Case Report RW:

Correction of a mandibular transverse discrepancy resulting from anteroposterior skeletal disharmony

Patients with severe Class II malocclusion commonly have transverse problems upon advancement of the mandible. These problems are due to maxillary transverse deficiency and need to be addressed by archwires, maxillary expansion, or mandibular constriction. This report illustrates management of a transverse problem opposite in nature where the mandibular dentition is too narrow upon advancement of the mandible. A removable bite plane to help correct the dental compensations, headgear with Class III elastics to prevent additional incisor proclination, and post-orthodontic restoration to enhance the stability are demonstrated.

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This 35-year-old patient knew his overbite was resulting in extreme wear on his teeth. His dentist knew that simply crowning the teeth would not solve the problem. Consequently, he referred the patient to an orthodontist for evaluation.

Upon comprehensive examination, the patient presented with a Class II skeletal and dental malocclusion. The mandible was retrognathic (ANB 7°) with minimal skeletal pogonion (Figure 3). The maxillary anterior teeth were well-related to basal bone with an acceptable nasolabial angle. Minimal arch length deficiencies existed in both the maxillary and mandibular arches. The mandibular incisors were proclined relative to basal bone (IMPA 107°) but the mandibular plane angle was relatively flat (FMA 18°). Consequently, the mandibular incisor to NB angle (29°) was not excessive.

From the front, the patient appeared to have balanced facial thirds. Laterally, however, he showed obvious mandibular retrognathia with lower lip eversion and mentalis strain on lip closure (Figure 1A).

The maxillary first and second premolars were over-erupted because of the complete buccal crossbites (Figure 2A-E). There was excessive wear on the facial surfaces of the mandibular premolars and lingual surfaces of the maxillary premolars due to this transverse problem. The complete

Figure 1A

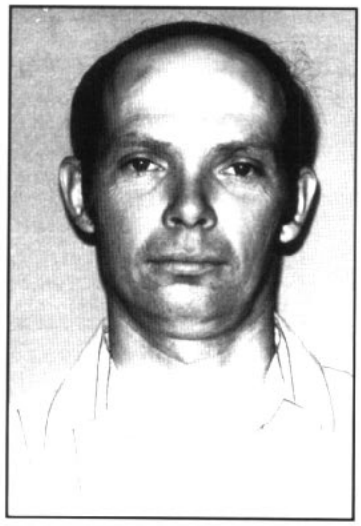

Figure 1B

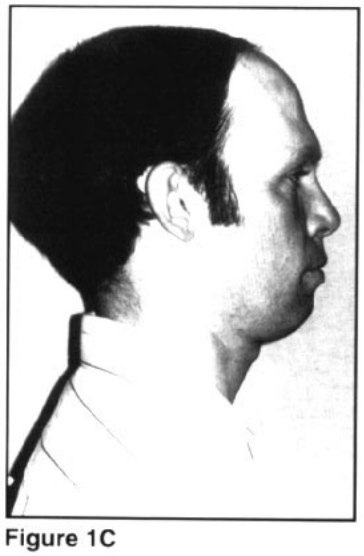

Figure 1C

Figure 1A-C Pretreatment photographs at 35 years 6 months. The profile improved when the mandible was postured forward, figure C.

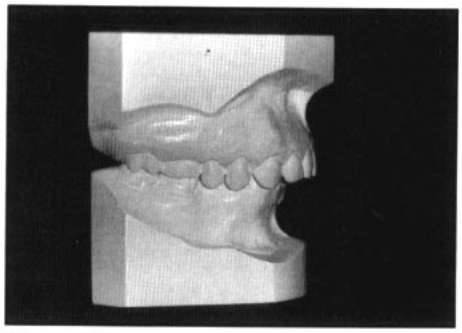

Figure 2A

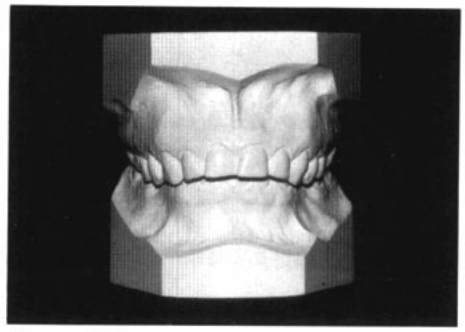

Figure 2B

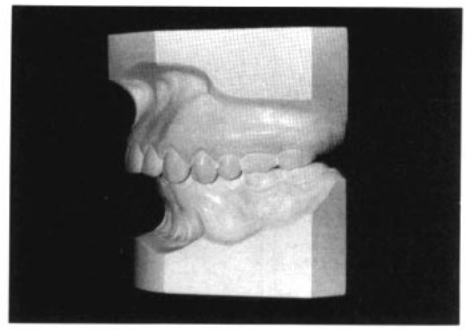

Figure 2C

Figure 2A-E
Pretreatment study casts. Bilateral buccal crossbites resulted from both mandibular retrognathia and mandibular dental constriction.

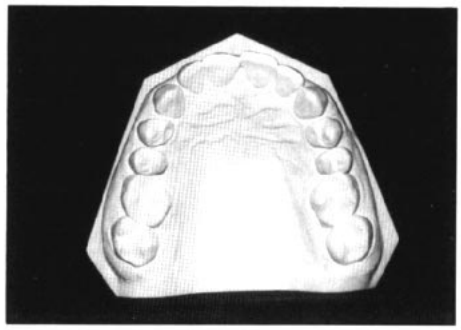

Figure 2D

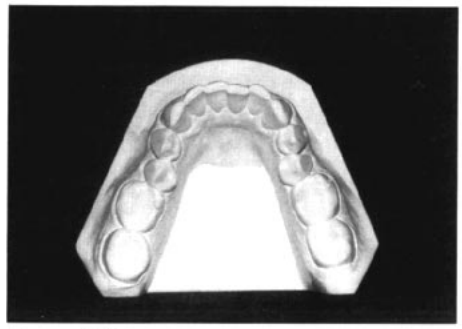

Figure 2E

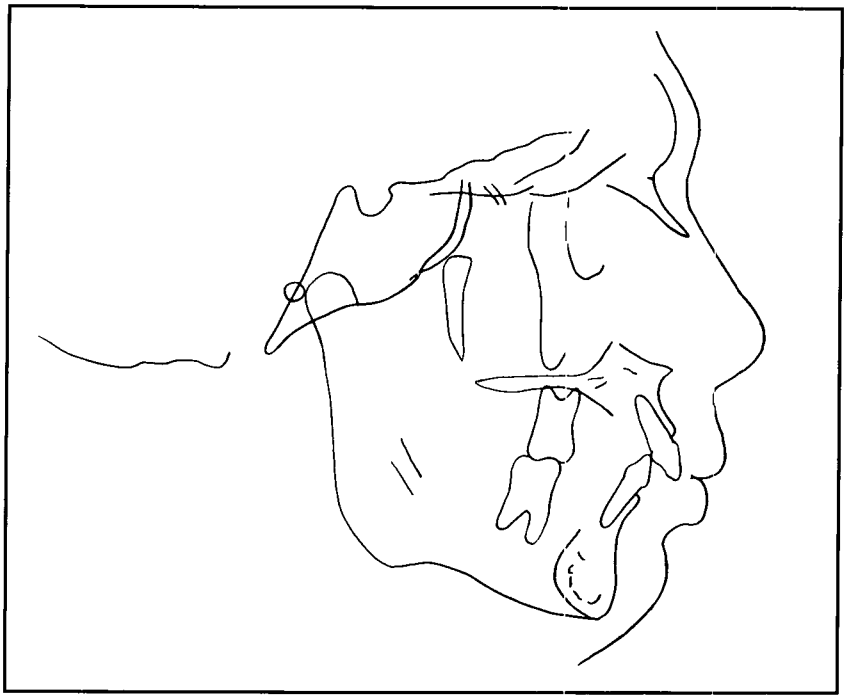

Figure 3

Figure 3
Mandibular incisor proclination was reduced with Class III elastics presurgically.

buccal crossbites were due, in part, to the marked anteroposterior discrepancy and, in part, to lingual tipping of the mandibular premolars. The lingual surfaces of the maxillary incisors also had marked attrition due to the excessive vertical overbite.

Full mouth pretreatment radiographs showed adequate alveolar bone support and healthy roots (Figure 5). All the posterior teeth were extensively restored with amalgam. No mucogingival problems were noted and both temporomandibular joints were asymptomatic. The patient had good range of movement in maximal opening and lateral and protrusive movements.

Treatment objectives

1. Reduce the excessive vertical overbite.
2. Reduce the excessive anterior overjet.
3. Correct the buccal crossbites of the posterior teeth.
4. Correct the Class II skeletal disharmony.
5. Improve the facial profile and lip competency.
6. Achieve a Class I canine occlusion bilaterally with no balancing or working interferences.

Fortunately, the patient was motivated, committed and decisive. Achieving these goals would have been difficult, if not impossible, without excellent cooperation.

Treatment plan

Due to the severe skeletal deformity, achieving all the treatment objectives with orthodontic treatment alone seemed unlikely. The mandibular

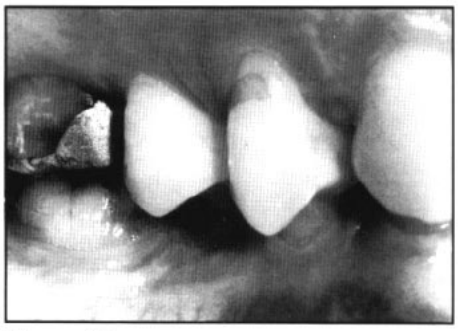

Figure 4A

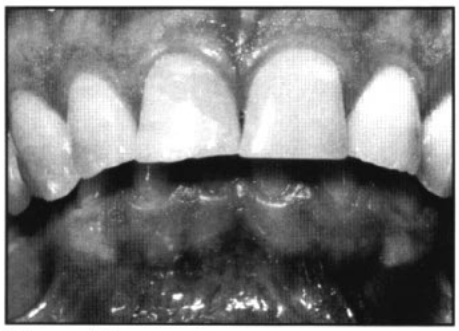

Figure 4B

Figure 4C

Figure 4A-C
Generalized attrition due to excessive overbite, transverse disharmony, and Class II skeletal and dental malocclusion.

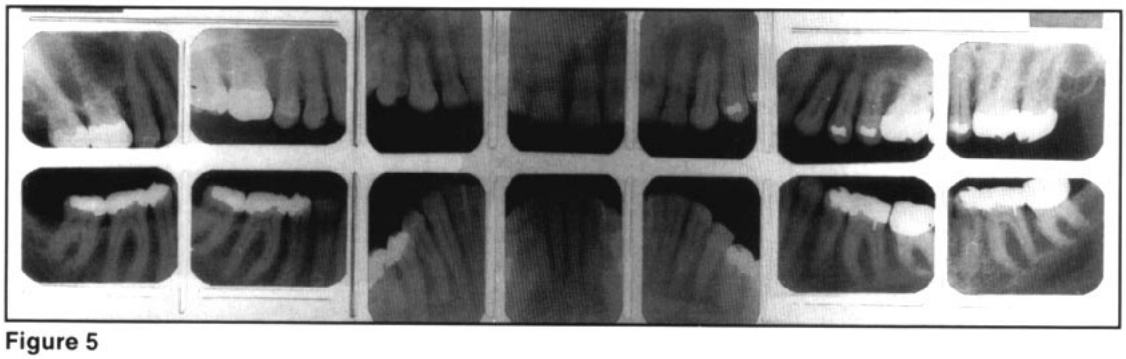

Figure 5

Figure 5
Pretreatment radiographs

retrognathia would have to be corrected with a combination of orthodontic treatment and oral surgery.

Mandibular advancement quickly improved the patient's profile, although some remaining retrognathia and lip incompetency suggested genioplasty would also be indicated (Figure 1C).

The transverse problem was primarily the result of an anteroposterior discrepancy rather than a transverse disharmony in basal bone. Positioning the mandibular model into a Class I relationship eliminated the relative transverse problem of the alveolar processes but did not eliminate the transverse problem entirely because of the severe lingual tipping of the mandibular premolars. Therefore, one major treatment obstacle would be discluding the posterior teeth to allow the mandibular premolars to be uprighted prior to the mandibular advancement surgery. This would be accomplished with a removable maxillary bite plane once initial alignment of the maxillary teeth was achieved.

Management of the excessively proclined mandibular incisors required another treatment decision. Removal of mandibular (and maxillary) premolars to upright the mandibular incisors would indeed allow maximal mandibular advancement, additional chin projection with reduction in lip incompetency, and possibly eliminate the need for advancement genioplasty. However, due to the minimal arch length deficiency, relative stability of the incisors at the their present position and only a slight curve of Spee, extractions were contraindicated. Removing teeth would not only unduly lengthen the treatment time but might also make the transverse coordination more difficult through additional deepening of the vertical overbite. Consequently, incisor proclination would be managed through cervical headgear supporting Class III elastics with 5 to 7 ounces of force during the initial alignment and presurgical orthodontic treatment. A horizontal advancement genioplasty, done at the time of the mandibular advancement surgery, could improve the position of the mandibular incisor to A point-pogonion line by a variable amount, calculated from the presurgical headfilm.

In order to complete mandibular advancement early in treatment (to reduce the amount of maxillary bite plane wear), it was necessary to spend as little time as possible (6 to 12 months) prior to surgery decompensating the mandibular dentition. Most of the tooth movement plus final finishing would be accomplished postsurgically when the vertical and transverse dimensional changes would be more stable. Postsurgical finishing would take an estimated 9 to 12 months. The pretreatment prediction tracing showed that 6 mm horizontal mandibular advancement and 4 mm advancement genioplasty would achieve optimal facial esthetics with the incisors proclined approximately as they were pretreatment. The treatment plan called for removable maxillary and mandibular retainers after the removal of the fixed appliances. The patient was advised that these should be worn full time for approximately

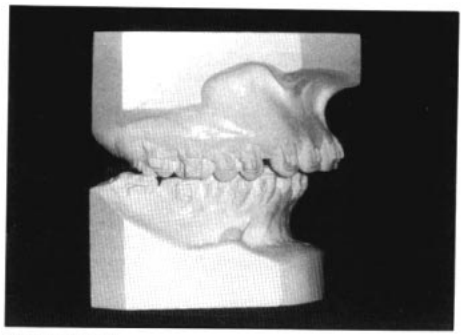

Figure 6A

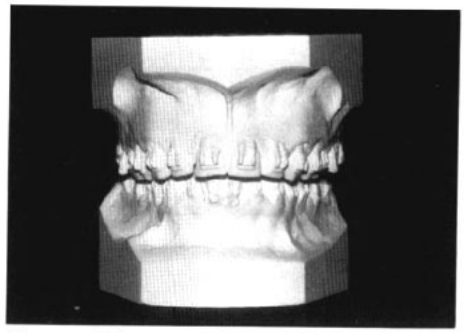

Figure 6B

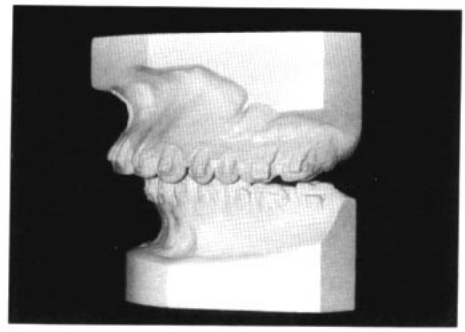

Figure 6C

Figure 6A-E
Arch coordination was accomplished in approximately 7 months through full-time wear of a maxillary bite plane and archwires.

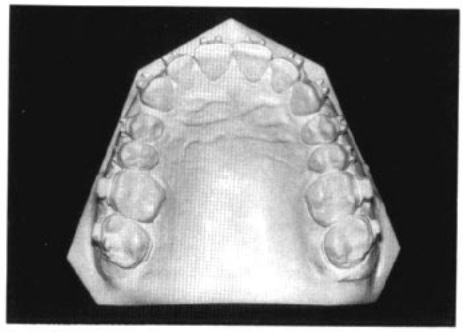

Figure 6D

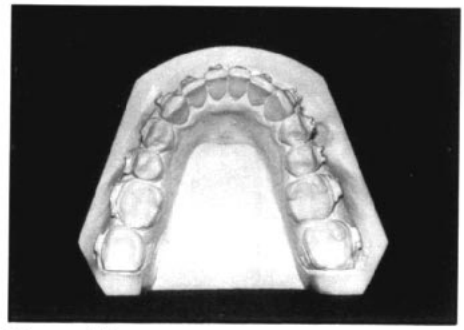

Figure 6E

one year, and nightly thereafter, indefinitely.

He was also advised that extensive restorative treatment would eventually be necessary to restore the working cusps that were weakened or eliminated by the severe attrition. The restorative dentist recommended full coverage restorations on the posterior teeth. Crowns were indicated on the premolars to reestablish the working cusps, and molar crowns would replace the extensive, poorly contoured amalgam restorations. Waiting at least 6 months before proceeding with the definitive restorations would allow for some stabilization of the occlusion.

Treatment progress

Separation was done 1 week prior to placement of fixed edgewise appliances. Because attrition of the buccal surfaces had caused dentinal exposure that precluded etching, the mandibular premolars were banded rather than bonded. Also, the excessive overbite would certainly have sheared off any direct bonds placed until the bite plane could be fabricated. The maxillary second premolars and first and second molars were also banded. Direct bonds were placed on the remaining teeth. Flexible spiral archwires were used initially until stainless steel round archwires could be placed.

Satisfactory alignment of the maxillary teeth was achieved 3 months after placement of appliances for fabrication of the anterior bite plane. Ball clasps were used for retention and the posterior occlusion was opened just to the point of discluding the premolars. The mandibular archwires were expanded in the posterior intermediate segments to upright the premolars while the bite plane was worn full time.

The cervical headgear and Class III elastics were started 1 month later. The headgear was to be worn as much as possible and the Class III elastics (6 ounce, 3/16 inch) were to be worn only with the headgear. Progress models and a headfilm were taken 5 months into treatment to assess arch coordination and mandibular incisor position. Although the incisors were still moderately proclined, they had uprighted 3° from the pretreatment position. The transverse coordination, on advancement of the mandible, was greatly improved. Surgery was scheduled for 6 weeks later.

Presurgical records were made 1 week prior to surgery (Figure 6A-E). The mandible would be advanced 8 mm, with a 4-mm horizontal advancement genioplasty. The surgery was completed without complications 7 months after the start of treatment.

The patient returned for check-ups 3 days, 4 weeks and 10 weeks after the surgery. Headfilms were taken and analyzed at each appointment. The 3-day postoperative headfilm showed acceptable posterior border relationships, and acceptable mandibular advancement and advancement genioplasty, although the latter was 3 mm rather than the planned 4 mm. Superior border wiring was used to stabilize the distal and proximal segments. The proximal segments were rotated counterclockwise and the gonial angle

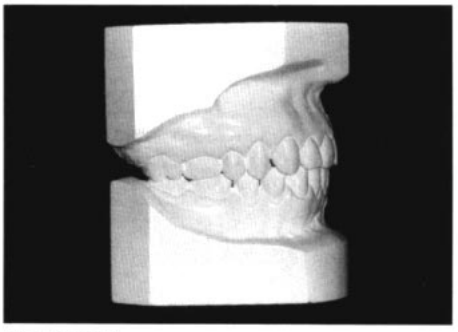

Figure 7A

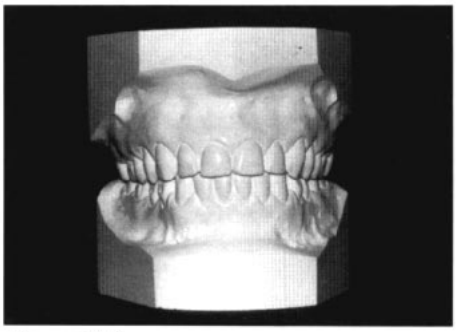

Figure 7B

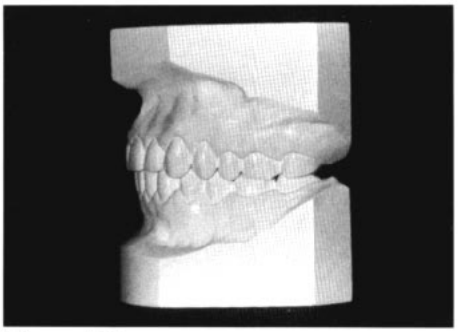

Figure 7C

Figure 7A-E
Posttreatment study casts at 37 years 3 months.

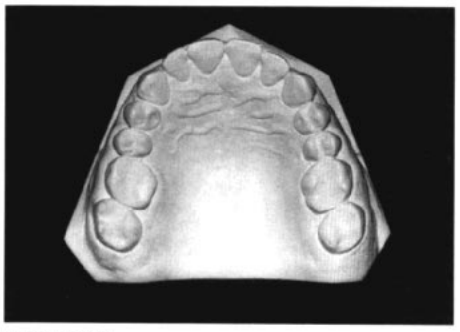

Figure 7D

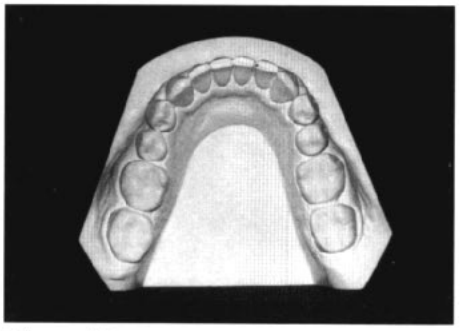

Figure 7E

Figure 8
Posttreatment panelipse.

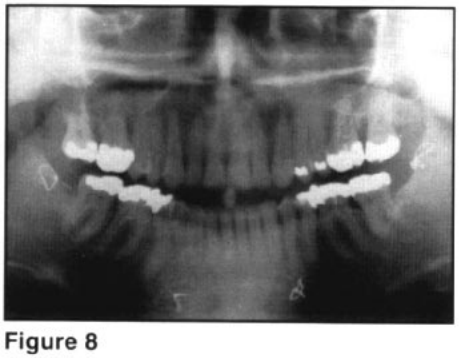

Figure 8

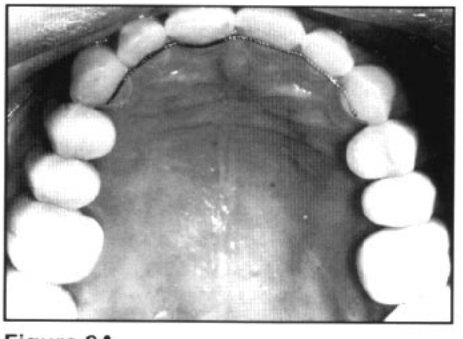

Figure 9A

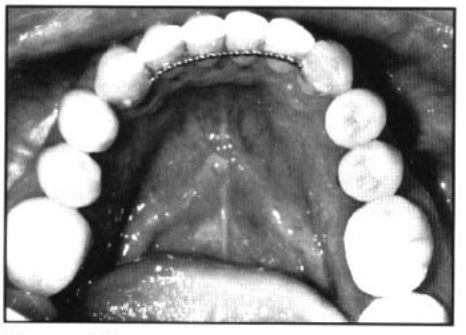

Figure 9B

Figure 9A-B
Occlusal photographs showing fixed retainers used to give the restorative dentist the capability to work on posterior segments sequentially. In addition, a removable maxillary bite plane was worn on a nighttime basis to inhibit recurrence of the excessive vertical overbite.

became more obtuse. The mandibular advancement relapsed 1 mm posteriorly and the advancement genioplasty relapsed 2 mm over the 10 week postoperative period.

Fortunately, approximately 3 mm of space that was present in the maxillary dentition presurgically could now be used to compensate for the relapse. The transverse correction was successful and stable and the patient appreciated not having to wear the bite plane any longer. Ten months of finishing was necessary before appliances were removed. Total active treatment time was 18 months.

Results

A very acceptable Class I dental occlusion was achieved. The skeletal result remained slightly Class II (ANB 5°) since the amount of mandibular advancement possible was less than the amount of skeletal disharmony due to proclination of the mandibular incisors. As planned, this was partially masked by the advancement genioplasty. The patient's facial balance improved and lip competency was achieved. There is acceptable root proximity on the posttreatment panelipse with normal alveolar bone support and healthy roots (Figure 8).

Retention

Removable maxillary and mandibular retainers were placed approximately 1 week after removal of the fixed appliances. Fixed canine-to-canine retainers were placed 12 months later, when the restorative dentist's work began. The fixed retainers minimized any relapse that may have occurred during the preparation, temporization and finalization of multiple restorations. A fixed mandibular bonded canine-to-canine retainer was placed using .032 inch flexible spiral wire attached only on the canines. In the maxillary arch, a .0195 inch flexible spiral wire was bonded to the lingual surfaces of the six maxillary anterior teeth (Figure 9A-B).

Once the final maxillary restorations were ce-

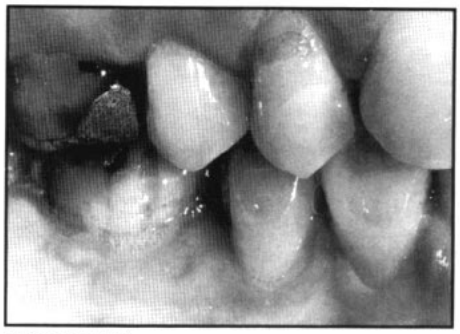

Figure 10A

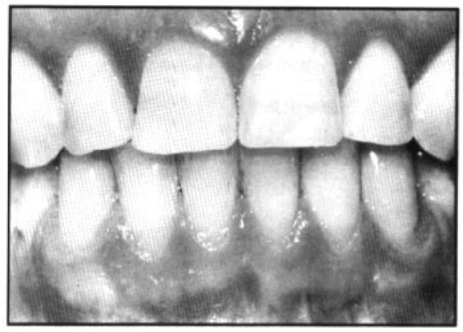

Figure 10B

Figure 10C

Figure 10A-C
The transverse disharmony was successfully corrected with a combination of mandibular advancement surgery (anteroposterior skeletal) and uprighting the mandibular posterior teeth (transverse dental) movements. No maxillary expansion was necessary.

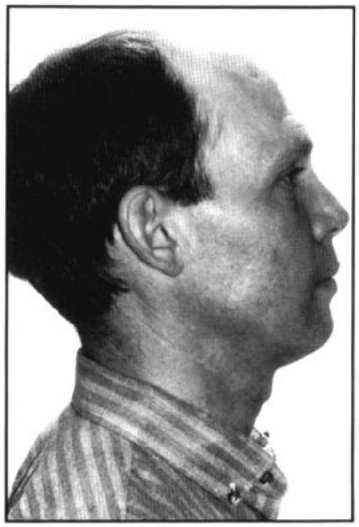

Figure 11A

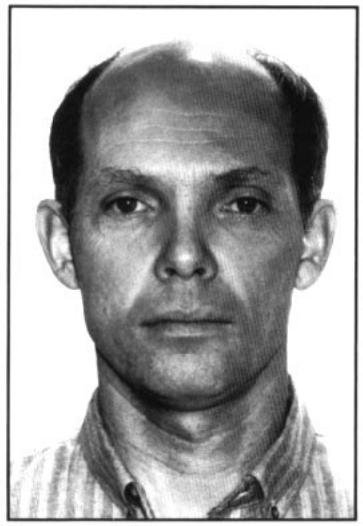

Figure 11B

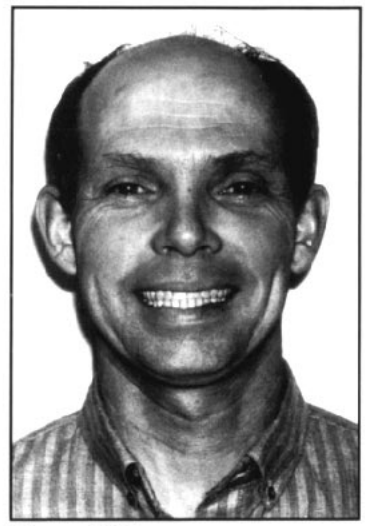

Figure 11C

Figure 11A-C
An improvement in facial balance accompanied the marked functional improvement.

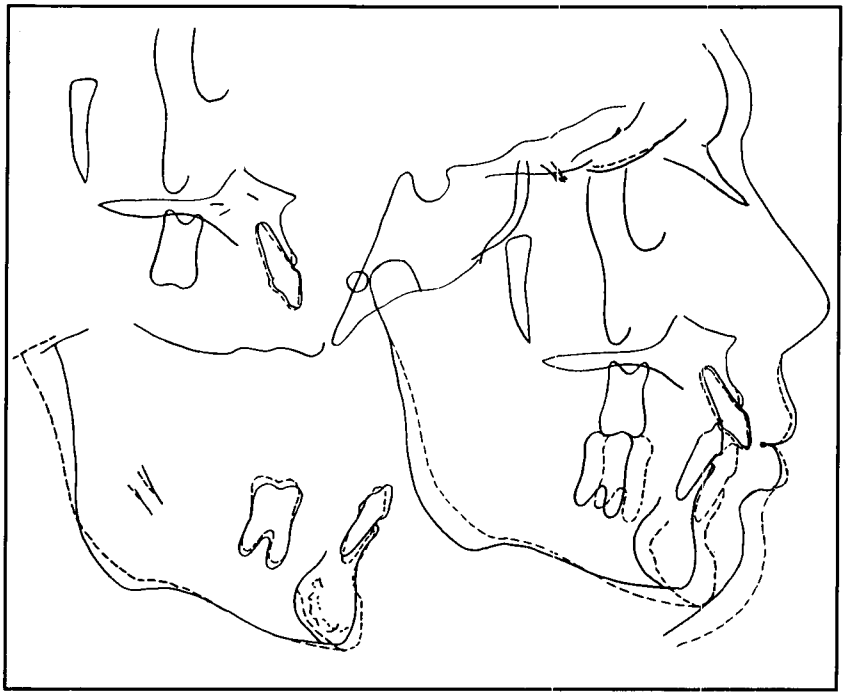

Figure 12

Figure 12
Pre- and posttreatment superimposition. The mandibular incisors were uprighted presurgically to maximaize the advancement as much as possible without premolar extraction.

mented, a maxillary anterior bite plane was made. The passive bite plane would not only protect the fixed retainer but also inhibit recurrence of the excessive vertical overbite. With this sequence and combination of retainers, it was possible to carry out the fixed restorative work in as many appointments as necessary and over an extended period of time. The patient was advised that the fixed retainers would remain indefinitely and the removable bite plane should be worn at night.

Final evaluation

Overall, a very acceptable correction was made. The patient and his dentist are pleased with the final result. There was some relapse of both the mandibular advancement surgery and the advancement genioplasty. There might have been less relapse with more contemporary techniques of skeletal fixation or rigid fixation. This might also have reduced the amount of counterclockwise rotation of the proximal segment at the time of surgery (Figure 12).

Posttreatment records taken 6 years after appliance removal show acceptable stability (Figure 13A-E). Cephalometrically, the maxilla and mandible moved approximately 1 mm inferiorly, pos-

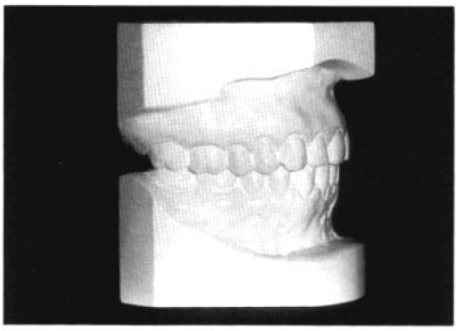

Figure 13A

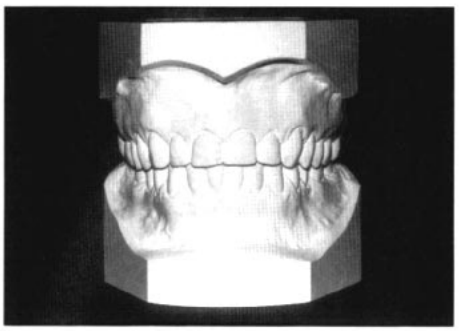

Figure 13B

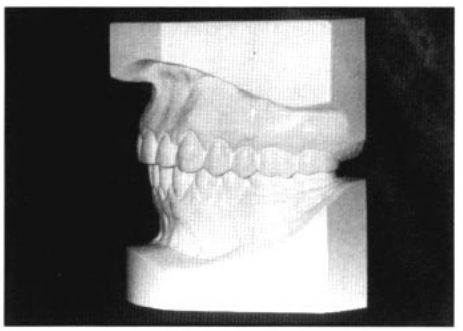

Figure 13C

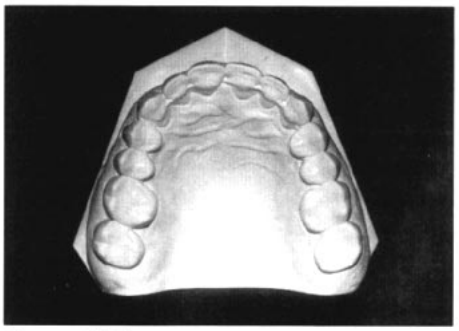

Figure 13D

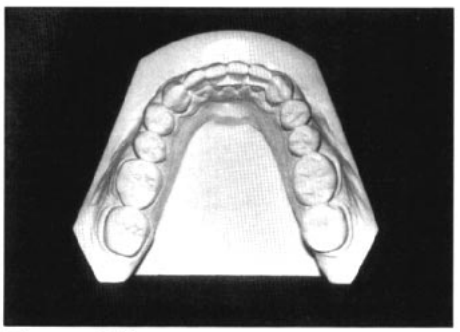

Figure 13E

Figure 13A-E
Study casts taken 6 years posttreatment, at 43 years 2 months. Restoration of posterior teeth was completed 12 months posttreatment enhancing the stability of the transverse and vertical corrections.

sibly related to continued relapse with compensation by skeletal remodelling. The fixed retainers have remained intact and the patient still wears the removable bite plane at night.

The periodontal tissues remained healthy, although slight recession labial to the mandibular left and right lateral incisors (#23 and #26) has been noted. Because of the stability of the change and acceptable functional result achieved in a relatively short treatment time, it's unlikely that extraction of mandibular premolars, with or without maxillary premolars, would have been a better treatment option. The transverse correction should be stable even without long-term retention since the working cusps and a functional occlusion has been reestablished restoratively and the anteroposterior skeletal disharmony corrected.

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