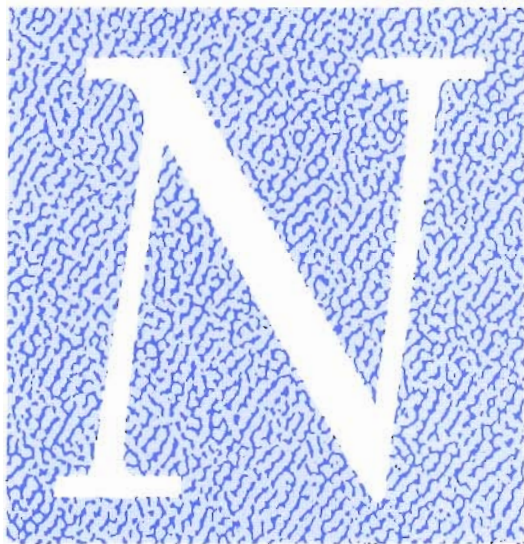


# Rapid Palatal Expansion – A

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umerous treatment methods have been used for crossbite correction – rapid palatal expansion, quad helix appliances, W-arch appliances, thermally activated expansion devices, fixed appliance therapy and, in adults, surgical expansion in conjunction with expansion devices or orthognathic surgery. Rapid palatal expansion is often recommended for:

1. Correction of unilateral or bilateral crossbites.

2. Mobilization of maxillary sutures to facilitate correction of Class III midfacial deficiency.

3. Increasing maxillary arch width to increase arch length.

4. Increasing apical base width to facilitate posterior buccal root torque.

5. Reducing nasal resistance in an effort to normalize breathing patterns.

In the past several years, the use of bonded rapid palatal expansion appliances has become fairly popular. The main reasons for this are:

1. Reduced number of appointments – Conventional banded appliances require an appointment for separator placement. This is followed by a banding appointment with impressions and then final placement of the appliance. For the fabrication of the bonded appliance, an impression is all that is required, and the appliance is seated in the next appointment after fabrication in the laboratory.

2. Reduced posterior tooth tipping – This is a problem frequently experienced with banded RPE (Brust)<sup>1</sup>. This is important in reducing the amount of posterior buccal root torque needed to treat the orthodontic case and is attributed to the rigidity of the appliance framework.

3. Bite block effect to facilitate the correction of anterior crossbites – As described by McNamara<sup>2</sup>.

## Statement of the Problem

The downward and forward movement of the maxilla frequently seen with rapid palatal expansion is not desirable in certain cases. Is it possible, then, that this sort of movement can be counteracted to prevent the undesirable effects of rapid palatal expansion? There are treatment variations which may reduce these undesirable vertical movements during the expansion phase:

1. Placement of a high pull headgear or a vertical pull chincup<sup>3</sup> during the expansion phase.

2. Use of posterior bite blocks during the expansion phase to minimize or negate the downward and forward movement of the maxilla during expansion.

In the mid 1980s we decided to test the hypothesis that bonded rapid palatal expansion appliances may indeed offer the possibility of a bite-block effect. The acrylic pads on the posterior occlusion may function very much like a functional appliance. How might this work? A look at the maxillary sutures (Figure 1) shows that they are oriented from superior to inferior and from medial to lateral. Logically,

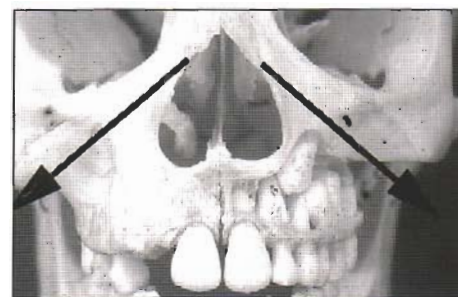


Figure 1. The orientation of the maxillary sutures is in a downward direction. During expansion of the maxilla, this may be the factor which encourages downward movement of the maxilla.

# Another Perspective

lateral expansion would result in a tendency for the maxilla to be forced downward. Furthermore, these sutures are oriented so that expansion also propels the maxilla forward. In 1988, we published the results of 20 consecutive cases, which tested the hypothesis that bonded rapid palatal expansion may reduce or negate the downward movement of the maxilla. This was published in the *American Journal of Orthodontics and Dentofacial Orthopedics* in 1989. We used the following method:

1. The study used Wertz's cephalometric data as a control for the comparison of the data from the bonded appliance population.

2. The measurement system used by Wertz was then duplicated in our study so that direct comparisons could be made.

3. We then took the 20 consecutive bonded rapid palatal expansion cases and analyzed them just as Wertz had, allowing us to make direct comparisons with his data.

The purpose of this article is to review this study and illustrate how it is applicable to improving clinical practice.

## Results of the Study

The statistically significant findings in the data comparison are graphically summarized in Figure 2. The most significant finding was that inferior and anterior displacement of the maxilla was lessened in the bonded appliance group. Other findings were:

1. There was a slight superior movement of the posterior aspect of the palatal plane. Downward and backward rotation of the mandible was negated.

2. The anterior aspect of the maxilla (ANS) had significant movement downward and posteriorly.

3. As the anterior maxilla moved posteriorly, there was an inferior and posterior

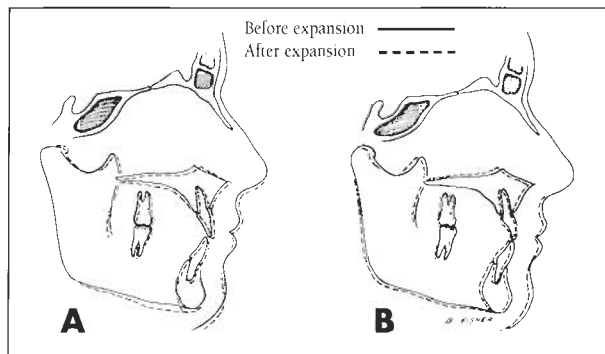


Figure 2. Average skeletal changes associated with (A) banded RPE and (B) bonded RPE appliances.

movement of the central incisors.

The clinical significance of these findings is rather important. I would like to summarize the indications for bonded RPE for crossbite correction in the following cases:

1. Any case in which vertical problems need to be controlled.

2. Class II patterns in which a downward and backward rotation of the mandible is undesirable (for example, a mandibular-deficient profile or a long-faciated patient).

3. Open bite patterns. With the bonded appliance, open bites tend not to worsen or may even improve because of the following factors:

- a. The mandible is prevented from rotating downward and backward.

- b. The posterior maxilla is intruded, which can result in rotation of the mandible closed.

- c. The anterior maxilla and its dentition continue vertical development, which results in bite closure.

4. Whenever the disocclusion effects of the appliance would be useful. For example, as McNamara describes, correction of anterior crossbite with midfacial protraction may be facilitated with bonded RPE.

However, banded appliances may facili-

tate Class III correction through the resulting forward movement of the maxilla (described in indications for banded appliances).

Indications for banded RPE in crossbite correction:

1. Class III skeletal patterns in which the malocclusion may be improved by either anterior movement of the maxilla or downward and backward rotation of the mandible.

2. Short lower facial heights of various skeletal types.

## Appliance Construction

There is more than one way to construct, place and remove this appliance. The method described herein is the one that has evolved in my practice over the years, and is certainly not the only way to go.

The impression is taken and a working model is poured up. The height of contour is marked in pencil to allow the appliance to be fabricated to the height of contour – not gingival to it. The appliance pads are then constructed above the height of contour of the teeth.

When we first started using bonded rapid palatal expansion appliances, we were concerned that they would not be as retentive as banded appliances. The reverse proved to be true. The biggest problem (as many other orthodontists experienced) was the difficulty in removal of the appliances. Therefore, several steps are incorporated into the fabrication of the appliance to accomplish these three goals:

1. Reduce the strength of retention.
2. Maximize oral hygiene.
3. Make appliance removal as clean and

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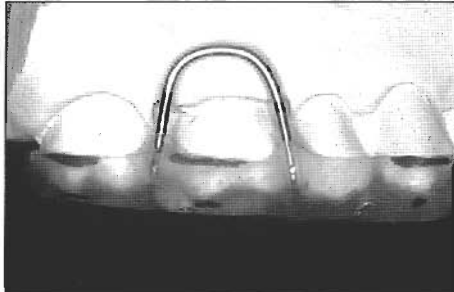


Figure 3. The bonding pads are fabricated to the height of contour, and the debonding loop is placed for access from the buccal.

as painless as possible.

We feel we accomplish this in appliance design by:

1. Not extending the appliance past the height of contour (Figure 3).
2. Waxing out the model interdentally to prevent the appliance from "snapping in" underneath the contact points.
3. Placing a debonding loop (also in Figure 3). This loop is designed to allow removal of the appliance with a vertical force against the occlusal surfaces of the teeth. This will be more clearly described in the removal section of this article.

### Appliance Placement

The appliance is cemented utilizing a fluoride releasing composite, and we prefer using a material in which the composite is a blue color, allowing remnants to be identified and eliminated upon appliance removal.

The teeth are pumiced and then etched on the buccal and palatal sides to the height of contour (Figure 4). The composite is mixed and loaded into the bonding pads and the appliance is seated. Material is allowed to extrude through the occlusal holes and removed. Any material that extrudes above the height of contour is removed with a scaler. Of course, there are a variety of ways to etch and place the appliance via auto-polymerized or light-polymerized material. The main point is to keep the material above the height of

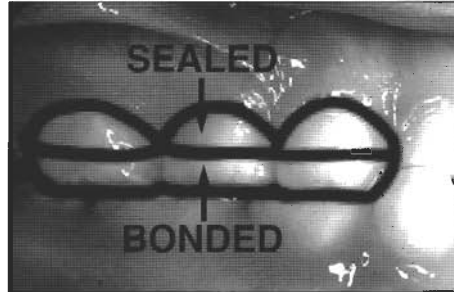


Figure 4. The teeth are etched on the buccal surfaces between the height of contour and the cusp tips.

contour, out of the interdental spaces. This allows the teeth to be cleaned with a toothbrush between the height of contour and the gingival margins.

The appliance is then equilibrated into place. We do not do a fine equilibration, since expansion will begin immediately, thus changing the occlusal relationships.

### Appliance Removal

Grasp the debonding loop with a plier and use an outward motion with the plier

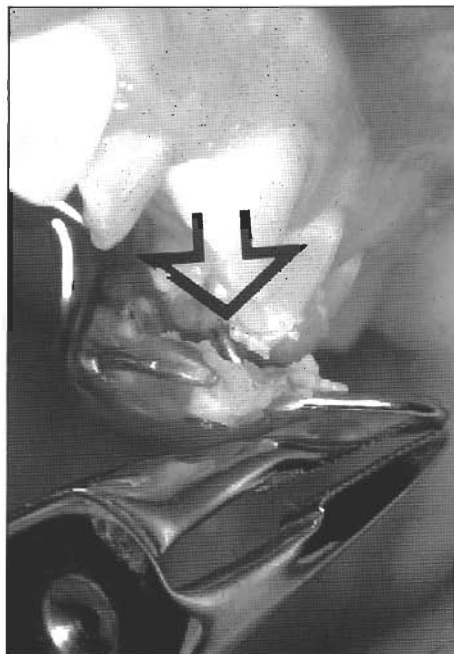


Figure 5. Grasp the debonding loop with a plier and use an outward motion with the plier pivoting on the bonding pad.

pivoting on the bonding pad (Figure 5). The debonding loop creates a force on the occlusal surface of the posterior teeth, unseating the appliance directly to the vertical (Figure 6). Final cleanup is usually done with a scaler, with minimal use of a finishing bur to remove any excess. We recommend the use of a colored bonding material rather than tooth-colored material so that it can be visualized readily at the time of cleanup and eliminated.

Admittedly, as in all bonded RPE cases, this method is not foolproof, and some cases require excessive cleanup procedures. However, this number is quite small.

### Case Presentations

Treatment on open bite patterns – This 12-year-old female presented with bilateral crossbite and an open bite (Figure 7). Her skeletal pattern was dolichofacial, with high mandibular plane angle and retrognathia. Crossbite correction was planned with rapid palatal expansion, and we decided against the banded appliance

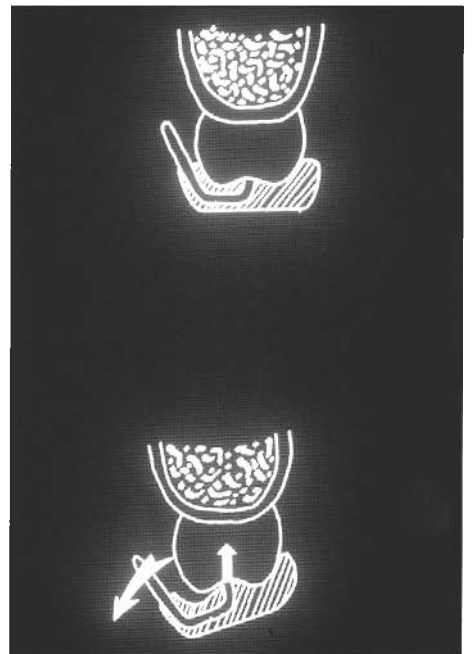


Figure 6. The bonding loop creates a force on the occlusal surface of the posterior teeth, unseating the appliance directly to the vertical.





Figure 7. This patient had bilateral crossbite with anterior open bite.



Figure 8. After expansion with the bonded appliance, the open bite was actually reduced, improving the chances of conservative treatment.

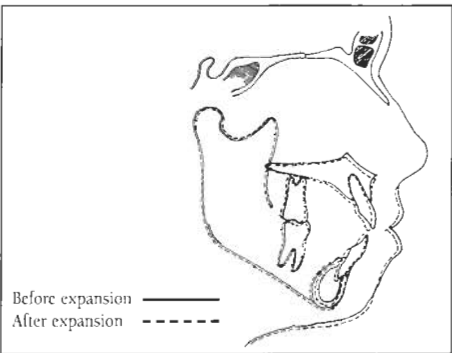


Figure 9. The posterior maxilla did not move downward while the anterior did, resulting in bite closure.



Figure 10. Final occlusal result.

since a downward movement of the maxilla would cause downward and backward rotation of the mandible, resulting in:

1. Increased bite opening.
2. Worsening of the Class II relation.
3. Increased profile convexity.

The bonded expansion appliance



Figure 11. This patient had bilateral posterior crossbite and anterior crossbite.



Figure 12. Expansion with the banded appliance resulted in correction of the anterior crossbite due to the downward and forward movement of the maxilla.

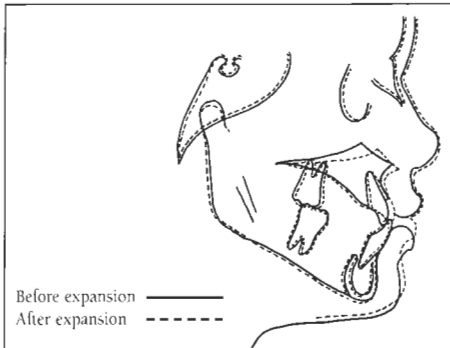


Figure 13. Cephalometric superimpositions illustrating the downward and forward movement of the maxilla with downward and backward rotation of the mandible.

achieved a 6mm expansion. The severity of the open bite actually diminished (Figure 8) after the expansion phase of treatment. The cephalometric superimposition (Figure 9) reflects that the bite closure occurred because:

1. The posterior maxilla did not descend vertically.
2. The anterior maxilla and maxillary dentition continued their vertical development, with the upper incisor moving inferiorly and posteriorly.

Finishing orthodontic therapy was successful from this point forward and a stable result was achieved (Figure 10).

The use of banded appliances in Class III

treatment – This 9-year-old was referred for consultation regarding his anterior and bilateral posterior crossbites (Figure 11). Skeletally, he had a low angle Class III pattern with mild maxillary insufficiency. Banded rapid palatal expansion was selected for his crossbite correction since:

1. The downward and forward movement expected from banded RPE would be helpful in improving the anterior crossbite and the Class III skeletal relationship.
2. The downward movement would also increase the lower facial height and help the Class III correction by producing a downward and backward rotation of the mandible.

The expected Class III improvement occurred (Figure 12) as a result of the expansion. Cephalometric superimposition (Figure 13) revealed a significant downward and forward movement of the maxilla, which resulted in correction of the anterior crossbite without any other treatment.

### Summary

Expansion of the maxilla and maxillary dentition may be accomplished in many ways. The type of skeletal and dental pattern greatly influences the type of expansion chosen, and the type of expansion selected can greatly facilitate your overall treatment objectives.

<sup>1</sup>Brust, E.W. Arch dimensional changes concurrent with expansion in the mixed dentition. Unpublished master's thesis, Dept. of Orthodontics and Pediatric Dentistry, University of Michigan, Ann Arbor, 1992.

<sup>2</sup>McNamara, J.A. and Brudon, W.L. Orthodontic and Orthopedic Treatment in the Mixed Dentition. Ann Arbor, MI: Needham Press, 1993.

<sup>3</sup>Majourau and Nanda. Biomechanical basis of vertical dimension control during rapid palatal expansion therapy. Amer. J. Ortho. and Dentof. Orthope., Vol. 106, No. 3, pp 322-28, Sept. 1994.