

Case Reports

Improving Esthetics with Minor Tooth Movement (MTM®) ✓ 📄

by Lori Trost, DMD

A technique that offers both versatility and creativity in dentistry today is the application of Minor Tooth Movement as it relates to not only improved orthodontic function, but enhanced esthetics. This orthodontic treatment option moves teeth using a combination of plastic aligners and Thermoplier® heat-activated pliers (Dentsply, York, Pa.). This method imparts a minimally invasive approach to patient care that applies fundamental mechanics to set the stage for a pleasing esthetic result.



Dr. Lori Trost maintains a private dental practice in Columbia, Illinois, that merges contemporary esthetic dentistry with a minimally invasive approach to patient care. Her practice and team pride themselves in utilizing the most current technology and continuing education, both in patient care

and treatment options. Lori earned a BA in both biological science and chemistry from SIU-Carbondale and went on to complete her dental education at Southern Illinois University School of Dental Medicine.

Her passion for teaching continuing education courses finds her lecturing extensively throughout the United States and Canada. Dr. Trost has authored over 50 articles relating to dental procedures, techniques, and materials. She also actively participates in clinical research and consults to the top dental companies. Her vision for dentistry, leadership, and entrepreneurial spirit has been recognized by the ADA in presenting her a Shils Foundation Award. Her webinars and programs are informative, energetic, and refreshing.

Introduction

Strictly speaking, Minor Tooth Movement (MTM®) involves the movement of 1 to 4 teeth per arch using continuous, gentle force. Traditional orthodontic movements such as rotation,



Figure 1: pre-treatment study model.

tipping, and lateral positioning can be achieved by having the patient wear an aligner fabricated in the office.

Upon each return patient visit, gentle pressure is applied to the aligner using Thermoplier pliers that are specifically designed to create a force point. These force points in turn guide tooth movement up to 1 mm per month, resulting in corrected or improved alignment. The majority of cases treated in this fashion are completed in 6 months or less (Figure 1).

Case selection

This option, of Minor Tooth Movement, provides treatment of easy orthodontic cases, refines alignment that may have been previously treated, and prepares for restorative and esthetic cases that may involve composite bonding, crowns, veneers, or implants.

Any patient considered for treatment with MTM should have permanent dentition, present with a healthy periodontal state, be without temporomandibular-joint symptoms, and, finally, demonstrate adequate arch length. Immediate criteria that warn practitioners of poor case selection are severe incisor rotation, xerostomia, active caries, and a non-compliant patient. As with most orthodontic treatment decisions, case selection is paramount to the final outcome and should always be respected.

Arch space

Available arch space in which to realign the teeth is a key component in many Minor Tooth Movement cases. More often



Figure 2: model prepared with block-out material.



Figure 3: aligner separated from model.

than not, an arch length discrepancy exists that must be taken into consideration for successful alignment.

First, dentists must make sure to adequately measure the given arch presentation. This is achieved by measuring from the distal margin of each canine, engaging the widest dimension of the arch presentation. Individual tooth widths are then recorded and added together to arrive at the total width of the teeth present.

These two totals (individual teeth and the given arch space) are compared to yield the arch discrepancy. The difference between given arch length and total teeth width determines how much space (if necessary) is needed to complete alignment. Arch presentations that exceed 2 mm in arch discrepancy are not considered to be within the guiding principles of MTM, and therefore are not acceptable cases for this treatment modality.

Symmetry and sequencing

Once the determination is made that a case qualifies for Minor Tooth Movement, the next set of treatment considerations will concern symmetry and staging or sequencing.

More often than not, teeth will not be identical in width; therefore, they offer the benefit of a “symmetry creation” area. These disproportions can be used to the clinician’s advantage to identify surfaces that, when reduced, help to promote or create a more symmetrical appearance. Interproximal

reductions are the compensation required to align teeth within the current given arch space.

If arch space is needed, the clinician has the options of proclining the teeth, if the opposing arch allows, or utilizing Interproximal Reduction (IPR). Interproximal Reduction is the technique used to create interproximal space so that teeth within the arch can pass each other into alignment without colliding.

It is recommended that tooth reduction for MTM not be done randomly, but rather be carefully planned and staged during treatment. The term “enamel contouring” is a much better approach and use of phraseology that will lead not only to better patient acceptance, but also to better case success.

Done properly, IPR should not be painful, should always allow for adequate, non-sensitive, remaining tooth structure, and should respect the initial tooth anatomy in order to provide for a pleasing final esthetic result.

We recommend performing IPR using a safe-tipped diamond bur, smoothing the affected surfaces with finishing strips, using floss to confirm that there is no ledging on the affected surfaces, and, finally, measuring the newly formed spacing with the appropriate interproximal gauge.

Model preparation

Critical to Minor Tooth Movement success is model preparation. Teeth that are to be correctly repositioned require two components: force on one side, and block-out material for the space that the tooth will move into, on the other. This element is central to MTM.

Block-out material can consist of composite or Triad material. Because these models will undergo a thermoforming or vacuum-forming process, wax should not be used because it will melt and not allow the proper amount of space necessary for correct tooth repositioning (**Figure 2**).

To create the aligner, specific tooth-moving plastic is selected with innate properties that remain constant during fabrication and treatment. We predominately use either Essix ACE® or Essix C+® plastic (Dentsply) for all cases. Model preparation consists of spraying the model with a separator, and then thermoforming or vacuum-forming the plastic over the model to create the aligner. The aligner is finalized by carefully separating the plastic from the model, trimming, and polishing (**Figure 3**).

Applying force

The final component of Minor Tooth Movement is force. This can be achieved by the use of Thermoplier pliers that place directional forces in the plastic aligner on the desired teeth to be moved. Each set of the pliers is properly gauged (usually 0.5 mm), heated (according to the plastic selection and its specific thermoplastic properties), and then activated by squeezing a force point into the aligner.

Because of the properties of the plastic material, it undergoes a thermal transformation process such that when the pliers' force point cools, the plastic will remain in that desired position, so that the newly created force point will retain its strength. If heat is not used to warm the pliers, the plastic will subsequently stretch, rebound, or even collapse—thus, the intentional force bump will lessen and not be effective (**Figure 4**).

The MTM advantage

The benefits of utilizing Minor Tooth Movement are especially apparent with respect to function, form, and esthetics. Too often in today's practice, the demand for instant cosmetic gratification dictates treatment offerings and therefore selection/outcome. Dental professionals who learn to understand underlying variations of tooth positions, their interocclusal relationships, and enamel etiology benefit greatly from implementing Minor Tooth Movement to better their patients' long-term dental presentation.

This article will present MTM cases that demonstrate basic principles of orthodontics, as it relates to occlusion, in order to establish improved esthetics, utilizing a minimally invasive approach to patient care.

Case #1: Correction of a deep overbite that was causing failed restorations

A 54-year-old patient presented with good oral hygiene, stable periodontal health, satisfactory existing restorations, and free of caries. However, his chief concern was that his "two front lower teeth fillings were constantly being replaced" (**Figure 5**).

Examination revealed a Class I molar occlusion with maxillary centrals collapsed into a deep overbite arrangement (**Figure 6**).

A standard orthodontic series of photographs was taken, and hybrid polyvinyl siloxane impressions were taken of the maxillary and mandibular arches to create both working and study models.

Measurements were made from the study model, to determine arch length discrepancy. It was determined that the patient needed 1.5 mm of additional space. Especially noteworthy were the disproportionately larger maxillary central teeth as compared to the maxillary lateral teeth, as well as the repeatedly broken full-surface facial restorations on teeth #24 and #25. This patient was deemed an excellent candidate for MTM treatment, with treatment time estimated at 6 months.

Treatment goals

Treatment goals for this case were:

1. Tip and rotate maxillary centrals.
2. Focus IPR on distal surfaces of centrals to improve esthetics and golden proportions.
3. Restore teeth #24 and #25 with composite.
4. Provide proper stabilizing retention.



Figure 4: Thermoplier pliers create a force bump.



Figure 5: pre-treatment.



Figure 6: pre-treatment.



Figure 7: block-out composite placed on facial aspects of teeth #8 and #9.



Figure 8: post-treatment.



Figure 9: post-treatment.

Model preparation and aligner fabrication

On the working model, block-out composite was placed on the facial aspects of both teeth #8 and #9. Once completed, the block-out created a “final wax-up” appearance, completely repositioning the teeth (**Figure 7**). Divots approximately 0.5 mm in depth were placed on the gingival-lingual surfaces of the centrals to create a combination of bodily movement and tipping force. Essix ACE plastic was selected to thermoform (Drufomat) over the model. The fabricated aligner was removed from the model, trimmed, and polished.

Treatment

At the patient’s first MTM appointment, IPR was performed on the distal surfaces of teeth #8 and #9 using a safe-tipped diamond bur (fine particle/FDST). Approximately 0.5 mm of enamel was recontoured and then confirmed using an IPR measuring gauge. A finishing strip was used to smooth the treated surfaces, and, finally, floss was used to confirm that the final surfaces were smooth and free of any ledges. The aligner was delivered and the patient was given instructions on wear and care of the aligner. The patient was scheduled to be seen in 1 month.

At the next appointment, using the same aligner, the maxillary Thermoplier pliers were heated and used to create a force point of 0.5 mm in the aligner on the lingual surface of the centrals, forcing the teeth to move facially. Approximately 0.5 mm of IPR was performed on the distal surfaces of both maxillary centrals

using the same safe-tipped bur, smoothing with a finishing strip, and confirming with floss. The patient was to return in 1 month.

The patient presented at his third appointment with improved alignment of the maxillary centrals. Continued tipping force was applied to both centrals’ lingual surfaces by heating the maxillary Thermoplier pliers to the recommended temperature for the selected plastic and using a 0.5 mm force point. A single-sided green QwikStrip abrasive strip was used to open the distal contacts on both centrals approximately 0.1 mm. Over the course of treatment, as both centrals bodily moved facially, the applied force on the lingual surfaces adapted from gingival to facial placement.

At the fourth appointment, we took an alginate impression in order to fabricate new aligners. The resulting stone model was prepared for aligner fabrication by blocking out the ultimate maxillary central positions. Divots were placed in the stone model using a slow-speed #4 round bur in order to create the slight tipping and rotation force points needed for finalization of these teeth. The aligner was thermoformed, trimmed, polished, and delivered to the patient the next day. The patient was rescheduled in 1 month.

The patient returned with the second aligner at the appointed time. The maxillary Thermoplier pliers were properly heated and engaged on the distal line angles and on the incisal-lingual surfaces, in order to finalize rotation and tipping of both centrals into their final stance. The patient would follow up in 1 month.

Maintaining the new arch form

At the final active appointment, all teeth were confirmed for stability and the decision was made to restore the lower centrals. The facial surfaces of teeth #24 and #25 were restored with TPH3 micro-matrix nanotechnology composite.

Figure 8 shows the final result of the restoration placement, and **Figure 9** illustrates the final maxillary arch alignment.

A final alginate impression was taken to create a maintainer of Essix C+ plastic. The patient was very motivated to wear the maintainer, and he was extremely pleased with his final alignment result.

Case #2: Simple maxillary crossbite correction and reestablishment of canine guidance

A 42-year-old patient had been consistent with recare visits, displayed few existing restorations, and presented without history of TMJ symptoms. His chief complaint was that one of his “front teeth crossed his lower,” and that when he ran long distances, sometimes his teeth would hit and “feel funny” (**Figure 10**).

Closer examination revealed a Class I occlusion with tooth #7 in crossbite. An occlusal exam revealed poor canine guidance leading to incisal wear patterns on teeth #6 and #11.

Also noteworthy was the prevalent dark triangle between teeth #23 and #24. Both arch views are shown in Figures 11 and 12.

A standard orthodontic series of photographs was taken, along with polyvinyl siloxane (PVS) impressions, to create both working and study models. Arch length measurements were made and found to have no discrepancies; therefore, adequate space already existed in which to reposition the teeth.

The determination was made that this patient would be an ideal candidate for Minor Tooth Movement to treat both arches. The patient gladly accepted this treatment plan. He also stated several times that he did not want to undergo traditional bracket-and-wire treatment. He very much welcomed the idea of keeping his hygiene optimal during treatment. Treatment time was estimated at 4 months, wearing both aligners 22 hours a day, 7 days a week.

Treatment goals

Treatment goals for this case were:

1. Correct the crossbite on tooth #7.
2. Rotate both mandibular canines into a more supportive and upright position.
3. Round both arches and properly align/maintain teeth.
4. Close the black triangle between teeth #23 and #24.
5. Restore incisal wear on maxillary canines, #6 and #11.
6. Provide adequate maintenance.

Aligner fabrication and MTM treatment

In preparation for aligner fabrication, composite material was used as block-out and placed on the specific maxillary and mandibular teeth that were to be realigned. This creation of space is critical to allow for the acceptance of the guiding force that directs each tooth into its newly anticipated position or interproximal space. A separating spray was applied to the prepared model, and then Essix ACE plastic was thermoformed (Drufomat) over the cast. The aligner was removed, trimmed, and polished.

As treatment commenced, directional forces were placed in the plastic aligner utilizing specific heated Thermoplier pliers at each monthly visit. Initially the mandibular canines, teeth #22 and #27, were tipped facially using force points from the maxillary Thermoplier pliers. All mandibular anterior teeth (#23-26) had force points applied centrally on the facial surface. Subsequently, both maxillary centrals had distal facial force points applied to rotate both teeth disto-facially.

Two months into treatment, mesial-distal Thermoplier pliers were used to engage the mandibular midline and slightly move tooth #24 distally toward the black triangle.

At month 3, because the mandibular anterior teeth were rounded into an improved lingualized position, the crossbite on tooth #7 was slated for correction. This tooth was tipped facially using maxillary Thermoplier pliers. Final force points were reinforced for the ultimate desired tooth positions at month 4.



Figure 10: Class I occlusion with #7 in crossbite, and dark triangle between #23 and #24.



Figure 11: note wear facets on cusps.



Figure 12: poorly aligned lower anterior teeth.



Figure 13: post-treatment. Note that #7 crossbite is corrected, lower anterior alignment improved, and dark triangle between #23 & #24 eliminated.

The patient returned at month 5. Both maxillary canines were restored incisally, to reestablish proper canine guidance, using a nano-hybrid composite, Herculite (Kerr).

Figures 13, 14, and 15 show the final result. The patient's new occlusion was maintained with newly fabricated aligners, fashioned from Essix C+ plastic, that were to be worn for 6 months, 22 hours daily, 7 days a week. After that period of time, 8-hour daily wear was recommended, for the patient's lifetime.

This case was completed 5 years ago, and the patient has totally complied with maintenance treatment. As of his last recare appointment, his corrected occlusion has remained stable and functional.

Conclusion

The use of Minor Tooth Movement is extremely beneficial not only for excellent patient care but also for very gratifying professional satisfaction.

With MTM, patients now have a treatment option that correctly aligns 1 to 4 teeth by focusing forces embodied in the plastic aligner. Earlier schools of thought would have mandated traditional wires and brackets to correctly align the malposed teeth. However, with current restorative technology and improved plastic materials, the ability to offer MTM to patients opens avenues of treatment that blend fundamental principles with esthetics, to create a win-win scenario for oral hygiene and tooth longevity. ■



Figure 14: post-treatment, upper arch.



Figure 15: post-treatment, lower arch.