CASE REPORT

"Sagittal First" Management of a Growing Skeletal Class II Patient

MADHAN BALASUBRAMANIAN, BDS, MDS(Orth), MS
ALOK OJHA, BDS, MDS

Sagittal and transverse discrepancies often coexist in skeletal Class II malocclusions.[1-3] Orthopedic growth modification can work well in such cases, provided that the remaining pubertal growth is adequate and that the clinician can time treatment to coincide with the peak growth period.[4,5]

The transverse discrepancy is generally corrected first, establishing a proper base for the sagittal correction to follow.[6,7] For example, in a skeletal Class II case with a narrow maxillary arch and retrusive mandible, maxillary expansion is performed initially to facilitate functional mandibular advancement.[6,8] The present article illustrates an exception to this rule, in a case where sagittal correction was undertaken before transverse correction to make optimal use of the patient's pubertal growth spurt.

Diagnosis

A 13-year-old male presented with the chief complaint of protrusive upper front teeth. He exhibited a convex profile, an acute nasolabial angle, a protrusive upper lip, a trapped lower lip, and a deficient chin (Fig. 1A). The incompetent lips, steep mandibular plane, and excessive incisal exposure and lower anterior facial height all indicated a vertical growth pattern.

Intraoral examination revealed generalized enamel hypoplasia. All permanent teeth were present except for the unerupted third molars. The molar, canine, and incisor relationships were Class II, the maxillary anterior teeth were severely proclined, and the overjet and overbite were excessive (12.8mm and 4mm, respectively). Midlines were coincident, but the anterior maxillary arch appeared narrow.

Cast analysis confirmed the narrow maxilla and a lack of space for dental expansion, since the buccal teeth were already flaring out from the alveolus (Fig. 1B). Cephalometric analysis supported the diagnosis of a Class II, division 1 malocclusion in a skeletal Class II base, with a vertical growth pattern and a combination of mild maxillary prognathism and mandibular retrusion (Table 1). Evaluation of the patient's hand-wrist and cervical radiographs indicated he was at the peak of the pubertal growth spurt, with considerable growth remaining (Fig. 1A).

When the patient positioned the mandible forward, he showed mild upper lip protrusion and an end-on transverse relationship of the canines, reemphasizing the need for maxillary expansion (Fig. 2).

Dr. Balasubramanian is a Professor and Dr. Ojha is a former postgraduate student, Department of Orthodontics and Orofacial Orthopedics, Jaipur Dental College, Jaipur, Rajasthan, India. Contact Dr. Balasubramanian at No. 4, Flat F3, II Main Road, Sri Iyappa Nagar, Koyambedu, Chennai 600092, India; e-mail: madhanb@hotmail.com.

Dr. Balasubramanian

Dr. Ojha

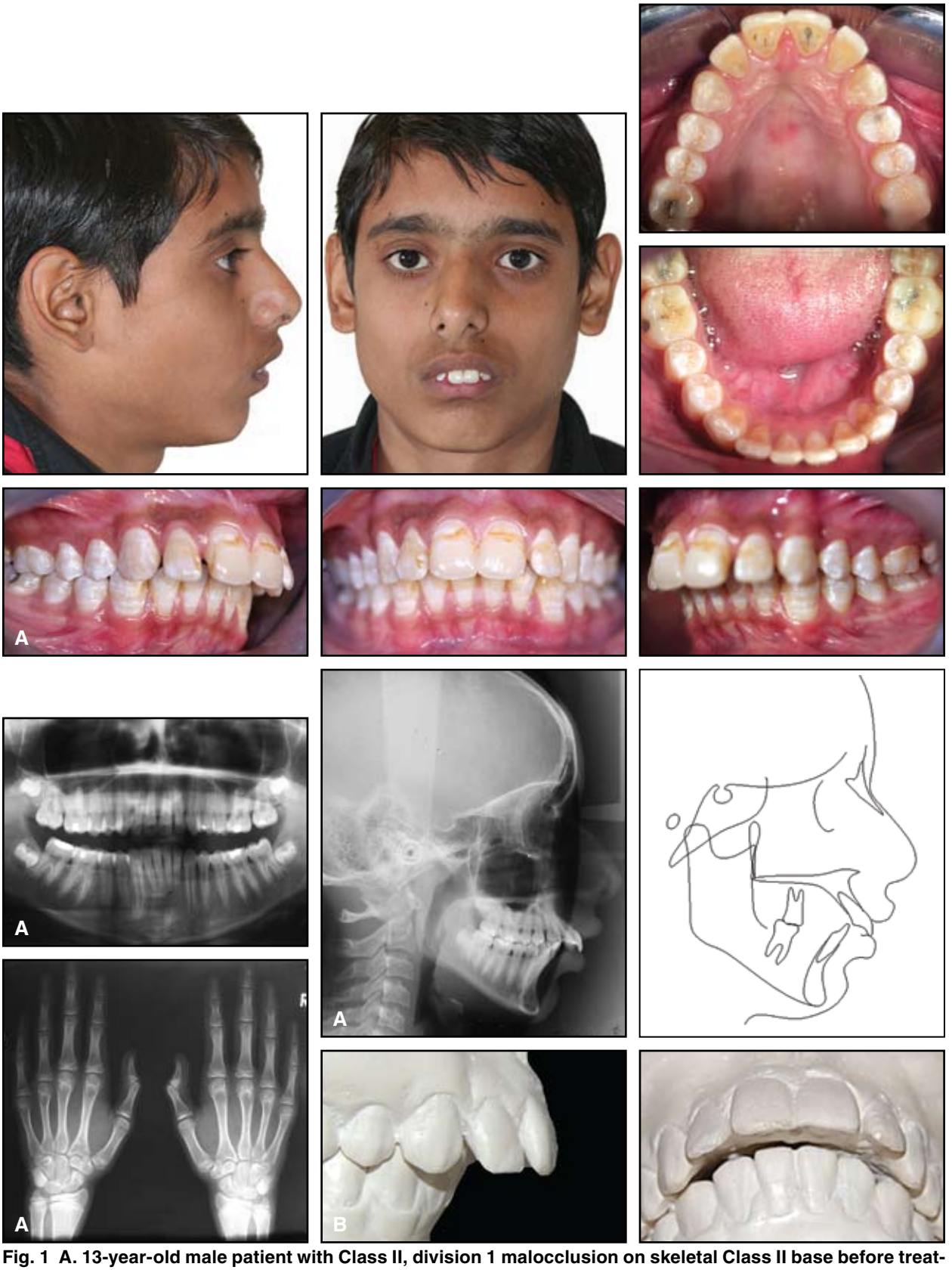

Fig. 1 A. 13-year-old male patient with Class II, division 1 malocclusion on skeletal Class II base before treatment. B. Cast photographs show flaring of buccal teeth within alveolar base.

TABLE 1
CEPHALOMETRIC AND CAST ANALYSIS

	Norm	Pretreatment	Post-Orthopedic	Post-Treatment
SNA	82.0°	69.6°	68.6°	67.8°
Co-A	—	86.0mm	85.7mm	85.6mm
SNB	80.0°	65.0°	67.0°	67.4°
SND	77.0°	64.3°	65.7°	67.8°
Co-Gn	—	118.0mm	123.0mm	125.0mm
ANB	2.0°	4.6°	1.6°	0.4°
Wits	–1.0mm	6.0mm	3.0mm	–0.4mm
SN-Occ	14.5°	23.5°	21.6°	23.6°
SN-GoGn	32.0°	43.1°	42.7°	40.9°
Jarabak ratio	64%	57%	58%	60%
U1-PP	109.0°	122.2°	114.0°	108.5°
U1-NA	4.0mm	15.0mm	13.0mm	11.5mm
L1-NB	4.0mm	8.0mm	8.5mm	7.5mm
IMPA	92.0°	100.0°	101.4°	99.0°
U6-PtV	16.0mm	23.5mm	21.0mm	22.0mm
Gl'Sn'Pog'	12.0°	–27.0°	–25.0°	–19.0°
Nasolabial angle	102.0°	94.0°	98.0°	108.0°
Overjet	2.5mm	12.8mm	5.2mm	2.1mm
Overbite	2.5mm	4.0mm	2.2mm	1.6mm
Upper intercanine width*		32.8mm	38.6mm	38.0mm
Lower intercanine width*		28.3mm	28.5mm	29.0mm
Upper intermolar width**		46.5mm	50.4mm	48.9mm
Lower intermolar width**		43.4mm	44.3mm	43.7mm

*Measured between cusp tips.
**Measured between occlusal central pits.

Treatment Plan

Because the skeletal discrepancies were in the borderline surgical range, both surgical and nonsurgical treatment plans were considered and presented to the patient. His refusal of any surgery and, more important, his growth status led us toward a functional-orthopedic approach.

A splinted Hyrax appliance was considered the logical choice to correct the transverse discrepancy. Normally, this would be followed by anteroposterior correction with combined headgear-activator orthopedics to restrict further maxillary growth and promote mandibular advancement. Because the pubertal growth status of a patient is more critical for sagittal than for transverse correction,[9] however, and because our patient was at the peak of pubertal growth, we decided to reverse the usual order of treatment and carry out the sagittal correction first. A fixed Twin Block-Hyrax appliance was chosen to perform the maxillary expansion while restricting forward maxillary growth[10,11] and retaining the mandibular advancement. This was to be followed by fixed-appliance therapy for simultaneous intrusion and retraction of the anterior teeth and finishing and detailing of the occlusion.

Treatment Progress

The activator-headgear appliance was fabricated with a 6mm sagittal advancement and a 7mm vertical opening in the pre-

Fig. 2 Patient with mandible postured forward, indicating occlusal interferences at canines and need for maxillary expansion.

Fig. 3 Patient at beginning of headgear-activator treatment phase.

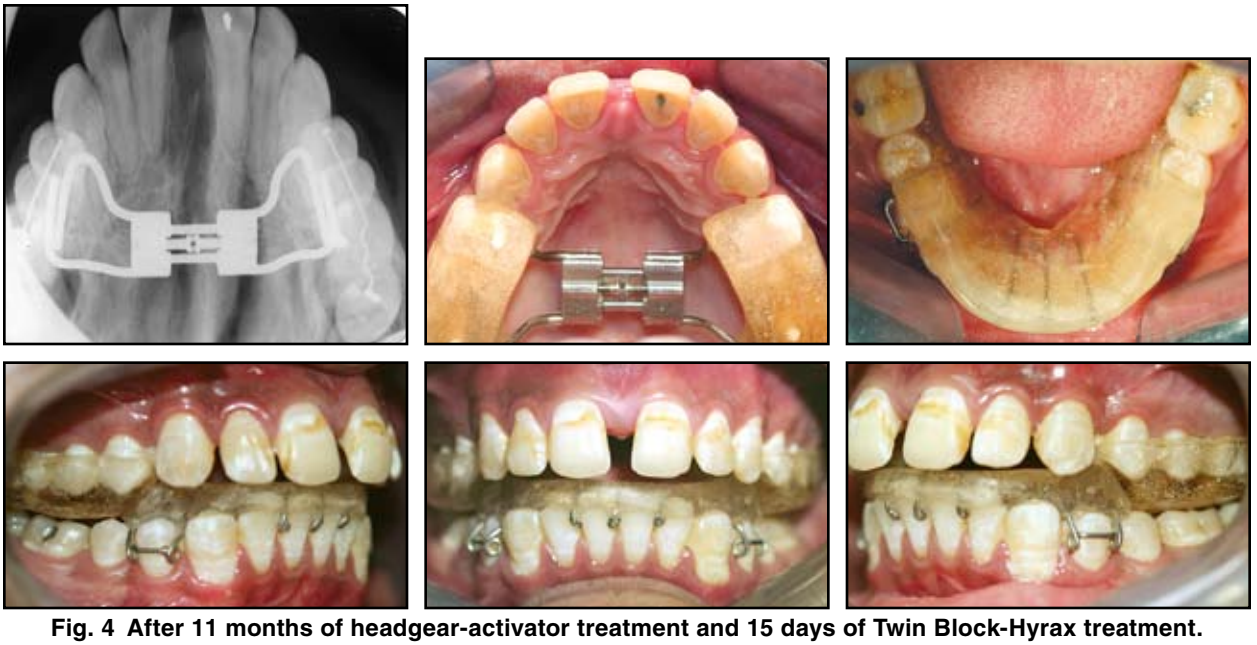

Fig. 4 After 11 months of headgear-activator treatment and 15 days of Twin Block-Hyrax treatment.

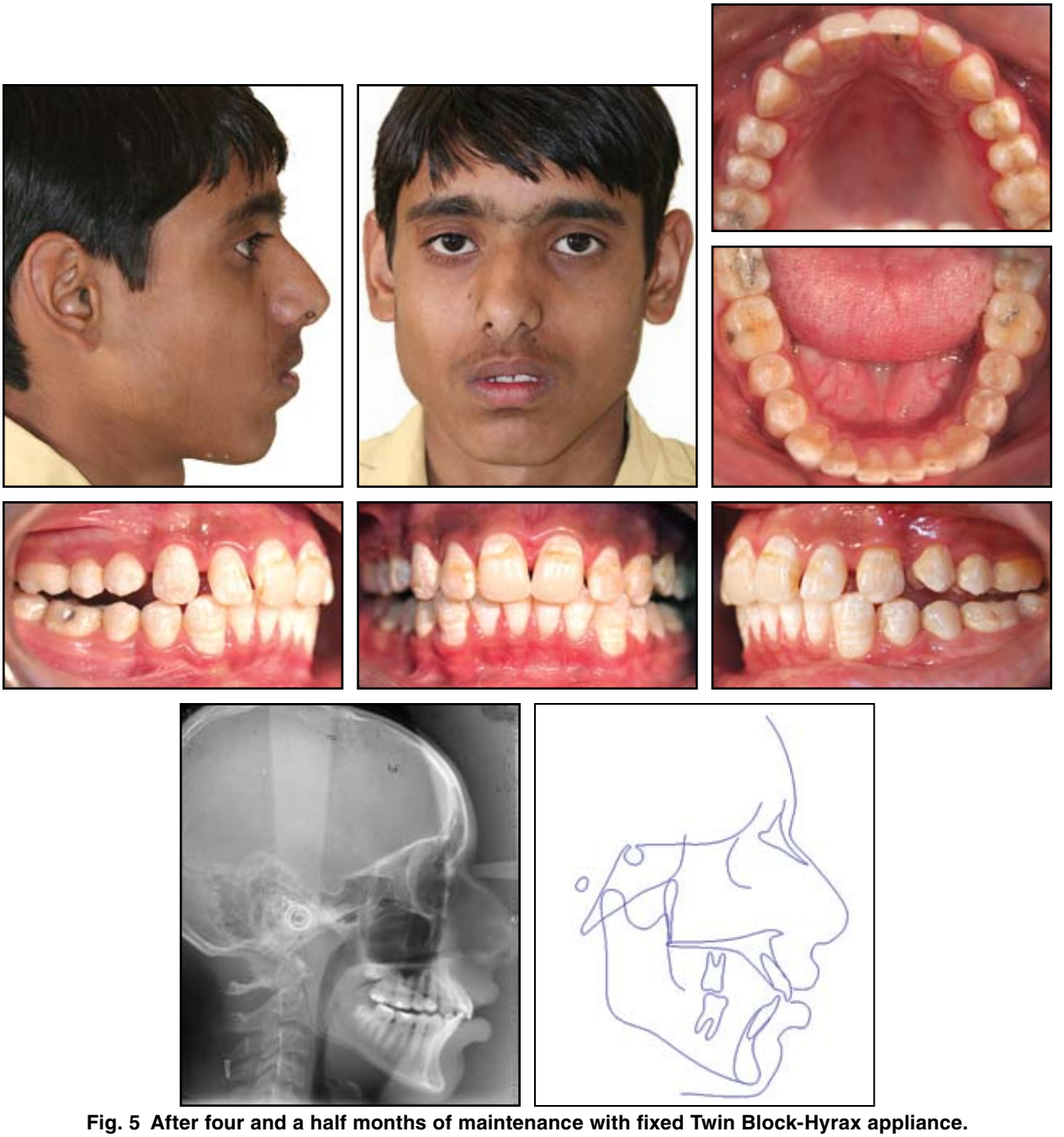

Fig. 5 After four and a half months of maintenance with fixed Twin Block-Hyrax appliance.

molar region, and the traction force was adjusted to 500g per side (Fig. 3). The patient was instructed to wear the activator full-time except during meals and contact sports, and the headgear at least 12 hours per day. After six months of wear, the labial bow was activated to retract the upper incisors into the opened spaces.

After 11 months of good compliance, the patient showed a Class I molar relationship with no dual bite and a considerably improved facial profile. He was then fitted with a fixed Twin Block-Hyrax appliance with the same vertical opening, but another 2mm of sagittal advancement. The upper component was cemented, while the lower remained removable. Following 15 days of expansion at .4mm per day (Fig. 4), the screw was stabilized with glass ionomer cement, and the appliance was left passively in place for another four and a half months.

After removal of the appliance, we noted a Class I molar relationship, an overjet of 5.2mm, and increases of 5.8mm and 3.9mm in the maxillary intercanine and intermolar widths, respectively. The increased arch width in the canine regions had

Fig. 6 Intrusion and retraction of maxillary incisors with utility arch.

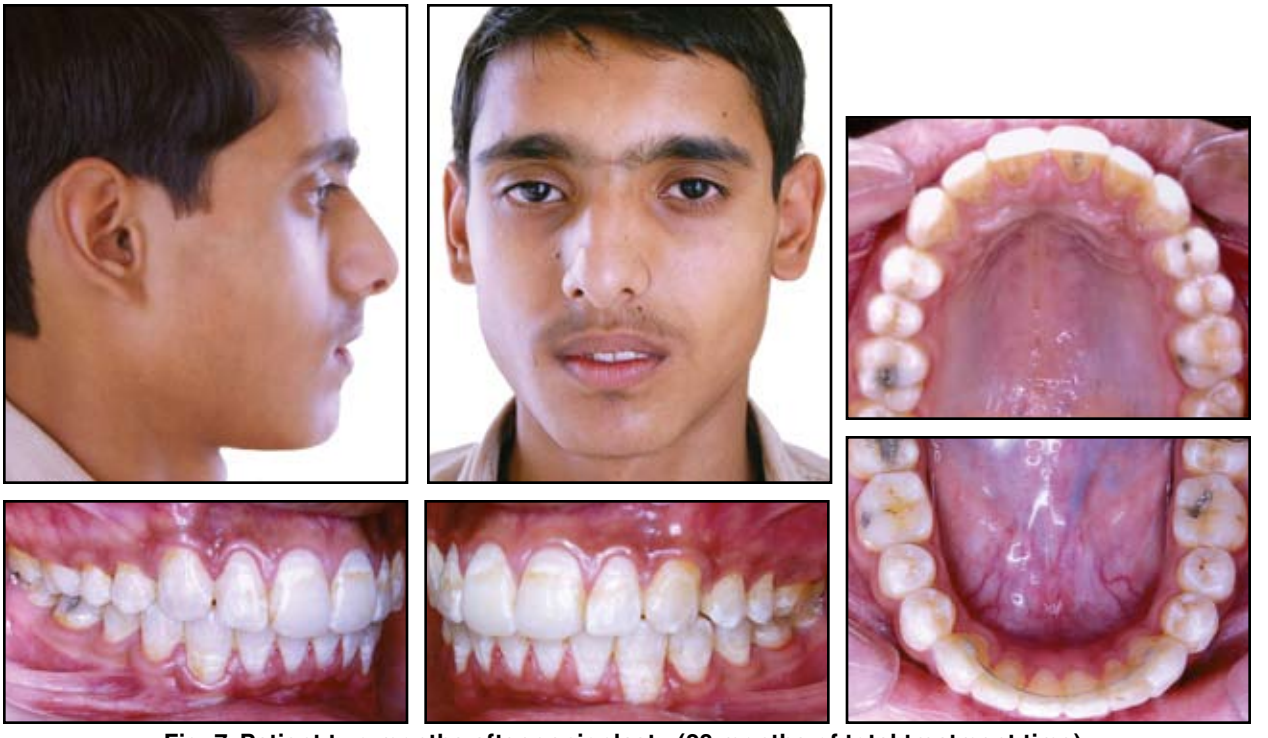

Fig. 7 Patient two months after genioplasty (28 months of total treatment time).

removed the occlusal interferences and settled the canines into a Class I relationship with adequate buccal clearance (Fig. 5). The patient's bilateral posterior open bite was normal for this stage (probably accentuated by intrusive forces from the untrimmed bite blocks) and was easily corrected in the subsequent phase. He practiced upper-lip exercises and an active anterior lip seal throughout the orthopedic treatment period.

Roth-prescription .022" brackets were then bonded. For the first seven months of fixed-appliance therapy, we used a removable transpalatal arch to maintain the vertical anchorage and sagittal expansion at the maxillary first molars, as well as 4.5oz Class II elastics to retain the sagittal correction. A utility arch was placed to intrude and retract the maxillary anterior teeth, closing the spaces created by arch expansion (Fig. 6).

After 10 months of fixed-appliance treatment, the patient was highly satisfied with the treatment results, but requested further improvement in the chin region. Since a Class I occlusion had already been established, we proposed a sliding augmentation genioplasty to advance the chin and reduce the lower anterior facial height. Motivated by the esthetic improvement he had seen to this point, the patient readily consented to surgery, and the procedure was performed under general anesthesia.

The fixed appliances were debonded two months after surgery, for a total treatment time of 28 months (Fig. 7). The patient wore an upper Hawley retainer and a bonded lower lingual retainer for one year (Fig. 8).

Fig. 8 Patient two months after end of one-year retention period.

Treatment Results

Superimposition of the cephalometric tracings revealed a restriction in maxillary growth and considerable forward movement of the chin, resulting in a harmonious basal relationship (Fig. 9). If we had followed the traditional sequence of transverse correction followed by sagittal advancement during the patient's growth phase, this magnitude of change would have been impossible.

Other factors contributing to the correction included sagittal and vertical maintenance of the maxillary molars, intrusion and

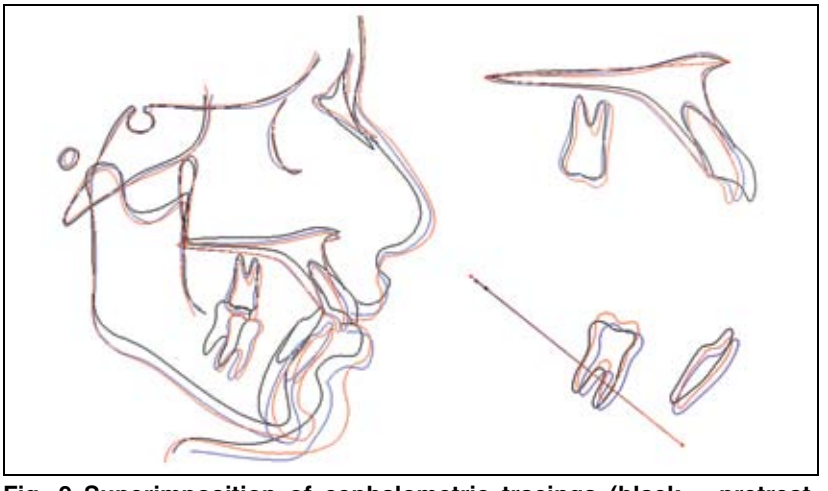

Fig. 9 Superimposition of cephalometric tracings (black = pretreatment; blue = after activator-headgear and Twin Block-Hyrax treatment; red = after debonding).

Fig. 10 Maxillary arch widths before treatment (left), after Twin Block-Hyrax treatment (middle), and after debonding (right).

retraction of the maxillary anterior teeth, and counterclockwise rotation of the occlusal plane. The genioplasty improved the esthetic appearance of the chin.

Figure 10 shows the significant maxillary expansion that was achieved with the Twin Block-Hyrax appliance and maintained until debonding. Although the upper anterior intrusion and increased tonicity of the upper lip reduced the incisal exposure, a complete passive lip seal could not be achieved. On retrospective analysis, however, the treatment plan was justified by the results achieved (Fig. 11).

Conclusion

This unconventional "sagittal first, transverse next" approach took advantage of the patient's pubertal growth spurt to achieve a sagittal correction that otherwise would have been a missed opportunity. Our case exemplifies the need for individualized treatment planning rather than a cookbook approach in the management of dentofacial deformities.

Fig. 11 Composite photograph depicting change in profile over 42 months.

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