



Distalization of Ectopically Erupted Molars Using a Modified Humphrey's Appliance

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Article Info

Article type:

Case Report

Article History:

Received: 31 Jul 2023

Accepted: 10 Feb 2024

Published: 05 Aug 2024

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ABSTRACT

Ectopic eruption of molars occurs more frequently in developing permanent dentition, and requires immediate intervention. Herein, two cases are discussed with ectopic eruption of permanent maxillary first molars which were diagnosed and managed conservatively using a modified Humphrey's appliance, named the NR's appliance. The appliance was fabricated by band adaptation and using wire components of a 21-gauge stainless-steel wire. Also, the Nance palatal arch was used as the anchorage unit. The molars were uprighted and distalized within 3 months. Early diagnosis and prompt treatment could result in prevention of malocclusion in the early mixed dentition period.

Keywords: Tooth Eruption, Ectopic; Molar; Orthodontics, Interceptive; Orthodontic Appliance Design; Dentition, Mixed

- **Cite this article as:** Kumar N, Kumari R. Distalization of Ectopically Erupted Molars Using a Modified Humphrey's Appliance. *Front Dent.* 2024;21:30.

INTRODUCTION

Ectopic eruption is a developmental anomaly in which a tooth erupts in an abnormal position during the transition period. The most commonly ectopically erupted permanent teeth are maxillary first molars followed by maxillary and mandibular canines, mandibular second premolars, and maxillary lateral incisors [1]. The prevalence of ectopically erupted permanent maxillary molars varies from 2% to 6% in different areas of the United States [2]. Moyers et al. [3] found a prevalence rate of 3% for ectopically erupted molars in the American population.

Root resorption is more severe and common in primary maxillary second molars than

mandibular molars due to ectopic eruption of permanent successors [4]. Ectopic eruption has been classified into various types depending on eruption in normal position or root resorption of primary molars. There are several etiological factors for ectopic eruption such as inadequate arch length, deviation in the eruption path of permanent first molars, lack of growth in the maxilla/mandible posteriorly, and abnormal size of permanent first molars [5].

Ectopic eruption of permanent molars can be diagnosed clinically based on partial or total failure to erupt, or mesial inclination of erupting molars. Early radiographic diagnosis can be made during the pre-

eruptive stage of permanent first molars. In this case report, two cases of ectopically erupted permanent maxillary first molars were diagnosed, which were successfully corrected using a modified Humphrey's appliance, named the NR's appliance.

CASE REPORT

Two 7-year-old patients were presented with a chief complaint of incomplete eruption of right and left upper back teeth. Both the children were monozygotic twins. Their medical history was non-contributory. On extra-oral examination, the patients were normal as per their age. Intra-oral examination revealed ectopically erupted permanent right and left maxillary first molars (i.e. teeth #16 and #26) which were diagnosed clinically (Figs. 1a and 2a). An orthopantomogram was later requested to check the eruption status of both right and left permanent maxillary first molars (Figs. 3 and 4). Both cases were classified under

irreversible type with moderate/severe grades of resorption. The cases were planned for distalization of the ectopically erupting molars after obtaining parental consent to preserve arch circumference and correct the path of eruption using a modified Humphrey's appliance, named the NR's appliance.

Fabrication of the appliance:

A stainless-steel band measuring 0.180 × 0.005 inch was used for band fabrication. The band was adapted on primary maxillary right and left first molars using wire banding pliers. After band adaptation, a maxillary impression was made with irreversible hydrocolloid material i.e. alginate (Zelgan, Dentsply India Pvt. Ltd., India) while the bands were seated on primary first molars. Then, the bands were removed from the primary molars and securely seated in the impression with the help of sticky wax. Next, the impression was poured with dental stone and a positive replica was duplicated.



Fig 1. (a) Preoperative photograph of case 1 showing teeth #16 and #26 ectopically erupted mesially, (b) NR's appliance cemented with distal wire loops fixed on teeth #16 and #26, (c) follow-up photograph after 6 months showing complete distalization



Fig 2. (a) Preoperative photograph of case 2 showing teeth #16 and #26 ectopically erupted mesially, (b) NR's appliance cemented with distal wire loops fixed on teeth #16 and #26, (c) follow-up photograph after 6 months showing complete distalization

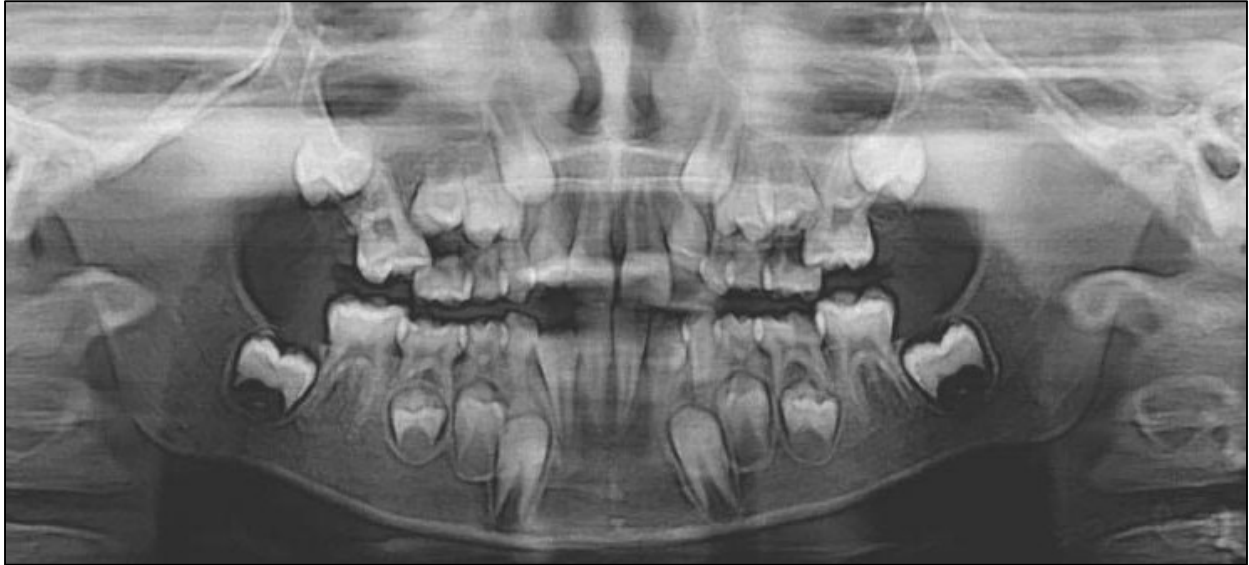


Fig 3. Preoperative orthopantomogram showing ectopically erupted permanent maxillary first molars (case 1).



Fig 4. Preoperative orthopantomogram showing ectopically erupted permanent maxillary first molars (case 2).

The wire components i.e. Nance archwire as the mesial wire components and two U-loops with the distal end wire approaching the occlusal surface of the molars from the buccal side on both sides were fabricated using a 21-gauge stainless-steel wire. Excess wire was cut at the distal end using a heavy wire cutter.

A 19-gauge needle was cut with a metal Burlew disc to make small pieces of 3-4 mm to act as wire retentive tubes for the distal wire component (Fig 5a). The wire components were soldered with the primary molar bands

using silver solder flux, and the appliance was acrylicized using cold-cure auto-polymerizing resin (DPI-RR Cold Cure Acrylic resin, Bombay, India). The appliance was subsequently finished using a mandrel bur, sand papers, and polishing burs (Fig. 5b).

The appliance was inserted and checked before final cementation with luting glass ionomer cement (Fuji I; GC corporation Tokyo, Japan). After cementation, the distal wire components were engaged in the needle pieces acting as retentive tubes, which were

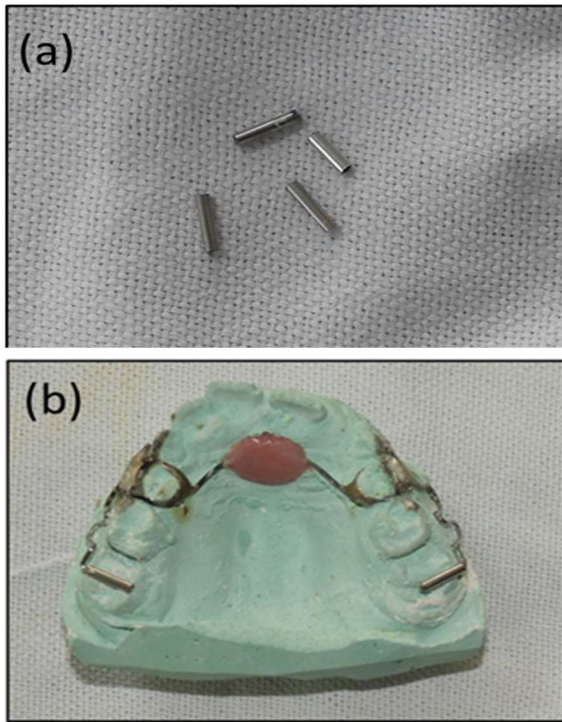


Fig 5. (a) A 19-gauge needle was cut into pieces and (b) the modified Humphrey NR's appliance was fabricated with Nance archwire and distal wire loops

fixed to the ectopically erupted permanent first molar using restorative composite resin (Filtek Z350 XT; 3M ESPE, St. Paul, MN, USA) (Figs. 1b and 2b). The Nance palatal arch provides anchorage to the applied forces. The buccal U-loop was activated every 3 weeks and after 4 activations, the molars were distalized, uprighted, and came into normal occlusion in approximately 3 months. The appliance was kept as a retention appliance, and after 6 months of follow-up, the appliance was removed and the patients were kept on regular follow-ups (Figs. 1c and 2c).

DISCUSSION

Ectopic eruption of a permanent tooth is a developmental anomaly, which was first described by Chapman [6] in 1923. There are various grades of severity of ectopic eruption of molars and they are also classified into reversible and irreversible types based on clinical and radiographic findings. In Young's 1957 [7] classification of the tendency of permanent molars to erupt into normal occlusion, two types are described:

Reversible/Jump type and Irreversible/Hold type. In the Reversible/Jump type, the permanent molar eventually erupts into its normal position after resorbing the distal root surface of the primary second molar. In the Irreversible/Hold type, the permanent molar remains locked against the primary second molar, unable to erupt into its correct position. In the 2005 classification by Barberia-Leache et al. [8] based on the magnitude of primary second molar distal root resorption, four grades are defined: Grade I (Mild) involves limited resorption to the cementum or minimal dentin penetration; Grade II (Moderate) includes resorption of dentin without pulp exposure; Grade III (Severe) entails resorption of dentin in the distal root, leading to pulp exposure; and Grade IV (Very severe) is characterized by resorption affecting both the distal and mesial roots. In a previous study, the prevalence of ectopically erupting permanent first molars was found to be 3.2%, and 66% of them required no intervention i.e. they were self-correcting type [7]. Bjerklin and Kurol [9] also reported that 4.3% and 60% of the ectopically erupted permanent molars were of reversible type. The prevalence of ectopic eruption varies from 2% to 6% in the general population [2] but a higher prevalence rate of 25% has been reported in cleft patients [10].

Various etiological factors have been suggested like abnormally large size of permanent first molars, posterior position of the maxilla relative to the base of the cranium, deviation in the path of eruption, asynchronization between the eruption time and growth of tuberosity, delay in development of first molars, familial tendency, and children with cleft lip and palate [5]. In both the present cases, the reason could be familial tendency or asynchronization between the eruption and growth of the tuberosity.

In reversible cases i.e. grades I and II, the molars are self-corrected in the majority of the cases but in irreversible cases i.e. grades III and IV, in conditions where permanent first molar is locked below the primary second molar, interceptive orthodontic treatment would be

required. In a previous study, 69.4% of the ectopically erupted permanent first molars were self-corrected spontaneously [8]. In both the present cases, distal root of the primary second molar was resorbed. The reason for root resorption of primary molar or an ectopic eruption path could be the emergence of distal cusps before the mesial cusps. The irreversible form could cause mesial inclination of permanent first molar, resorption of the roots of primary molars, and exfoliation at a later stage. This could result in a reduction in arch length and arch circumference, and impaction of maxillary second premolars.

The management of ectopically erupted molars requires immediate attention during the growth phase. Different methods have been suggested in the literature for distalization of ectopically erupting permanent molars like elastomeric separators [11], brass separating wire [12], K loop [13], Croll's bilateral band and wire appliance [14], Halterman appliance [15], modified Hawley's appliance [16], modified Nance palatal arch appliance [17], and Humphrey's appliance [18]. Although elastomeric separators, brass separating wire, and helical springs have advantages of minimal chair side time, no impression, no laboratory work, and not requiring anchorage, they can only be used in mild cases and not in severe cases as in the reported two cases in the present study. The modified Hawley's appliance requires distal stripping of the primary first molars which is a major disadvantage. Auychai et al. [19] treated ectopic eruption by slicing the distal side of the adjacent primary second molar. This treatment modality results in loss of arch length as a major disadvantage. The Croll and Halterman appliances require soldering, laboratory work, and frequent changing of elastics for activation, which are their main disadvantages. The Humphrey's appliance has the same laboratory procedures and requires soldering, and the distal wire component is fixed to the molar to be distalized; but in the NR's appliance, the distal wire component is placed in the retentive tubes which can be easily removed and activated when required.

In the present case report, irreversible type of ectopically erupted maxillary permanent first

molars were diagnosed clinically and radiographically. Distalization of ectopically erupted permanent first molar was done using a modified Humphrey appliance i.e. the NR's appliance with buccal loops in both cases, which acted as a maintenance appliance after the correction. The simplicity of the NR's appliance is weighed against the complications of untreated ectopic eruption cases and other appliances used in irreversible cases of ectopic eruption of molars. Although the NR's appliance has cumbersome steps like impression making, and laboratory work including soldering, it can be completed in one sitting and activation can be done easily compared to other fixed appliances which require frequent changing of elastics.

CONCLUSION

Early intervention is required in cases with ectopic eruption of molars to guide their normal eruption while preventing detrimental effects on the developing occlusion. The innovative NR's appliance is effective for distalization and uprighting of ectopically erupting permanent first molars during the mixed dentition period. The authors recommend early interceptive intervention to prevent severe complications like early loss of primary molars, and premolar impaction in cases of ectopically erupted molars.

ACKNOWLEDGMENTS

The authors wish to acknowledge that the present cases were not copied from any other sources. The authors have no conflict of interests.

CONFLICT OF INTEREST STATEMENT

None declared.

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