Nonextraction treatment of Class I malocclusion with severe anterior crowding: A case report

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The treatment of a 12-year-old girl with a Class I malocclusion, severe anterior crowding, and posterior crossbite is described. The patient, who had limited growth potential and exhibited a straight facial profile, was treated with rapid maxillary expansion and nonextraction edgewise mechanics. (Quintessence Int 2003;34:123–129)

Key words: Angle Class I malocclusion, anterior crowding, nonextraction treatment, rapid maxillary expansion

Class I malocclusions include anomalies in which the anteroposterior relationship of the mandibular and maxillary arches is within normal limits. However, there may be transverse or vertical malrelationships of the arches. Crowding and local irregularities are common causes of Class I malocclusion. Primarily, three basic treatment strategies can be used to solve crowding: extraction, interproximal reduction, and expansion. Recently, use of dental alveolar distraction osteogenesis to gain arch length has gained popularity.

One approach to the treatment of tooth-arch length discrepancies is the extraction of permanent teeth. Removing one or more teeth within an arch reduces total tooth mass and allows the relationship between the dentition and the bony bases to be corrected. The primary advocates of this technique during this century include Tweed and Begg.

A second method of eliminating discrepancies between aggregate tooth size and existing basal arch length is interproximal reduction or, as termed by Peck and Peck, reproximation.

A third approach to the treatment of crowding is expansion. In the early stages of the mixed dentition, removable expansion appliances can be used. In the permanent dentition, rapid maxillary expansion is indicated. Rapid maxillary expansion is the best example of true orthopedic expansion. Changes are produced primarily in the underlying skeletal structures rather than by the movement of teeth through alveolar bone. After the active phase of expansion is completed, the appliance is left in place for an additional 4 or 5 months to allow reorganization of the midpalatal suture.

CASE REPORT

A 12-year-old girl with severe crowding in the maxillary and mandibular arches presented with a straight soft tissue profile (Figs 1a and 1b) and an Angle Class I malocclusion (Fig 2a). The dentition and the periodontium were in good health. Analysis of the diagnostic casts revealed severe tooth-arch length discrepancies in both arches. Haws-Nance analysis showed a −10-mm discrepancy in the maxillary arch and a −8-mm discrepancy in the mandibular arch (Figs 2b and 2c).

The permanent maxillary right lateral incisor was in contact with the maxillary right first premolar, completely blocking the eruption of the canine (Fig 3). The maxillary canine could be palpated under the buccal mucosa. In the mandibular arch, the right permanent canine was blocked to the labial. An edge-to-edge occlusion was present in the anterior segments. Nasal deviation, mouth breathing, and maxillary transverse discrepancy were noted.
Evaluation of a hand-wrist radiograph revealed that the patient had limited growth potential. The cephalometric tracing (Fig 4) revealed a straight facial profile, a vertical growth pattern, and upright maxillary incisors (Table 1).

**Treatment objectives**

1. Correction of the maxillary transverse deficiency
2. Creation of space for the maxillary right canine and mandibular right canine
3. Alignment of the maxillary and mandibular incisors
4. Class I canine relationship
5. Optimum functional occlusion

**Course of treatment**

The first objective was correction of the maxillary transverse deficiency. A Haas-type® rapid maxillary expansion appliance was utilized and expanded at the rate of one turn per day (Fig 5). The appliance was retained in place for an additional 4 months to allow reorganization of the midpalatal suture.

The mandibular molars were banded, the mandibular and maxillary anterior teeth were bonded with 0.018 × 0.025-inch edgewise brackets, and protraction utility arches were applied. The remaining teeth were progressively bonded, and continuous arches were placed. The mandibular collapse was corrected with
TABLE 1 Cephalometric data

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*Norms obtained from Athanasios.13

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expanded arch wires. The active treatment time was 18 months.

Maxillary and mandibular Hawley retainers were placed after debonding of the orthodontic brackets. The retainers were worn full time for 12 months and then at night only during a progressive phaseout of 12 additional months.

**Treatment results**

The maxillary arch was expanded. Class I molar and canine relationships were obtained (Fig 6a). The maxillary anterior teeth were proclined. Space for the maxillary right canine was established with expansion and proclination of the anterior teeth, resulting in alignment of the canine to normal position (Fig 6b). Space for the mandibular permanent right canine was established by interproximal reduction and proclination of the mandibular incisors (Fig 6c).

The proclination of the maxillary anterior teeth moved the lips labially, enhancing the facial profile. The soft tissue profile had clearly improved at the end of fixed orthodontic treatment (Figs 7a and 7b), as verified by a cephalometric tracing (Fig 8).
Fig 6a Intraoral view at the end of fixed orthodontic treatment.

Fig 6b Maxillary arch at the end of fixed orthodontic treatment.

Fig 6c Mandibular arch at the end of fixed orthodontic treatment.

Figs 7a and 7b Extraoral views at the end of fixed orthodontic treatment.

Fig 8 Superimpositioning of the initial and final cephalometric tracings.

The panoramic radiograph taken at the time of debonding indicated that not all the roots of the teeth were in good alignment (Fig 9). The right maxillary canine-lateral incisor roots and mandibular right and left premolar-canine roots were not parallel. The patient was unable to continue treatment, because of the relocation of the family, and the patient insisted that the orthodontic appliances be removed prior to detailing. The mandibular and maxillary third molars had not erupted when active orthodontic treatment was finished.

The patient was reexamined 2 years after debonding (2 years posttreatment). The occlusion was partly stable (Fig 10). There was not enough overbite to provide for anterior coupling and guidance with posterior disocclusion. The maxillary right second premolar and maxillary left first premolar were out of occlusion.

The patient was examined 5 years postretention (7 years posttreatment) and records were taken (Figs 11a to 11c). The dentition was partly stable. The right buccal segment was out of occlusion, as was the maxillary left first premolar. Rotational relapse of the mandibular left lateral incisor, maxillary right central incisor,
and maxillary left canine was observed. During this postretention period, the mandibular and maxillary third molars were extracted (Fig 12).

The soft tissue esthetics were pleasing 5 years postretention (Figs 13a and 13b). The improvement in the soft tissue profile at the end of treatment and 5 years postretention was obvious (Fig 14).

DISCUSSION

Crowding is the result of a discrepancy between tooth size and arch size. When crowding is confined to labi-olinguai irregularity in the incisor and canine regions, treatment may be achieved by means of first premolar extraction. The vertical growth pattern (gonion-gnathion-sella-nasion angle: 42 degrees; Frankfort horizontal-mandibular plane angle (FMA): 26 degrees) (see Table 1) and severe crowding (–10-mm discrepancy in the maxillary arch and –8-mm discrepancy in the mandibular arch) in this patient were indications for extraction treatment. However, the patient's straight profile and obtuse nasolabial angle did
not permit tooth extraction. Instead, the tooth-arch length discrepancy in this patient was treated with rapid maxillary expansion, proclination of the maxillary incisors, and interproximal reduction of the mandibular anterior teeth. With rapid maxillary expansion and limited maxillary growth, point A came forward, and the sella-nasion-point A angle increased from 67 to 73 degrees (see Table 1). If the patient had been treated with maxillary and mandibular first premolar extraction, the profile would be concaved and dished in. Favorable growth at pogonion also enhanced the soft tissue facial profile.

In the mandibular arch, the collapse was corrected with expanded arch wires. A recent study of patients treated with maxillary expansion\(^1\) suggested that slight uprighting of the mandibular posterior teeth may occur during the postexpansion period. The occlusion of the patient was stable 5 years postretention. The patient is now 21 years old and is still monitored periodically.
CONCLUSION

A Class I malocclusion with severe crowding and unilateral posterior crossbite in the permanent dentition was treated without tooth extraction to prevent adverse facial changes. The crowding was resolved through rapid maxillary expansion, proclination of the maxillary incisors, and interproximal reduction of the mandibular anterior teeth.

REFERENCES