Case Report MM

Surgical-orthodontic correction of bilateral buccal crossbite (Brodie Syndrome)

A surgical approach to treatment was required for this 35-year-old patient to correct a malocclusion characterized by a bilateral buccal crossbite. Surgical procedures included a LeFort 1 osteotomy to reduce maxillary width and correct the vertical asymmetry. The mandible was lengthened with a bilateral sagittal split osteotomy. Treatment options for the nongrowing patient are limited in the correction of severe skeletal disharmonies.

—Editor

By Douglas S. Ramsay, DMD, PhD, MSD; Terry R. Wallen, DDS, MSD; and Dale S. Bloomquist, DDS, MSD

This adult Caucasian female presented with a malocclusion characterized by a bilateral buccal crossbite and skeletal disharmonies in all three planes of space. The patient's chief complaint was the poor esthetic appearance of her maxillary front teeth. She had a convex facial profile and a retrognathic mandible (Figure 1). The nasolabial angle was 90 degrees; the labiomental fold and the throat to chin length were normal. From a frontal view, both the nose and the asymmetric mandible were deviated to the right. The lower left side of the mandible was more inferior than the right side which gave that side of the face a more prominent appearance. When smiling, the patient showed an excessive amount of gingiva, with still greater gingival display on the left side due to the asymmetric maxillary vertical excess. The asymmetric maxillary vertical excess was also believed to be responsible for the cant of the occlusal plane.

Pretreatment intraoral photographs (Figure 2) and study casts (Figure 3) illustrate the most remarkable aspect of this patient's malocclusion. The mandibular teeth were completely contained within the maxillary dentition such that they were in buccal crossbite. This is often referred to as a 'scissors bite' or Brodie Syndrome. This condition occurs in less than 0.01% of the population according to the U.S. Public Health Service Survey.[1] This malocclusion can result from either excessive width of the maxilla, deficient width of the mandible, or a combination of both. In this case, the maxilla was too

Figure 1A

Figure 1B

Figure 1C

Figure 1A-C
Pretreatment photos

Figure 2A-B
Pretreatment intraoral photographs

Figure 2A

Figure 2B

Figure 3A-E
Pretreatment study casts. The patient's mandibular teeth were completely contained within the maxillary dentition.

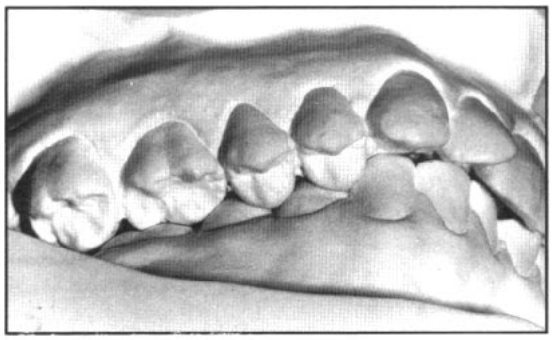

Figure 3A

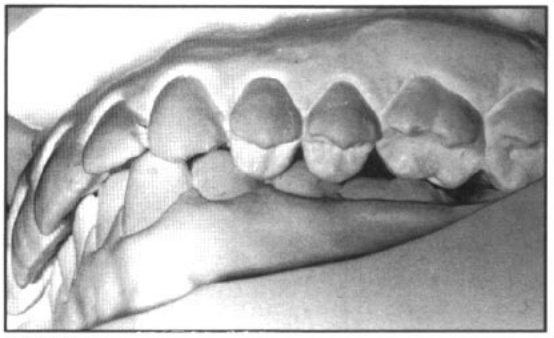

Figure 3B

Figure 4
Pretreatment radiograph

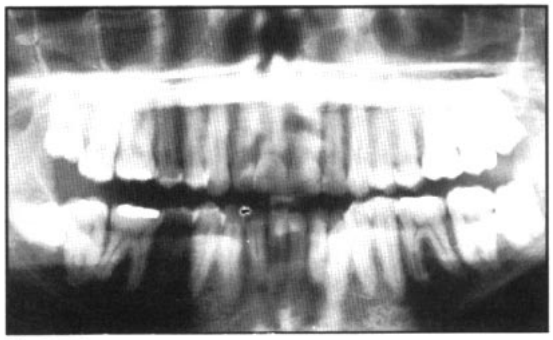

Figure 4

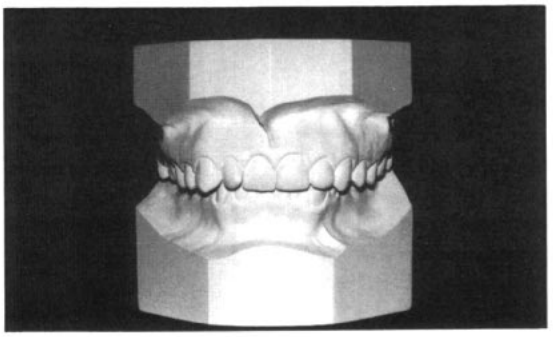

Figure 3C

Figure 5
Pretreatment cephalometric tracing

Figure 5

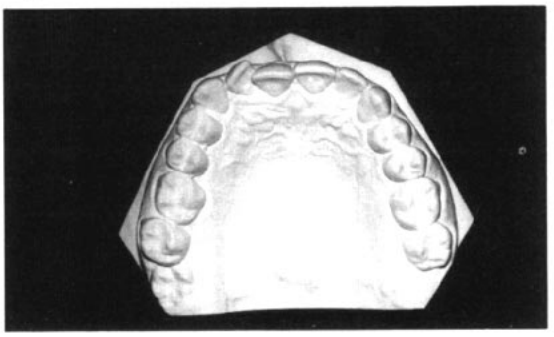

Figure 3D

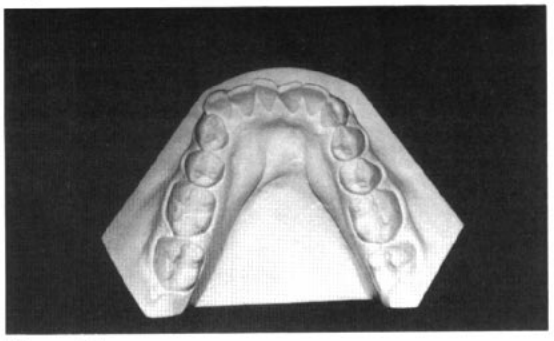

Figure 3E

wide. Bell, Proffit and White[1] provide female cast analysis norms to evaluate the width of the maxilla. This patient's inter-canine, inter-first premolar, inter-second premolar and inter-first molar widths all exceeded the norms by at least three standard deviations.

After correcting for the crossbite, the patient would be classified as having an Angle Class II malocclusion, subdivision left. The mandibular dental midline was 3 mm to the right of the facial and dental midlines, which were coincident. The overjet was 5 mm and the overbite 4 mm. Centric relation and centric occlusion were coincident with all teeth contacting. Conventional lateral excursive movements could not be made, but anterior guidance was present in protrusive movement. Mild arch length deficiencies (3 mm) existed in both arches. Both arches were mildly asymmetric; the maxillary right posterior teeth were slightly anterior to the left side while the mandibular left posterior teeth were slightly ahead of the right side. A Bolton analysis indicated no tooth size discrepancies between the maxillary and mandibular teeth.

The periodontal condition included moderate gingival inflammation with bleeding upon probing in many interproximal areas. However, there were no periodontal probing values greater than 4 mm. There was an adequate amount of attached gingiva with slight recession on the facial aspect of the mandibular right canine. Third molars were removed just prior to the initiation of orthodontic treatment. The patient also presented with a large torus palatinus measuring 15 mm by 25 mm as well as mandibular lingual tori. There were no signs or symptoms of temporomandibular joint dysfunction.

No pathology was seen on the panoramic radiograph (Figure 4) and both condyles appeared to have normal morphology. Cephalometric analysis (Figure 5) indicated the patient had a retrognathic mandible in relation to both cranial base (SNB=74) and maxilla (ANB=5). The maxillary incisors were upright relative to cranial base while the mandibular incisors were proclined relative to the mandibular plane. An antero-posterior headfilm further substantiated the clinically observed mandibular asymmetry.

Diagnosis

This patient presented as a 35-year-old Caucasian female with an uncommon malocclusion: the maxillary teeth were in complete buccal crossbite with the mandibular teeth. The Angle classification was a Class II subdivision malocclusion (Class I on the left) with minimal crowding in each arch (<3mm). Additionally, there were skeletal disharmonies in all three planes of space. In the A-P plane the mandible was retrognathic and asymmetric. Transversely, the maxilla was too wide which explains the crossbite or Brodie Syndrome. (Simply advancing the retrognathic mandible would not correct the crossbite.) Maxillary alveolar vertical excess on the left in the vertical plane resulted in a cant of the occlusal plane. The patient also had excessive gingival display when smiling.

Etiology

The skeletal relationship of the malocclusion is probably related to hereditary influences. Although the history is unclear, this patient's cousin had a "similar malocclusion" that was corrected with orthodontic treatment and jaw surgery.

Treatment objectives

1. Establish normal skeletal relationships
   —narrow the maxilla
   —advance the mandible
   —reduce the maxillary vertical excess
2. Correct the dental relationships and improve occlusal function
   —improve overbite and overjet
   —achieve Class I canine relationship bilaterally
   —align dental midlines
3. Improve facial esthetics
   —reduce gingival display when smiling
   —reduce the mandibular asymmetry
   —increase chin prominence

Treatment plan

An orthognathic surgical approach to treatment was formulated to accomplish the treatment objectives. Surgical constriction of the maxilla was considered necessary to correct the excessive width. Due to the large palatal torus, a LeFort I osteotomy with a midline cut would be difficult to perform surgically. Therefore, a multiple segment LeFort osteotomy was planned that would require cutting the maxilla distal to the canine and making a horseshoe-shaped cut around the torus. By extracting the right and left first premolars there would be adequate space to make the osteotomies while also facilitating the transverse correction. The posterior dental segments would be moved mesially to close most of the extraction space during surgery, thus maintaining the anterior dental segments' A-P position relative to the upper lip. This would result in a Class II molar occlusion.

Simultaneously, the maxillary osteotomy would also permit the asymmetric impaction of the maxilla. A bilateral sagittal split osteotomy was planned to asymmetrically advance the mandible. The patient declined the recommendation

Figure 6A

Figure 6A-B
Superimposed pretreatment and presurgical cephalometric tracings

Figure 7A-E
Presurgical study casts

Figure 8A-B
Presurgical facial photographs

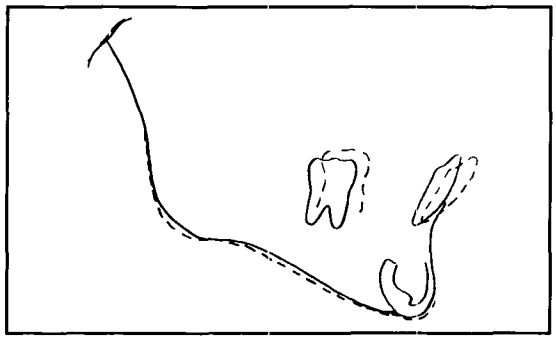

Figure 6B

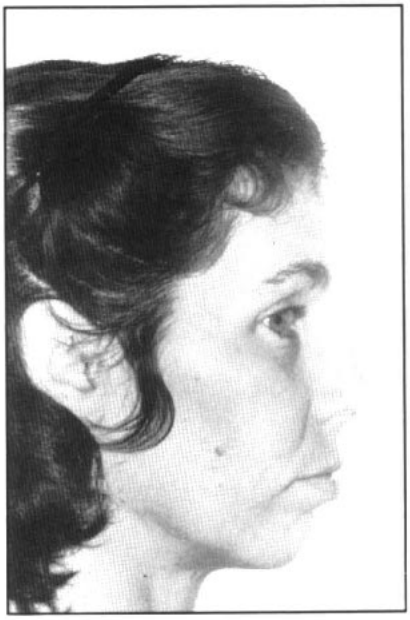

Figure 8A

Figure 8B

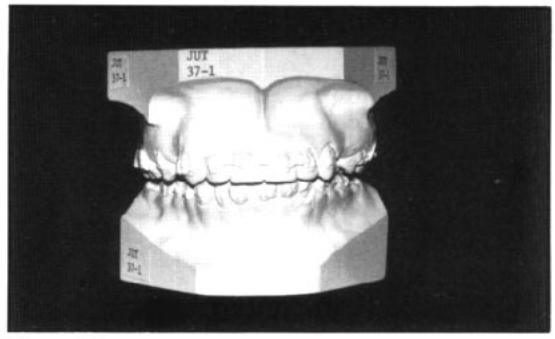

Figure 7A

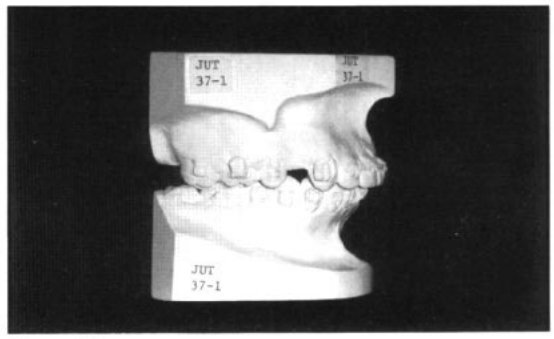

Figure 7B

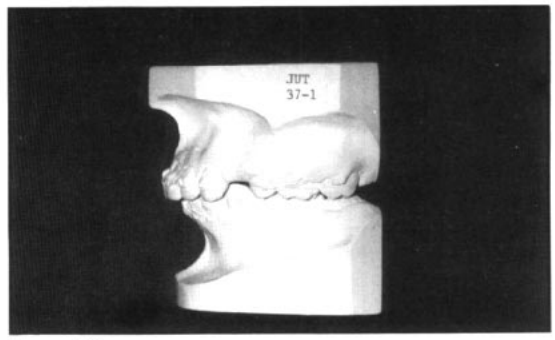

Figure 7C

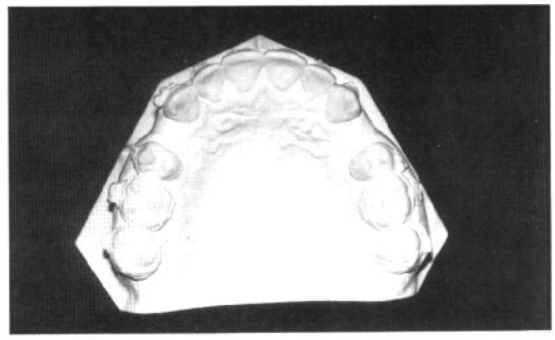

Figure 7D

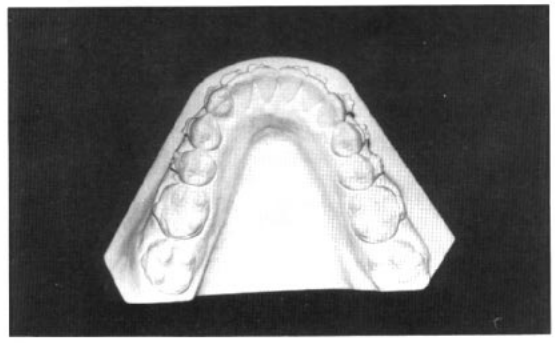

Figure 7E

for a horizontal osteotomy of the mandible to advance the antero-posterior chin position.

Specifics of this treatment plan are presented below.

Pre-surgical treatment plan

1. Place a fixed bonded and banded appliance on the maxillary arch.
2. Extract the maxillary first premolars.
3. Align and level the maxillary teeth while maintaining the extraction site. Correct the torque of the maxillary anterior teeth and maintain maxillary arch width.
4. Fabricate a maxillary biteplate and place a fixed bonded and banded appliance on the mandibular arch.
5. Align, level and expand the mandibular arch.
6. Collect complete pre-surgical records.

Surgical treatment plan

1. Perform a LeFort I osteotomy (3 dental segments) to reduce arch width, asymmetrically impact the left side and close the extraction space from the posterior.
2. Perform a bilateral sagittal split osteotomy to asymmetrically advance the mandible.

Post-surgical treatment plan

1. Collect complete post-surgical records.
2. Coordinate and finish occlusion.
3. Remove appliances.
4. Collect complete final records.
5. Monitor retention with maxillary and mandibular removable appliances.

Treatment progress

The patient's treatment progressed according to the treatment plan. The maxillary arch was aligned with a progression from light round wires to a 0.019 x 0.025 in. stainless steel archwire while the extraction spaces were maintained. Then a maxillary biteplate was delivered and the mandibular arch aligned. Surgery was delayed for several months because the patient had recently delivered a baby which was not yet weaned. The surgery was eventually performed 22 months after the appliance had been placed. The pre-surgical orthodontic changes are illustrated in the cephalometric superimposition shown in Figure 6. Additionally, the pre-surgical facial photographs shown in Figure 8 re-emphasize the asymmetric nature of the patient's maxillary vertical excess.

Surgery was completed as planned and without complication. The patient wore an acrylic splint and Class II elastics for less than 12 hours per day for 7 weeks. The patient reported pain and popping in the temporomandibular joint during a two-month period post-operatively. Symptoms then dissipated and she has remained asymptomatic. She had limited opening immediately after the surgery but within 3½ months was able to open to 46 mm.

The orthodontic treatment following surgery consisted of closing much of the remaining extraction space using a combination of elastomeric chains and closing loop archwires. Vertical elastics were also worn bilaterally in the posterior to aid in finishing the occlusion. Appliances were removed 10 months after surgery and final records taken that same day.

Results

The results obtained from this treatment plan successfully met the treatment objectives for this patient.

Facially, the most improvement resulted from the maxillary impaction which reduced the amount of gingival display when smiling. (Compare Figure 9 to earlier views.) The amount of maxillary impaction is illustrated in the cephalometric superimposition of the pretreatment and final headfilms (Figure 12). The convex profile was not altered dramatically. The mandibular advancement corrected the skeletal and dental asymmetry but there was little overall advancement of the mandible (1mm), as shown by the mandibular superimposition presented in Figure 12. The patient chose not to have an advancement genioplasty to improve her profile by accentuating the chin. As a secondary treatment plan, removal of the mandibular first premolars was considered to allow

Figure 9A-B
Posttreatment facial photographs

Figure 10A-B
Posttreatment intraoral photographs

Figure 10A

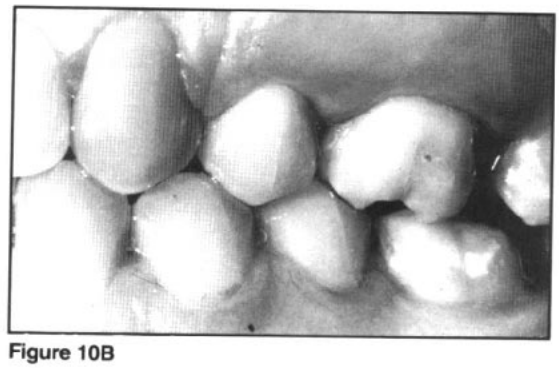

Figure 10B

Figure 11A-E
Posttreatment study casts

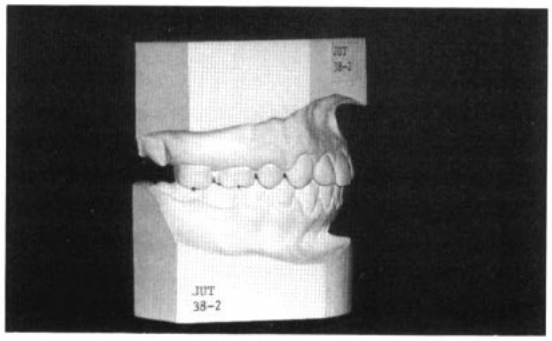

Figure 11A

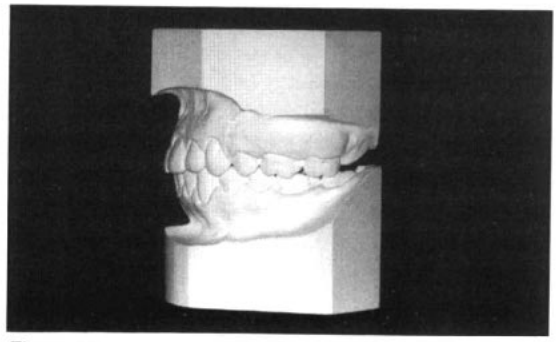

Figure 11B

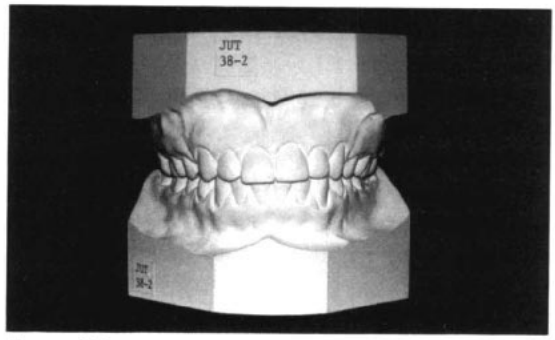

Figure 11C

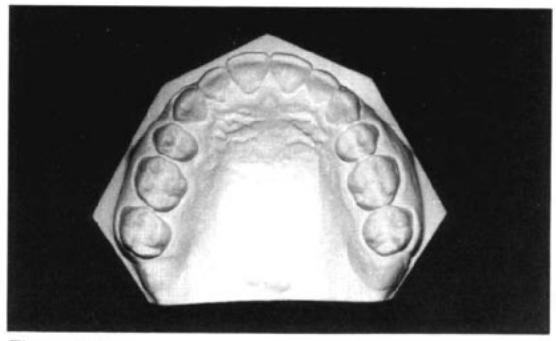

Figure 11D

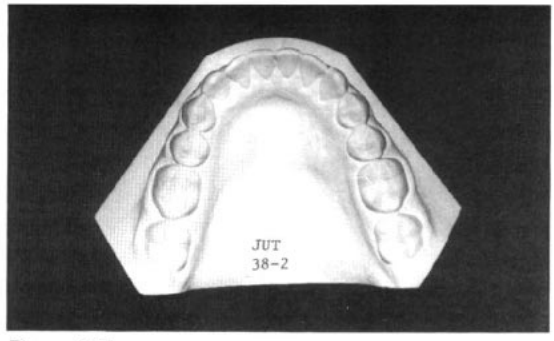

Figure 11E

Figure 12A

Figure 12A-B
Superimposed pretreatment and posttreatment cephalometric tracings

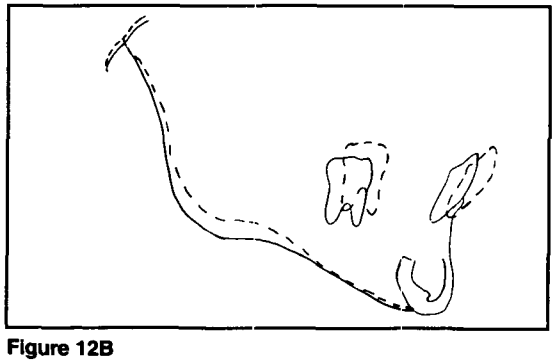

Figure 12B

retraction of the mandibular incisors and thus permit greater mandibular advancement.

Although the mandibular dental midline is slightly to the right of the maxillary dental midline, a Class I canine relationship was achieved bilaterally. The overjet and overbite are 2 mm. Posterior dental relationships are significantly improved with the bilateral buccal crossbite being corrected by the maxillary constriction (Figures 10 and 11). A symmetrical Class II molar relationship was established bilaterally due to asymmetric advancement of the mandible. A tooth size discrepancy developed because of the Class II molar relationship which necessitated leaving some interproximal spacing between the maxillary posterior teeth. After occlusal settling and drift, these spaces may eventually be closed restoratively, in consultation with the patient's dentist. There are no occlusal interferences during protrusive or excursive movement. Centric occlusion is coincident with centric relation.

The patient was well-maintained periodontally throughout treatment. There is no clinical or radiographic evidence of alveolar bone support loss or root resorption. Examination of the posttreatment panoramic radiograph (Figure 13) shows acceptable root alignment although the maxillary left first molar has excessive distal root tip.

The patient is pleased with the results of treatment.

Retention

The patient has been instructed to wear removable retainers full-time for the first year, then to wear them nightly. After 2 to 3 years of nightly wear, the patient will gradually reduce wear to 1 to 3 nights per week.

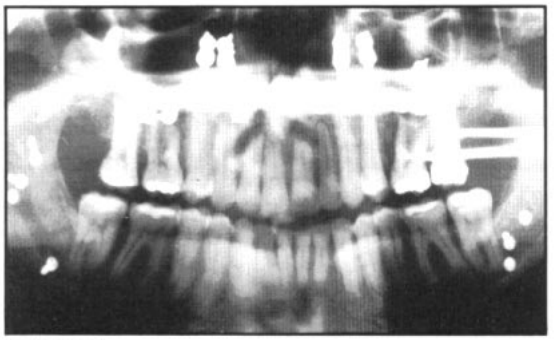

Figure 13

Figure 13
Posttreatment radiograph

Acknowledgements

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D.S. Bloomquist is an Associate Professor in the Department of Oral and Maxillofacial Surgery at the University of Washington.

References

1. Bell, W.H.; Proffit, W.R.; White, R.P.: Surgical Correction of Dentofacial Deformities, Volume 1, W.B. Saunders Company, 1980.