

Stability of open bite treatment

Peter A. Shapiro, DDS, MSD

Seattle, Wash



Is early orthodontic treatment indicated for anterior open bite malocclusions? Is the stability of open bite treatment a significant clinical problem? To answer these questions, I would like to define open bite as the lack of overlap of the anterior teeth in centric occlusion. Overlap pertains to

the incisal edges as viewed from the anterior; the mandibular incisors do not contact any opposing structures, such as the maxillary incisors or the palate. Some use the term *open bite tendency* as a synonym for overlap. Contact occurs when the anterior and posterior teeth touch opposing structures in centric occlusion.

In a soon-to-be published review article on the stability of open bite treatment, Huang¹ searched the English language literature for studies with reasonable methodologies, sample sizes, and follow-up periods. He found 6 that evaluated open bite stability in non-surgical patients and 15 that evaluated it in orthognathic surgical patients. Obviously, relatively few scientific studies have evaluated stability of open bite treatment.

Lopez-Gavito et al² evaluated the cephalometric radiographs of 41 patients (29 females, 12 males) pretreatment, immediately posttreatment, and 10 years postretention. At the beginning of treatment, they were adolescents in the permanent dentition who had a Class I or II malocclusion. Each had an open bite of at least 3 mm measured along the long axis of the mandibular incisors. They were treated conventionally with fixed appliances, headgear, and elastics. In the long term, 35% of the patients had an open bite of 3 mm or more, and 65% had relatively stable results. Because of concerns that the measurement of the open bites in this

study was unduly influenced by the angular and antero-posterior position of the mandibular incisor, the study was redone a few years later by Zuroff.³ He expanded the sample and subdivided the subjects into 3 groups: a contact group of 24 with an average overbite of 4.79 mm, an overlap group of 25 with an average overlap of 1.80 mm, and an open bite group with an average overlap of -2.23 mm. The overbite measurement was made relative to the nasion-menton line. At 10 years postretention, 60% of the open bite subjects did not have incisor contact. On the other hand, in the entire sample of 64, the largest vertical relapse was 2.4 mm, and no one had negative incisor overlap. In the subjects who showed instability of overbite correction, the mandibular incisors failed to erupt vertically as they continued to move lingually (with increasing crowding). As with Lopez-Gavito's study, analysis of pretreatment records did not allow stability or instability to be predicted in the treatment result. Katsaros and Berg⁴ evaluated 20 patients who had pretreatment open bites as determined from plaster casts. The open bite, measured perpendicular to the nasion-menton line, was an average of -1.9 mm. Nineteen of the patients were treated with edgewise appliances and 1 with a functional appliance. They were evaluated at least 1 year posttreatment. The criterion for successful treatment was the presence of occlusal contacts of at least 2 incisors in habitual occlusion or after forward sliding of the lower cast. On that basis, 15 of 20 patients (75%) were treated successfully. Huang et al⁵ studied the stability of crib therapy in open bite patients. The sample included 26 growing and 7 nongrowing patients who were evaluated cephalometrically before treatment, at the end of treatment, and at least a year posttreatment. Before treatment, the average negative overbite, measured relative to the nasion-menton line, was -2.8 mm. The overall success rate for achieving a positive overbite was 88%. All patients who achieved a positive overbite during treatment maintained it during the follow-up period.

It is helpful to compare the stability seen in nongrowing open bite patients treated surgically with that of open bite treatment in children, to give some perspective. Denison et al⁶ evaluated 66 patients who had undergone LeFort I osteotomies to decrease facial

Clinical professor, Department of Orthodontics, University of Washington, Seattle.

Presented at the International Symposium on Early Orthodontic Treatment, February 8-10, 2002; Phoenix, Ariz.

Am J Orthod Dentofacial Orthop 2002;121:566-8

Copyright © 2002 by the American Association of Orthodontists.

0889-5406/2002/\$35.00 + 0 8/1124175

doi:10.1067/mod.2002.124175

height. Before treatment, 28 of them had open bites, 24 had overlap, and 14 had deep overbites. Over time, 43% of the open bite patients had a statistically and clinically significant increase in facial height, a decrease in overbite, and an eruption of maxillary molars. Twenty-one percent of the open bite sample relapsed to no overlap. In a recent study, Proffit et al⁷ evaluated the long-term stability of open bite patients treated with LeFort I osteotomy. Twenty-eight of the patients had maxillary surgery only, and 26 had maxillary and mandibular surgery. In the long term, overbite decreased 2 to 4 mm in 7% of the maxilla-only group and in 12% of the 2-jaw surgery group. No patient had a change greater than 4 mm. In 75% of those who had a posttreatment increase in anterior facial height, further eruption of the incisors maintained the overbite. The authors speculated that, in the other 25%, incomplete adaptation of tongue posture may have led to a lack of incisor eruption and a tendency for return of the open bite. Previously, Proffit⁸ wrote that tongue and lip pressures during function, eg, swallowing, speaking, and chewing, were relatively unimportant as determinants in malocclusion, but that resting pressures might have a significant impact.

As would be expected, the etiology of open bite malocclusion varies, but a number of factors have been generally associated with the problem: growth pattern, digit sucking habits, abnormal tongue function or posture, nasal airway obstruction, mouth breathing, and abnormal mandibular or head posture. Although excessive vertical growth might be associated with anterior open bite, many patients have long faces and deep overbites, and some with normal skeletal patterns have persistent open bites. Digit sucking, as with any physical interference with tooth eruption, can cause anterior open bite. If the habit is discontinued and the open bite remains, then one must suspect abnormal tongue posture or function. As mentioned above, the resting posture of the tongue is probably more important than its function during swallowing. Partial nasal airway obstruction, caused by any number of problems, including allergies or enlarged adenoids, may be related to anterior open bite, but many patients have those problems without open bites.

IN SEARCH OF STABILITY

Many therapies have been advocated to increase the stability of open bite correction. In terms of abnormal tongue function, many clinicians recommend 1 to 2 years of crib or sharp spur therapy, hoping to cause the tongue to adapt to its space. Huang's study⁵ gives credibility to this approach, but the observations are relatively short-term. Myofunctional therapy seems to

be useful in some situations, but no long-term studies support its benefit. Partial glossectomy is another therapy prescribed to improve the stability of open bite therapy. Although a number of case reports show good short-term results, no long-term data support its general use, especially in light of the potential morbidity.

Allergies and enlarged adenoids are the most common causes of nasal obstruction in children, and there has been much research in these areas. Numerous studies document that nasal airway obstruction can affect facial growth to some degree, but it is not conclusive that eliminating the problem makes a consistent and significant difference in future growth. Even more important to this discussion, no studies have shown that tonsillectomy and adenoidectomy make a difference in stability of open bites treated orthodontically. Linder-Aronson and Woodside have published a number of studies about various changes in dentofacial development after adenoidectomy and state in 1: "The response to adenoidectomy in the present study is highly variable. . . . Thus clinicians face a difficult decision in recommending adenoidectomy as a prophylactic orthodontic procedure for patients. Before prescribing a surgical procedure involving general anesthesia, they must consider the cost, risk to the patient, and the possibility that, in a specific patient, the result may be small or nonexistent."⁹

Other nonsurgical therapies have been used to increase the stability of open bite treatment, including multiloop edgewise archwires, chinups, functional appliances, and bite blocks with and without magnets. Although many case reports show excellent management of vertical facial height and anterior open bites, no studies demonstrate long-term stability of open bite treatment with any of these methods. In terms of different types of retainers that might help the stability of open bite correction, no studies have addressed this issue. Many have advocated positioners, but long-term patient compliance might be a problem. Thin overlay retainers that might prevent differential eruption of posterior and anterior teeth might be effective, but this has not been tested.

In summary, let us return to the original questions about the stability of orthodontic correction of anterior open bite malocclusion. First, is early treatment indicated? Yes, depending on many factors, including severity, age, and parental concerns. Second, is the stability of open bite treatment a clinical problem? Yes and no. No, in that in a recent literature review, Huang¹ reported that about 80% of open bite patients have overlap of the incisors after some time, whether treated with or without jaw surgery. But yes, in that about 20% of open bite patients do not develop incisal overlap.

There are many possible explanations for this instability, but most evidence points to nonadaptation of the tongue. Understanding the etiology of the open bite in individual patients might help us to improve the long-term stability of their correction, but scientific research to test these theories is necessary.

REFERENCES

1. Huang G. Long-term stability of anterior openbite therapy: a review. *Semin Orthod*, in press 2002.
2. Lopez-Gavito G, Wallen T, Little R, Joondeph D. Anterior open-bite malocclusion: a longitudinal 10-year postretention evaluation of orthodontically treated patients. *Am J Orthod* 1985; 87:175-86.
3. Zuroff J. Orthodontic treatment of anterior open-bite malocclusion: stability ten years post-retention [thesis]. Seattle: University of Washington; 1990.
4. Katsaros C, Berg R. Anterior open bite malocclusion: a follow-up study of orthodontic treatment effects. *Eur J Orthod* 1993;15:273-80.
5. Huang G, Justus R, Kennedy D, Kokich V. Stability of anterior openbite treated with crib therapy. *Angle Orthod* 1990;60:17-24.
6. Denison T, Kokich V, Shapiro P. Stability of maxillary surgery in openbite versus nonopenbite malocclusions. *Angle Orthod* 1989;59:5-10.
7. Proffit W, Bailey L, Phillips C, Turvey T. Long-term stability of surgical open-bite correction by LeFort I osteotomy. *Angle Orthod* 2000;70:112-7.
8. Proffit W. On the aetiology of malocclusion. *Brit J Orthod* 1985;13:1-11.
9. Linder-Aronson S, Woodside D, Hellsing E, Emerson W. Normalization of incisor position after adenoidectomy. *Am J Orthod Dentofacial Orthop* 1993;103:412-27.