Case Report SH

Combined surgical and orthodontic treatment of an anterior open bite

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This 27-year-old female presented to the orthodontic clinic with a chief complaint of poor function when chewing. She also expressed a desire for improved esthetics. Her past medical history was significant as she was medicated for increased intraocular pressure.

The patient exhibited a straight profile with a shallow labiomental sulcus and a mildly obtuse nasolabial angle. Lower facial height appeared to be long and her lips were incompetent. She had a Class I malocclusion with mild crowding in both dental arches. Her occlusion was complicated by a severe anterior open bite and bilateral posterior crossbite. The maxilla appeared to have a posterior cant suggested by excessive gingival exposure posteriorly with no gingival display of the incisor teeth when smiling broadly. Gingival recession was apparent on the mandibular right central incisor. A periodontal evaluation suggested that a free gingival graft was not warranted as an adequate amount of attached gingiva was present.

Functional examination revealed the presence of balancing interferences upon lateral excursive movements and no incisal guidance during mandibular protrusion. Maximum opening was 54 mm with no deviations or joint sounds.

Cephalometric evaluation revealed a Class III skeletal relationship (ANB + 1.5, WITS Appraisal -8 mm) which was camouflaged somewhat by a skeletal hyperdivergency (MP-SN 45°, PFH 60%). The apparent posterior cant to the maxilla was confirmed cephalometrically with a PP-NA angle of 94°. Dental compensations typical of a skeletal Class III malocclusion were present; mildly procumbent and proclined maxillary incisors (27°, and 7 mm to NA) and retroclined and retrusive mandibular incisors (13°, 2 mm to NB; and 73° to MP).

Figure 1A

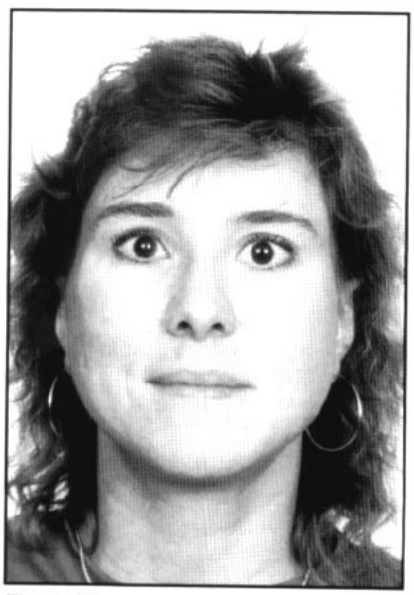

Figure 1B

Figure 1A-B Pretreatment photographs

The problem list is summarized as follows:

Skeletal: Class III maxillo-mandibular relationship with a skeletal hyperdivergency

Dental: Anterior open bite with a bilateral posterior crossbite

Dental compensations with mild crowding

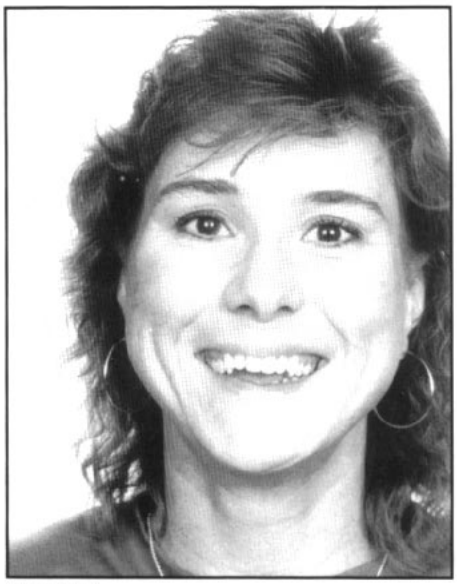

Figure 2A

Figure 2B

Figure 2A-B
A. Pretreatment photograph
B. Presurgical photograph

Figure 3
Video imaging projection

Figure 3

Figure 4A

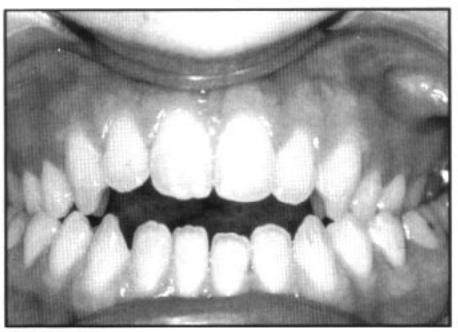

Figure 4B

Figure 4C

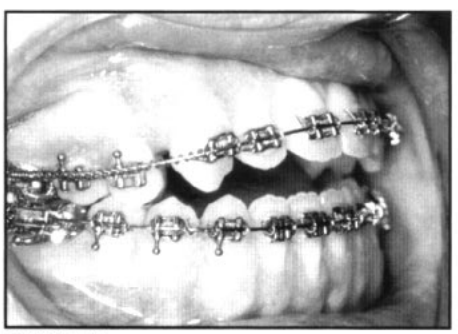

Figure 5A

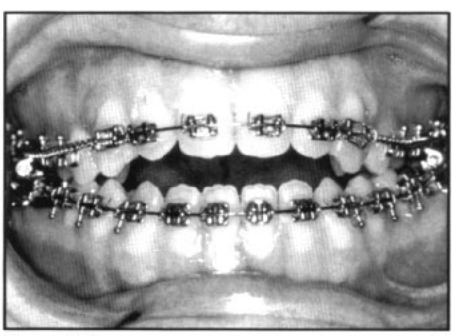

Figure 5B

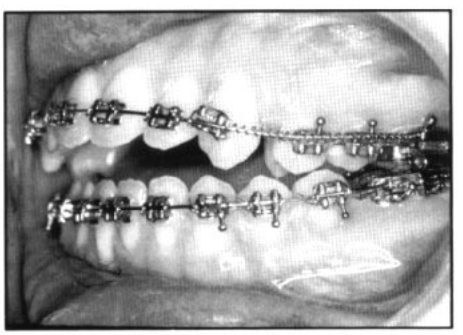

Figure 5C

Figure 4A-C
Pretreatment intraoral photos

Figure 5A-C
Presurgical intraoral photos

Severe step in the maxillary occlusal plane
Esthetic: Anterior open bite with lip incompetence
Straight profile
Functional: Absence of a functional occlusion

A combined orthodontic and surgical option was accepted by the patient. The surgical plan included a segmental LeForte I osteotomy with differential impaction combined with a bilateral sagittal split osteotomy to shorten the mandible following autorotation. Video imaging projections predicted that facial change would be minimal with the proposed surgical approach. This finding was significant to the patient since she was satisfied with her facial appearance. Presurgical orthodontic treatment consisted of dental alignment (nonextraction), continuous leveling of the mandibular arch and segmental leveling of the maxillary dentition.

Course of treatment

All teeth were bonded/banded with .018″ x .025″ edgewise appliances. Triple buccal molar tubes were placed on the maxillary first molars while bands with single tubes were used on the remaining molars. The brackets on the maxillary canines were reversed to move the roots

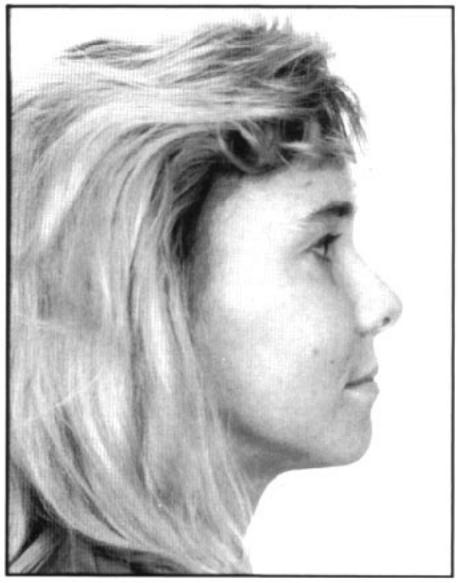

Figure 6A

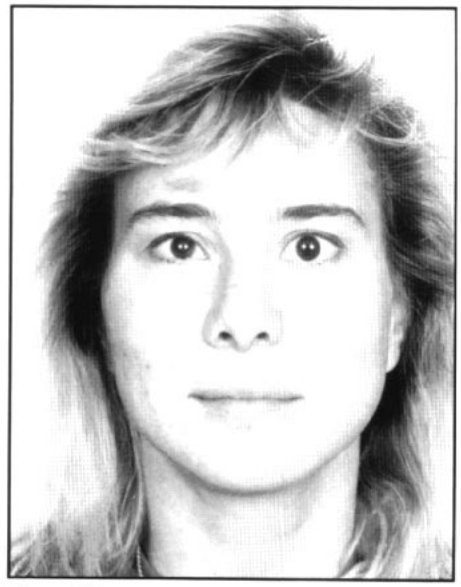

Figure 6B

Figure 6C

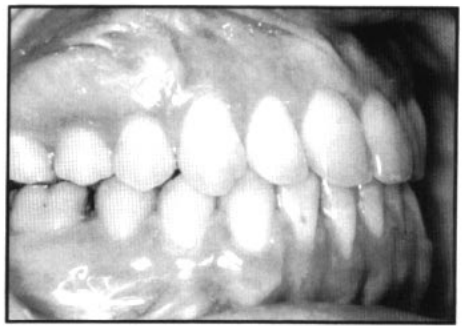

Figure 7A

Figure 7B

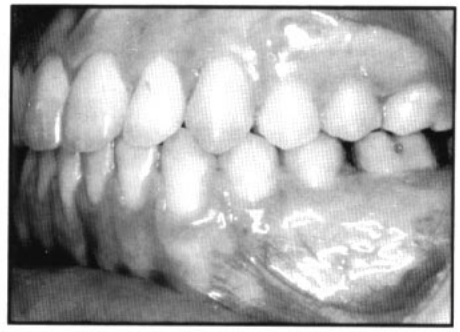

Figure 7C

Figure 6A-C Posttreatment photographs

Figure 7A-C Posttreatment intraoral photos

mesially, away from the proposed sites of the osteotomy. The anterior segment (3-3) was leveled from a continuous wire originating from the auxiliary slot on the first molar. Once the segments had been aligned, opening coils were inserted from the auxiliary slot to the canines to increase access for the osteotomy. The mandibular arch was aligned and leveled pre-surgically.

Pre-surgical orthodontic treatment was completed in nine months and the patient was scheduled for surgery. A four-piece LeForte I osteotomy (parasagittal split) was performed to impact the posterior maxilla 4 mm and to expand the posterior segments 5 mm. The anterior segment was downgrafted approximately 2 mm. The mandible was shortened 4 mm with a bilateral sagittal split osteotomy. Rigid fixation was used for both the maxillary (miniplates and suspension wires) and mandibular (miniplates) procedures.

The surgical splint was removed two weeks postoperatively and active orthodontic treatment was resumed. The maxillary canines were rebonded in an ideal position and Class II elastics were used to maintain anchorage as the maxillary canine roots were repositioned distally. Box and triangle elastics were used concurrently in the posterior segments to close a bilateral posterior open bite. Appliances were removed eight months after surgery. Total treatment time was 17 months. Retention consisted of a fixed mandibular retainer (3-3) and a maxillary wraparound retainer to be worn 12-16 hours per day.

Results

As predicted in the video imaging consultation, changes in the profile were minimal. The shortening of the lower third of the face was the most remarkable aspect of facial change. The most obvious change from the frontal aspect was elimination of the anterior open bite. When animated, a more favorable smile line was achieved with approximately 1 mm of gingival exposure superior to the central incisors. Gingival exposure posteriorly was reduced significantly.

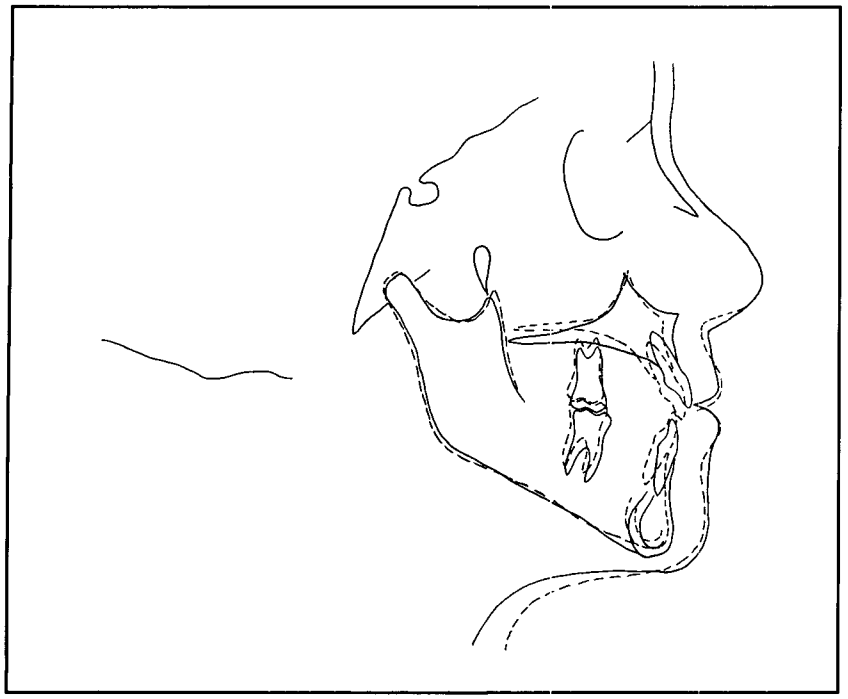

Figure 8A

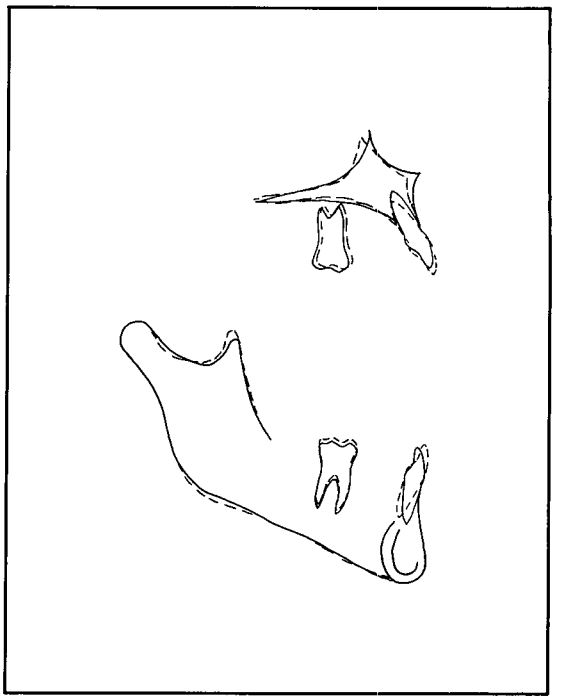

Figure 8B

Table 1

Measurement	Norm	Pre-Tx	Pre-Sx	Post-Tx
SNA	82	78	75	76
SNB	80	75	73	74
ANB	2	2	2	2
WITS	0±1	-8	-5	-6
SN-MP	32	45	46	42
PP-NB	90	94	94	89
PFH (%)	65	60	61	61
LFH (%)	56	54	55	54
Lip to E-line	0±1	-3	0	-2
Lower 1-MP	91	77	84	88
Lower 1-APo	0	2	4	4
Lower 1-NB	25	18	21	24
Lower 1-NB (mm)	4	4	6	6
Upper 1 [illegible]	22	27	30	21
Upper 1-NA (mm)	4	7	8	6
Upper 1-PP	112	110	116	110
Upper 1-SN	103	101	105	97
Interincisal	135	137	132	134

Figure 8A-B Superimposed cephalometric tracings

An ideal Class I dental occlusion with favorable over bite and overjet relationships was attained. The occlusion was canine-guided in lateral excursion and incisor-guided with protrusive movements of the mandible. Dental alignment for the maxillary and mandibular arches was satisfactory. Gingival recession on the mandibular right central incisor was not exacerbated during treatment although the incisors were proclined significantly to gain alignment.

Cephalometrically, orthodontic treatment was successful in decompensating the mandibular incisors to a near ideal position (lower 1 to NB 24°, and 6 mm, 88° to MP). Clockwise rotation of the premaxillary area during the LeForte I procedure resulted in maxillary incisors that are slightly upright relative to the NA line (21°), the palatal plane (110°), and the SN line (97°). Through maxillary and mandibular autorotation the mandibular plane angle decreased 3° to 42°. Skeletally, the ANB angle was unchanged and the WITS Appraisal improved to -6 mm. The posterior cant to the maxilla was improved following the differential impaction of the maxilla as evidenced by a decrease in the PP-NA angle to 89°.

Final evaluation

The results achieved in this case fulfill initial treatment objectives and may be considered a success. From a functional and esthetic standpoint the patient is completely satisfied with the outcome of her treatment.

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