

## The Hygienic Rapid Palatal Expander

[WARREN HAMULA, DDS, MSD](#)

[DAVID W. HAMULA, DDS, MSD](#)

[ARLEN HURT, CDT](#)

Jackscrews have been used to open the midpalatal suture since 1860,<sup>1</sup> but only since the 1950s has the procedure found widespread acceptance. The Haas-type rapid palatal expander, with a midline jackscrew embedded in acrylic pads, is currently used by many orthodontists<sup>2</sup> (Fig. 1).

This type of banded expander exerts forces against the teeth and, through the acrylic, to the underlying hard and soft palatal tissue. Proponents feel there is less tipping of the buccal segments, more bodily movement, and more sutural expansion than with other designs. Drawbacks include the possibility of tissue inflammation beneath the acrylic and the difficulty of oral hygiene. Even compliant patients with good cleaning habits may experience areas of tissue sloughing and gingivitis. Upon removal of the appliance, the palatal tissue can be a source of embarrassment or an issue of contention with the patient or parent.

The Hyrax jackscrew uses four wire extensions soldered to bands and thus does not require acrylic palatal support. While its heavy buccal and lingual wires, closely contoured around the gingivae, provide a mechanical advantage, the wires and especially the solder joints can be plaque collectors. Accuracy of band placement is critical because of the considerable variation in molar axial inclination; however, the Hyrax expander's large solder joints can make once-flexible and well-fitted molar bands too rigid. This inflexibility can affect band seating and sometimes cause loosening.

### **Bonded Acrylic Splint Expanders**

Bonded acrylic splint expanders (Fig. 2) have several advantages over other RPE devices<sup>3</sup>:

- No band fitting required.
- Easy in-house lab fabrication.
- No acrylic coverage of the palatal soft tissue.
- Occlusal coverage to help intrude the posterior teeth in open-bite cases.

The design does have some shortcomings that should be considered, especially in cases of long-term use or retention. Gingival irritation can still be significant, and the potential for pericoronal injury is a particular disadvantage in reverse headgear cases (Fig. 3). Placement is more time-consuming than with banded expanders because of the need for crown preparation and for removing excess adhesive. Some clinicians use glass ionomer cements, which are easier to clean up and may be more tissue-compatible. However, these cements are not as strong as composites when bonding acrylic to tooth surfaces.

Acrylic splint expanders are quite successful in the deciduous dentition, but loosening can be a concern in cases with small clinical crowns, pyramid-shape molars, or teeth with few anatomical undercuts. In the mixed dentition, it is not uncommon for teeth to completely resorb or loosen beneath the splint. Patients must be forewarned about the possible need for a local anesthetic injection to facilitate removal of the appliance. In fact, McNamara recommends the routine use of local anesthetic in all permanent dentition cases.<sup>3</sup> Debonding can be time-consuming as well as irritating to the gingival tissue. In extreme cases, it may be necessary to cut the occlusal surface and

base wire with a high-speed crosscut fissure bur.

### **Healey Expander with Sure-Fit Bands**

The Healey splint expander has the same advantages and disadvantages as acrylic splints, but is more versatile. Sure-Fit bands can be embedded in the acrylic in the deciduous or permanent first molar areas with a high degree of accuracy (Fig. 4). These bands provide a tighter and more secure fit because of their strength at the cervical edges, and they allow the appliance to be made either removable or fixed.

The removable version avoids the usual hygiene problems by permitting unrestricted access to the palatal tissue. In the cemented version, the full strength of the glass ionomer cement in the embedded band promotes a strong adhesion of the band to the enamel, which helps prevent loosening in the deciduous dentition. Removal, debanding, and clean-up are less difficult than with composite cements.

### **Hygienic Rapid Palatal Expander**

A basic version of the Healey RPE, called the Hygienic RPE, eliminates all acrylic material, which is the primary site of plaque accumulation in a conventional expander. The Hyrax-type screw has mesial and distal extensions; the distal extensions are soldered to the first molar bands, and the mesial extensions are snugly contoured to pass through the embrasures distal to the cuspids (Fig. 5). If a reverse headgear is to be used, the mesial extensions are continued to form hooks for Class III elastics (Fig. 6).

The Sure-Fit first molar band incorporates a mesial rest, which provides a solder attachment for the distal end of the .021" X .025" occlusal wire. This wire is carefully adapted to the depth of sulcus of the bicuspid, and the mesial end is soldered to the Hyrax mesial extension crossing the cuspid embrasure.

Glass ionomer cement is the preferred material for placing the molar bands. It has excellent compressive strength, releases fluoride ions, and is virtually insoluble.<sup>4</sup> It provides added protection against decalcification under the mesial rest, especially when the appliance is to be used over an extended period of time.

The occlusal wires and the occlusal surfaces of the bicuspid should be microetched to enhance adhesion. The composite should completely encircle the wires in the sulcus to the height of the marginal ridges of the teeth (Fig. 7). The problem of resorption in the deciduous or mixed dentition is simple to monitor. If it occurs, the occlusal composite is removed from the tooth, freeing it from the occlusal wire. The tooth is allowed to exfoliate gradually, the appliance continues to function, and treatment is uninterrupted.

The normal amount of occlusal coverage will adequately stabilize the appliance with minimal opening of the posterior bite. If more bite opening is desired, more bulk can be added—as with splint expanders, but without their hygiene problems. The composite is less porous than acrylic splints, and it is restricted to the occlusal surfaces, without contacting the inflammation-susceptible gingival tissues.

Another method of opening the bite is to extend the occlusal wire distally from the mesial rest on the first molar (Fig. 8). The distal extension serves as a framework for extra composite.

If intrusion of the posterior segments is called for in the treatment plan, the Sure-Fit band and occlusal wires can provide the framework for a full posterior splint from the bicuspid to the second molar regions. Such an appliance, when used for a long period, has the same potential to intrude the posterior segments as an occlusal-coverage appliance with magnets would have.

Sutural expansion in the deciduous dentition is highly predictable, but clinical experience has shown that greater forces are required in the permanent dentition. Rigid fixed appliances with lingual and buccal bars, as are often used with four-banded RPEs, can generate 3-10 lbs of force.<sup>5</sup> An extra lingual bar is not required on the standard Hygienic RPE in deciduous or early mixed dentition cases, but is optional in the permanent dentition.

Two varieties of lingual bars are possible for those who desire extra rigidity in their expanders and are particularly concerned about tipping. An .032" lingual wire can follow the general contour of the posterior teeth, making contact only on the upper half of the crowns. To increase tooth-surface engagement, light-cured adhesive may be placed at contact points of the tooth and wire. Hygiene will not be compromised, since the composite is high on the teeth and away from the gingivae. In an even more hygienic version, the rigid lingual wire is kept away from the posterior teeth altogether (Fig. 9).

### **Reverse Headgear Modification**

Patients who need palatal expansion often have Class III skeletal patterns. After expansion and stabilization, reverse headgear therapy may be needed for many months. The ideal RPE appliance would:

- Be strong and rigid enough to accept heavy elastic forces without loosening.
- Be able to withstand the heavy external torquing forces developed by the reverse headgear.
- Allow thorough oral hygiene, with minimal plaque collection.
- Have molar tubes available to continue other tooth movements during the stabilization phase.
- Permit repair without removal, or removal without destroying the appliance.

Unlike traditional four-banded expanders and acrylic splint expanders, the Hygienic RPE with lingual and buccal support bars meets all of these criteria.

A unique feature of the Sure -Fit molarband is the strong mesial reinforcement ridge, with a solid anti-rock rest that resists molar tipping.<sup>6</sup> The occlusal wires of the expander further increase overall strength and resist tipping forces. Even more stabilization is added by the composite on the occlusal surfaces of the bicuspid.

Since standard acrylic splint expanders do not have molar bands, any tubes or hooks must be embedded in the acrylic. Placement accuracy and strength can be problematic. With banded expanders, molar tubes are readily available, and other treatment objectives can be accomplished during the stabilization period.

Repairing or removing conventional expanders without destroying them is difficult at best. Attempts to squeeze composite around loose areas are usually futile. The Hygienic RPE can be visually monitored for looseness; if the occlusal composite fails on one of the teeth, it can easily be repaired without removing the entire appliance. A high-speed bur is used to remove the composite from the occlusal sulcus of the affected tooth. The wire and sulcus can be microetched again for rebonding. This repair procedure is similar to rebonding a loose bracket during treatment without removing the entire wire.

## Laboratory Considerations

A common problem faced by commercial laboratories is incorrect band placement on casts received for construction of appliances. Sometimes the laboratory can take a new impression from the cast and reposition a tooth (Fig. 10). This procedure is costly and time-consuming, whether done in-house or commercially, but the time and expense involved in rescheduling a patient and repeating the chairside work is even greater.

The most common errors made in the office are:

- Bands fitted too far down on the mesial side. This occurs more with the mandibular molars because of their flat mesial anatomy and convex distal surfaces. The mesial rest of the Sure-Fit band eliminates such mistakes.
- Improper placement of the band in the impression. The edge of a band can be knife-sharp, and therefore it is easy to push a band too far down into an alginate impression. The mesial rest of the Sure-Fit band becomes an occlusal stop to prevent the band from being overseated (Fig. 11).
- Band movement during pour-up. Vibrating plaster can cause band movement even if there are buccal or lingual attachments held by alginate, but the flat mesial rest gives the band three-point contact and additional security against movement.

A trend currently observed by commercial laboratories is that clinicians, to save chairtime and prevent pour-up problems, are sending in casts without bands for appliance construction. Special laboratory techniques are used to preserve molar anatomy and accurate crown widths, and the Sure-Fit molar band is proving to be extremely reliable. Its mesial rest is helpful as a guide and stop for accurate band placement on a plaster tooth, and later as a guide for appliance placement in the mouth. The band also seems to provide a safety factor compared to conventional bands, since clinical experience shows it to have "a range of functional fitting". A size above or below the most ideal fit seems to be workable in most cases. This is an advantage when appliances are returned, when the impression technique is less than ideal, or when poor separation occurred in the mouth.

For orthodontists who make their own palatal expanders, the Hygienic RPE is simple to fabricate compared to conventional appliances (Fig. 12). Only two bands are involved instead of four, and a second step of acrylic buildup is not required. The Hygienic RPE can be rapidly incorporated into a practice routine, whether in-house or commercial laboratory fabrication is employed. □

## FIGURES



**Fig. 1** Traditional Haas-style rapid palatal expander.



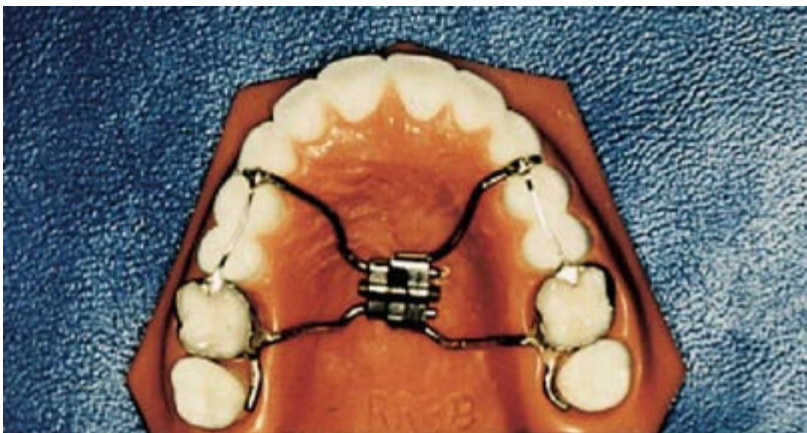
**Fig. 2** Acrylic splint RPE.



**Fig. 3** Pericoronitis tissue impingement from acrylic splint expander.



**Fig. 4** Healey splint expander with embedded Sure-Fit molar bands.





**Fig. 5** Hygienic Rapid Palatal Expander with occlusal wires.



**Fig. 6** Hyrax mesial extension continued to form Class III elastic hook.



**Fig. 7** Composite covering occlusal wire to height of marginal ridge.



**Fig. 8** Composite placed over distal extensions of occlusal wires for posterior bite opening.

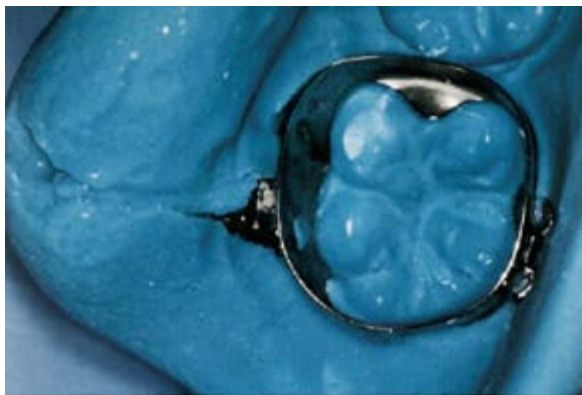


**Fig. 9** Lingual bars added for rigidity in permanent dentition.



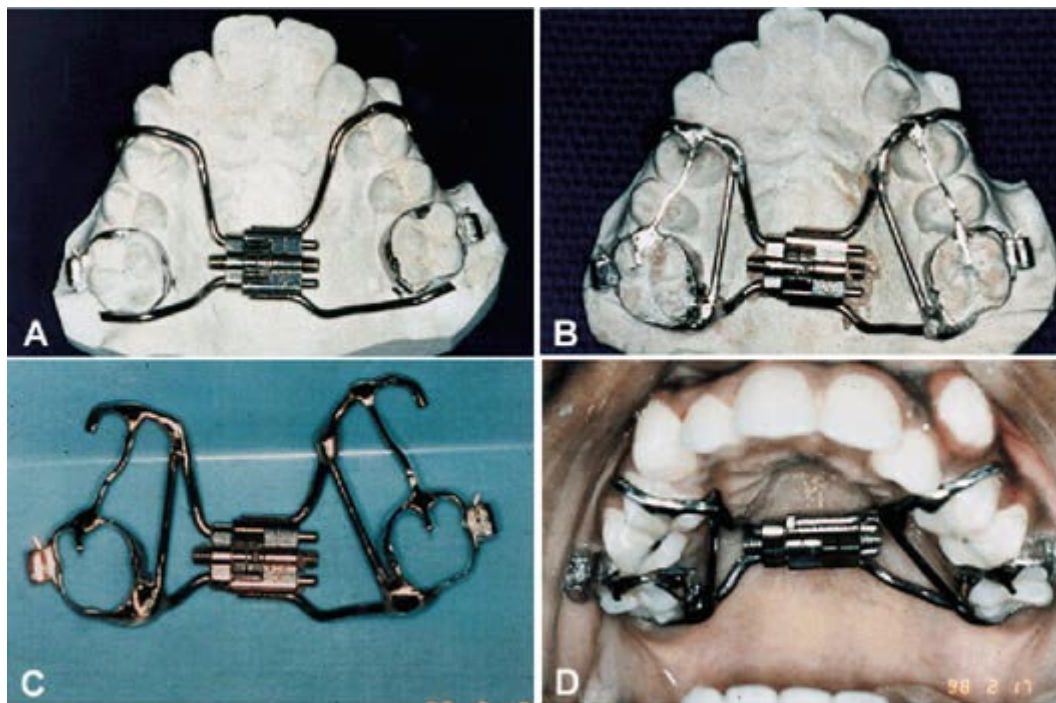
**Fig. 10** A. Poorly positioned molar band that moved during pour-up. B. Band replaced with Sure-Fit band by laboratory for better accuracy.

**Fig. 10** A. Poorly positioned molar band that moved during pour-up. B. Band replaced with Sure-Fit band by laboratory for better accuracy.



**Fig. 11** Mesial rest of Sure-Fit band ensures accurate three-point placement and seating.

**Fig. 11** Mesial rest of Sure-Fit band ensures accurate three-point placement and seating.



**Fig. 12** Hygienic RPE fabrication and placement. A. Hyrax framework soldered to Sure-Fit bands on working cast. B. Occlusal wires contoured to sulcus of bicuspid and soldered to mesial extensions of Hyrax framework and mesial rests of molar bands; lingual bars soldered to framework. C. Hygienic RPE ready for placement. D. Hygienic RPE in mouth

**Fig. 12** Hygienic RPE fabrication and placement. A. Hyrax framework soldered to Sure-Fit bands on working cast. B. Occlusal wires contoured to sulcus of bicuspid and soldered to mesial extensions of Hyrax framework and mesial rests of molar bands; lingual bars soldered to framework. C. Hygienic RPE ready for placement. D. Hygienic RPE in mouth.

## REFERENCES

- 1 Angell, E.H.: Treatment of irregularities of the permanent adult tooth, *Dent. Cosmos* 1:540-544, 599-601, 1860.
- 2 Haas, A.J.: Lecture, University of Illinois Orthodontic Alumni Association, Chicago, March 1964.
- 3 McNamara, J.A. and Brudon, W.L.: *Orthodontic and Orthopedic Treatment in the Mixed Dentition*, Needham Press, Ann Arbor, MI, 1993, pp. 132, 165.
- 4 White, L.W.: Glass ionomer cement, *J. Clin. Orthod.* 20:387-391, 1986.
- 5 Zimring, J.F. and Isaacson, R.J.: Forces produced during maxillary expansion, *Angle Orthod.* 35:178-186, 1965.
- 6 Hamula, W.; Hamula, D.W.; and Brower, K.: A new molar band, *J. Clin. Orthod.* 30:428-433, 1996.

## FOOTNOTES

- 1 Dentaaurum, Inc., 10 Pheasant Run, Newtown, PA 18940.