Angle Class III malocclusion treated with mandibular first molar extractions

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A Class III malocclusion associated with dental asymmetry is a complex diagnostic and treatment problem in orthodontics. The goals of maintaining or improving the facial profile and achieving good function are decisive factors when considering whether to plan a surgical or a nonsurgical treatment approach. A fixed appliance in combination with extractions could be considered for nonsurgical management of this type of malocclusion in the permanent dentition. This article presents the results of an orthodontic approach to a Class III subdivision malocclusion in an adult treated with mandibular first molar extractions. The extractions provided the space needed to correct the overjet and overbite and to improve the intercuspation. (Am J Orthod Dentofacial Orthop 2012;142:384-92)

Class III malocclusions represent a small proportion of all malocclusions among orthodontic patients. However, the treatment is a considerable clinical challenge because of the complex diagnosis and the difficult prognosis, mainly when the Class III relationship is associated with dental or skeletal asymmetries. There are 2 main treatment options for a Class III malocclusion that is identified after facial growth has been completed: orthodontic treatment and orthognathic surgery. For many patients with a Class III malocclusion, surgical treatment is the best alternative. The amount of the skeletal discrepancy usually determines whether a surgical correction is appropriate. However, in borderline cases, a balanced soft-tissue profile will help to determine whether patients are unsuitable for surgery. Generally, fixed appliances in conjunction with tooth extractions are considered the best option for nonsurgical management of adult Class III patients.

Traditionally, the extraction of the 4 premolars (mandibular first and mandibular second) is the most common choice. Alternative extractions have also been used. If the mandibular third molars are present, extraction of the mandibular first molars could be a good substitute option to solve the anteroposterior and vertical problems and obtain a Class I molar relationship. This approach is not indicated for all patients, because it requires first molar space closure, which is time-consuming. Also, the mandibular second molars have a tendency to tip mesially and lingually, requiring additional orthodontic mechanics to prevent that problem.

This case report describes a 20-year-old man with a Class III malocclusion. The treatment was carried out by using fixed appliances and mandibular first molar extractions. Our aim is to illustrate that, with careful case selection, a first molar extraction protocol can be relatively straightforward.

ETIOLOGY AND DIAGNOSIS

This patient came to the orthodontic clinic at the Federal University of Rio de Janeiro in Brazil with the chief complaint of “dysfunctional bite.” Anamnesis was carried out, and the medical and dental histories showed nothing abnormal. The swallow and speech functions were normal, and the respiratory function was bucco-nasal. The extraoral assessment showed a straight profile, a slightly high mandibular plane angle, and an increased lower facial height. The nasolabial angle was slightly increased. No significant discrepancy between habitual occlusion and centric relation was
found. The temporomandibular joints were normal, and his face was symmetric. Although he had a prominent lower lip, his facial appearance was pleasing, and he had no complaints about esthetics (Fig 1).

The intraoral examination showed a Class I molar relationship on the right side and a complete Class III molar relationship on the left side (Fig 2). The maxillary and mandibular anterior teeth were in an edge-to-edge relationship, with no overjet or overbite. Crossbites of the maxillary left lateral incisor and first premolar were noted. The dental midline was not coincident with the facial midline. The maxillary midline was deviated 2 mm to the left. All permanent teeth were erupted, except for the maxillary third molars. Minor crowding was present only in the mandibular arch, with incisor irregularity of 1.2 mm. Significant rotations of the mandibular left second premolar and right second premolar were noted. The space analysis indicated a positive discrepancy of 1.3 mm in the mandibular arch. Both arches had a parabolic form.

A panoramic radiograph confirmed the presence of all permanent teeth, including developing maxillary third molars (Fig 3). A frontal radiograph showed no transverse or asymmetric skeletal problems. The lateral cephalometric evaluation (Fig 4) indicated a skeletal Class I, bordering on mild skeletal Class III pattern (ANB, 0°). This skeletal pattern was confirmed by the Wits analysis that showed Wits appraisal (AO-BO) to be −4 mm. The mandibular planes were higher than normal limits, indicating a vertical growth pattern.
The maxillary and mandibular incisors were protruded (1.NA, 33°; 1.NB, 28°) and proclined (1-NA, 9 mm; 1-NA, 8 mm). The lower facial profile was straight, with the upper lip lying behind the S line, and the lower lip passing it slightly (S-LS, −2 mm; S-LI, 1 mm).
TREATMENT ALTERNATIVES

Orthognathic surgery was not a viable treatment option because the skeletal deficiency was not clinically significant and the patient was satisfied with his facial profile and appearance. Maximum anchorage was discussed for en-masse movement of the mandibular teeth and correction of the maxillary dental asymmetries, but the patient refused to use any kind of temporary anchorage device. Maxillary second premolar and mandibular first premolar extractions could be a treatment option; however, no changes in the upper lip were desirable. Because the mandibular third molars were in an ideal position and the patient was cooperative, we chose to extract the mandibular first molars.

TREATMENT OBJECTIVES

The treatment objectives were to maintain the patient’s profile, improve dental and smile esthetics, level and align the maxillary and mandibular dental arches, correct the dental asymmetries, achieve Class I molar and canine relationships on both sides, achieve normal overjet and overbite, and establish a good functional occlusion.

To achieve all the desired objectives, we decided to use fixed orthodontic appliances with extraction of the mandibular first molars to align and level, correct the overbite and overjet, and achieve a Class I relationship.

The maxillary third molars would also be extracted to facilitate distalization of the maxillary right posterior teeth to correct the dental asymmetries (midline).

TREATMENT PROGRESS

The molars were banded, and the remaining teeth were bonded with a standard edgewise fixed appliance (0.022 × 0.028 in; Morelli, São Paulo, Brazil) (Fig 5). The teeth were aligned and leveled by using a sequence of round steel continuous archwires of 0.014- to 0.020-in stainless steel. Subsequently, rectangular steel archwires of 0.018 × 0.025-in stainless steel were used and were followed by 0.019 × 0.026-in rounded-edge stainless steel working wires to allow final space closure and occlusal adjustment. All the steel archwires were conformed according to the patient’s initial arch form. Elastic chains were used to move the second molars mesially, with anchorage reinforcement on the mandibular teeth (right second premolar to left second premolar). Lingual buttons were used to control the rotation of the premolars and the second molars during space closure. Class II intermaxillary elastics and sliding jigs were used on the right side to distalize the teeth and correct the maxillary midline. The right third molar was extracted before this phase to facilitate the distalization. Class III and Class II elastics were used to coordinate the arches; after a good occlusal relationship was obtained, detailing and finishing procedures were undertaken.

Before removal of the fixed appliances, the interdental gingival clefts that occurred after the extraction space closures were surgically removed. Appliance adjustments were made every 4 weeks, and the active treatment lasted 30 months.

After debonding, the patient was instructed to wear a maxillary circumferential Hawley retainer for a year and at night for another year. In addition, a mandibular lingual retainer was bonded from canine to canine (0.028-in stainless steel).

TREATMENT RESULTS

The treatment plan was a satisfactory alternative to achieve the objectives (Figs 6-9). The maxillary and mandibular arches were well aligned and leveled. Overjet and overbite were corrected to normal standards. Good torque control was maintained, and the incisors were aligned with better inclination after treatment. The interincisal angle increased, as the mandibular incisors uprighted and the ANB angle remained unchanged (Table). Class I molar and canine relationships were achieved on both sides (Fig 6). The upper and lower lips moved very little. The mandibular
plane was maintained during the treatment. Good intercuspal contacts, coincident midlines, and root parallelism were achieved. Ideal occlusion was established with satisfactory dental and smile esthetics. The result of the gingivectomy procedure showed significant improvement in the gingival cleft depths in the previous extraction sites.

DISCUSSION

Class III malocclusion has been a subject of interest in many investigations because of the challenges involved in treating this type. When a Class III relationship is diagnosed after the completion of facial growth, the treatment alternatives are more limited. Generally, fixed appliances in conjunction with tooth extractions are considered the only option for nonsurgical treatment. Traditionally, extraction of 4 premolars would be the first choice. First molars could be chosen for extraction in preference to premolars when the first molars have extensive caries, hypoplastic lesions, apical pathoses, or significant restorations. Other situations in which first molars could be extracted are significant crowding at the distal part of the mandibular arch, high mandibular plane angle, and anterior open bite. Of course, evaluation of the mandibular second and third molars is imperative, because they would be part of the functional dentition.

Fig 5. Treatment follow-up photographs.
One disadvantage of first molar extraction is the difficulty with extraction space closure, because the mandibular second molars tend to tip mesially and lingually. Treatment success can be partially attributed to the use of large enough rectangular archwires to allow space closure with minimal tipping. The treatment time, when compared with that of a similar patient treated with extraction of 4 premolars in a graduate school setting, is probably 6 to 8 months longer. The cephalometric superimposition (Fig 10) showed that the left second molar did not move significantly mesially. The extraction space was used to align the teeth and correct the overjet.

In this patient, only the mandibular first molars were extracted. This option prevented significant changes in the upper lip that would have been undesirable to the patient’s facial profile (Figs 9 and 10). Fortunately, there was sufficient space to align and level all the maxillary teeth without extractions, except for the maxillary right third molar; this facilitated distalization of the maxillary right posterior teeth and correction of the asymmetry and midline deviation.

After the orthodontic closure of the extraction sites, it is common to find interdental gingival clefts. These are defined as invagination of the interproximal tissues with definite mesial and distal peaks having a depth of at least 1 mm. The presence of these clefts might have clinical implications not only in terms of orthodontic relapse, but also in the maintenance of gingival health. Therefore, surgical removal of the
gingival clefts is indicated to help maintain the orthodontic treatment results as well as the periodontal health.\textsuperscript{16,18-20}

These patients should be followed monthly after debonding for at least 3 months, because it is common to see opening of some space in the extraction sites. We...
believe that this typically happens because the mandibular second molars are smaller than the first molars. So, even after space closure with ideal root paralleling, the occlusion might cause the second molars to move distally to achieve better intercuspation. If a space appears and fails to close spontaneously, it can be closed easily with composite restorations.\(^4\)

**CONCLUSIONS**

Extraction of the mandibular first molars provided the space needed to correct the overjet, overbite, and molar relationship. This case report illustrates a good alternative for treating adults with a Class III malocclusion. Adequate root parallelism, prophylactic gingivectomy, and immediate and adequate retention should help to maintain the orthodontic results.

**REFERENCES**

Fig 10. Cephalometric superimposition of the initial and final tracings: A, total superimposition, registered on sella; B, partial superimpositions of the maxilla (best fit) and the mandible (symphysis registration).