

Case Report ES

Patients occasionally place limitations on the best of us, forcing major changes in our carefully designed treatment plans. When the following plan of orthodontic treatment was proposed by Dr. Roberto Justus (Mexico City, Mexico), the patient ruled out the use of fixed appliances on her anterior teeth. Out of necessity, an alternative approach to treatment proved effective in the correction of this malocclusion. Records gathered 15 years post-retention point to the stability of the resulting treatment.

—Editor

By Roberto Justus, DDS, MSD

The patient presented with a Class I malocclusion characterized by a lingual crossbite on the left side extending from lateral incisor to first molar. The maxillary second premolar was also in lingual crossbite on the right side. The maxilla was constricted bilaterally and the transverse width between first molars was 5 mm narrower than required to occlude correctly. Centric occlusion and centric relation did not coincide. When the mandible was in centric relation, the buccal cusps of the maxillary teeth occluded against the mandibular buccal cusps with the maxillary right second premolar in lingual crossbite.

In order to achieve centric occlusion the patient shifted her mandible to the left producing a unilateral lingual functional crossbite with the mandibular dental midline deviated 4 mm from the maxillary dental midline. In this shift from centric relation to centric occlusion, the patient's molar relationship on the right side changed substantially. A mutually protected occlusion was not present. Bolton analysis indicated no tooth size discrepancy.

The maxillary central incisors each had a congenital horizontal enamel defect on the cervical third of the labial surface. The incisal borders of the maxillary and mandibular left incisors were partially worn down. The buccal surface of the maxillary left second molar was decalcified. The alloys on the buccal surfaces of the mandibular left molars and left second premolar were deteriorated.

The face in frontal view was asymmetric with the lip commissure tilted down on the left. The chin deviated to the left when in centric occlusion and less so with the mandible in centric relation. In profile view the chin was prominent and the face was concave; this was confirmed cephalometrically by a facial plane angle of 90 degrees (norm = 87 degrees), a Wits analysis of -5 mm (norm = 0 mm) and an angle of convexity of -4 degrees (norm = 0 degrees).

Intraoral periapical radiographs revealed carious lesions on the distal surface of the first maxillary left bicuspid and on the distal surface of the second maxillary left bicuspid. The mandibular right third molar was impacted.

Figure 1A,B
Pretreatment photographs



Figure 1A



Figure 1B

Figure 2A,B
Pretreatment photographs — note bilateral posterior crossbites



Figure 2A



Figure 2B

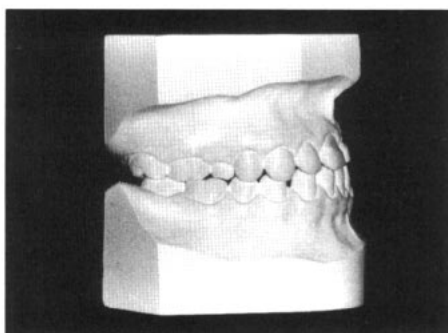


Figure 3A

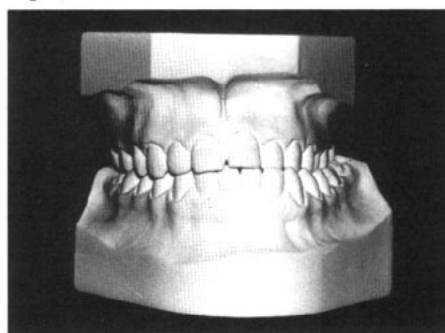


Figure 3B

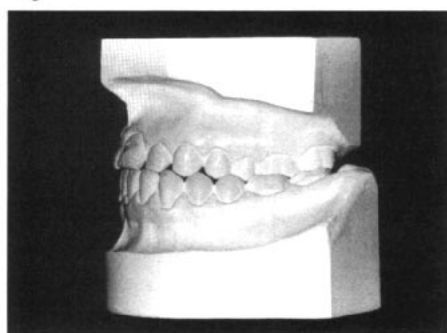


Figure 3C

Figure 3A-E
Pretreatment study casts at 23 years 2 months

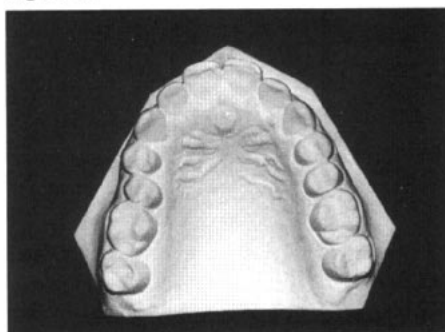


Figure 3D

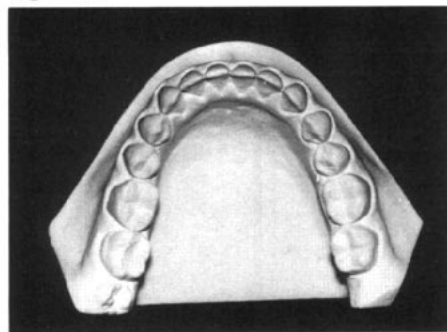


Figure 3E

History and etiology

The patient was a white woman, 23 years 2 months old at the time of initial records. She was in good health, tonsils and adenoids were removed at age 3; her appendix was removed at age 7 and her medical history was non-contributory. She reported in her dental history that, since childhood, she had her chin deviated to the left when biting. She also reported that during a recent dental appointment, her gnathologist insisted that she should have her bite corrected with orthodontic treatment before he would do any definitive dental work on her decayed teeth.

Breathing was normal through her nose and no oral habits were present. Her lips were unstrained in closure. The oral mucosa, tongue, hard and soft palates were normal in color and texture. Oral hygiene was good and the amount of attached gingiva was adequate. TMJ function was abnormal because the right condyle was out of the fossa in centric occlusion although

the patient had no TMJ dysfunction symptoms nor signs.

The cause of this malocclusion was probably genetic. There was no history of thumbsucking, tongue had a normal posture, and the patient's mother had the same malocclusion.

Treatment plan

Treatment objectives were as follows:

1. Correct posterior crossbites, improve mandibular dental midline deviation and obtain front view facial symmetry by increasing maxillary transverse width 5 mm with slow maxillary orthopedic and orthodontic expansion.
2. Correct the anterior crossbite of the maxillary left lateral incisor and the dental midline deviation with a full edgewise appliance and elastics.
3. Improve her facial profile and achieve a functional occlusion (with centric occlusion coinciding with centric relation) by eliminating the left lateral shift.

The patient was made aware that an attempt would be made to orthopedically-orthodontically expand the maxilla without surgery, but with the understanding the surgery might be needed if sufficient expansion was not attained. A non-extraction approach to treatment was chosen because the incisors were in a good anterior posterior relationship, there was no crowding and the patient had good soft tissue balance with competent lips. A Minne Expander (Ormco Corporation, Glendora, CA) would be used to expand the maxilla, delivering a continuous and known force of 7 lbs. This has been demonstrated to be enough force to achieve orthopedic expansion.^{1,2} The advantage of the Minne Expander is that at any time during treatment the effective force can be determined by measuring the compression of the spring and consulting the compression-to-load chart.

A schedule of slow activation would be used because of the increased sutural resistance to expansion which occurs in a patient of this age.^{3,4} As soon as the posterior crossbite was overcorrected (anticipating some relapse) a full edge-wise fixed appliance would be cemented. Anterior cross elastics would be used to finish correction of the dental midlines in addition to aligning all remaining permanent teeth. Before starting orthodontic treatment the patient would be referred for the extraction of all third molars. All teeth would be restored as necessary. Removable retainers would be placed at the end of active treatment.

When this treatment plan was presented to the patient she rejected categorically using full bands. After much discussion the plan was modified by eliminating the objective of dental midline correction. The maxillary left lateral incisor crossbite would be corrected with a removable appliance. This second treatment plan was accepted by the patient.

Prognosis for the patient was fair. She was at an age when her natural resistance to sutural expansion was great which would help reduce the orthopedic response and increase unwanted dental movement (which tends to relapse). Further affecting the prognosis was the fact that full fixed appliances were not to be used and, after years of abnormal function, the patient's form was probably altered in the shape of some asymmetrical mandibular and maxillary growth and asymmetrical dental wear.

Treatment progress

Bands were adapted to the four maxillary molars and two second premolars. When fabrication was completed, the expansion appliance was cemented and the spring compressed 2 mm,

which delivered approximately 7 lbs of force. The patient was taught how to activate the spring. Since maintenance of a continuous 7 lbs of force during treatment was required, the patient activated the spring at the same rate as the forces decayed due to the expansion. In other words, the schedule of activations was at the same rate as the skeletal response in order to avoid accumulation of additional (residual) forces. To accomplish this, the patient was given the following appointment schedule:

The first week the expander was cemented, the patient activated the nut one-quarter turn (.2 mm) every 12 hours and was seen twice; the next week the nut was activated one-quarter turn per day and the patient was seen once; the next four weeks the nut was activated one-quarter turn twice a week and the patient was seen every two weeks and the final 2½ months the patient activated the nut one-quarter turn every week and was seen every three weeks.

During these appointments the compression of the spring was measured and readjusted so there would be a continuous force of 7 lbs (2 mm compression). If the spring was found to be compressed more than 2 mm, the nut was turned to obtain a 2 mm compression and the patient told to reduce the activation schedule by one-half. If the spring was found to be less compressed than 2 mm it was adjusted to a 2 mm compression and the patient told to activate the nut at the same rate as the previous activation schedule to prevent excessive forces from accumulating.

One month after cementing the Minne Ex-



Figure 4A



Figure 4B

Figure 4A,B
Posttreatment photographs at 24 years 4 months

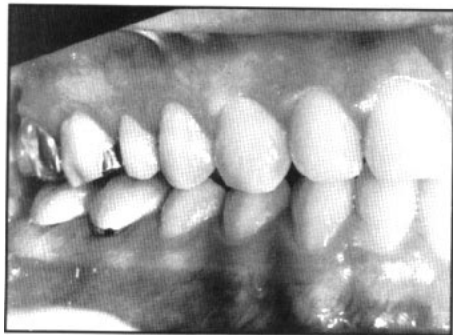


Figure 5A



Figure 5B



Figure 5C

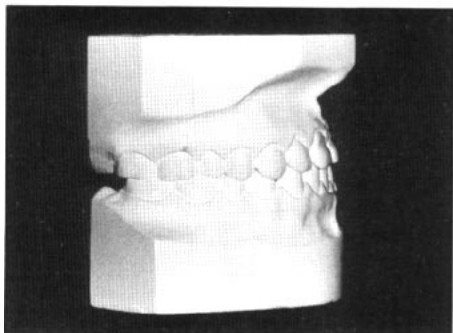


Figure 6A

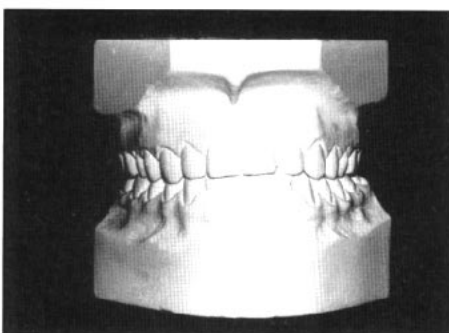


Figure 6B

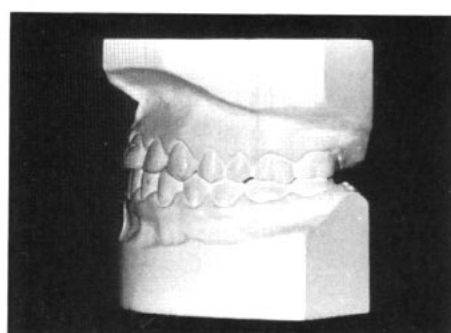


Figure 6C

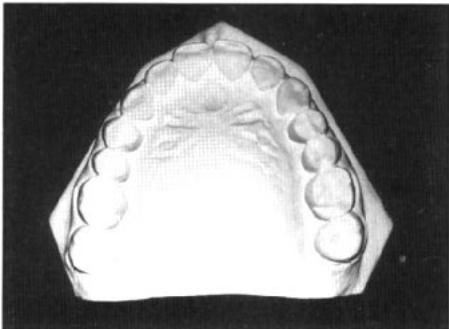


Figure 6D

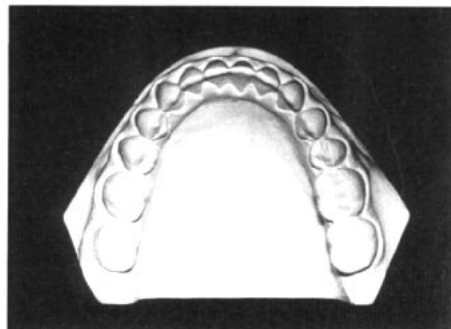


Figure 6E

Figure 5A-C
Posttreatment intraoral photos at 27 years
5 months

Figure 6A-E
Posttreatment study casts

pander a 1 mm space appeared between the maxillary central incisors. This space closed autonomously 2 months later.

Four months after cementing the appliance, the nut activations were discontinued because the desired lingual crossbite overcorrection was achieved with maxillary molar lingual cusps occluding more buccal than ideal on the mandibular molars.

Five months after discontinuing the activations (leaving the Minne Expander in place as a fixed retainer with the nut locked), it was removed and a maxillary wraparound removable retainer was given to the patient.

Response to treatment was excellent with no complications. Final records were taken 6 months after removing the Minne Expander.

Results

In front view the patient's chin is now within the normal range of facial symmetry. The patient's smile is improved because her mandibular midline is off center only 1.5 mm instead of 4

mm and her lip commissure is now horizontal instead of tilted.

In profile view her facial concavity improved from a -4 degree to a -2 degree angle of convexity (norm = 0 degrees) due to SNA moving 1 degree forward. Her lips are unstrained in closure.

Good gingival health was maintained with no gingival recession occurring and no abnormal tooth mobility. No caries or enamel decalcification occurred during treatment.

All anterior and posterior crossbites were corrected. The required maxillary expansion was achieved to obtain a more normal occlusion. The increase in width between first molars was 4 mm.

Since the mandible can now reach centric occlusion without a lateral shift, the following three factors improved:

- The mandibular dental midline and the chin moved 2.5 mm towards the maxillary midline.
- The almost Class III occlusion on the right side (due to the condyle being out of



Figure 7A



Figure 7B

Figure 7A,B
Postretention photographs at 38 years 11 months

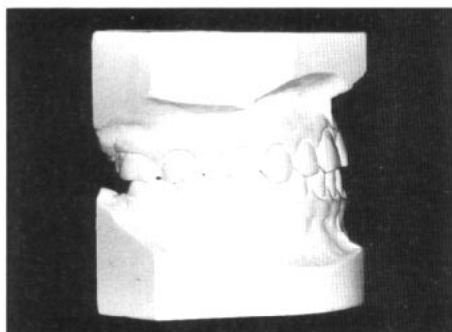


Figure 8A

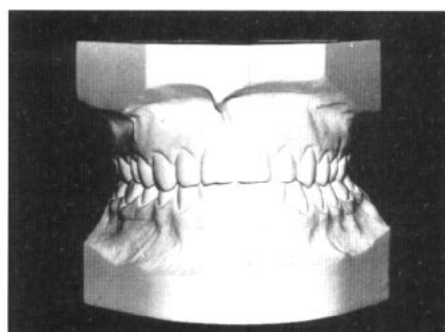


Figure 8B

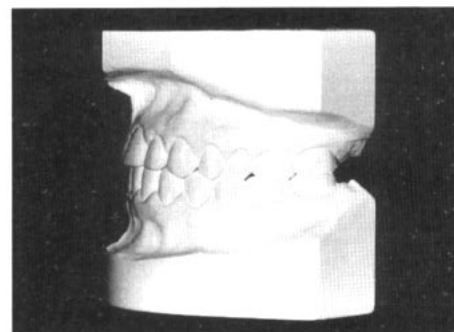


Figure 8C

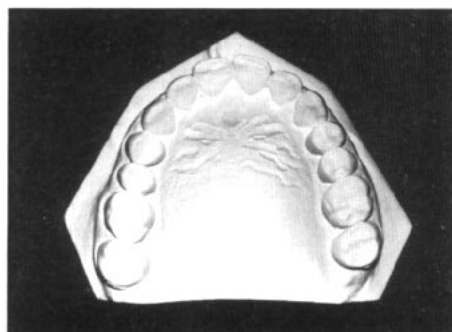


Figure 8D

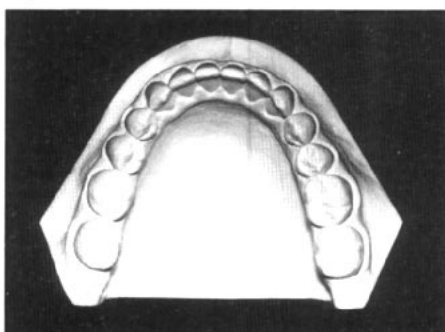


Figure 8E

Figure 8A-E
Postretention study casts at 38 years 11 months

the fossa) changed to an almost Class I relationship.

- c) The left lateral maxillary incisor in anterior crossbite corrected autonomously without the need to add a spring to the maxillary removable retainer.

A canine rise and anterior guidance exist in left lateral, right lateral and protrusive excursions. No TMJ dysfunction symptoms exist; centric occlusion and centric relation now do coincide; no interferences are detectable in working or balancing functions.

The lateral overall cephalometric superimposition shows that skeletal changes were minimal (due to the patient's age). The posterior part of the maxilla (PNS) moved 2 mm downward, possibly due to the maxillary expansion. Point A moved 1 mm forward (SNA increased 1 degree). Hard tissue pogonion moved .5 mm forward and soft tissue pogonion moved 1 mm forward.

The full set of periapical radiographs taken

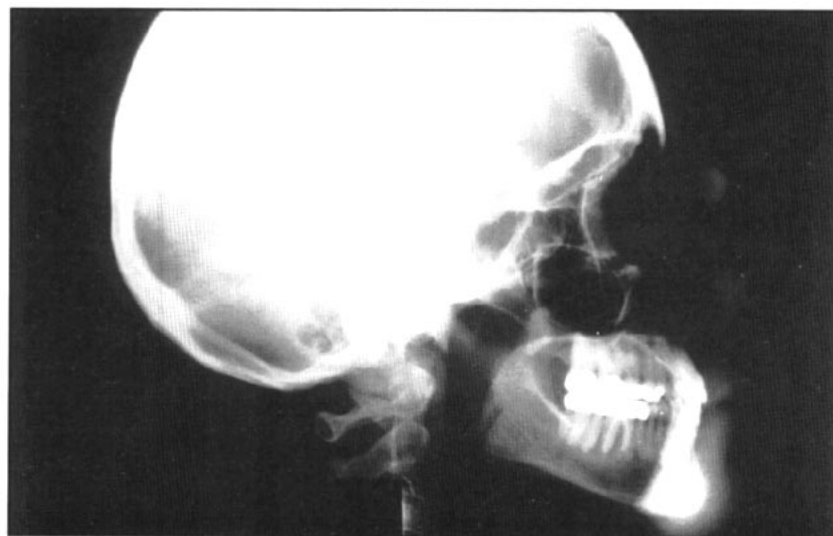


Figure 9
Headfilm at 38 years 11 months

after treatment reveal that the teeth and surrounding tissues are healthy and that there is no discernible evidence of bone loss or root resorption.

Retention

A maxillary removable retainer was inserted immediately after removal of the Minne Expander and the patient was instructed to wear it full-time for 3 months. A mandibular retainer was not required because the mandibular teeth were not moved orthodontically. After 3 months the lingual acrylic was gradually relieved in the molar and premolar areas (which had been over-corrected) to allow these teeth to settle. Three months later, all teeth had settled into correct occlusion and a new retainer was made. The patient was seen monthly for the first 6 months after active treatment ended, and thereafter was seen every 6 months for 3 years, until she stopped using her retainer. She has been seen yearly since discontinuing retention. She also sees her dentist and a periodontist yearly for preventive procedures.

Postretention evaluation

Front and profile facial views demonstrate skin aging but the same soft tissue balance and maintenance of treatment results, with some additional improvement in the angle of convexity which changed from the original -4 degrees to 0 degrees (norm = 0 degrees).

The patient continues to demonstrate good oral health. Stability of the dental correction has been maintained, with an improvement over the treatment result because the buccal interdigitation on the right side is now in Class I relationship.

Transverse width of the maxillary buccal segments relapsed 1 mm; since there are no lingual or anterior crossbites, this has been of no clinical significance. The horizontal enamel defects on the maxillary central incisors have been covered with bonded resin.

The overall cephalometric superimposition reveals that in the 16 years between initial and final headfilms 2 mm of nose growth occurred in a downward and forward direction and the lip commissure moved down 2 mm.

The maxillary and mandibular composite tracings demonstrate practically no change in incisor or molar position. The apex of the maxillary incisors moved forward 2 mm.

The panoramic and periapical radiographs taken 15 years postretention reveal continued health in all areas. Two crowns have been placed and the mandibular right first molar has had endodontic therapy.

Final evaluation

The correction accomplished for this patient with a fixed expansion appliance in just 4 months of active treatment is remarkable. Because of excellent stability, good health, and normal function, it is believed that the original diagnosis and plan of treatment were correct.

In conclusion, this patient benefited from orthodontic treatment in a number of ways. She is psychologically improved because of the reduction in facial asymmetry. Her occlusal function improved with correction of the posterior crossbite and elimination of the lateral shift. The patient now has a relatively stable dentition following orthopedic-orthodontic correction of a deficient maxilla.

Author Address

Roberto Justus
Ejercito Nacional 530-502
Mexico City, Mexico 11560

R. Justus is a professor of orthodontics, Universidad Tecnológica de Mexico and Research Director in the graduate department of orthodontics, Universidad Intercontinental. He is a Diplomate of the American Board of Orthodontics and maintains a private practice in Mexico City. He presented this case to the American Board of Orthodontics in partial fulfillment of the requirements for Board certification.

References

1. Isaacson, R.J., Ingram, A.H.: Forces produced by rapid maxillary expansion. II. Forces present during treatment. *Angle Orthod.*, 34:261-270, 1964.
2. Justus R.: A cephalometric and clinical study of the use of the Minne Expander to correct posterior crossbites in adults. *PCSO Bulletin*, 50:48-51, Winter, 1978.
3. Kokich, V.G.: Age changes in the human frontal zygomatic suture from 20 to 95 years. *Am. J. Orthod.*, 69:411-430, 1976.
4. Miroué, M., Rosenberg, L.: The human facial sutures; a morphologic and histologic study of age changes from 20 to 95 years. MSD thesis, Department of Orthodontics, University of Washington, 1975.