TREATMENT OF AN ANTERIOR OPEN BITE WITH THE MULTILOOP ARCHWIRE TECHNIQUE

This is a treatment report of a patient with an anterior open bite and predominance of vertical growth. Multiloop edgewise archwire (MEAW) mechanics were used and resulted in an efficient bite closure and good occlusion. For retention, a bonded 3-3 retainer was used in the mandible whereas a wraparound retainer was employed in the maxilla. World J Orthod 2009;10:104–110.

Open bites are one of the most challenging malocclusions because of stability concerns. Open bites are caused by multiple factors, among which is the overeruption of the maxillary molars. Previous studies using lateral cephalometric radiographs showed that skeletal open bites are characterized by a steep mandibular plane, obtuse gonial angle, and increased lower facial third. Kim described the anterior open bite as a malocclusion in which the maxillary and mandibular anterior teeth have no contact due to two diverging occlusal planes with an accompanying bimaxillary mesial angulation of all teeth.

The appropriate treatment approach depends on the severity and etiology of the malocclusion and the patient’s age. Therapy can involve tongue cribs, high-pull headgear, vertical chin cups, fixed appliances, vertical elastics, orthognathic surgery, microscrews, miniplates, regular implants, or a combination thereof. Kim developed the multiloop edgewise archwire (MEAW) mechanic in 1987. The respective archwires have boot loops whose vertical segments act as breaks to reduce the deflection load and promote horizontal control. Their horizontal segments work similarly and promote vertical control. These L-shaped loops are 2 to 3 mm high. The length of the horizontal segments depends on their location (Fig 1). MEAWs generate light and constant forces, which lead to efficient and physiologic tooth movements. They are made from 0.016 × 0.022-in stainless steel with an accentuated Spee curve in the maxilla and reverse curve of Spee in the mandible. With anterior vertical elastics, this will intrude the posterior teeth.

DIAGNOSIS

A nearly 9-year-old girl reported to the Orthodontic Clinic of Rio de Janeiro State University, Rio de Janeiro, Brazil, with the chief complaint of an overly prominent chin (Fig 2). Her anamnesis revealed a skeletal Class III trend in both parents.

Intraorally, she presented with a Class I molar relationship, a 1-mm overjet, a 2-mm anterior open bite, a maxillary constriction with a posterior crossbite, a mandibular midline deviation of 1 mm to the left, and bimaxillary crowding (Fig 3).

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After evaluating the patient’s records, the following treatment goals were established: (1) obtain normal overjet and overbite; (2) establish and maintain Class I occlusion; (3) obtain space for eruption and alignment of the maxillary canines; and (4) improve smile esthetics.

During the first phase of treatment, rapid maxillary expansion and a face mask were used to correct the posterior crossbite and establish more overjet. Figures 4 to 6 show the situation at the completion of this phase.

The second phase of treatment started with bonding 0.022 × 0.028-in standard edgewise brackets on all teeth except the molars, which received bands with tubes. Due to negative tooth-size–arch-length discrepancies (TSAL), all first premolars were extracted. After initial leveling, a 0.019 × 0.025-in MEAW with loops between canines/second premolars, second premolars/first molars, and first molars/second molars with welded hooks mesial to the canines was inserted in the maxillary arch (Fig 7). Progressive tip-back bends were incorporated distally from the second premolars onward. A stabilizing 0.019 × 0.025-in archwire with hooks welded mesially to the canines was placed in the mandibular arch. The patient was instructed to wear 3/16-in elastics fulltime. She was alerted that lack of elastic use could increase her open bite.

In the following 4 weeks, a reduction of the open bite was observed. At this time, the tip-back bends on the second molars were accentuated (Fig 8). After 7 weeks, the open bite was closed and small adjustments were made to increase the overbite (Fig 9). Three months after placement of the MEAW mechanics, the open bite was completely corrected and the second molars were fully discluded. Next, the final 0.019 × 0.025-in archwire with a pronounced Spee curve was inserted in the maxilla (Fig 10). The elastics were worn until all brackets were removed.
In the mandible, a 3-3 retainer was bonded, whereas in the maxilla, the patient received a wraparound retainer that was to be worn full-time for 6 months and at night only for 24 months thereafter.

**TREATMENT RESULTS**

All treatment objectives were fully achieved. The patient demonstrated a relaxed lip closure and an esthetically pleasing smile with a favorable smile arch. Cephalometrically, the maxillary molars were intruded and the anterior teeth extruded. In the mandible, significant anchorage loss had occurred. Also, an increase of the lower facial third became obvious (Fig 11). Panoramic radiographs revealed no apical resorption or bone loss but good parallelism of all roots (Fig 12). No significant occlusal changes were observed during the retention period (Fig 13).

**DISCUSSION**

Because the open-bite etiology is complex and multifactorial, if at all possible, it is essential to eliminate the causes of this malocclusion before initiating orthodontic treatment. This is important because the
chance of relapse after orthodontic correction is very high. Risk factors in open bites are genetically induced vertical growth, respiratory problems, anterior tongue posture on rest, and anterior tongue thrust and habits.1–3,18,19

Therapeutic possibilities are myriad. In the mixed dentition, they involve abolition of deleterious habits. Using fixed tongue cribs in the maxillary arch or tongue spikes in the mandibular arch can eliminate anterior tongue thrust on deglutition and sucking habits.18 Further, vertical chin cups can be used to decrease mandibular vertical growth and high-pull headgear can control this in the maxilla.20 However, the problem with high-pull headgear is that it also retards anteroposterior growth of the maxilla, which is contraindicated in patients with a Class III growth trend, as in the present case. Anterior teeth can be extruded with elastics, and microscrews, as well as miniplates, are helpful in the intrusion of posterior teeth. Orthognathic surgery is also an option.2,8–14
**Fig 7** First maxillary and mandibular archwires with vertical elastics (3/16-in).

**Figs 8 to 10** Intraoral situation 4 weeks (*top*), 7 weeks (*middle*), and 12 weeks (*bottom*) after initial archwire placement.

**Fig 11** Cephalometric radiographs at the beginning (*left*), during (*center*), and end (*right*) of treatment.
**Fig 12** Final panoramic radiograph reveals no apical resorption, good root parallelism, and no bone loss; third molars were removed.

**Fig 13** Facial and intraoral photographs 2 years postretention with no changes with the exception of some settling of the second molars.
During corrective treatment in a patient with a vertical growth trend, leveling, and aligning, especially with Ni-Ti wires, is problematic because this can extrude the posterior teeth with a subsequent bite opening.

MEAW mechanics can be considered an alternative treatment for patients with an anterior open bite, provided the patient is cooperative. The reason is that the use of anterior elastics is fundamental to obtain a favorable result. If the patient does not wear the elastics, the malocclusion is worsened by the positive Spee curve incorporated into the maxillary archwire as by reverse Spee curve in the mandibular archwire. Other limiting factors of the MEAW mechanics are the difficult archwire bending and impeded oral hygiene.

**CONCLUSION**

MEAW mechanics are efficient as demonstrated in the present patient, in whom a normal overbite was established with good incisor exposure, favorable esthetics, and a balanced smile.

**REFERENCES**