Deep-Bite Correction Using a Clear Aligner and Intramaxillary Elastics

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Deep bite can be corrected by intrusion of anterior teeth, extrusion of posterior teeth, or a combination of the two.[1] Anterior intrusion is often indicated in patients with excessive maxillary incisor display at rest or a deep mandibular curve of Spee associated with excessive lower anterior facial height. Such treatment can simplify control of the vertical dimension and allow forward rotation of the mandible, thus facilitating Class II correction.[2]

As demonstrated in this article, a Suspender Clear Aligner can be used with intramaxillary elastics to achieve minor intrusion during aligner treatment or to correct relapse during the retention phase of deep-bite treatment.

Appliance Fabrication and Activation

To fabricate a Clear Aligner for correction of deep bite, first take an impression for a working cast. Form an .030" plastic sheet* over the cast using a pressure molding machine** or a vacuum machine.***[3-5] Blocking out undercuts on the model before thermoforming allows more efficient intrusion of the target tooth (Fig. 1A). After the aligner has been fabricated, mark the locations of grooves for elastics with a pencil (Fig. 1B).

Use a 1mm-diameter fissure bur to make 1.5-2mm-deep channels or grooves at the marked locations (Fig. 2A). Finish the grooves with a laboratory knife, and check the depth with a ruler (Fig. 2B).

Mark labial and lingual hook positions on the aligner, gingival to each target tooth (Fig. 3A). Use Clear Aligner Pliers† or Hilliard Thermopliers*** to make projections in the plastic and convert them to hooks (Fig. 3B,C). Use Clear Aligner Pliers or ThermoAire Undercut Enhancing Pliers*** to improve the mechanical retention and thus the

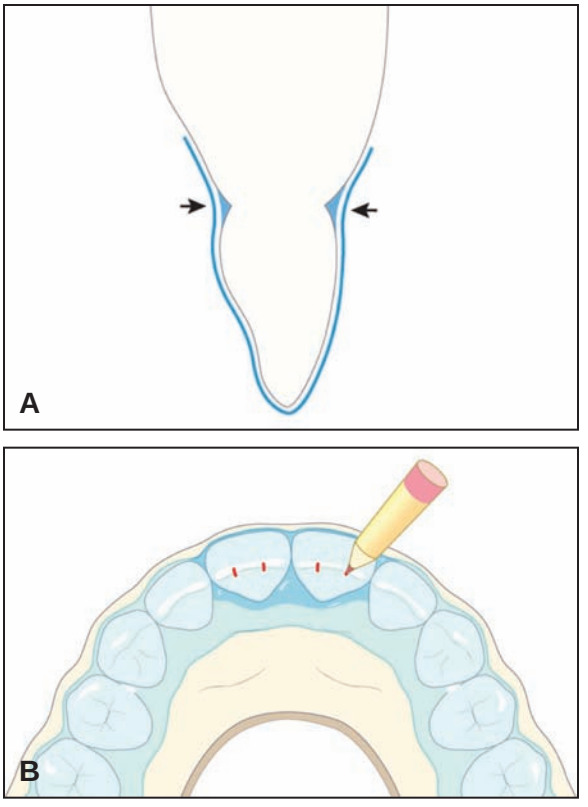

Fig. 1 A. Undercuts blocked out before thermoforming for more efficient intrusion of target tooth. B. Grooves for elastics marked on aligner with red pencil.

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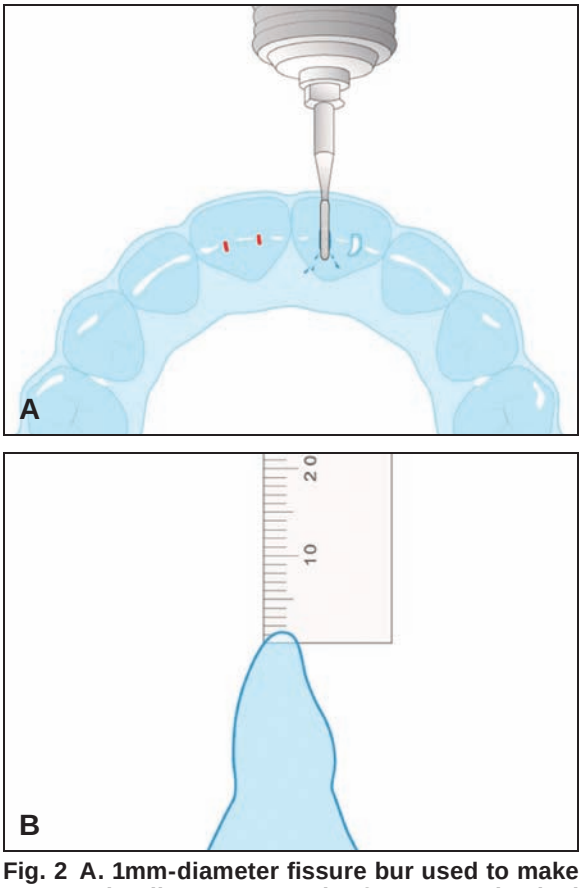

Fig. 2 A. 1mm-diameter fissure bur used to make grooves in aligner. B. Depth of grooves checked with ruler after finishing.

stability of the aligner (Fig. 4).

Engage ⅛", 4oz elastics‡ to the labial and lingual hooks over the target teeth (Fig. 5A). Alternatively, elastic hooks can be placed between two adjacent teeth to be intruded simultaneously (Fig. 5B). This method is recommended in the mandibu-

‡3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016; www.3Munitek.com.

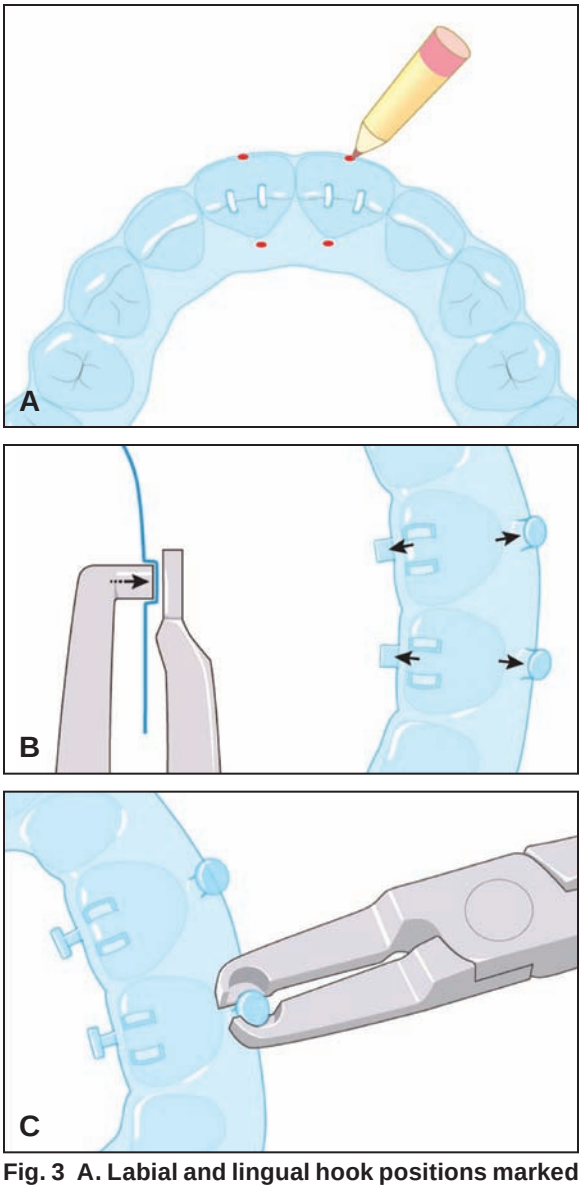

Fig. 3 A. Labial and lingual hook positions marked on aligner. B. Cylinder-forming plier used to make projections. C. Undercut-forming plier used to turn projections into hooks.

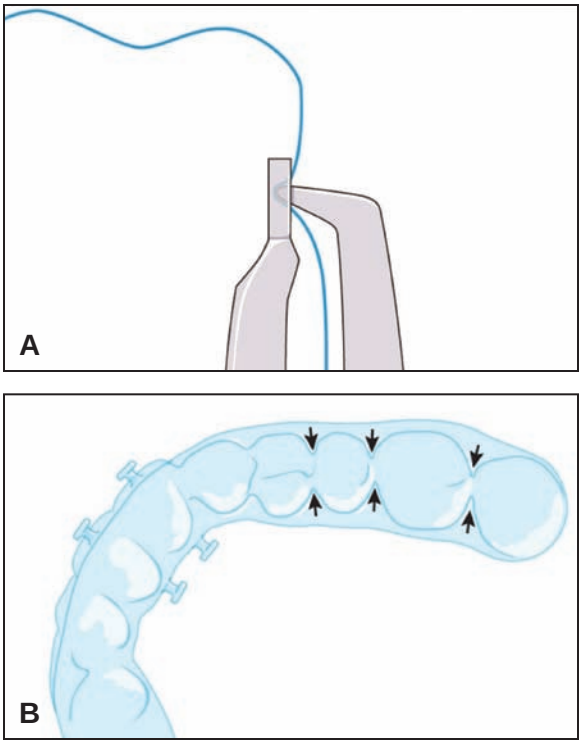

Fig. 4 A. Undercut-enhancing plier used to improve aligner retention. B. Interproximal locations of undercuts.

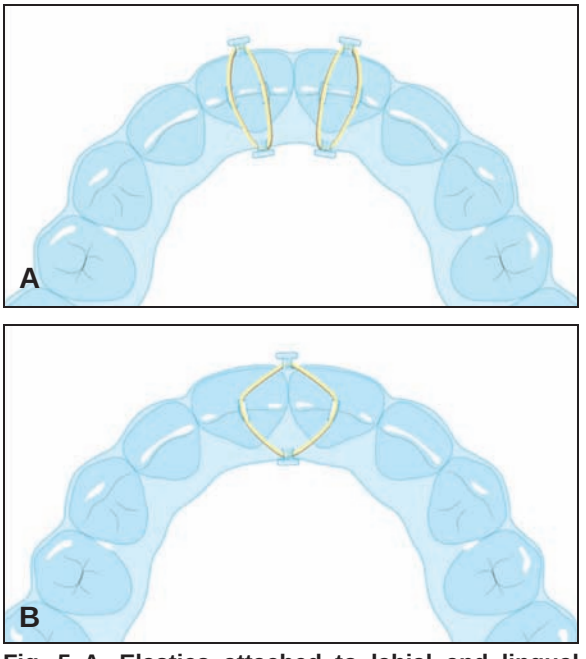

Fig. 5 A. Elastics attached to labial and lingual hooks over target teeth. B. Adjacent teeth engaged with single elastic, using interproximal hooks.

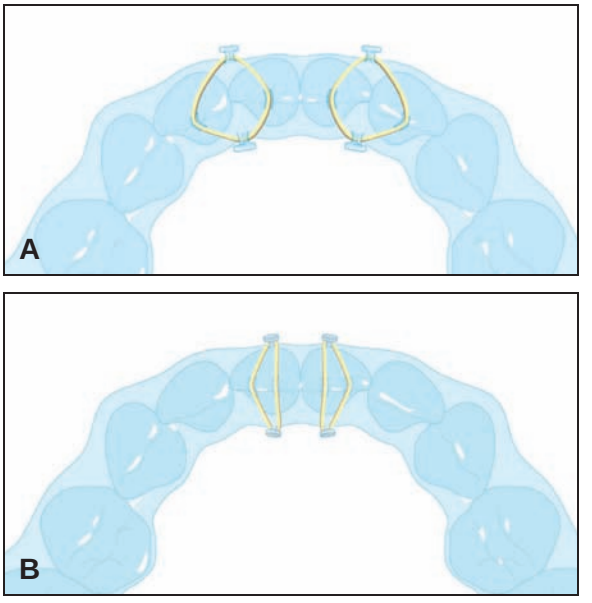

Fig. 6 A. Elastics attached to interproximal hooks over adjacent mandibular incisors. B. Because of small surface area, multiple grooves on individual mandibular incisors are not recommended.

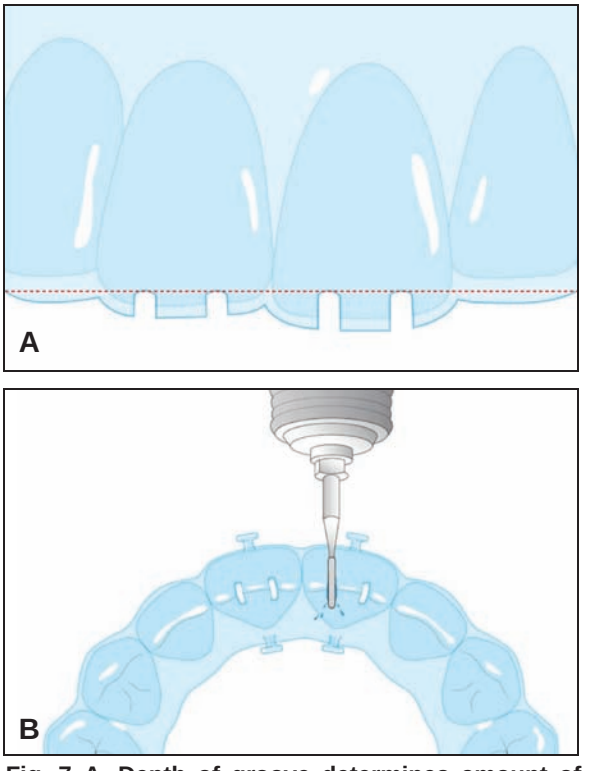

Fig. 7 A. Depth of groove determines amount of intrusion potential. B. Groove deepened for additional intrusion.

lar arch because of the small surface area available for grooves on individual incisors (Fig. 6).

If additional intrusion is desired, the groove can be deepened with the same fissure bur (Fig. 7). This procedure allows rapid intrusion with a single aligner, using chairside reactivation if necessary.

Case Report

A 29-year-old female presented with a Class I malocclusion and deep bite (Fig. 8A). She asked for treatment to be completed as quickly as possible, without conventional fixed appliances. Using the Suspender Clear Aligner (Fig. 8B), the deep

Fig. 8 A. 29-year-old female patient with Class I malocclusion and deep bite before treatment. B. During treatment with Suspender Clear Aligner. C. Bite opening after 10 weeks of treatment.

Fig. 9 A. Patient casts before treatment. B. Intrusion achieved in 10 weeks. C. Mandibular cast before treatment. D. Intrusion achieved in 10 weeks.

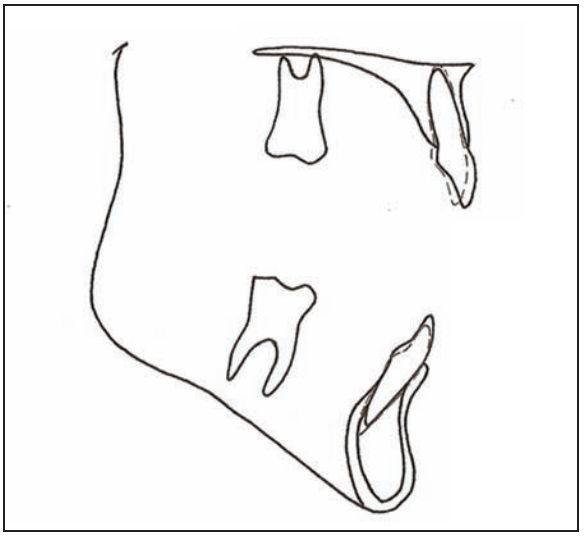

Fig. 10 Superimposition of pre- and post-treatment cephalometric tracings, showing maxillary and mandibular incisor intrusion.

bite was improved after 10 weeks of treatment (Fig. 8C).

To verify the amount of intrusion indicated by the casts (Fig. 9) and regional superimpositions (Fig. 10), the Clear Aligner Program† (CAP) was used to superimpose digital photographs of the pre- and post-treatment casts. The program can measure tooth movements in .1mm increments; in this case, the linear CAP measurements showed a 1.3mm intrusion of the maxillary central incisors and a 2.0mm intrusion of the mandibular incisors (Fig. 11). The Aligner Model Checker† (AMC) was used to measure torque changes between the pre- and post-treatment casts. After the casts are placed in the holder, the correct orientation plane should be established with a level. For this patient, the AMC showed a reduction in maxillary central incisor torque from 12° to 7°, but no change in mandibular central incisor torque (Fig. 12).

At the end of active treatment, .0175" Twist-flex wire‡ retainers were bonded from canine to canine in both arches. New Clear Aligners were ordered as removable retainers, to be worn full-time for six months and then at night indefinitely. Follow-up records taken three years after the end of treatment showed good long-term stability (Fig. 13).

Discussion

Treatment of deep bite is controversial, especially when the patient exhibits a brachyfacial pattern. Schudy recommended extrusion of the

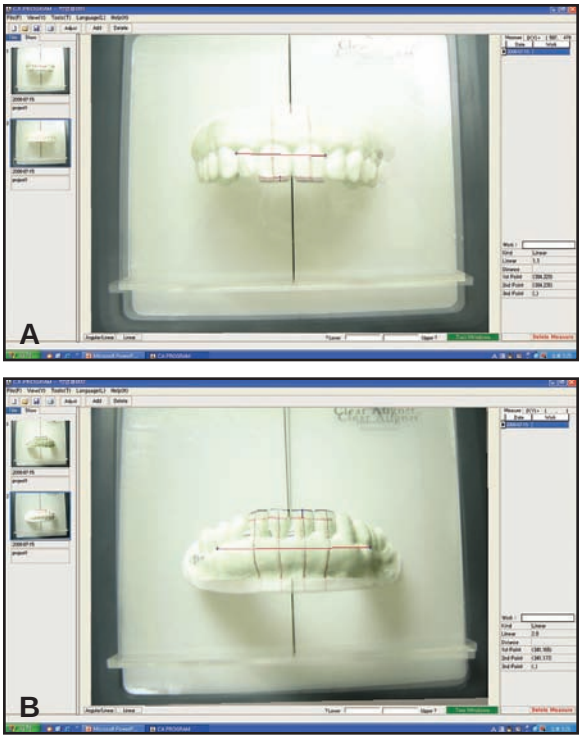

Fig. 11 Clear Aligner Program† showing intrusion of target teeth before treatment (black lines) and after treatment (red lines). A. 1.3mm intrusion of maxillary central incisors. B. 2.0mm intrusion of mandibular incisors.

premolars and molars to open the bite in nearly all cases.[6] On the other hand, Ricketts and colleagues advocated intrusion of the incisors, particularly the mandibular incisors, reporting an average intrusion of 3mm and post-treatment relapse of 1mm, for an expected net intrusion of 2mm.[7] If more than 2mm of mandibular incisor intrusion were required, however, the results would be compromised by unwanted mandibular incisor proclination or premolar extrusion.

Vertical anterior relapse is common after deep-bite correction. Stackler noted that this relapse is due to a combination of factors, including elongation of the mechanically depressed maxillary incisors and mesial tipping of the leveled posterior teeth.[8] Previous studies have suggested that axial inclinations of the incisors or the interincisal relationship at the end of active treatment may also be involved.[6,9] When all other relationships remain unchanged, anterior vertical overbite

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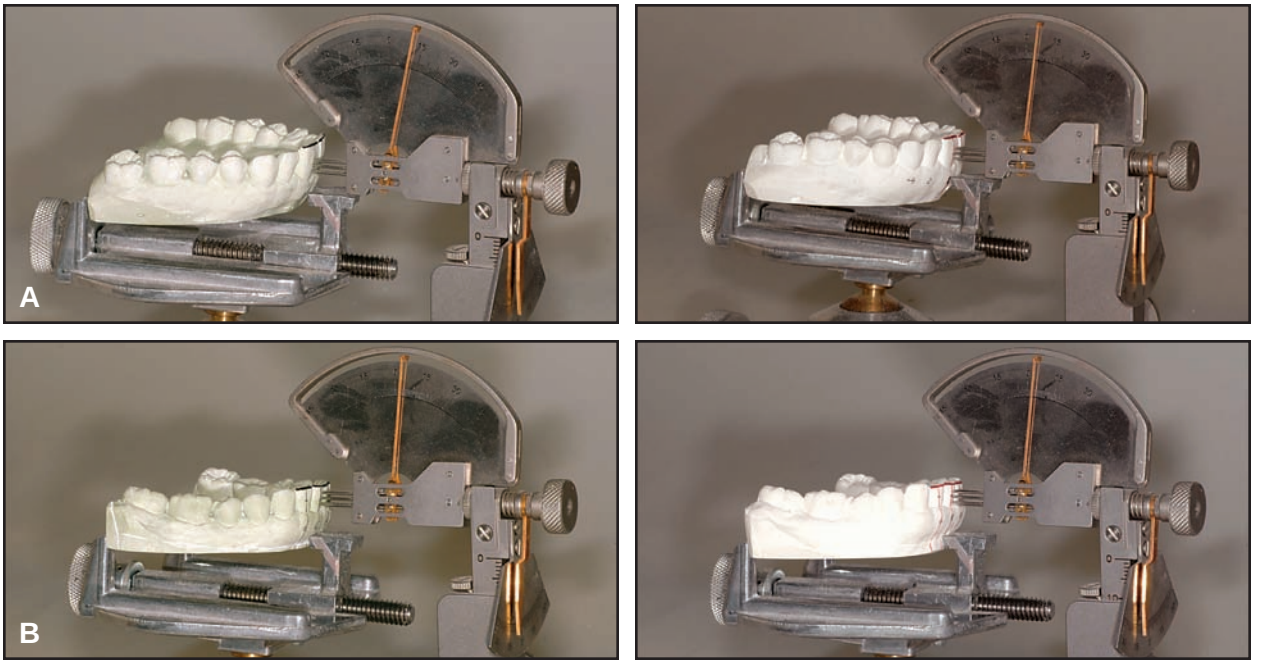

Fig. 12 Measurement of maxillary and mandibular incisor torque with Aligner Model Checker† and model holder. A. Torque change of –5° in maxillary central incisors. B. No change in mandibular incisors.

Fig. 13 Follow-up records taken three years after end of treatment.

decreases as the interincisal angle decreases. In our case, however, interproximal reduction was used along with maxillary central incisor intrusion to maintain the pretreatment overjet. This caused a reduction in maxillary central incisor torque and a slight increase in the interincisal angle. Interproximal reduction has also been recommended to reduce friction between contact points during the intrusion procedure.[10]

Conclusion

A Clear Aligner, in combination with intramaxillary elastics worn at least 17 hours per day, can achieve 1-2mm of intrusion in four to 10 weeks.[3-5] Therefore, this can be an effective treatment method in selected deep-bite patients. In particular, it is a good alternative to conventional fixed appliances for patients who want fast and esthetic treatment.

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