Orthodontic treatment of a unilateral impacted mandibular canine and first premolar: a case report

Y. Fujita, Y. Sorada, K. Maki

Division of Developmental Stomatognathic Function Science, Department of Growth and Development of Functions, Kyushu Dental College, Kitakyushu, Japan.

e-mail: k-maki@kyu-dent.ac.jp

Introduction

Impaction of the permanent teeth is a common clinical occurrence. Most frequently, the impacted teeth are maxillary canines, excluding third molars, with a prevalence of 0.9-2.2% [D’Amico et al., 2003; Aydin et al., 2004; Rohrer, 1929]. Tooth impaction in the mandible is less frequent, and the prevalence of impacted mandibular permanent canines is only 0.05-0.4% [Rohrer, 1930; Mead, 1930; Yavuz et al., 2007; Sham et al., 1978; Brown et al., 1982]. The options for treating maxillary canines are well established, but no treatment has been established for impacted mandibular canines and premolars. There have been few reports on the orthodontic traction of a mandibular canine or mandibular premolar [Batra et al., 2005; Boj et al., 2008]. However, there are no reports on patients with a unilaterally impacted mandibular canine and first premolar, and the successful treatment of this uncommon condition is rare.

In the case presented here, we performed comprehensive orthodontic therapy for the impacted mandibular canine and first premolar using a lip bumper appliance, as well as surgical treatment.

Case report

Diagnosis

A 13-year-old male came to our dental clinic with the chief complaint of non-eruption of the permanent mandibular right canine and first premolar. The patient’s medical history was unremarkable. An intraoral examination showed the permanent dentition (Fig. 1). The molar relationship of the left side was Class 1, and the lower right molar relationship was Class 3. The mandibular right canine and first premolar were unerupted, although the contralateral teeth had erupted. The mandibular left lateral incisor was in linguoversion. Diastema and a V-shaped arch in the maxilla were observed (Fig. 1). A radiographic examination revealed that the mandibular right canine was almost horizontal, with its crown tip near the apex of the lateral incisor; the mandibular right first premolar was located almost horizontally over the right canine, with its crown tip near the root of the lateral incisor (Fig. 2A).

Treatment

The goals of orthodontic treatment for this patient were to bring the impacted mandibular right canine and first premolar into the dental arch, to level and align the dental arches, and to establish a bilateral Class 1 molar relationship.

After banding both lower first molars, a lingual arch was placed. One week later, under local anaesthesia, the impacted mandibular right canine and first premolar were exposed surgically, and the mucoperiosteal flap was reflected just enough to expose the crowns of these teeth. Brackets were bonded onto the canine and first premolar soon after crown exposure. An auxiliary wire (0.016 inch diameter, stainless steel) was used to pull the impacted canine and first premolar (Fig. 3). The distal end of the auxiliary wire was secured in the auxiliary tube of the right molar bands. Then, to move the crown of the canine away from the apex of the root of the lateral incisor, distal and upward traction was applied to the canine, using an elastic chain hooked from the mesial end of the auxiliary wire to the canine. Two months later, the same procedure was initiated to upright the first premolar and move distally (Fig. 2B). Six months later, the lingual arch was removed, and a prefabricated mandibular lip bumper appliance was placed to create adequate space for eruption of the right canine and first premolar. Furthermore, the appliance also improved crowding of the left incisors by moving the first molars distally (Fig. 2C).

Six months later, a quad helix appliance was applied to the upper arch for labial movement of the lateral incisors and lateral expansion (Fig. 4).

Two years after initiating mandibular lip bumper therapy, the right canine and first premolar were nearly aligned in the arch, and orthodontic treatment with a multi-bracket appliance was started. Alignment and leveling was initiated with a 0.016-inch nickel-titanium arch wire. In addition, a power chain was attached to the upper first molar and extended to the right first premolar, to improve the first premolar distal rotation.

The quad helix appliance was removed 32 months after initiating expansion of the upper arch, and alignment and leveling of the upper dental arch were initiated with a
0.016-inch nickel-titanium arch wire. Four months later, a maxillary removable retainer was placed. In addition, 18 months after initiating treatment with a multi-bracket appliance, a fixed retaining appliance was placed from the right first premolar to the left first premolar in the mandible. The maxillary removable retainer was removed 1 year later, because the upper dentition had been well maintained. However, the mandibular fixed retainer will be continued for an additional 2 years to prevent relapse.

It took 4 years to upright the canine and first premolar and allow them to erupt into occlusion. The molar relationships were changed to Class 1 bilaterally (Fig. 5). No apical root resorption was evident radiographically (Fig. 6). The arches were aligned and level. The patient was very pleased with the results.

Discussion

There are many reasons for the failure of tooth eruption, including inadequate space, supernumerary teeth, premature loss of deciduous teeth, retention of deciduous teeth, excessive crown length, hereditary factors, functional disturbance of endocrine glands, tumors, cysts,
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However, our patient had no apparent tumors, cysts, and dental trauma. Therefore, in the present case, we believe that the origin of the canine and first premolar impaction was mesial movement of the posterior teeth attributable to early loss of the primary canine and first primary molar. Thus, we suggest that with early loss of the primary molars, space needs to be maintained in order to prevent eruption disturbance of the permanent teeth.

Traction can fail, with ankylosis and external root resorption [Fournier et al., 1982]. The successful alignment of impacted teeth depends on their position and direction,

FIG. 4 - Intraoral photographs during treatment. A quad helix appliance was placed on the upper arch. A lip bumper appliance was placed on the lower arch.

FIG. 5 - Intraoral photographs at 1 month after retention.

FIG. 6 - Panoramic radiograph at 1 month after retention.
the degree of root complications, and the presence of space for the impacted teeth. In this case, the patient was 13 years old, and the root development of the impacted lower canine and first premolar was still incomplete. Nevertheless, the impacted canine and first premolar were lying nearly horizontally, without adequate eruption space. An alternative treatment for our patient would have been surgical removal of the two impacted teeth and prosthetic treatments such as a removable denture or implants. However, we selected orthodontic treatment after surgical treatment, because of the request of the patient. The advantages of treating without extracting the teeth were both functional and aesthetic. Therefore, it was necessary to create space for the eruption of the impacted teeth in the lower dental arch.

A lip bumper is a simple functional appliance and is usually well tolerated by the patient. Lip bumpers have been used to gain arch length for the alignment of mildly to moderately crowded dental arches, to correct molar rotation, to control anchorage loss, to improve labial muscle activity, and to eliminate habitual lower lip biting [Lagravère et al., 2005; Hashish and Mostafa, 2009]. In this case, a lip bumper appliance was used to create adequate eruption space for the right canine and first premolar and to reduce the crowding of the left lateral incisors. In addition, it helped to slightly right the mandibular right first molar, because the appliance transmitted the labial forces at the molar tubes. In previous studies, treatment time with the lip bumper appliance ranged between 4 and 12 months [Germec and Taner, 2005; Hayashi and Mostafa, 2009; Klocke et al., 2000]. In our case, lip bumper therapy led to desirable results in 24 months. The treatment required more time in our case because of the distalisation of the right first molar and traction of the right canine and first premolar through the first molar anchorage were needed simultaneously. On the other hand, treatment time with quad helix appliance for the slow maxillary expansion was reported to range between 1.4 to 4.9 months (6.7-11.3 years of age) in previous studies [Boysen et al., 1992; Sandikçio lu and Hazar, 1997]. In our case, active treatment times of the maxillary dental arch was 36 months. However, Chaconas and Caputo reported that the effects produced by a quad helix appliance are dependent on the patient’s age [Chaconas and Caputo, 1982]. In addition, when midfacial sutures are patent, as seen in children 7 to 9 years old, activation of the quad helix appliance meets with little resistance [Lagravère et al., 2005]. Therefore, the longer period of treatment time in our case might be because the intermaxillary and surrounding sutures were less patent, which made orthodontic result difficult.

Many authors have emphasised that early identification of malpositioned teeth enhances the possibility of correcting them orthodontically [Taguchi et al., 2001; Rebellato and Schabel, 2003; Shapira et al., 1998]. In our case, the impacted mandibular canine and first premolar could be exposed surgically and moved using orthodontic forces. In addition, no ankylosis, root resorption, or lost vitality of the impacted teeth occurred with orthodontic treatment in this patient. However, long-term monitoring of the patient’s periodontal health and prevention of relapse are necessary.

Conclusion

We treated a rare case of a unilaterally impacted mandibular canine and first premolar. We performed comprehensive orthodontic therapy for the impacted mandibular canine and first premolar using a lip bumper appliance, as well as surgical treatment. As a result, the mandibular canine and first premolar were aligned into a functional position and stable occlusion.

References