Treatment of ankylosis of the mandibular first molar with orthodontic traction immediately after surgical luxation

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The aim of this article was to report a clinical case of orthodontic treatment in a patient with Class II malocclusion and ankylosis of a maxillary first molar. Surgical luxation was performed, followed immediately by traction with an orthodontic arch with straps. The results obtained were satisfactory, and occlusal equilibrium was improved. (Am J Orthod Dentofacial Orthop 2011;140:396-403)

Dentoalveolar ankylosis is an anomaly of eruption that involves anatomic fusion of the alveolar bone with the cementum or dentin.1,2 The periodontal ligament disappears, and the cementum and dentin can be resorbed and replaced by bone, resulting in fusion.1,3

Ankylosis can occur during any eruptive period or after the occlusion is established.1,2 If there is dentoalveolar ankylosis, vertical growth and development of the alveolar bone are affected, diminishing the height and not allowing vertical movement of the affected tooth, which will remain below the occlusal plane, giving the impression of being submerged.2,6

Ankylosis of a tooth can cause various complications, such as loss of arch length,7 inclination of the adjacent teeth,8 risk of caries and periodontal disease of the neighboring teeth because of the difficulty of cleaning,9 food impaction,10 reduction in the vertical height of the teeth next to the infraoccluded tooth with extrusion of the antagonist teeth and consequent alteration in the occlusal plane,11 lateral open bite (lateral open occlusal relationship), tongue habits,9 and deviation of the midline to the side of the infraoccluded tooth.11

According to Lim et al,12 five treatment approaches have been suggested for impacted teeth: no treatment, orthodontic treatment, prosthetic buildup, segmental osteotomy, and extraction. No treatment might be the option when the infraocclusion is mild and the tooth can be periodically observed. Orthodontic treatment combined with luxation might be an acceptable approach in some cases, although there are risk factors including fracture, recurrence of ankylosis, and the need for endodontic treatment. Prosthetic buildup is possible if infraocclusion is less than 5 mm. Segmental osteotomy is a surgical procedure in which alveolar bone including the affected tooth is sectioned and repositioned. Surgical removal might be appropriate for a nonrestorable tooth with severe infraocclusion and tipping of the adjacent teeth. This approach, however, often results in an exaggerated bony defect.

There have been few case reports regarding treatment of submerged permanent molars.13,14 Several articles described the successful orthodontic treatment combined with surgical luxation in 3 adolescent patients with ankylosed permanent posterior teeth.5,12,13 Also, there have been 2 examples in adults.12,13

The aim of this article was to describe a clinical case of ankylosis of a molar in an adolescent patient, in which surgical luxation followed by traction with a fixed orthodontic appliance was performed.

DIAGNOSIS AND ETIOLOGY

This female patient was 14 years 5 months of age and sought orthodontic treatment with the chief complaint of “crooked teeth.” She was in a good state of general health.

The patient had an Angle Class II subdivision right molar relationship, with a moderate overbite, a maxillary
midline deviation to the right, lack of occlusal contact between the mandibular right first molar and the maxillary right first molar with an open occlusal relationship (open bite) in this region, and a mild arch-length discrepancy in the mandibular arch (Figs 1 and 2). The patient had a straight profile with proportional facial thirds and no asymmetries. Radiographically, she had all of her teeth, with the third molars still forming. The infraocclusion of the mandibular right first molar produced a bone defect in this region (Fig 3). Cephalometrically, the patient had a Class I skeletal relationship, a trend toward horizontal facial growth, a straight profile (LS-S, 0 mm; LI-S, 0.5 mm), retroclined maxillary incisors and well-positioned mandibular incisors (Fig 4).

A percussion test was performed on the mandibular right molar, by using the handle of a clinical mirror for this purpose. A sharp sound was produced, different from the muffled sound of the neighboring teeth, and ankylosis was confirmed.

**TREATMENT OBJECTIVES**

The treatment objectives were (1) tooth alignment and leveling, (2) correction of the Class II dental relationship, (3) occlusal repositioning of the ankylosed mandibular molar, (4) obtainment of space in the maxillary arch to align the teeth, (5) reduction of the vertical overbite, and (6) correction of the bone defect in the ankylosed molar region.

**TREATMENT ALTERNATIVES**

The treatment alternatives were (1) orthodontic treatment, and surgical luxation and respositioning of the ankylosed molar; (2) orthodontic treatment to improve the relationship of the other teeth, followed by
Fig 2. Pretreatment dental models.

Fig 3. Pretreatment radiographs.

Fig 4. Pretreatment cephalometric tracing.
restoration of the ankylosed tooth; and (3) extraction of the ankylosed tooth and placement of orthodontic appliances, followed by an osseointegrated implant in the place of the extracted tooth.

TREATMENT PROGRESS

After reviewing all of the information, we decided to attempt traction of the ankylosed mandibular molar with fixed orthodontic appliances after surgical luxation. Initially, orthodontic brackets with $0.022 \times 0.028$-in slots were placed on all teeth. A sequence of $0.014$-in, $0.016$-in, and $0.018$-in steel archwires accomplished the initial alignment and leveling. At this stage, Class II mechanics were used on the right side to correct the Class II relationship. Then a $0.020$-in mandibular archwire was placed with a compressed open-coil spring positioned between the mandibular right second molar and the mandibular right second premolar. To increase the anchorage of the anterior teeth, the teeth were ligated together.

After space was opened for the mandibular right first molar (Fig 5), an orthodontic ring was made for this tooth, and a $0.020$-in archwire with L-shaped loops was prepared. At this stage, the patient was referred to the maxillofacial surgeon for the luxation (Fig 6).

Immediately after the luxation procedure, the patient returned to the orthodontist to begin the traction. Seven days after the archwire was placed, the patient returned, and a positive response to the traction was noted (Fig 7). After this stage, $0.019 \times 0.025$-in ideal finishing arches were made to correct the tooth inclination and refine the alignment and leveling. Vertical elastics were used to achieve improved dental interdigitation. After this, the orthodontic appliances were removed, and a maxillary circumferential retainer and a mandibular canine-to-canine lingual bonded retainer were placed.

TREATMENT RESULTS

The orthodontic treatment produced a Class I molar relationship, reduction of the vertical overbite, tooth
alignment and leveling, and traction and repositioning of the ankylosed mandibular molar to the level of the occlusal plane. With traction, the alveolar bone in this region also improved and corrected the alveolar defect. The luxated tooth did not fracture, and pulp vitality was maintained (Figs 8-11).

DISCUSSION

Dentoalveolar ankylosis is generally described as the union between dentin cement and the alveolar bone. This condition increases the complexity of orthodontic treatment, making it difficult to resolve the tooth malposition. Several different procedures for treating ankylosed teeth have been described in the literature. The decision of which option to use depends on the orthodontic treatment plan, the patient’s motivation and age, and the degree of ankylosis.

The aim of this article was to report a clinical case of orthodontic treatment in a patient with an Angle Class II malocclusion and ankylosis of a mandibular first molar. The patient was young and motivated, and the tooth was moderately submerged, so we decided to perform orthodontic treatment together with surgical luxation. Few reports of treating ankylosed molars were found in the literature. This will be the fifth report of treating an ankylosed molar, and the fourth in a young patient.

The orthodontic treatment was conventional with the use of fixed edgewise orthodontic appliances. Class II elastics were used on the right side to take advantage of the absolute anchorage provided by the ankylosed molar, which prevented proclination of the mandibular incisors. After achieving distalization of the maxillary right posterior teeth, the treatment for the molar ankylosis was then pursued.

Surgical luxation of ankylosed teeth has been used to allow further orthodontic movement with considerable success. This technique assumes that, if a tooth is moved enough to disrupt the area of ankylosis but maintains a periapical blood supply, the subsequent

Fig 8. Posttreatment photographs.
inflammatory reaction could result in formation of a new fibrous ligament in the area of ankylosis. Based on these assumptions, an attempt was made to luxate the molar (Fig 12).

Biederman advocated surgical luxation of an ankylosed permanent tooth, and, if no change were apparent after 6 months, a second procedure should be performed. Moreover, he suggested extracting the tooth if
the second luxation were unsuccessful. In our patient, it was not necessary to perform a second luxation, since the tooth responded well to the first surgery. The orthodontic force was applied immediately after luxation. Turley et al suggested immediate application of an orthodontic force after luxation so that the tooth will not ankylose again. This might be the reason that it was not necessary to perform the second luxation.

Before we began the treatment, the patient and her guardian were informed that our treatment would be an attempt. Depending on the response, the therapy might be changed to extraction of the tooth if it fractured during luxation, or to restoration to reestablish occlusal contact.

Ankylosis of a tooth in a young patient eventually leads to infraocclusion and a defect in the alveolar process because of arrested development of the alveolar ridge.21 This condition was seen in the patient and corrected with traction of the tooth.

At the conclusion of treatment, there was better occlusal contact with the addition of the ankylosed tooth in function. An important fact noted at the end was root resorption of the distal root of the molar. Possibly it was the distal root that was ankylosed. The patient is now in orthodontic retention and is being evaluated periodically. An important and positive fact was that pulp vitality was maintained.

CONCLUSIONS

From the treatment provided in this clinical case, it can be concluded that surgical luxation associated with immediate orthodontic traction is a possibility and might be the most opportune therapy in the treatment of some ankylosed mandibular molars.

REFERENCES


Fig 12. Superimposed cephalometric tracings.