or in some stage of active growth.\(^4\) He stated that different retention devices based on facial morphology and severity of the malocclusion should be considered. For example, Class II individuals who may still need upper retraction force to prevent the maxilla from continuing to grow forward when the mandible has stopped growing. Patients with short face syndrome may need bite-plate type retainers until maxillomandibular growth is completed. Conversely, patients who have long face syndrome may require a high-pull face bow headgear to hold the position of the molars and to prevent further downward and backward growth of the mandible.

Indefinite retention is the only solution we have today to keep teeth aligned over time. It is hard to argue the fact that without indefinite retention the dental arches will change, starting with the lower anterior teeth. In many individuals, these changes will result in varying degrees of collapse of the dental arches. Discussing orthodontic retention with patients should be no different than discussing brushing and flossing regimens. Preventing relapse is possible. I recommend the following:

1. Dentists, hygienists, and orthodontists need to inform patients that retention should be indefinite regardless of the pre-existing malocclusion, the treatment modality, or length of time they were in treatment. Since we have no way of determining who will develop lower crowding relapse, the retainer will act as insurance indefinitely.

2. Dental practitioners need to incorporate a statement regarding indefinite retention into their pretreatment informed consent documents and remind patients at the end of orthodontic treatment that indefinite retention is a must.

3. Dental practitioners need to develop a regular post-orthodontic retention program. Fee structures need to be developed to accommodate retention needs, including a retainer exam fee, a retainer adjustment fee, a retainer replacement fee, and, if needed, limited re-treatment fees.

4. Practitioners need to perform “retention relapse examinations” similar to providing their patients with an oral cancer screening. This is easily done at the regularly scheduled prophy exam. The exam can begin with some simple questions:
   a. Have you had orthodontic treatment?
   b. Do you wear retainers?
   c. Do you see your orthodontist to have them adjusted?
   d. Do you know that indefinite retention is necessary?

An oral examination needs to be performed to evaluate the dentition for relapse, beginning with the lower incisors.

5. Dental professionals need to offer retainers to their patients, regardless of whether patients have had braces or not. If patients need bruxing appliances, combination splint-retainers can be fabricated for the lower jaw.

Summary

Many studies have been performed to ascertain if there is a better way to move teeth that will reduce post-orthodontic relapse. Relapse happens, and it may have very little to do with the treatment mechanics or plan. Despite recommended measures to decrease the chances of relapse, nothing definitive has been developed. Permanent retention is the only reliable way to keep the dental arches in a position similar to the position they were in the day after the patient’s braces were removed. Prevention of dental relapse is possible if an interdisciplinary approach is developed.

Patients come into our offices trusting that we will give them a straight smile. They spend thousands of dollars and years of their lives awaiting straight teeth. We make them retainers, tell them to wear them, and send them on their way. The majority of these patients eventually discontinue wearing their retainers.

Orthodontic practices in this country are not geared to track patients for more than a year or two after treatment. The majority of these practices are efficient at treating patients and getting them into retention but do not continue to monitor them over their lifetime. The responsibility for evaluating a patient’s post-orthodontic occlusion rests in the hands of the dentists and the hygienists who will care for them for the rest of their lives. The orthodontist is not in this chain of professionals until a problem returns, and the patient is being referred back for re-treatment. Most orthodontic patients graduate high school, move away to college, and lose touch with their orthodontist. The general dental practice is the only line of defense that exists to spread the message and provide the retention services needed indefinitely.

The general dentist needs to take advantage of this opportunity to not only provide patients with an invaluable service but to establish a new income stream for the practice. We have committed our lives to the practice of dentistry and the principles of ethics, which were founded on the basis of nonmaleficence. We counsel our patients on brushing, flossing, smoking cessation, effects of tobacco and oral cancer, bruxing, and sleep disorders. We all must continue the campaign on educating our peers and patients on the importance of retention. I hope this article will be a catalyst for all dentists and hygienists as our profession continues to evolve.
Author Profiles

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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 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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Dr. Partovi received her dental degree from New York University College of Dentistry. Dr. Partovi is presently managing two clinical orthodontic studies and plans on pursuing a specialty degree in the field of orthodontics in the near future. She is a member of the American Dental Association and the California Dental Association.

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Questions

1. At what ages do girls mature with skeletal patterns similar to women?
   a. 9–10
   b. 11–13
   c. 13–15
   d. 15–17

2. Which is not correct about latent mandibular growth?
   a. It causes sagittal discrepancies
   b. It results in lower jaw overgrowth
   c. It can occur in boys into their twenties
   d. It usually occurs in girls

3. As people age, lower facial height increases due to:
   a. Lower anterior teeth tipping forward
   b. Continued eruption of teeth
   c. Lower crowding of anterior teeth
   d. All of the above

4. As we age, investigators have found that:
   a. All dimensions of the nose increase
   b. Men show increases in mandibular profiles
   c. Thickness of upper lips decreases
   d. All of the above

5. Arch width increases in growing children until the eruption of:
   a. Permanent central incisors
   b. Permanent lateral incisors
   c. Permanent canines
   d. Permanent first molar

6. The increase in incisal crowding in untreated subjects is what fraction of the total amount of crowding observed after orthodontic retention?
   a. One fifth
   b. One quarter
   c. One third
   d. One half

7. It is believed that which muscle(s) create a zone of equilibrium keeping teeth in their position?
   a. Tongue
   b. Cheek
   c. Lip
   d. All of the above

8. Due to the muscles of mastication, there are mesial directed forces on the teeth. Multidirectional chewing patterns have nothing to do with tooth migration.
   a. 1st statement is true. 2nd statement is true.
   b. 1st statement is true. 2nd statement is false.
   c. 1st statement is false. 2nd statement is true.
   d. 1st statement is false. 2nd statement is false.

9. Interproximal forces keep teeth in a state of compression and contact. Occlusal loading may explain crowding between lower teeth.
   a. 1st statement is true. 2nd statement is true.
   b. 1st statement is true. 2nd statement is false.
   c. 1st statement is false. 2nd statement is true.
   d. 1st statement is false. 2nd statement is false.

10. Supercrestal fibers remain deviated for up to how many months after orthodontic treatment?
    a. 1
    b. 3
    c. 5
    d. 7

11. Arch length and depth continue to decrease over time:
    a. In the maxillary arch only
    b. In the mandibular arch only
    c. In both arches
    d. None of the above

12. The curve of Spee was relatively stable after orthodontic treatment. There were differences between extraction groups vs. non-extraction groups.
    a. 1st statement is true. 2nd statement is true.
    b. 1st statement is true. 2nd statement is false.
    c. 1st statement is false. 2nd statement is true.
    d. 1st statement is false. 2nd statement is false.

13. A recent study demonstrated that males show greater facial growth and increased instability after treatment.
    a. True
    b. False

14. Relapse is not associated with the severity of the original malocclusion.
    a. True
    b. False

15. If advancement of the lower incisors occurs during treatment, there is more need for permanent retention.
    a. True
    b. False

16. Tooth shape and size discrepancies play a large role in mandibular crowding prediction.
    a. True
    b. False

    a. True
    b. False

18. Serial extractions with appliance therapy compared to patients with four bicuspids extracted showed no difference in relapse.
    a. True
    b. False

19. What percent of patients studied had spacing relapsed?
    a. 20
    b. 30
    c. 40
    d. 50

20. In patients treated who had spacing initially, where was the most common relapse area?
    a. Mandibular midline
    b. Dilar to premolars
    c. Maxillary midline
    d. None of the above

21. In the lower incisor extraction studies, what percent of the single tooth extraction group and the double tooth extraction group showed unacceptable post-retention crowding?
    a. 30, 76
    b. 76, 30
    c. 56, 29
    d. 29, 56

22. In the non-extraction studies, what percent of the treated cases showed unsatisfactory alignment of the lower incisors?
    a. 98
    b. 89
    c. 76
    d. 45

23. In a study of extraction patients, what percent of patients maintained satisfactory lower incisor alignment 10 years out of retention.
    a. 20
    b. 30
    c. 40
    d. 50

24. There were no differences between the extraction groups studied and the non-extraction groups.
    a. True
    b. False

25. Which is not a problem associated with the studies in this article?
    a. Treatment ages were not uniform
    b. Different clinicians treated the patients
    c. Retention times varied between patients
    d. None of the above

26. It is taught: Teeth that have moved tend to return to their former positions. Corrections carried out during periods of growth are likely to relapse.
    a. 1st statement is true. 2nd statement is true.
    b. 1st statement is true. 2nd statement is false.
    c. 1st statement is false. 2nd statement is true.
    d. 1st statement is false. 2nd statement is false.

27. It is taught: The mandibular arch form can be permanently altered by appliance therapy. Proper occlusion holds the teeth in their positions.
    a. 1st statement is true. 2nd statement is true.
    b. 1st statement is true. 2nd statement is false.
    c. 1st statement is false. 2nd statement is true.
    d. 1st statement is false. 2nd statement is false.

28. CSF has not proven to be very valuable in preventing post-retention relapse.
    a. True
    b. False

29. Orthodontic stability begins with the mandibular anterior teeth. The maxillary teeth are held in position by the mandibular teeth.
    a. 1st statement is true. 2nd statement is true.
    b. 1st statement is true. 2nd statement is false.
    c. 1st statement is false. 2nd statement is true.
    d. 1st statement is false. 2nd statement is false.

30. Which is not true?
    a. Dentists and hygienists should be incorporating retention examinations into their practice.
    b. The orthodontist does a poor job in following up with patients years after treatment.
    c. Dentists should offer patients retainers services as part of a long term commitment to their dental health.
    d. None of the above.
Indefinite Orthodontic Retention

Educational Objectives
1. Describe orthodontic relapse in detail and understand how and why it occurs
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Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?  Objective #1: Yes No Objective #5: Yes No
2. To what extent were the course objectives accomplished overall?  5 4 3 2 1
3. Please rate your personal mastery of the course objectives.  5 4 3 2 1
4. How would you rate the objectives and educational methods?  5 4 3 2 1
5. How do you rate the author's grasp of the topic?  5 4 3 2 1
6. Rate the instructor's effectiveness.  5 4 3 2 1
7. Was the overall administration of the course effective?  5 4 3 2 1
8. Do you feel that the references were adequate?  Yes No
9. Would you participate in a similar program on a different topic?  Yes No
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