

Correction of Severe Overbite and Gummy Smile in Patients with Bimaxillary Protrusion

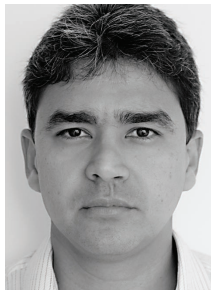
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Deep overbite can be corrected by several means, including extrusion of posterior teeth, flaring of lingually tipped anterior teeth, intrusion of incisors, and orthognathic surgery.¹⁻³ The tendency of the teeth to move vertically during orthodontic treatment, however, necessitates careful design of the force system to avoid negative effects on the profile.^{4,7} Posterior extrusion is inappropriate for long-face patients because it will rotate the mandible clockwise and thus worsen the Class II relationship.^{4,7-9} Incisor intrusion can control the vertical dimension and is therefore indicated in a patient with long-face syndrome, excessive upper incisor exposure, a high gingival smile line, and a deep curve of Spee.^{2,8}

This article describes the treatment of severe overbite and an accompanying “gummy smile” with high-pull J-hook headgear and a modified intrusion archwire.

Case Report

A 14-year-old female in the permanent dentition presented with the chief complaints of a gummy smile and crowding. She showed a convex profile, a large interlabial gap in rest position, labial protrusion, and excessive lower facial height (Fig. 1). The gingival display in both the anterior and posterior areas suggested vertical maxillary excess (Fig. 2). Intraoral examination revealed a Class II canine relationship with a severe anterior deep bite and 10mm overjet. The upper incisors were lingually tipped, and the first upper premolars were in buccal crossbite. The lower arch was crowded, with a deep curve of Spee. Cephalometric examination indicated a convex profile, a Class II skeletal relationship, a retrognathic mandible, a slightly excessive mandibular plane angle, and protrusive upper incisors (Table 1).



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Correction of Severe Overbite and Gummy Smile

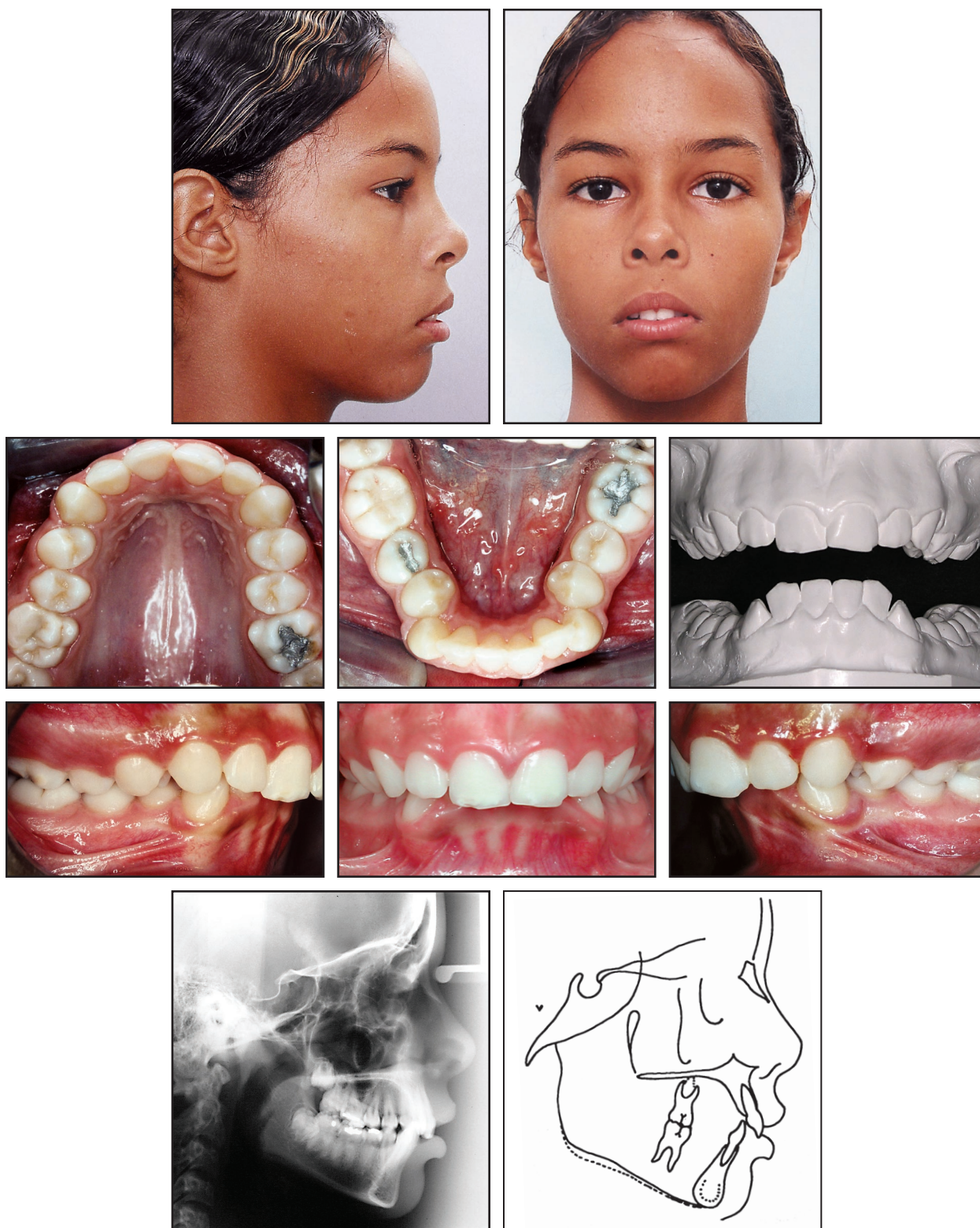


Fig. 1 14-year-old female with Class II malocclusion, deep overbite, excessive facial height, moderate arch-length discrepancy, and “gummy smile” due to vertical maxillary excess before treatment.

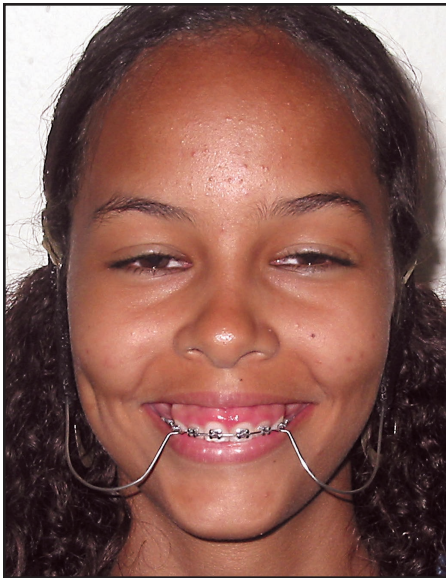


Fig. 2 High-pull J-hook headgear placed after premolar extractions; note excessive gingival exposure during full smile.

The treatment strategy was to extract the upper and lower first premolars to obtain space for leveling and alignment of the dentition and to reduce the labial protrusion.

A high-pull J-hook headgear was prescribed to distalize the upper canines and control the vertical dimension during the later phases of treatment (Fig. 2). The patient was instructed to wear

TABLE 1
CASE 1 CEPHALOMETRIC DATA

	Pretreatment	Post-Treatment
SNA	80.0°	78.0°
SNB	74.0°	75.0°
ANB	6.0°	3.0°
IMPA	94.0°	94.0°
SN-GoGn	34.0°	32.0°
1-NA	7.0mm	4.0mm
1-NB	5.0mm	4.5mm
LS-Ls	4.0mm	0.0mm
LS-Li	5.0mm	1.5mm

the headgear eight to 10 hours per day.

The lower canines were moved distally with a passive .019" × .025" stainless steel archwire and elastomeric chain, using anchorage from a lingual arch and from tying the posterior teeth together as a unit, to create space for incisor alignment. After two months of initial alignment, lower incisor intrusion was initiated with a three-segment stainless steel archwire consisting of two .019" × .025" base arches, each incorporating the canines, second premolars, and first and second molars on both sides; and an .018" × .025" intrusion arch welded between the first molars and second premolars and inserted into the incisor bracket slots, with an intrusive force of 120g (Fig. 3A,B). The archwire

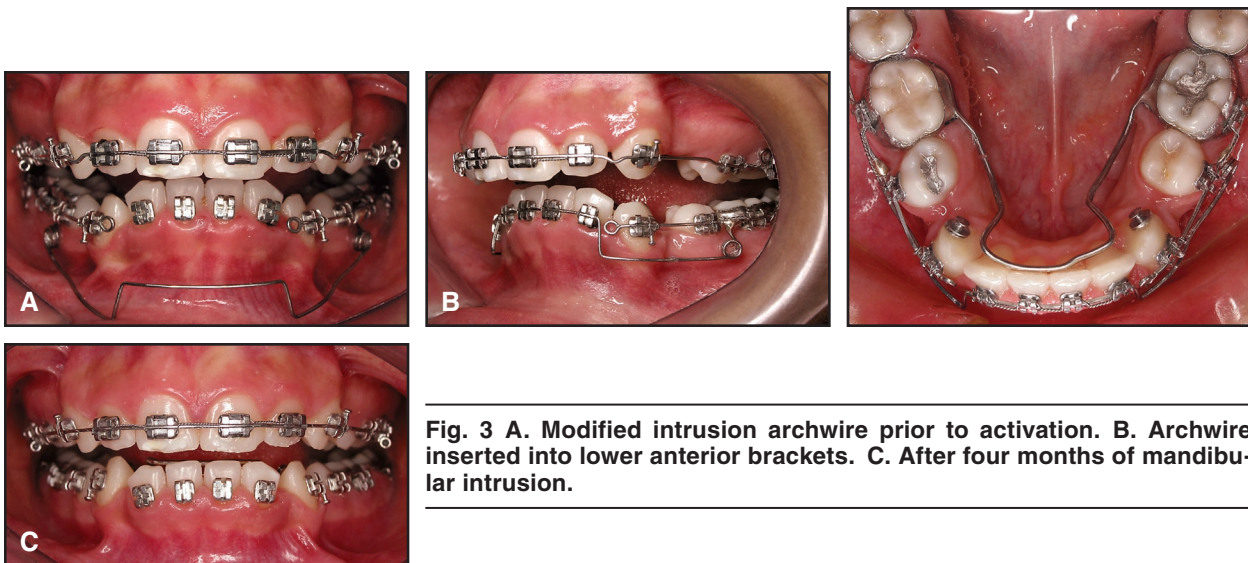


Fig. 3 A. Modified intrusion archwire prior to activation. B. Archwire inserted into lower anterior brackets. C. After four months of mandibular intrusion.

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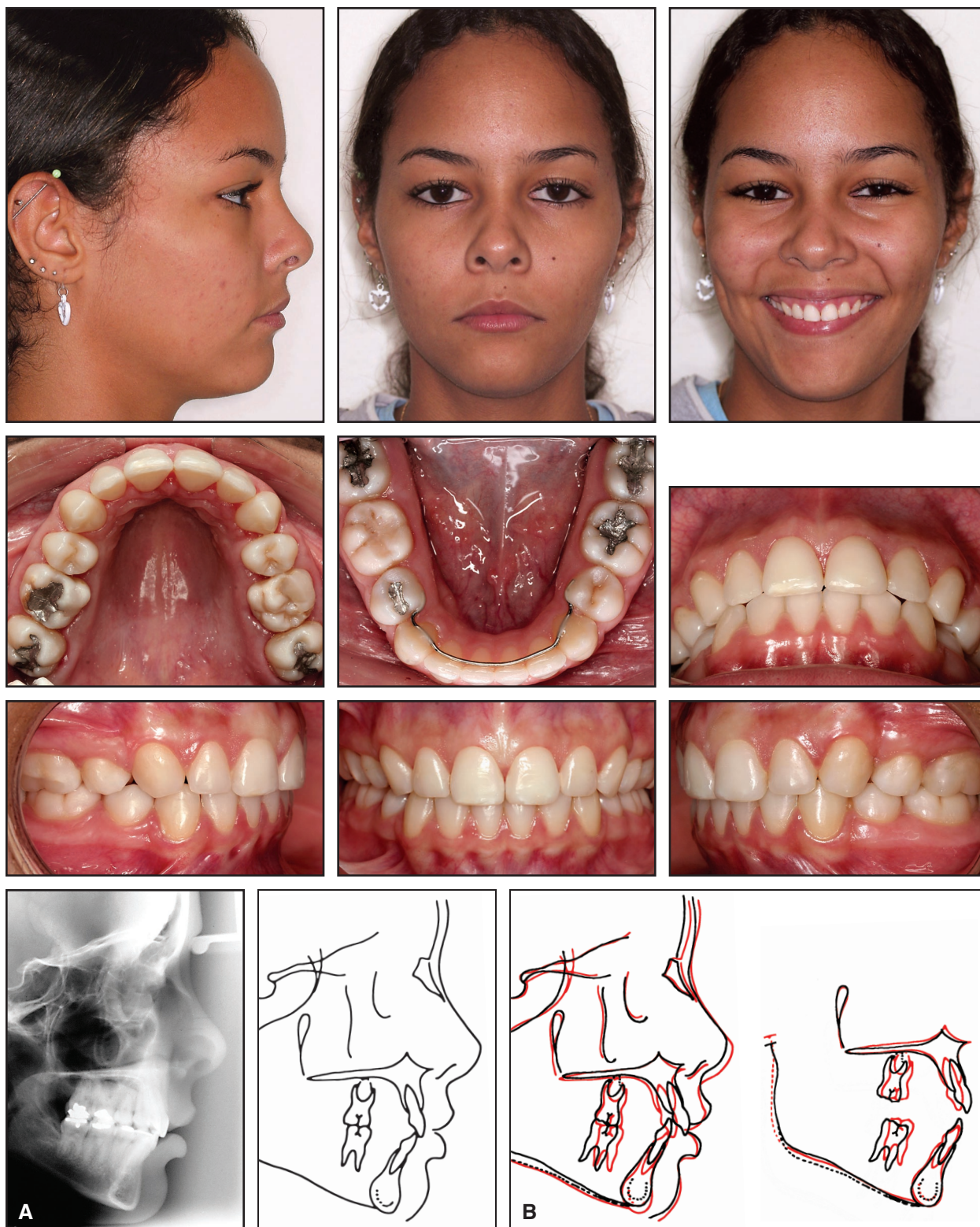


Fig. 4 A. Patient after 36 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

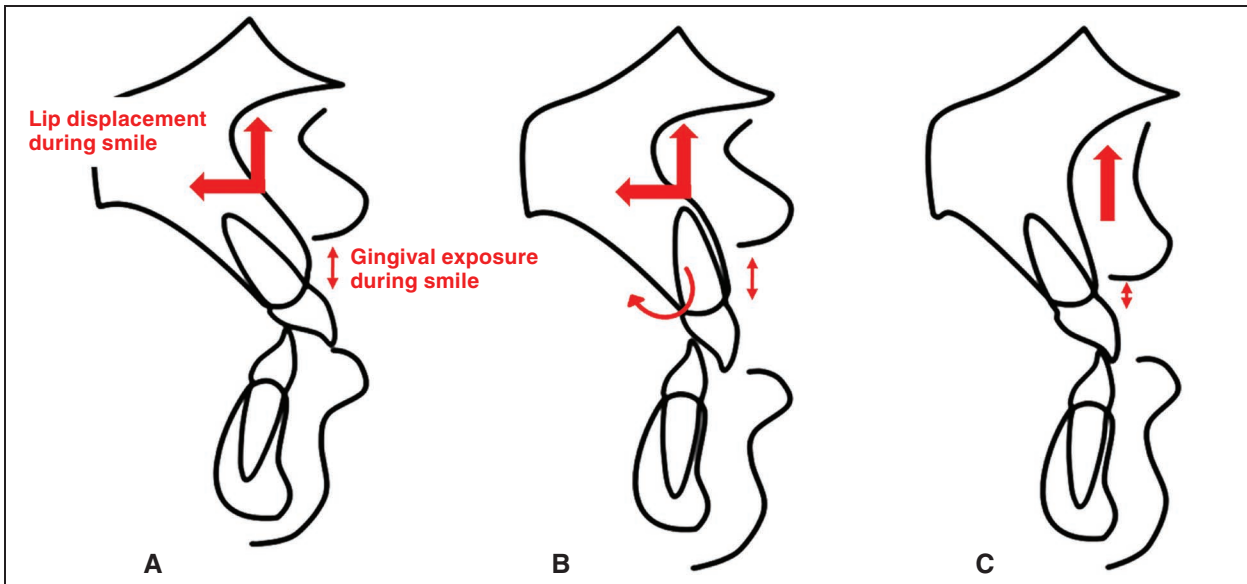


Fig. 5 Upper-lip dynamics in smiling. **A.** Pronounced alveolar sulcus: upper lip moves significantly upward and backward during smile. **B.** Upper incisors retracted without torque control: sulcus and behavior of upper lip are unchanged, possibly increasing gingival display due to anteroposterior position of gingivae relative to labial surfaces of maxillary incisors. **C.** Torque-controlled retraction of upper incisors: anatomy of vestibular sulcus and movement of upper lip are modified so that lip cannot “slip” backward toward sulcus; maxillary incisor display is thus significantly reduced.

was tied back to avoid incisor proclination.

Four months later, when the curve of Spee had been completely leveled and the deep bite corrected, continuous stainless steel archwires were placed in both arches (Fig. 3C). The anterior teeth were retracted with helical space-closing loops and Class II elastics. During this phase, which lasted about eight months, the patient wore the J-hook headgear only while sleeping to control the vertical dimension. A gingivectomy was performed to increase the crown lengths of the anterior teeth and help reduce the gummy smile.

After 36 months of treatment, including 16 months of headgear wear, the patient showed proper overbite and overjet, Class I canine and molar relationships, and well-aligned, level dental arches (Fig. 4, Table 1). The gummy smile and labial protrusion were significantly reduced, and the profile had improved. Superimpositions showed favorable downward and forward mandibular growth that could be attributed to control of the vertical dimension. The upper incisors had been intruded 2mm, and the lower incisors 3mm. After appliance removal, a maxillary wraparound retainer with a passive anterior bite block was delivered,

and a lingual 4-4 retainer was bonded in the mandibular arch.

Discussion

The mechanics described in this case are based on the segmented-arch technique in the mandibular arch^{10,11} and Tweed-Merrifield directional forces in the maxillary arch.⁶ The posteriorly directed and intrusive forces from the headgear produce a moment that minimizes steepening of the occlusal plane.¹² Many authors warn against the use of a continuous archwire to correct deep overbite in patients with flared incisors.^{1,12,13} Our intrusion archwire is a modification of the one described by Shroff and colleagues,¹¹ but since insertion of the archwire into the incisor brackets can produce undesirable moments that promote labial tipping,^{11,13} we use a tie-back to induce a slight retractive force.

Some clinicians avoid incisor retraction in patients with gummy smiles because of the fear of worsening the gingival display.⁷ We believe that adequate torque control will prevent excessive lingual incisor inclination, which may be the true

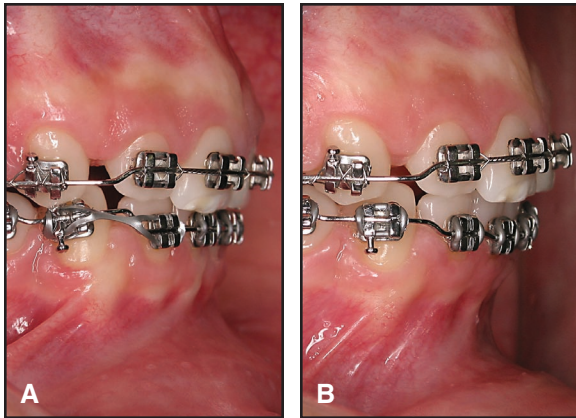


Fig. 6 A. Incisor angulation before torque application. B. Incisor torque six months later.

cause of increased gingival display during smiling. Retraction of the maxillary incisors without torque control may not reduce the alveolar sulcus—an important requirement of treatment for dento-alveolar protrusion, considering that the upper lip can be displaced posteriorly and upward in smiling, thus increasing the gingival display (Fig. 5). In the case shown here, although torque application during incisor retraction led to changes in the buccal alveolar region as the roots became less pronounced (Fig. 6), we still finished the case with an acceptable degree of palatal tipping of the upper incisors (Fig. 4). Our patient had a slightly retrusive mandible, which often requires such compensation because of the amount of retraction needed and the proximity of the roots to palatal cortical bone.¹⁴⁻¹⁶

In view of the correlation of torque with smiling esthetics, torque expression must be

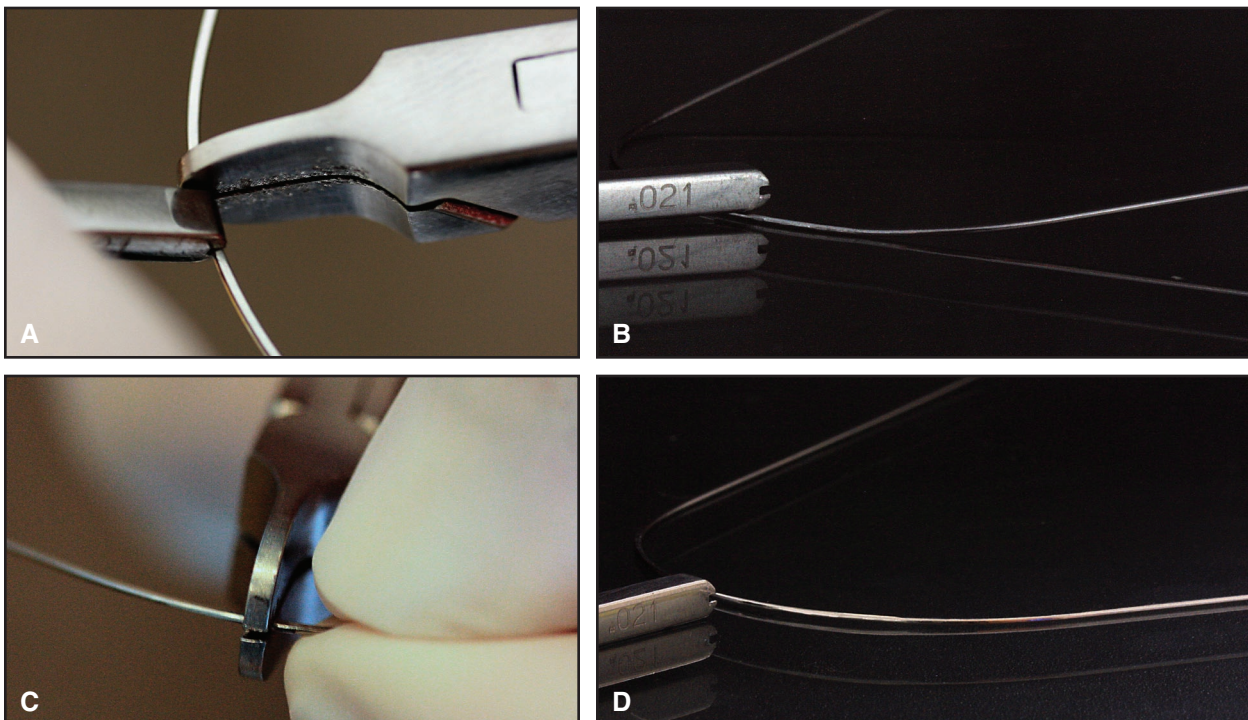


Fig. 7 Sequence of applying 3rd-order bends to anterior region of .019" × .026" stainless steel archwire* for palatal root torque of incisors. A. Torsion bends applied to mesial aspect of canines with torquing key and No. 442 plier (or two pliers). B. Posterior sections of archwire bent at about 15° to anterior section. C. Sequential short, gentle, upward 2nd-order bends placed from canine to canine to apply torque to anterior section. D. Finished archwire in one horizontal plane.



Fig. 8 Incisor torque corrected in 60-year-old patient by bending .019" × .026" stainless steel wire with No. 442 pliers (Tweed style). **A.** Before treatment. **B.** After two years of treatment.

assessed repeatedly during treatment. Clinical examination and progress cephalograms can help determine the appropriate amount of torque for each patient. Cone-beam computed tomography can provide more accurate views, albeit at relatively high cost. Torquing requirements must sometimes be balanced with the need for palatal tipping of the upper incisors to avoid negative esthetic results or compromised bone levels.

Accurate wire bending is the fastest and most flexible way to obtain the desired torque. In this case, we sequentially applied torque by bending the anterior section of the archwire with two No. 442 pliers or with one plier and a torquing key (Fig. 7). In other patients requiring torque control in the upper anterior region, we have bent .019" × .026" stainless steel archwires* with No. 442 pliers and used zero-torque brackets (Figs. 8,9). For the patient in Figure 9, we applied segmental intrusive mechanics in the mandibular arch, similar to the treatment shown in this article. Regardless of method, torque application can take as long as five

*TP Orthodontics, Inc., 100 Center Plaza, La Porte, IN 46350; www.tportho.com.

months to complete, due to the amount of bone to be resorbed and other factors.¹⁷

Some degree of relapse is often seen during post-retention assessment of deep-bite correction. Nevertheless, incisor intrusion seems to be more stable than posterior extrusion in these cases.¹⁸

Conclusion

Patients with bimaxillary protrusion and gummy smile require accurate and repeated evaluation during orthodontic treatment, given that the degree of retraction of the anterior teeth can change the anatomy of the vestibular sulcus and modify the maxillary incisor display during movement of the upper lip. The modified intrusion archwire is a predictable means of correcting deep overbite when incisor intrusion is indicated and molar extrusion is undesirable. Retraction of the maxillary incisors with torque and vertical control, using high-pull J-hook headgear, changes the vertical behavior of the upper lip in smiling and thus improves facial and smile esthetics during the correction of severe overbite.



Fig. 9 Retreatment of 38-year-old patient previously treated with four first premolar extractions, with incisor torque corrected by bending .019" x .026" stainless steel wire with No. 442 pliers (Tweed style). **A.** Before treatment. **B.** After 30 months of treatment.

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