Treatment of ectopic eruption of permanent mandibular first molars with innovative dental appliances

ABSTRACT

Aim Ectopic eruption (EE) of a first permanent molar occurs during mixed dentition. However, treatment of first permanent mandibular molar EE has been seldom reported.

Case report The cases of an 8-year-old girl and a 7-year-old boy are described, whose EE first permanent mandibular molars were correctly positioned after treatment with a dental appliance comprising a lingual arch, sectional arch, crimpable hook, and power chain or a simple molar controller, respectively. Both dental appliances are technically easy to construct, require short chair time, induce little discomfort on the patient, and ensure high-level treatment efficiency.

Keywords Ectopic eruption; First molar; Orthodontic treatment.

Introduction

A trouble-free exchange from primary to permanent dentition and acquirement of normal occlusion are priorities in paediatric dentistry. However, ectopic eruption (EE) of a first permanent molar is oftentimes seen in the developing mixed dentition. In these cases, the permanent molar is initially blocked from complete eruption by the second primary molar. A unique aetiological factor for EE has not been reported, but commonly reported reasons are an abnormally large first permanent molar and second primary molar combined with inadequate arch size and mesially angled path of eruption [Kupietzky, 2000; Kurol and Bjerklin, 1986].

The prevalence of first permanent molar EE varies from 1.8% to 6%. The maxillary first permanent molar is the most commonly affected tooth, whereas mandibular first permanent molars are less often affected [Kennedy, 2008]. EE is classified into 2 types: reversible (or “jump”) and irreversible (or “hold”). In a study on ectopically erupting maxillary permanent molars, 4.3% of children showed ectopic EE and 59% of children with EE had reversible EE; the remaining children had irreversable EE and were referred for treatment [Kurol and Bjerklin, 1986]. If left untreated, EE can cause serious sequelae, including early loss of the second primary molar, space loss, impaction of the second premolar, and crowding. Early correction of EE is crucial for the proper development of a normal occlusion. Treatment of EE with or without extraction of the primary second molar is followed by orthodontic distalisation of the permanent molars and space maintenance [Hartmann, 1984; Pulver and Croft, 1983; Groper, 1985; Bayardo et al., 1979; Kennedy, 2007]. However, few reports have documented restoration of early dentition space in the mandibular arch [Kennedy, 2008; Ohtae et al., 2011].

We have previously successfully used 2 types of dental appliances containing a lingual arch, sectional arch, and elastic for treating EE [Kaihara et al., 2007; Yoshimura et al., 2009]. Here, we report the use of two types of appliances for the management of 2 cases of permanent mandibular first molar EE. Ethical approval for the current study was granted by an independent ethical committee of Hiroshima University (Eki-126-1).

Case reports

Case 1

A girl was followed-up at our clinic for regular oral check-ups and caries prevention since the age of 5 years. When she reached 8 years of age, her right mandibular permanent molar inclined mesially and showed signs of EE (Fig. 1a). A radiograph demonstrated non-root resorption on the distal root of the adjacent primary molar (Fig. 1b). A few months later, we diagnosed it as irreversible EE. Based on the diagnosis, the patient was referred for treatment.

Before treatment, we prepared the dental casts and performed cephalometric analyses. The primary molar relationship was distal step type (half cusp Class 2). Overjet was 4.25 mm, and overbite was 3.69 mm. Her mandibular arch revealed crowding, coronal arch widths were narrower than the normative mean ±2 from standard deviation (SD) [Otsubo et al., 1964]. These findings predicted a lack of space for permanent dentition. Cephalometric analysis revealed a skeletal Class I relationship and no problems other than a short condyion to gnathion length (smaller than the normative mean –1 ± from SD). Our treatment plan included
treatment of EE of the first permanent molar followed by expansion of the coronal arches.

We chose a convenient appliance composed of a lingual arch, a first molar buccal tube, sectional wire, 2 crimpable hooks, and a power chain. Our therapeutic approach is justified because: bilateral second primary molars could not be used as abutment teeth because the right second primary molar’s distal root had no resorption; there was space to set a buccal tube on the buccal side of the first permanent molar. The lingual arch was prepared and cemented. It had bands for the second primary molar, and the right band was soldered to a buccal tube on the right side. Another buccal tube was bonded on the buccal surface of the first permanent molar. Nickel titanium (.16” x .22”) sectional wire was inserted in both tubes, and crimpable hooks were fixed at the mesial site of the first permanent molar’s buccal tube and 5 mm away from the mesial side of the second primary molar’s buccal tube. The crimpable hook on the mesial side of the second primary molar and the hook of the primary molar’s buccal tube were ligated by the power chain (Fig. 2a, 2b). Sectional wire with crimpable hooks and the power chain were changed at 3- or 4-week intervals. The first permanent molar gained its normal position after 2 months (Fig. 2c). The patient was followed-up for 4 years, and the treated tooth maintained a favourable condition during that period (Fig. 3).

Case 2

A 7-year-old boy presented with EE of the permanent left mandibular first molar at the first visit (Fig. 4). A radiograph demonstrated extensive root resorption on the distal root of the adjacent primary molar; the mesial site of the first molar bordered the resorbed root (Fig. 5a). The diagnosis was irreversible EE.

For treatment, we chose a simple molar controller (SMC) with an improved lingual arch and power chain. The main wire of the lingual arch was extended and bent into the shape of a horseshoe to allow adjustment and hooking of the power chain. The main wire was soldered on the lingual side of the band; another wire of a similar shape was soldered on the other side. The right primary second molar and left primary first molar were selected as abutment teeth. The lingual arch was cemented. A bonded button was attached to the occlusal surface of the first permanent molar. The distal side of the primary second molar was sliced to facilitate the uprighting of the first permanent molar. The power chain was set between hooks and the bonded button (Fig. 6a) and changed at 3- or 4-week intervals. The first permanent molar gained its normal position after 2 months (Fig. 5b, 6b). Then, another lingual arch connecting the right and left first permanent molars was set as the retention. The patient was followed-up for almost 2 years, and the treated tooth maintained a favourable condition during follow-up.

Discussion and conclusion

In case 1, the right mandibular permanent molar was
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European Journal of Paediatric Dentistry clinical supplement to vol. 15/2-2014

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inclined mesially. Furthermore, the mesial marginal edge of the first permanent molar was attached under the adjacent distal contour of the second primary molar. There was sufficient space to bond the buccal tube on the buccal phase of the first permanent molar. Therefore, we were able to employ a simple appliance consisting of a lingual arch between the second primary molars, crimpable hooks, sectional arch, and elastic.

Case 2 exhibited extensive root resorption on the distal root of the adjacent primary molar, and the medial side of the first molar had occupied the area of the resorbed root. The left primary molar was not selected as an abutment tooth because it could promote resorption of the root and lead to its early extraction; and we planned to slice the distal side of the primary second molar to facilitate the uprighting of the first permanent molar. Hence, we selected the second primary molar (right side) and first primary molar (left side) as abutment teeth. Sufficient space was not available to bond a buccal tube to the buccal phase of the first permanent molar. We selected a SMC consisting of an improved lingual arch and a power chain.

The appliances used in both cases were simple; the adjustment could be completed in a short time, and the chair time of the treatment was short.

Ectopically erupting mandibular first permanent molars have been uprighted using the Halterman appliance or a modified Halterman appliance [Kennedy, 2008; Ohta et al., 2011]. However, in our experience, some elastics can slip out if the patient bites the distally extending wire with the recurved hook; in other cases, the wire at the buccal distal area causes discomfort to the patient. The Halterman appliance is also effective used with a mild power chain of the same type as reported herein. We believe that all appliances are effective, but they must be selected according to the child’s oral condition and treatment objective [Ohta et al., 2011].

In conclusion, the dental appliances described are technically easy to construct, require short chair time, induce little burden on the patient, and ensure high-level treatment efficiency.

References


