Surgically assisted palatal expansion: An important consideration in adult treatment

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An increasing percentage of orthodontic patients are adults with challenging malocclusions. While some aspects of many adult cases are similar to those seen in children, others must be addressed quite differently. Although many adults appear to be generally more cooperative than children in dealing with the inconveniences of orthodontic treatment, they nonetheless require efficient, less lengthy treatment plans. Many are intolerant of multiple extractions or elaborate surgery. Consequently, the need for practical treatment plans that assure good, stable results is real. Also, any perceived change in the soft tissue profile (positive or negative) is likely to be significant to the patient. The case presented here, in which surgically assisted palatal expansion and extraction of one mandibular incisor were employed, illustrates an approach to a difficult adult orthodontic problem that is both practical and efficient from diagnostic and biomechanical points of view. In this case, in which an adult patient exhibited significant transverse discrepancies and dental crowding, a treatment plan that addressed these considerations was employed. (Am J Orthod Dentofacial Orthop 1991;99:85-90.)

CASE REPORT
Diagnosis
A 35-year-old man exhibited a Class I malocclusion with significant narrowness of the maxillary arch and dental crowding of both dental arches (Fig. 1). Both maxillary lateral incisors were in crossbite, and the remaining anterior teeth were in an edge-to-edge relationship. Also, the four maxillary premolars and the maxillary right first molar were in crossbite. The maxillary left second premolar was palatally blocked out of the arch. Thus the maxillary arch length was deficient.

Similarly, there was inadequate space in the mandibular arch, resulting in significant dental crowding from second

Fig. 1. Pretreatment orthodontic casts. Projected alignment of the mandibular teeth with proper torque further dictates the need for aggressive maxillary expansion. Note that maxillary left second premolar is blocked from the arch.
Fig. 2. Pretreatment extraoral views showing well-balanced facial features.

Fig. 3. A and B, Intraoral photographs showing marked palatal expansion at point of final turn of Hyrax appliance.

The lateral incisors were lingually malposed.

Facially, the patient had an orthognathic, straight profile. The dental midlines coincided and were centered relative to the facial midline. The lips were competent at rest (Fig. 2).

There was no evidence of temporomandibular joint dys-

function. The intraoral radiographic analysis revealed no ap-

parent pathologic condition. The third molars had been ex-

tracted previously.

History and general clinical picture

The patient's medical history was negative except for the
usual childhood diseases. There were no known allergies,
although the patient was a mouthbreather. No nasal obstruc-
tion was evident, and the tongue posture and the tonsillar area
appeared unremarkable. Occasional bruxism was reported.

Etiology

Genetic predisposition was considered a likely etiologic
factor. However, the mouthbreathing may have contributed
to the development of the transverse discrepancies.

Cephalometric analysis

The skeletal relationships indicated an orthognathic,
straight profile as evidenced by an average facial angle (NPo-
FH = 85°) and an average angle of convexity (NAPo = 0°).
The cephalometric analysis also indicated that the denture
bases were in good positions relative to the cranial base
(SNA = 82° and SNB = 80°), while the sagittal denture
base discrepancy was average relative to the norm
(ANB = 2°). The mandibular incisors were in essentially
normal positions relative to the mandibular plane and the NB
plane (IMPA = 90°; IT NB = 24°). Similarly, the interin-
cisal angle (137°) was average (Fig. 6).

The patient's nose was somewhat prominent when related
to his overall profile. This was evidenced by the lip positions,
which were 3 to 4 mm more posterior than average, relative
to the E plane (Ricketts).

PLAN OF TREATMENT

A main goal of this treatment plan was to attain a pre-
dictably stable result that would preserve the acceptable
Fig. 4. Immediate posttreatment facial photographs show that pleasing profile has been maintained.

Table I. Interdental width measurements showing amount of expansion achieved during treatment and the remarkable stability 2 years 2 months after active treatment

<table>
<thead>
<tr>
<th>Teeth measured</th>
<th>Interdental width (mm)</th>
<th>Difference (mm)</th>
<th>+ ( I - ) Change (mm) Postretention 2 yrs. 2 mos</th>
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<tr>
<td></td>
<td>Pretreatment</td>
<td>Immediate posttreatment</td>
<td></td>
</tr>
<tr>
<td>Maxillary canines</td>
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<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Maxillary first premolars</td>
<td>36</td>
<td>42</td>
<td>+6</td>
</tr>
<tr>
<td>Maxillary second premolars</td>
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<td>59</td>
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integumental profile. Consequently, premolar extractions seemed to be contraindicated.

In an effort to eliminate the transverse discrepancies and much of the dental crowding, expansion of the maxillary arch seemed necessary. Surgically assisted palatal expansion was the technique of choice since conventional rapid palatal expansion, typically used in the treatment of children, is usually contraindicated in skeletally mature adults.

It was thought that this approach would best address the narrow maxillary arch, a chief cause of the malocclusion, and would provide for a nonextraction treatment plan in the maxillary arch. After the expansion and concomitant alignment of the maxillary arch, a diagnostic wax setup was planned to determine the feasibility of extracting one mandibular incisor. Such a plan would provide for minimal dental retraction and thus would ensure retention of the pleasing profile. Minimal morbidity and recovery time after the surgery seemed assured.

Conventional rapid palatal expansion was deemed unacceptable because such a plan would likely provide for merely dental-alveolar (not basal) expansion with the anticipation of an unstable result and potential damage to the periodontal structures. Removable transverse expansion appliances were not considered because it was believed that the treatment time would be unduly long and the results would be less stable over the long term. The extraction of four premolars was rejected since such a plan (1) would most assuredly dictate considerable dental retraction, thus harming the orthognathic, straight facial profile; (2) would unnecessarily sacrifice more teeth; and (3) could provide for a considerably longer treatment time (a significant deterrent to many adults).

**PROGRESS OF TREATMENT**

A Hyrax palatal expansion appliance (O.I.S. Orthodontics, Inc., Aston, Pa.) was cemented to the maxillary first molars and first premolars, and the patient was referred to the maxillofacial surgeon for the surgical procedure. The pa-
The patient was scheduled for outpatient surgery at a local hospital. A modified LeFort I osteotomy was performed through three vertical soft tissue incisions. By means of a tunneling technique, lateral osteotomies were created from the piriform aperture to the pterygomaxillary junction, through the lateral antral wall and the anterior portion of the lateral nasal wall. The pterygoid plates and the midline suture were separated with an osteotome. This allowed both halves of the maxilla to be mobilized with the palatal expansion device.

At the conclusion of the surgery, the surgeon turned the expansion appliance until the papillary gingival tissue blanched between the central incisors (8 turns or approximately 2 mm). The patient tolerated the surgery well and was instructed to turn the appliance twice in the morning and twice in the evening until the next orthodontic visit 4 days later. At that time, the patient was advised to continue turning the appliance in a similar fashion for 3 more days, then reduce the turns to twice daily for a total of 28 turns (approximately 7 mm). Thus a total of approximately 9 mm of expansion was achieved.

Significant expansion, particularly between the maxillary central incisors, was achieved (Fig. 3). The patient returned to work as a systems analyst within a few days of the surgery.

The expansion screw was stabilized with a brass wire, and the mandibular appliances were placed. The mandibular arch was leveled for approximately 3 months while the maxillary teeth were allowed to settle with the expansion device in place.

The expansion appliance was then removed, and a removable shell plate (self-retaining palatal acrylic) was given to the patient, to be worn on a full-time basis. The purpose of this appliance was to retain the expansion until the maxillary teeth were fully banded, bracketed, and engaged with a heavy arch wire.

For approximately 10 months, various arch wires with open coil springs and chain elastics were implemented to align and coordinate both arches as much as possible. At that time, impressions were made for a diagnostic wax setup with the extraction of the mandibular right central incisor.
The setup confirmed the original hypothesis that the incisor extraction would provide for the most acceptable result. The patient was subsequently referred for this procedure before orthodontic treatment was resumed. The mandibular dental crowding was eliminated, with minimal extraction space remaining. Final alignment and remaining coordination of both arches were completed 14 months later. The total treatment time from insertion of the expansion appliance until retention was approximately 1 1/2 years.

RESULTS ACHIEVED

The patient's profile and facial features remained harmonious and well balanced, with little change (Fig. 4). The gingival tissues appeared normal, with no apparent signs of inflammation or strain. The molars and canines were treated to good Class I positions. The maxillary dental midline remained centered and, as planned, the mandibular dental midline bisected the middle incisor (mandibular left central incisor) as a result of the extraction of one incisor (Fig. 5).

The overbite and overjet appeared ideal. Functionally, the occlusion appeared to be well interdigitated, with no obvious interferences in lateral or protrusive excursions.

Considerable maxillary expansion was achieved in the posterior segments as evidenced by the interdental width measurements in Table I. Most of the expansion was realized between the second premolars and the second molars, respectively, with significant expansion between the first molars.

The interdental width measurements of the mandibular teeth showed that there was some minor narrowing between the canines and premolars, whereas the second molars expanded slightly. The mandibular first molars showed no significant change.

Table I further shows that the significant expansion achieved in this case has remained stable 2 years and 2 months after completion of the active treatment and 8 months out of palatal retention. Bonded lingual wires were still in place, however, on the incisors. (One bonded wire between the maxillary left central and left lateral incisors was lost and was left off without consequence.)

The expansion provided sufficient space for alignment of the maxillary teeth and elimination of all the crossbite relationships evident before treatment. The mandibular incisor extraction provided enough space to eliminate the mandibular dental crowding with minimal excess space closure while providing for an ideal overbite and overjet. Similarly, the expansion enabled good coordination of both arches.

The immediate posttreatment panoramic radiograph indicated there were no apparent anomalies. Cephalometric analysis and superimposition of the pretreatment and post-treatment cephalograms indicated the skeletal profile and the integumental profile remained essentially unchanged (Fig. 6).

The facial angle, the angle of convexity, and the mandibular plane angle remained within 1° of the original measurements. The sagittal denture base discrepancy (ANB) remained at 2° with no apparent flattening of the midface (SNA = 80°; SNB = 78°).

Similarly, the denture analysis revealed minimal change as a result of treatment. This was evidenced by a 2° change in the interincisal angle (135°), and essentially no change in the lower incisor position relative to the mandibular plane and the NB plane (IMPA = 89°; ITNB = 23.5°). Most noteworthy was the finding that the soft tissue profile was preserved as evidenced by only 2 mm flattening of the lip positions relative to the E plane.

Superimposition of the pretreatment and post-treatment cephalograms further showed the molars uprighted somewhat, whereas the maxillary incisors extruded minimally. Also, there was slight depression of the mandibular incisors.
RETENTION

At the conclusion of the active treatment, the fixed appliances were removed and three 0.0175-inch GAC Wildcat wires (GAC International, Inc., Central Islip, N.Y.) were bonded lingually between the four maxillary incisors with a light-cured bonding agent. Similarly, two 0.0175-inch GAC Wildcat wires were bonded between the three mandibular incisors. Maxillary and mandibular wraparound Hawley retainers were also inserted.

The patient was instructed to wear the retainers on a full-time basis. At the end of 1 year, the maxillary retainer wear was reduced to nighttime only for an additional 6 months. At the same time, the mandibular retainer wear was limited to nights only, but for an additional year.

It was intended that the bonded lingual wires should remain indefinitely as long as the areas involved could be kept clean. The patient's general dentist was advised to remove them if necessary for diagnostic or restorative purposes.

FINAL EVALUATION

The primary goals set forth before treatment were largely realized. The pleasing profile was significantly maintained with a plan that involved only one extraction and a relatively minor surgical procedure. The surgery resulted in minimal morbidity; thus it required only a brief recuperation period and minimal loss of time from work—important considerations for an adult orthodontic treatment plan.

The transverse discrepancies and insufficient arch lengths, the chief causes of the malocclusion, were appropriately addressed and involved less than 2 years of active treatment. Tooth size discrepancies in the anterior regions were recognized, allowing for the achievement of an ideal overjet and overbite.

The final posttreatment records indicate that the transverse corrections and dental alignment remained exceptionally stable. There were no apparent adverse responses to the surgical procedure (Fig. 7).

The prognosis for a continued stable result appeared good. The success of this treatment would seem to indicate that surgically assisted palatal expansion is a practical treatment modality for adults with significant maxillary arch width deficiency.

REFERENCES


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