

Attachment of Intermaxillary Elastics to Thermoformed Aligners

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Although intermaxillary elastics are most commonly used with fixed orthodontic appliances, they can also be used with removable, thermoformed appliances such as Essix* or Invisalign.** This article describes various methods of attaching intermaxillary elastics to thermoformed aligners.

*Registered trademark of Raintree Essix, Inc., 6448 Parkland Drive, Sarasota, FL 34243; www.essix.com.

**Registered trademark of Align Technology, Inc., 881 Martin Ave., Santa Clara, CA 95050; www.aligntech.com.



Fig. 1 Commercially available hole-punching pliers, with detail of head.

Rinchuse Slits

Elastic hooks can be made in aligners using specially designed tools such as the Hilliard Thermoplier Elastic Hook-Forming Pliers* or by creating vacuum-formed ball hooks in the aligner material.¹⁻² A simpler technique, however, is to create “Rinchuse slits” in the aligners with scissors.³ If the slits are appropriately angulated, the intermaxillary elastics can be attached directly between an aligner and another removable or fixed orthodontic appliance.

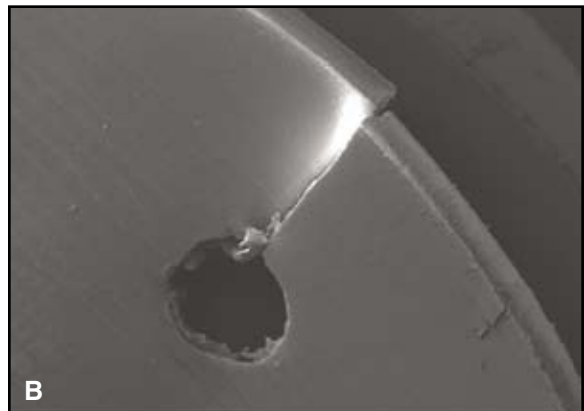


Fig. 2 A. Slit and hole made in aligner with pliers. B. Electron microscopic image.

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The sharp edges of Rinchuse slits can cause patient discomfort if the aligner is dislodged by the force of the elastics. To improve retention of an Essix-type aligner, undercuts can be made on the model or in the aligner itself with Hilliard Thermoplier Undercut Enhancing Pliers.* With the Invisalign system, bonding an appropriate number of attachments to the teeth will prevent dislocation of the aligner.

A disadvantage of Rinchuse slits is that as the aligners loosen with wear, their gingival borders may become ill-fitting, causing patient discomfort and deformation of the aligners by the elastics. Cutting the slits also weakens the aligner material, which, in combination with the forces exerted by the elastics, may lead to aligner breakage.

Bonded Buttons

Another method of attaching elastics to thermoformed aligners is by bonding metallic or composite buttons to the teeth and removing the corresponding sections of the aligners; alternatively, composite buttons can be attached to the aligners themselves.⁴ These buttons may become detached from the teeth or aligners, however, and

many patients find them esthetically unacceptable. Moreover, the removal of portions of the aligner to accommodate bonded buttons is not only time-consuming, but may create sharp edges that can cause patient discomfort.

Hole-Punching Tool

Problems associated with Rinchuse slits and bonded buttons can be addressed by using a hole-punching tool that produces smooth edges in the aligner material; a commercially available pincer tool*** has been designed specifically for this task (Fig. 1). The instrument is used to make small holes in the aligner that will accommodate either intramaxillary or intermaxillary elastics (Fig. 2). The process is quick and easy, and the holes prevent the elastics from detaching and the aligner from breaking. In addition, the discomfort associated with sharp edges is eliminated. The patient can easily attach intermaxillary elastics to the upper and lower aligners before placing them in the mouth (Fig. 3).

***Hammacher Instrumente, Steinendorfer Str. 27, D-42699 Solingen, Germany; www.hammacher.de.



Fig. 3 A. Elastic inserted in hole. B. Class III elastic attached to upper and lower aligners. C. Aligners with Class III elastic in place.

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“Virtual Hooks”

For patients using the Invisalign system, another simple method of attaching elastics is to form “virtual hooks” in the aligners. Attachments are normally designed during the ClinCheck** stage, so that raised bumps will be built into the aligners to accommodate the attachments. To create “virtual hooks”, instead of bonding attachments to the teeth, convert the bumps into hooks

**Registered trademark of Align Technology, Inc., 881 Martin Ave., Santa Clara, CA 95050; www.aligntech.com.

as follows:

1. During the ClinCheck procedure, specify vertical rectangular attachments (5mm × 2mm × 1mm) on the canines and horizontal rectangular attachments (4mm × 2mm × 1mm) on the molars.
2. When the aligners and template arrive, bond attachments as usual to any teeth that are not involved in the “virtual hooks” arrangement.
3. Using a diamond disk, carefully slice into the bumps in the aligners to form hooks for elastics in the planned locations (Fig. 4). In the example shown, for attachment of Class II elastics, the



Fig. 4 Diamond disk used to slice into raised bumps in upper and lower aligners for attachment of elastics.

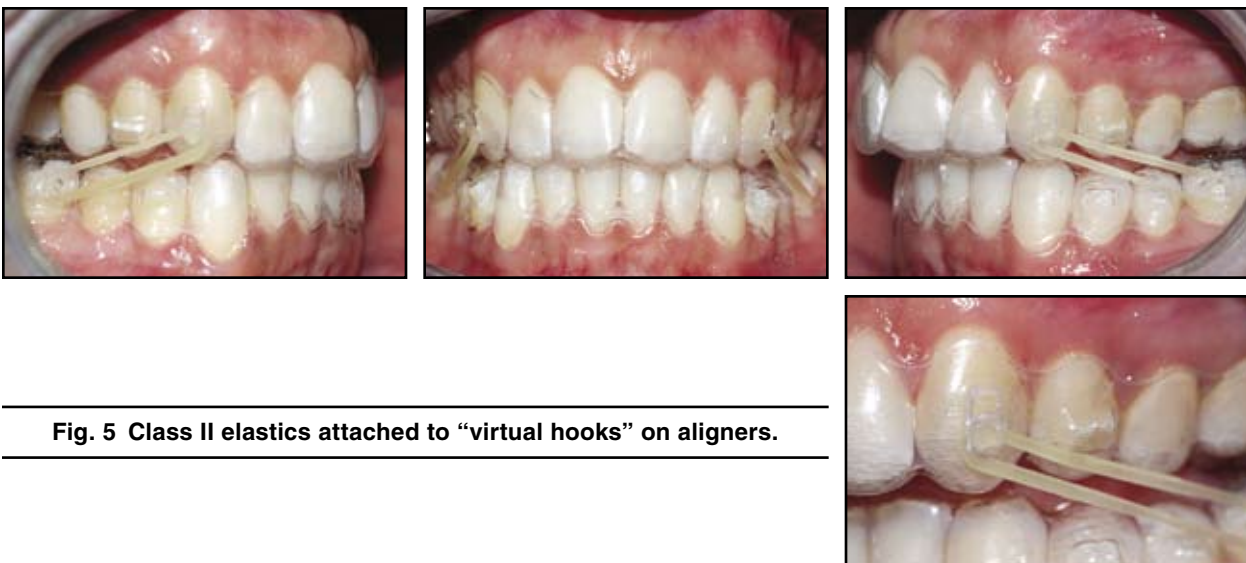


Fig. 5 Class II elastics attached to “virtual hooks” on aligners.

bump at the upper canine is sliced from the gingival, and the bump at the lower first molar is sliced from the distal.

4. Show the patient how to insert the intermaxillary elastics while wearing the aligners as prescribed (Fig. 5).

The “virtual hooks” are economical, quick, and easy to produce, with no unexpected effects on the planned biomechanics. They are generally comfortable for the patient, and compliance is good because of the ease of placing the elastics, even on the most posterior teeth. The disadvantages of this method are that it must be planned in advance and that it requires some extra work at the chair each time the aligners are changed.

Conclusion

A hole-punching pincer is an effective tool for overcoming the disadvantages of other methods

of attaching elastics to both Essix-type and Invisalign thermoformed aligners. The “virtual hooks” are another effective means of attaching elastics in patients being treated with the Invisalign system. Because any significant modification can eventually weaken the aligners, however, we recommend using them for no longer than one month at a time.

REFERENCES

1. Sheridan, J.J.; McMinn, R.; and LeDoux, W.: Essix thermo-sealed appliances: Various orthodontic uses, *J. Clin. Orthod.* 29:108-113, 1995.
2. Rinchuse, D.J. and Rinchuse, D.J.: Active tooth movement with Essix-based appliances, *J. Clin. Orthod.* 31:109-112, 1997.
3. Rinchuse, D.J.; Rinchuse, D.J.; and Dinsmore, C.: Elastic traction with Essix-based anchorage, *J. Clin. Orthod.* 36:46-48, 2002.
4. Pendleton, R.; Rinchuse, D.; Robison, J.M.; Close, J.M.; and Marangoni, R.: Attachment bond strengths of thermoplastic retainer materials using two acrylic bonding resins, *J. Clin. Orthod.* 42:215-219, 2008.