

Feature Article

Understanding Post-orthodontic Relapse and Retention



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Children's National, he dedicated time to the study of facial growth and development as a member of the Craniofacial Team at the Washington Hospital Center in Washington, D.C. Dr. Halabi is a member of the Omicron Kappa Upsilon honor society. His interpersonal, clinical, and management skills are all cutting-edge. His communication skills are mirrored by the fact that he is able to speak four languages, enabling him to communicate with and treat individuals from various walks of life. Dr. Halabi maintains private practices on Kings Highway in Brooklyn, N.Y. and in Denville, N.J.

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After active orthodontic treatment is completed, teeth tend to shift unless restrained by retainers. The retention phase is extremely important and is often a source of frustration for both the patient and the treating doctor. The prudent clinician should "build in" overcorrection of tooth movement during the active phase of treatment in anticipation of relapse, and then implement an appropriate retention protocol with fixed and/or removable retainers (**Figures 1-3**).

Many theories have been suggested as to why teeth relapse after orthodontic treatment. One possible cause is a force exerted by the supracrestal gingival fibers, which are slow to remodel. Let's examine the most commonly relapsed orthodontic movements:

Lower incisor crowding

Lower incisor crowding is the most common undesirable change that occurs after treatment. It has been associated with many variables. One variable is change in the intercanine dimension.

In general, increasing intercanine distance to gain arch length by lower anterior arch expansion is an unstable change and usually leads to higher incidence of relapse. Therefore, limiting the amount of lower anterior arch expansion is advisable.

Interproximal Reduction or, in cases of severe crowding, premolar or lower incisor extraction is the more appropriate treatment plan. The initial orthodontic study models or the Invisalign ClinCheck can serve as excellent diagnostic tools to determine the amount of pre-treatment arch length discrepancy. They can help the clinician establish the amount of Interproximal Reduction to perform, and/or whether extractions are needed. Of course, other diagnostic methods, such as cephalometric and soft-tissue profile analyses, should also be considered if extraction treatment is contemplated.

Third molars

and their role, represent another concern. Some believe that the presence of third molars leads to more incisor crowding due to pressure, in the form of an anterior component of force exerted from the back part of the arch. At present, there is no consensus on the validity of this theory. Some studies in which third molars have been removed, either unilaterally or bilaterally, support the view that third molars are related to lower incisor crowding.

For example, when third molars were removed on one side of the arch, it was noted that there was less incisor crowding on that side. In contrast, no differences in lower incisor crowding were noted by others who evaluated groups of patients with and without third molars. The universe of studies, then, is inconclusive on this point.

Post-treatment growth has been also implicated as a source of lower incisor crowding. Maxillary growth is usually completed before mandibular growth. Therefore, as the



Figure 1: Essix-type retainer.



Figure 2: Hawley retainer.



Figure 3: fixed lingual retainer. (Courtesy of Reliance Orthodontic Products.)



Figure 4: ClinCheck showing initial deep bite.

mandible continues to grow, change develops in the sagittal maxillomandibular relationship. If the mandibular incisors cannot move forward because of the restraining influence of the maxillary arch, they may become retroclined and, as a consequence, crowded.

The foresighted clinician will include overcorrection of tooth movement in the active phase of orthodontic treatment. For example, if a lower incisor has a significant pre-treatment mesial-in rotation, the clinician can overcorrect the derotation by adding 5 to 10 degrees of mesial-out rotation past perfect alignment, in anticipation of future relapse.

The amount of overcorrection to use is determined by the pre-treatment misalignment and the doctor's own clinical experience. The new Invisalign ClinCheck Pro with 3-D Controls software can help the clinician "dial in" these overcorrections, and can potentially reduce or eliminate the need for refinement in some cases.

The use of fixed retention for the lower incisor region has become increasingly popular in recent years because of worry about patient compliance when wearing a removable retainer. One system entails placing a passive, flexible spiral wire extending from canine to canine, and fixing the wire to every incisor with composite. These retainers maintain tooth position well.

However, a few issues can occur. One such issue is that the composite can break off a tooth, unbeknownst to the patient, allowing the tooth to move. Another problem is that hygiene can be a challenge because plaque can accumulate in the interproximal surfaces around the retainer.

Since fixed retainers are left in position for years, they should be reserved for adult patients who have adequate hygiene and can be relied upon to maintain them as clean as possible.

Deep overbite

Studies have shown that deep overbite correction will relapse at a rate of 20% to 40%. This means that if the bite is opened 5 mm, we can expect 1 mm to 2 mm of relapse. Therefore, overcorrection of bite opening by 20% to 40% is advisable (**Figures 4-6**).

The best retention following correction of deep overbite is a maxillary removable retainer (Hawley or Essix type) with an anterior bite plane or bite ramps built in. It is worn as much as possible (a minimum of 10 to 12 hours daily, usually at nighttime). The anterior bite plane disoccludes the posterior teeth, which become free to erupt, thereby keeping the anterior bite from deepening.

Open bites

The etiology of the anterior open bite should be determined before treatment. Higher incidence of relapse has been noted in cases when the incisors are extruded to close an open bite that is skeletal in nature. A more appropriate approach for such patients would be orthognathic surgery, or the use of



Figure 5: intentional overcorrection of bite depth.

temporary anchorage devices (TADs) to intrude the posterior teeth so as to close the anterior open bite.

Further, newfound success has been shown in using Clear Aligner Therapy to intrude the posterior teeth to aid in closing the anterior open bite.

Overcorrecting the anterior bite as much as possible is recommended, owing to the high incidence of relapse. Accordingly, Essix-type retainers with full-thickness plastic posterior coverage are the best retainers for open bites because they maintain intrusive force on the posterior teeth, which in turn maintains good anterior bite depth.

Overjet

The correction of increased overjet and Class II molar position appears to be reasonably stable when a successful occlusal result has been achieved during treatment. In cases that had severe pre-treatment overjet, overcorrecting the anterior teeth to almost edge-edge bite in anticipation of relapse is advisable.

Rotated teeth

Studies in cases of rotated teeth have shown a markedly decreased tendency toward relapse after surgical transection of the supracrestal fibers, especially in the maxillary arch. However, the long-term benefits of this procedure have not been established. Overcorrecting the derotations is highly recommended (**Figures 7-9**).

Since orthodontic relapse is multifactorial, it is impossible to predict the rate at which a specific case will relapse. Therefore, it is prudent to implement a strict retention protocol for all patients who undergo orthodontic therapy. The onus of maintaining the orthodontic treatment result should be put squarely on the patient, though of course with the continued guidance of the doctor. The patient must be educated to the fact that, in order to continue having straight teeth, indefinite retention is a must.

Understanding the pre-treatment records, choosing the appropriate treatment plan, incorporating overcorrections of tooth movements, and establishing a proper retention protocol are all necessary measures in retaining the orthodontic



Figure 6: ideal bite depth, expected result after overcorrection followed by partial relapsing.

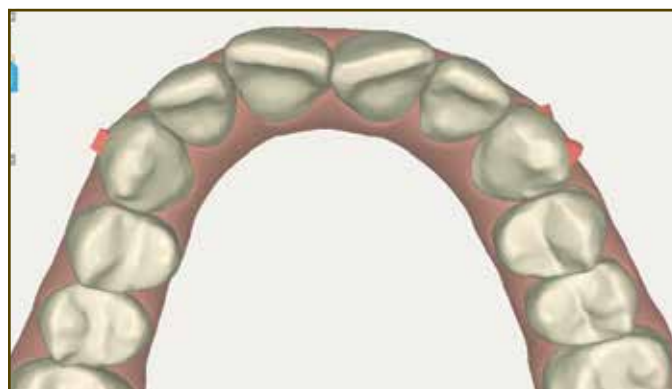


Figure 7: ClinCheck showing misalignment prior to treatment.

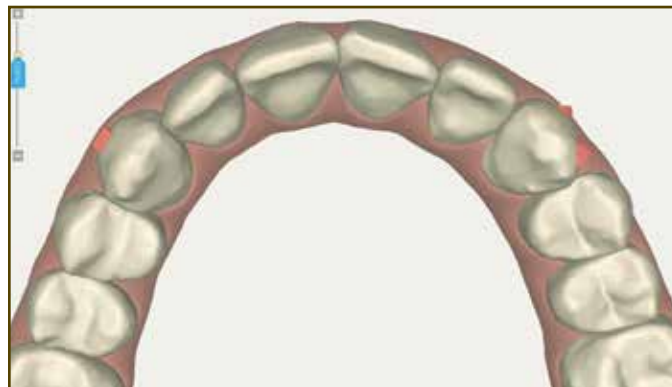


Figure 8: intentional overcorrection of rotations.



Figure 9: ideal alignment, expected result after overcorrection followed by partial relapsing.

treatment result that both patient and doctor have worked hard to achieve.

Maxillary anterior spacing

Although orthodontic treatment for this common problem may appear deceptively simple, proper and thorough diagnosis as to the cause of the spacing is essential in achieving excellent results and preventing relapse. The list of etiological factors of maxillary spacing includes perio-induced pathological migration, posterior bite collapse, habits, deep overbites, prominent labial frenum, tooth-size discrepancy, or a combination of the above.

A multidisciplinary approach to space closure is often needed for a successful and stable outcome. For example, if the cause of the spacing is periodontally related migration, then it behooves the clinician to address the perio condition when attempting orthodontic space closure.

Reestablishing the posterior vertical dimension of a collapsed bite with prosthetics might be necessary before attempting to address the anterior spacing. By contrast, in deep overbite cases, opening the bite orthodontically first might be necessary before attempting space closure. If a prominent labial frenum is the culprit that is causing spacing, it would make sense to perform a frenectomy after orthodontic space closure.

If there is an active habit (tongue thrust or digit, for example), then the cessation of the habit is essential in minimizing the chance of relapse.

If the spacing is due to tooth-size discrepancy in the upper arch, resulting, for example, from peg-shaped or undersized lateral incisors, then restorative treatment in addition to orthodontics could be a more appropriate treatment plan than orthodontic space closure alone. The Invisalign ClinCheck is a great diagnostic tool that can serve as an accurate digital "wax-up" in cases of tooth-size discrepancy. The "virtual power chain" feature in Invisalign is also useful in overcorrecting space closure in anticipation of relapse.

Bonded fixed retainers are the retainers of choice in maxillary anterior spacing cases because of the strong tendency for space to reopen; but knowing and addressing the etiology of the original spacing remains the most crucial factor in minimizing any future relapse. ■

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The AACO Retainer Agreement

If retention is supremely important in maintaining the changes made through Clear Aligner Therapy, how can we make sure that patients recognize this importance and act on it? The Academy offers its members a powerful tool in the Retainer Agreement. This is a document that provides detailed instructions to the patient on how and how much to wear the retainers, what to do in the event the retainers are lost or stolen—and the responsibilities of both clinician and patient, should the patient fail to follow the instructions. Practitioner and patient should go over the agreement in detail and sign it when treatment is complete (or sooner).

The Academy's attorneys have vetted the Agreement so that it provides a legal contract making it the patient's responsibility to follow the retention protocols. It's available as a free download for members at the Academy's website (www.aacortho.com).

For more about retention agreements, see "Retainers: Prevent Orthodontic Relapse; Retainer Agreements: Prevent Relationship Collapse," in the winter 2013 issue of the AACO Journal.



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