

Anterior open-bite treatment with bonded vs conventional lingual spurs: A comparative study

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Introduction: The purpose of this study was to compare the isolated effects of bonded and conventional spurs on the craniofacial and dentoalveolar complexes of patients in the mixed dentition with anterior open bite.

Methods: The sample included 68 subjects with anterior open bite and Class I malocclusion. Group 1 comprised 20 patients treated with bonded lingual spurs with a mean initial age of 9.31 years (SD, 1.17). Group 2 consisted of 21 patients treated with conventional lingual spurs with a mean initial age of 9.22 years (SD, 1.62). The control group (group 3) consisted of 27 untreated subjects. One-way analysis of variance tests followed by Tukey tests were used for intergroup cephalometric comparisons. After 1 month of treatment, patient acceptance of the spurs was evaluated with a questionnaire. **Results:** There were significantly greater overbite increases in the experimental groups than in the control group. The group with bonded lingual spurs showed significantly better acceptance than did the group with conventional lingual spurs during chewing and eating. **Conclusions:** The 2 appliances resulted in similar overbite increases during early open-bite treatment. After a week or less of treatment, 92.5% of the children had adjusted to the spurs. (*Am J Orthod Dentofacial Orthop* 2016;149:847-55)

Anterior open bite is a common malocclusion in growing patients. The incidence of anterior open bite varies with age¹ and has a high prevalence (17.7%) in the mixed dentition.^{2,3} The etiology is multifactorial, including oral habits, abnormal size or function of the tongue, oral breathing, vertical growth pattern, and congenital or acquired diseases.⁴ Among the most frequent habits are finger sucking, pacifiers, altered labial postures, and tongue habits.⁵

Treatment of an anterior open bite is a great challenge in orthodontics. After treatment, patients can benefit from an improved ability to incise and chew

food, and improved esthetics and speech. Several early approaches to treat anterior open bite have been developed. Frequently, early anterior open-bite treatment is performed with fixed and removable palatal cribs and lingual spurs that may be associated with a chin cup or high-pull headgear in patients with a vertical facial pattern.⁶⁻⁹ Although many treatment modalities are available, the effectiveness and the stability after treatment are still critical issues because evidence on the long-term stability of these options is lacking.⁸⁻¹⁰

Investigators have cited tongue position or activity as reasons for difficulty in achieving long-term stability of anterior open-bite treatment.^{9,11} It was concluded that banded-spur appliances correct anterior tongue posture and maintain long-term stability of open-bite correction. Lingual-spur therapy results in closure of the anterior open bite by successfully keeping tongue pressure away from the anterior teeth and serving as a reminder to the patient to discontinue oral habits. Spur appliance effects include palatal tipping of the maxillary incisors, increases in overbite, and increases in dentoalveolar development of the maxillary and mandibular incisors.^{6,9} Also, when associated with a chin cup, they can lead to a significant decrease of the gonial angle.⁶ However, some clinicians are wary of using banded spur appliances because of expected negative patient or parent reactions. The use of this appliance has faced resistance from patients, parents, speech pathologists, and psychologists, as well as

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All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported.

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Submitted, July 2015; revised and accepted, November 2015.

0889-5406/\$36.00

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<http://dx.doi.org/10.1016/j.ajodo.2015.11.026>

from some orthodontists.¹² This aversion is linked to the idea that this orthodontic device is a source of irritation, generates discomfort, violates the patients' space, and is not well tolerated by patients and parents.^{12,13} However, recent studies have shown that treatment with banded or bonded spurs was well accepted by patients and parents and that their reactions to treatment seemed to be similar to or even better than other functional and fixed orthodontic appliances.^{6,12}

Bonded lingual spurs (BLS) were envisioned and designed based on the principles of conventional orthodontic spurs. This appliance has some apparent advantages, such as small size, low cost, esthetics, no laboratory preparation, easy installation, and reduced clinical time for bonding. However, we are aware of only 2 studies that analyzed the effects of the bonded spur appliance in growing patients with anterior open bite.^{6,14} Despite favorable arguments about effectiveness of BLS in early correction of anterior open bite, their effects have not yet been compared with conventional spurs. Therefore, the purpose of this study was to compare the isolated effects of bonded and conventional spurs on the craniofacial and dentoalveolar complexes of patients in the mixed dentition with anterior open bite.

MATERIAL AND METHODS

Ethical approval for this multicenter randomized trial was obtained from the research ethics committee of the Federal University of Pernambuco. Written and verbal explanations about the study were provided to the patients' guardians. Those agreeing to participate completed a written consent form.

The sample size of each group was calculated based on an alpha significance level of 0.05 and a beta of 0.2 to achieve power of 80% to detect a mean difference of 2.0 mm in overbite change between the groups, with an estimated standard deviation of 1.69 mm, according to Cassis et al.⁶ The sample size calculation showed that 21 patients in each group were needed. The sample sizes of this study comprised at least 20 patients in each group.

To obtain patients for the 2 experimental groups, 1 operator (L.F.G.C.) examined 1124 schoolchildren in Recife, Brazil, with written authorizations from their parents and school supervisors. The subjects were consecutively selected according to the following criteria: between 6 and 11 years of age with Angle Class I malocclusions, anterior open bite equal to or greater than 1 mm, and maxillary and mandibular permanent central incisors fully erupted. Patients with an anterior open bite of at least 1 mm, without other occlusal changes,

were invited to participate. None of the selected patients, according to all sample selection criteria, refused to participate after a detailed treatment explanation.

Full eruption in young children is difficult to determine. Therefore, children in the first transitional period were considered to be eligible for treatment when the maxillary lateral incisors were beginning to erupt and the maxillary central incisors still showed an open bite. Additionally, all patients had at least 1 oral habit, such as tongue thrust or thumb or digital sucking, at treatment onset. Children with tooth agenesis, loss of permanent teeth, crowding, maxillary constriction, or posterior crossbites were excluded from this study.

The selected patients were randomly allocated to 2 groups with different treatment protocols: BLS and conventional lingual spurs (CLS). The 2 experimental groups of the study were prospectively treated by 1 investigator (L.F.G.C.) at the orthodontic department of the Federal University of Pernambuco. The control group data were obtained from the files of the orthodontic department of the Bauru Dental School, University of São Paulo.

Group 1 consisted of the initial and final lateral headfilms of 20 patients (10 girls, 10 boys) treated with BLS. Each subject had an Angle Class I malocclusion, and the initial mean anterior open bite was 4.01 mm (SD, 2.52). The initial mean age was 9.31 years (SD, 1.17).

The protocol used in this group consisted of therapy with BLS (Tongue Tamers; Ortho Technology, Tampa, Fla) for 12 months. These appliances were bonded on the palatal and lingual surfaces of the maxillary and mandibular incisors with Concise Orthodontic Chemical Curing Adhesive (3M Unitek, Monrovia, Calif). The bonded spurs were sharpened with a carborundum disk before installation, according to the methods of Haryett et al¹⁵ and Justus.^{9,16} The bonded spurs were positioned in the cervical and incisal portions of the maxillary and mandibular incisors, respectively, to prevent possible future occlusal interferences (Fig 1, A).

Group 2 consisted of the initial and final lateral headfilms of 21 patients (12 female; 9 male) treated with CLS. Each subject had an Angle Class I malocclusion, and the initial mean anterior open bite was 3.03 mm (SD, 1.37). The initial mean age was 9.22 years (SD, 1.62).

The protocol used in this group consisted of therapy with CLS for 12 months. The spur appliance was constructed from 0.045-in stainless steel wire to which 8 short, sharpened 0.026-in spurs, 3 mm in length, were soldered to the anterior part. The spurs were positioned 3 mm from the cingula of the maxillary incisors and were directed at an angle (downward and backward) to encourage correct tongue posture, with the tip of the tongue behind the maxillary central incisor papilla. The spur appliance was soldered to maxillary molar bands

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