

# CASE REPORT

## Nonextraction Treatment of an Open Bite with a Preadjusted Lingual Appliance and Intermaxillary Elastics

ENRICO ALBERTINI, DDS  
GIUSEPPE SCUZZO, DDS  
LUCA LOMBARDO, DDS  
GIUSEPPE SICILIANI, DDS

**T**his case report describes re-treatment of an adult open-bite patient using a preadjusted lingual appliance and intermaxillary lingual elastics, combined with logopedic therapy.

### Diagnosis and Treatment Plan

A 23-year-old male present-

ed with the request to align his teeth by means of an esthetic appliance. His previous orthodontic treatment, performed by a colleague with a fixed labial technique and completed seven years previously, had relapsed.

From a frontal view, the face appeared well proportioned but showed a significant mandibular symphysis deviation to the

right (Fig. 1). The profile was convex, with a prominent nose, normal nasolabial angle, marked labiomental sulcus, and retrusive mandibular position. A slight midline deviation to the left was accompanied by an interincisal diastema. The patient displayed a crossbite involving the upper left first and second premolars, with the upper left first molar in a



Dr. Albertini



Dr. Scuzzo



Dr. Lombardo



Dr. Siciliani

Dr. Albertini is in the private practice of orthodontics at Via Pansa 55/i, 42124 Reggio Emilia, Italy; e-mail: info@dralbertini.com. Drs. Scuzzo and Lombardo are Adjunct Professors, and Dr. Siciliani is Chairman, Department of Orthodontics, University of Ferrara, Ferrara, Italy. Dr. Scuzzo is also in the private practice of orthodontics in Rome.

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Fig. 1 23-year-old male patient with anterior open bite and skeletal Class II relationship before retreatment.

transverse edge-to-edge relationship, and an anterior open bite on the left side. He had a Class I molar relationship on the right, a mild Class II canine and molar relationship on the left, and a notable open bite in the buccal and posterior segments. The upper arch showed a dentoalveolar asymmetry involving a slight transverse deficiency; the lower arch was crowded, with a contraction of the archform in the left anterior area and a relatively flat curve of Wilson.

The panoramic radiograph indicated the presence of all teeth, including the third molars. The reduced height of the lower-incisor roots was apparently due to significant lower-incisor proclination, as confirmed by cephalo-

metric analysis (Table 1). A skeletal Class II relationship was diagnosed, with both the maxilla and mandible in retrusive positions. The skeletal pattern was normodivergent tending toward hyperdivergence. A prominent mandibular symphysis and a clockwise-oriented occlusal plane were also noted. The upper incisors appeared normally inclined, but the lower incisors were significantly proclined.

The ideal treatment plan would have involved four premolar extractions combined with orthognathic surgery, which would also have enabled correction of the skeletal asymmetry, but the patient declined this approach. Considering the maxillary and mandibular retrusion,

prominent nose, lip position with respect to the Ricketts E-line,<sup>1</sup> and only slightly reduced Merrifield Z-angle (67°),<sup>2</sup> a non-extraction treatment plan was designed.

Since the open bite appeared to be mainly caused by a functional problem—a tongue-thrust habit on the left side—rather than the vertical skeletal pattern, the patient was sent for evaluation by a speech therapist. The therapist suggested an immediate initial session before placement of orthodontic appliances. A bonded lower retainer was removed, and the patient completed his logopedic therapy over the next three months.

Although the case could have been successfully treated

**TABLE 1**  
**CEPHALOMETRIC DATA**

	Norm	Pretreatment	Post-Treatment
SNA	82.0°	70.1°	73.7°
SNB	80.0°	68.7°	71.0°
ANB	2.0°	1.4°	2.7°
Maxillary skeletal (A-NA perp.)	0.0mm	-3.2mm	0.8mm
Mandibular skeletal (Pg-NA perp.)	-4.0mm	-5.9mm	0.1mm
Wits appraisal	0.0mm	+4.2mm	+3.1mm
FMA (MP-FH)	26.0°	19.7°	19.3°
MP-SN	33.0°	36.5°	36.4°
Palatal-mandibular angle	28.0°	29.8°	28.4°
Palatal-occlusal plane (PP-OP)	10.0°	11.3°	10.9°
Mandibular-occlusal plane	11.4°	18.4°	17.5°
U1 protrusion (U1-APo)	6.0mm	10.2mm	7.7mm
L1 protrusion (L1-APo)	2.0mm	6.7mm	4.1mm
U1-Palatal plane	110.0mm	111.4mm	115.6mm
U1-Occlusal plane	54.0°	57.3°	53.5°
L1-Occlusal plane	72.0°	51.9°	57.5°
IMPA	95.0°	109.6°	105.0°

## Nonextraction Treatment of an Open Bite with a Lingual Appliance

with Invisalign,\* the patient was unwilling to cooperate with aligner wear and requested a completely invisible appliance. A lingual appliance was selected based on its esthetic appearance and reeducation effect on tongue activity. Because the intrusion force would pass closer to the lower incisors' center of resis-

tance, this approach would also produce less lower-incisor proclination while resolving the lower crowding, flattening the curve of Spee, and correcting the Class II relationship.<sup>3</sup> Open-bite and lower-incisor torque overcorrections were included in the setup prescriptions for preadjusted Ormco STb\*\* brackets.<sup>4</sup>

The patient was informed that the upper left central and lateral incisors might need conservative reconstruction at the end of treatment to ensure symmetry with the contralateral teeth. We therefore decided to align the gingival margins while leaving the incisal margins at slightly different heights.



Fig. 2 Manual setup for indirect bonding using Komori system.

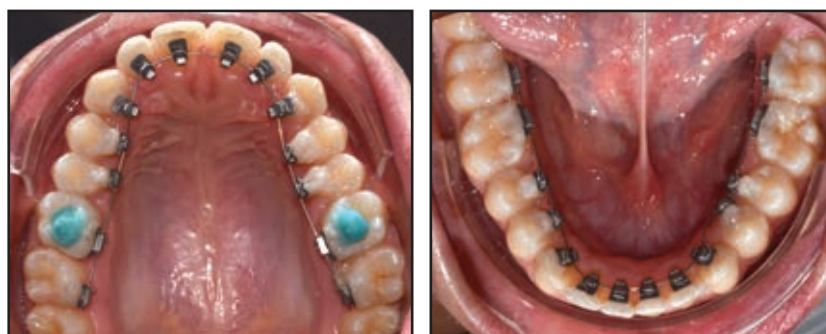


Fig. 3 .013" Copper Ni-Ti\*\*\* wires inserted (medium in upper arch and small in lower arch).



## Treatment Progress

Brackets were bonded indirectly in both arches with a manual setup and single jigs, using the Komori KommonBase system (Fig. 2).<sup>5</sup> A medium .013" Copper Ni-Ti\*\*\* wire was inserted in the upper arch, and a small wire of the same type in the lower arch (Fig. 3). Occlusal build-ups were bonded to the upper right and left first molars to avoid premature contact and to provide intrusion and vertical control during the leveling, alignment, and working phases.

Three months later, a small .016" × .016" Copper Ni-Ti wire was inserted in the upper arch,

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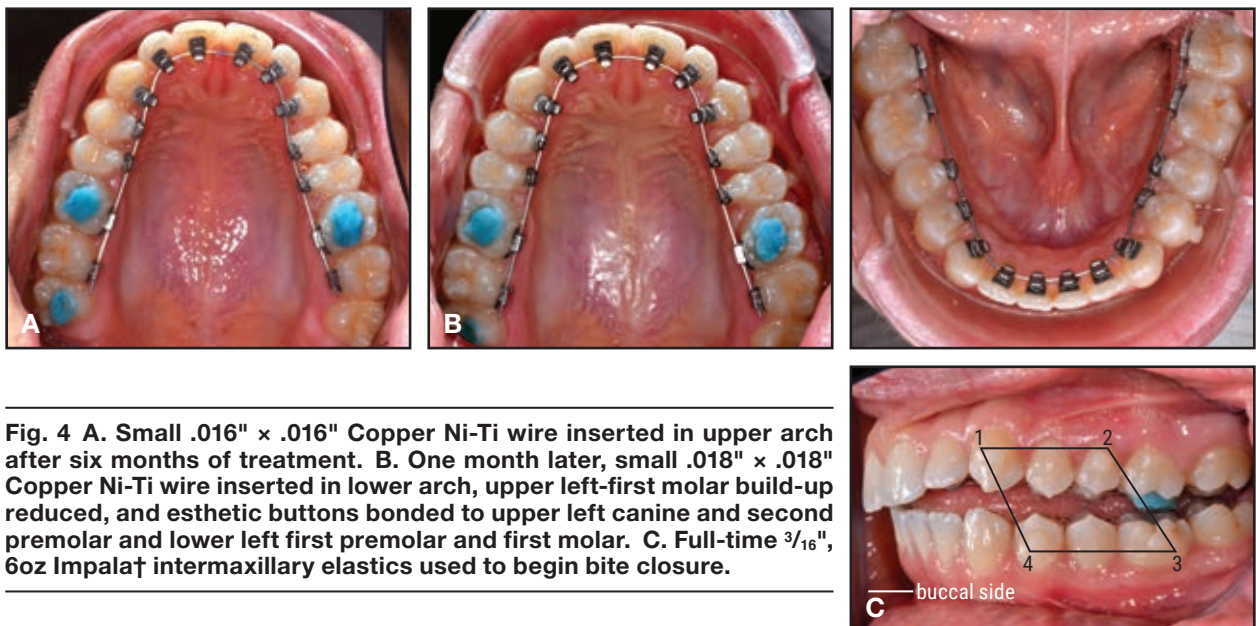
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†Ormco Corporation, Orange, CA; [www.ormco.com](http://www.ormco.com).

and a build-up was added on the upper right third molar to prevent its extrusion (Fig. 4A). After another month, the mandibular wire size was increased to .018" × .018" Copper Ni-Ti to achieve maximum torque control of the lower incisors (Fig. 4B). At the same appointment, esthetic buttons were bonded to the upper left canine and second premolar and the lower left first premolar and first molar to allow full-time wear of  $\frac{3}{16}$ ", 6oz Impala† intermaxillary elastics for buccal and posterior bite closure (Fig. 4C). The build-up on the upper left first molar was reduced to permit selective extrusion of that tooth and the lower left first molar, facilitating resolution of the posterior open bite.

One month later, Kobayashi ligatures were tied to the upper left lateral incisor and canine and the lower left canine to allow full-

time wear of  $\frac{3}{16}$ ", 6oz Impala vertical lingual elastics for anterior open-bite resolution (Fig. 5). These elastics were worn throughout treatment to take advantage of an important functional effect: the barrier generated by the elastics is comparable to that of a lingual tongue crib, which prevents the tongue from contacting the teeth and thus maintaining the open bite.

After another two months, occlusal build-ups were added on the upper right and left second molars to improve vertical control. A Kobayashi ligature was tied to the upper left first premolar to allow full-time wear of  $\frac{3}{16}$ ", 6oz Impala criss-cross elastics, attached to buccal esthetic buttons on the lower left first premolar and first molar, for posterior crossbite correction on the left side (Fig. 6).



**Fig. 4** A. Small .016" × .016" Copper Ni-Ti wire inserted in upper arch after six months of treatment. B. One month later, small .018" × .018" Copper Ni-Ti wire inserted in lower arch, upper left-first molar build-up reduced, and esthetic buttons bonded to upper left canine and second premolar and lower left first premolar and first molar. C. Full-time  $\frac{3}{16}$ ", 6oz Impala† intermaxillary elastics used to begin bite closure.

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**Fig. 5** After eight months of treatment, Kobayashi ligature tied to upper left lateral incisor and canine and lower left canine. Full-time  $\frac{3}{16}$ ", 6oz Impala vertical lingual elastics used to resolve anterior open bite.



**Fig. 6** After 10 months of treatment, occlusal build-ups added on upper right and left second molars, and Kobayashi ligature tied to upper left first premolar. Full-time  $\frac{3}{16}$ ", 6oz Impala criss-cross elastics attached to buccal esthetic buttons on lower left first premolar and first molar to facilitate posterior crossbite correction.

One month later, a medium .018" × .018" Copper Ni-Ti wire was inserted in the upper arch, and an open elastic chain was added between the lower right and left first molars to close the space between the lower left lateral incisor and canine (Fig. 7). Another four months later, an .0175" × .0175" TMA\*\*\* lingual wire was inserted in the upper arch, with finishing bends added to improve anterior and posterior intercuspation. Kobayashi ligatures were tied to the upper left first premolar and lower left second premolar to allow daytime wear of  $\frac{3}{16}$ ", 6oz Impala lingual

elastics between the upper left canine and first premolar and the lower left second premolar (Fig. 8). This again created a barrier for the tongue (tongue-crib effect) in the buccal region to improve bite closure and stability. Thereafter, the criss-cross elastics between the upper left first premolar and the lower left first premolar and first molar were worn at night only to counteract the crossbite tendency.

Three months later, an open elastic chain was added between the upper right first molar and left first molar to keep all the spaces closed. In the ensuing months, upper and lower elastic chains were replaced as the upper occlusal build-ups were progressively reduced. After another four months, an esthetic button was bonded to

the lower right first molar and a Kobayashi ligature was tied to the upper right second premolar to allow full-time wear of  $\frac{3}{16}$ ", 6oz Impala criss-cross elastics, improving intercuspation and counteracting the crossbite tendency on the right side (Fig. 9).

After 24 months of treatment, the fixed appliances were removed and temporary upper and lower Essix‡ retainers were delivered (Fig. 10A). Two weeks later, upper 4-4 and lower 3-3 fixed lingual retainers were bonded indirectly, and new upper and lower Essix retainers were fabricated.

## Treatment Results

Solid Class I canine and molar relationships were obtained



Fig. 7 After 11 months of treatment, medium .018" × .018" Copper Ni-Ti wire inserted in upper arch and open elastic chain added between lower right and left first molars to start space closure in lower arch.

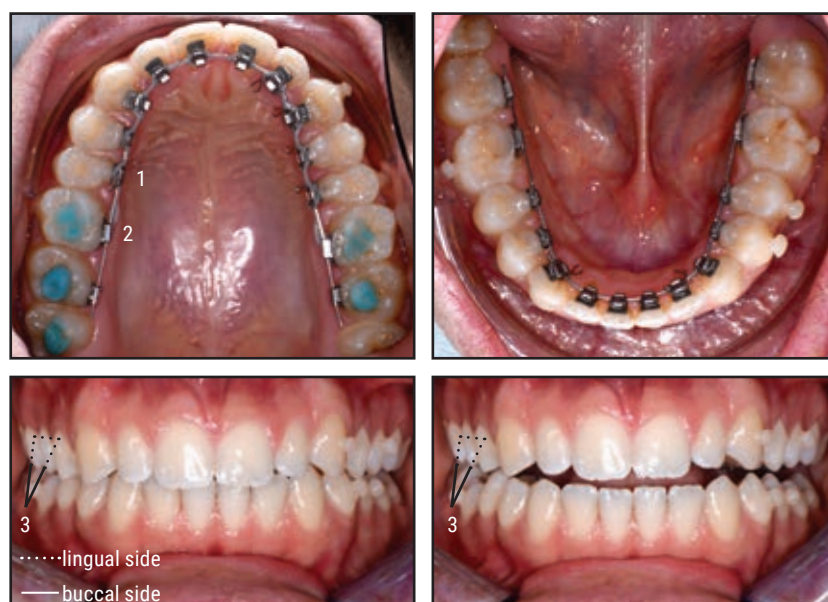
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**Fig. 8** After 15 months of treatment, .0175" × .0175" TMA\*\*\* lingual wire with finishing bends inserted in upper arch and Kobayashi ligatures tied to upper left first premolar and lower left second premolar. Daytime  $\frac{3}{16}$ ", 6oz Impala lingual elastics worn between upper left canine and first premolar and lower left second premolar to improve bite closure.



**Fig. 9** After 22 months of treatment, esthetic button bonded to lower right first molar and Kobayashi ligature tied to upper right second premolar. Full-time  $\frac{3}{16}$ ", 6oz Impala criss-cross elastics worn between upper right second premolar and first molar and lower right first molar to improve intercuspation and counteract crossbite tendency.



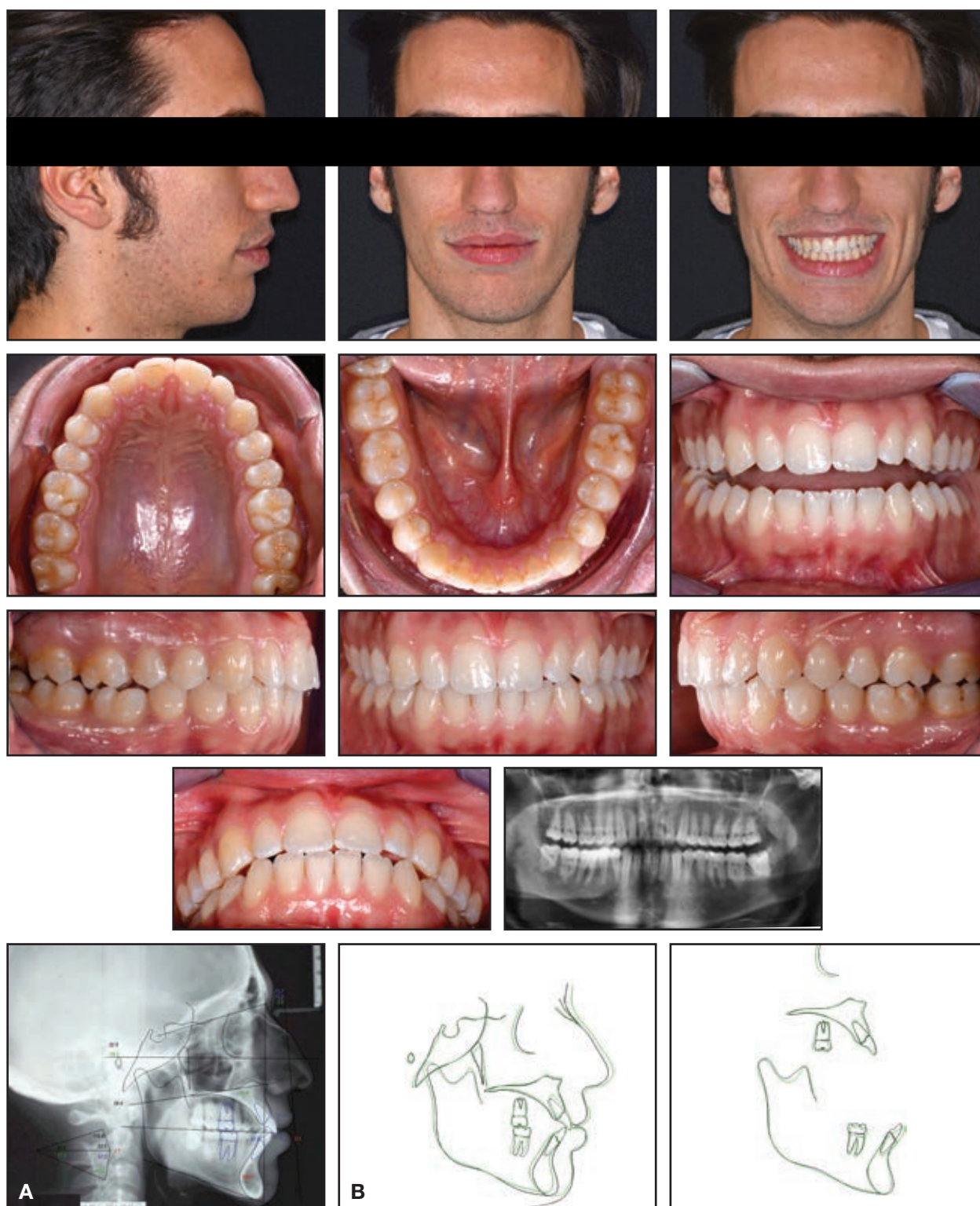


Fig. 10 A. Patient after 24 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

## Nonextraction Treatment of an Open Bite with a Lingual Appliance

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**Fig. 11** Patient six months after treatment.

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on both sides. The crowding was resolved, and the open bite was corrected in the anterior, buccal, and posterior regions. The resulting light occlusal contact was ideal. The patient finished with a pleasant smile arc and a harmonious profile. A final panoramic radiograph confirmed root parallelism, while cephalometric analysis indicated a skeletal Class I relationship with a properly oriented occlusal plane. Due to favorable lingual biomechanics and setup prescriptions, the lower-incisor inclination was reduced by 5° (Fig. 10B, Table 1). The Ricketts E-line and Merrifield Z-angle were harmonious, demonstrating the efficacy of the non-extraction treatment.

Composite reconstructions were performed on the upper left lateral incisor and canine. Six months after the completion of treatment, the results were stable (Fig. 11).

## Discussion

Researchers have confirmed the stability of open-bite resolution by means of lingual orthodontics in adult patients.<sup>6</sup> Combining this treatment approach with speech therapy is the key to success in many cases.<sup>7</sup> In the case presented here, the tongue-crib effect of the intermaxillary lingual elastics was crucial, resulting in faster closure of the open bite and reducing the tendency to relapse.

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