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Case Report
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Modified Halterman Appliance for management of ectopically erupting permanent molar: A case report

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Highlights

- Early diagnosis and treatment of ectopic eruption has to be done as an integral part of interceptive orthodontics to prevent molar malposition and arch length loss.
- Modified Halterman appliance was constructed by incorporating cross-arch anchorage with a distal extension engaging chain elastic from occlusion button on permanent molar.
- This case report shows that this appliance is effective in achieving distalization of ectopically erupting permanent molar in a mixed dentition period.

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Abstract

Ectopic eruption is a disturbance in the eruptive path of a tooth in an abnormal position leading to many local problems, such as premature loss of the second primary molars, space loss, increased prevalence of dental caries, supra-eruption of the opposing molars, a mesial inclination of the permanent maxillary first molars, and class II molar relationship. The present case report describes the management of an ectopically erupting mandibular first molar in an 8-year-old child with a modified Halterman appliance. Halterman appliance was modified by incorporating cross-arch anchorage. Follow-up was carried out at 1 month, 3 months,6 months, and 9 months until distalization of the molar was achieved. Space analysis was carried out and a fixed functional space maintainer was cemented which was followed up at 12 months. According to the present case report, a modified Halterman appliance is an effective appliance in achieving distalization of an ectopically erupting permanent molar in a mixed dentition period.

Keywords: Ectopic Eruption; Orthodontic Appliance; Tooth Uprighting

INTRODUCTION

Ectopic eruption is a disturbance in the eruptive path of a tooth in an abnormal position.[1] Its prevalence varies from 3-4% of permanent first molars in children and the maxillary arch is more commonly affected than the mandible.[2] The distal aspect of deciduous second molars serves as an eruption guide for the permanent first molars to attain stable and functional occlusion during the initial mixed dentition stage.[3] Ectopic eruption of the permanent first molar was classified by Young into two forms: i)Reversible or jump form, where the permanent molar erupts into a normal position after the resorption of the distal root surface of the second primary molar. It is self-correcting and accounts for around 66% and ii) Irreversible or hold form, where the second primary molar blocks the permanent molar and it remains in a locked position until treatment or premature exfoliation of the primary molar.[4]

When the first permanent molar has not fully emerged by age seven, then it is unlikely that natural correction will occur. Hence, early diagnosis of ectopic eruption has to be made using an Intraoral Periapical radiograph (IOPAR) or bitewing radiograph in 5-7 years aged children. If not, it may lead to permanent first molar malposition, and arch length loss.[5] Therefore, the main goal of correcting ectopic tooth eruption is to regain lost space and maintain a normal dental arch perimeter using various orthodontic procedures until the ectopic tooth erupts.[3] The problem of mixed dentition space loss needs to be resolved by repair and subsequent maintenance. Since the molars of the late mixed dentition are known to move more easily before the eruption of the second molars, the timing of treatment initiation for molar distalization plays an important role.[6]

Several methods of treating ectopically erupting permanent first molars include i) Interproximal wedging: after the occlusal surface of the first permanent molar becomes exposed in the oral cavity and ii) Distal tipping.[7] Severe impaction presents a distal tilt technique with or without extraction of the second molar. Various types of removable and fixed molar distalization devices includes an elastomeric separator, brass wire, prefabricated clip separator, lip bumper, Humphrey appliance, Halterman appliance, distal jet, and Jones jig.[8] Halterman Appliance is advantageous over others because of its ease of fabrication and less bulkiness. It can be fabricated for maxilla as well as mandible, and adjustments can be made directly in the child's mouth with Hoe Pliers or Bird-beak Pliers. If required, it can be removed easily and re-cemented after the adjustments are made. The disadvantage related to this appliance is the frequent changing of elastics and patient cooperation.[3]

To enhance clinical success some modifications of the appliance can be done. One among them is the placement of a reverse band and loop appliance with a bonded button on the permanent molar and chain elastic for distalization of the molar. The advantage of this modification over conventional Halterman appliance is that it can move the impacted molar both distally and to the buccal/lingual.[2] This appliance is simple to use, less irritating, more effective, and more reliable in treating ectopic eruption of permanent molars.[7]

The present clinical case describes the management of ectopically erupting permanent mandibular first molar with a modified Halterman appliance.

CASE REPORT

An 8-year-old male reported to the Department of Pedodontics and Preventive Dentistry, Bapuji Dental College and Hospital for a routine check-up. Past medical history was noncontributory. No significant findings were seen on extraoral examination. Informed consent was obtained from

the patient's parent after explaining the treatment procedure.

Intraoral examination revealed mesially tilted 36 and only distal cusps of this tooth were visible. Intact stainless steel crown was present in 75 and it showed grade 3 mobility according to Miller's classification of tooth mobility. 46 was erupting in normal position (Figure 1).

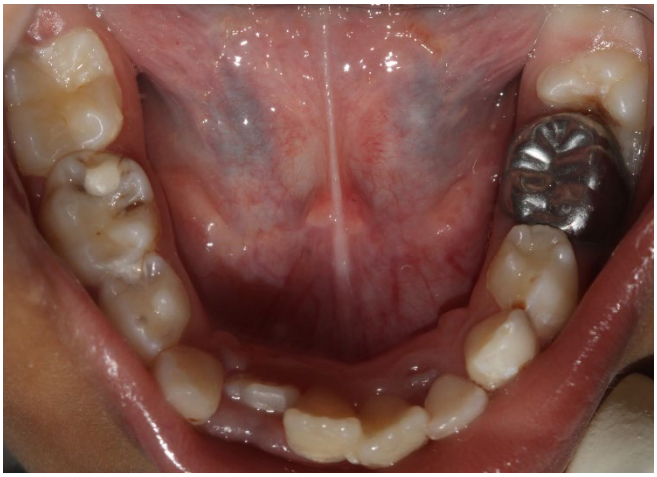

Figure 1. Pre-operative intra-oral photograph showing mesially tilted 36 and intact stainless steel crown in 75

The following teeth were present: 16, 55, 54, 53, 52, 61, 62, 63, 64, 65, 26, 46, 85, 84, 83, 42, 41, 31, 72, 73, 74, 75 and 36. Intraoral periapical radiograph revealed mesially tilted 36 where mesial cusps were completely locked under the distal part of 75. Grade 3 resorption of roots of the 75 (according to Barberia-Leache's classification) was also evident. Further panoramic radiograph revealed congenitally missing 35 (Figure 2).

The case was diagnosed as an ectopic eruption of permanent left mandibular first molar i,e 36. Huckaba's mixed dentition analysis was done to determine the space loss. Since there was a congenitally missing premolar, a measurement of contra lateral premolar was taken for the analysis which showed 4 mm of space loss. The treatment plan was distalization of the permanent mandibular molar using a modified Halterman appliance after extraction of primary second molar followed by placement of a functional space maintainer. After correction, when the permanent dentition stage will be achieved, patient was advised for fixed prosthesis, or implant placement.

Treatment procedure

In the first visit, pre-operative impression was made to prepare a study cast and then extraction of 75 was done and the patient was recalled after one week allowing the healing of the socket. In the second visit, band (Dentaurum, Germany) adaptation was done on 74 and 85. An alginate (Algitex, Dental Products India) impression was made and with the band placed in the impression, a cast was prepared. Modified Halterman appliance was fabricated using 0.9 mm stainless steel archwire (Dentaurum, Germany) which was adapted and soldered to the buccal surface of the band wrt 74 with a distal extension consisting of a hook shape at the terminal end. Anchorage for the appliance was taken from the lingual surface of the band bilaterally (Figure 3).

Figure 2. Pre-operative Panoramic Radiograph (OPG) showing congenitally missing 35

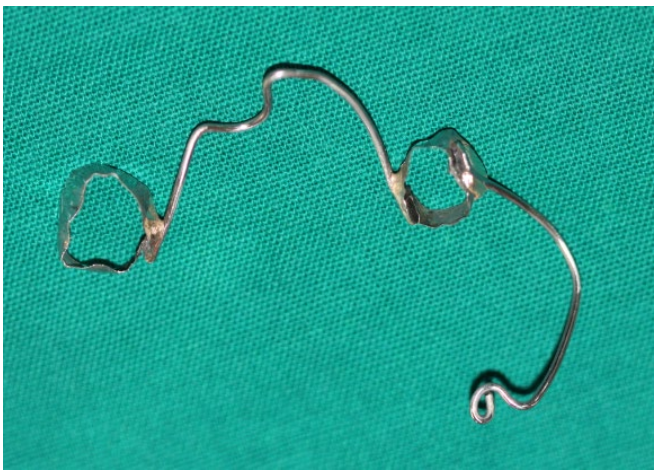

Figure 3. Fabricated Modified Halterman appliance with distal extension consisting hook

In the third visit, an occlusal button was placed on the occlusal portion of molar 36 using a light cure composite (3M ESPE, US). Occlusal button was placed as far mesially as possible to reduce occlusal trauma, because the mesial inclination of the impacted molar results in occlusal interference if the bonded button were placed more distally. The appliance was cemented using GIC luting cement (GC Corp, Japan). Chain elastic (U-Ortho E-Chain, Vasa Denticity Pvt Ltd, New Delhi) was incorporated from the occlusal button to the distal extension of the hook of the halterman appliance to assist in distalization of the first permanent molar and elastic was replaced every 2-3 week interval. The distal extension was accurately adapted to avoid tissue impingement (Figure 4).

During the follow-up, the tension on the elastic was increased by adjusting the chain elastic with the distal hook. Distalization of molar was appreciable a month after starting the treatment. Complete distalization was achieved in 9 months of follow up and the appliance was removed (Figures 5-8). Moyers mixed dentition analysis was done which showed enough space available in comparison with the contralateral side. Since the patient was not willing for a removable appliance, a fixed functional space maintainer was fabricated in relation to 75 and followed up at 12 months (Figure 9).

DISCUSSION

The treatment objective to use Halterman appliance for the present case was to distalize the ectopically erupting molar to regain space and to correct the mesial tipping of the permanent molar.[9] Although Ectopic eruption sometimes is self-correcting, it is considered that if the first permanent molar has not fully emerged by age seven, then it is unlikely that natural correction will occur. Various authors suggest that correction should be done immediately after the diagnosis is established. The situation usually requires active treatment.[5]

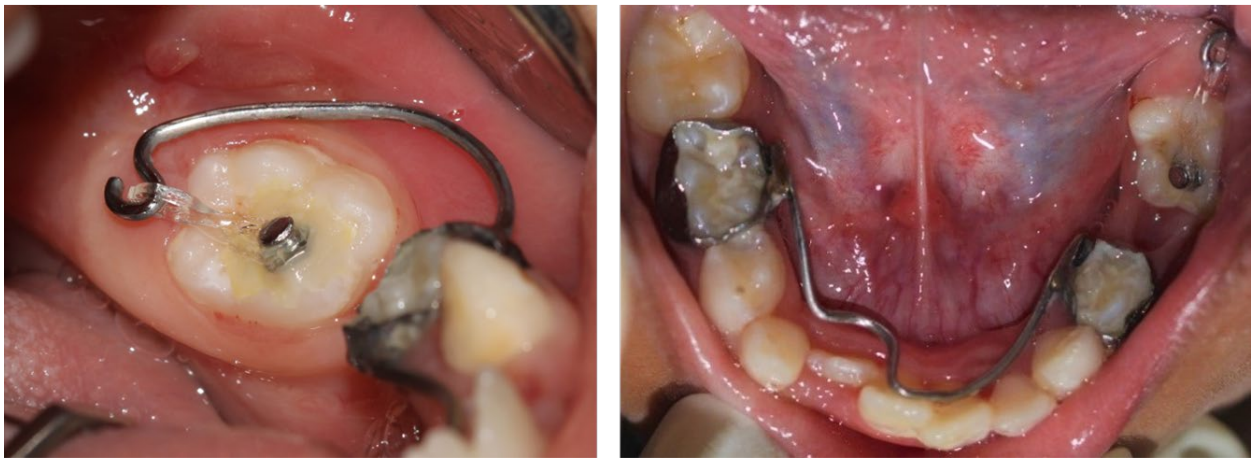

Figure 4. Cementation of Modified Halterman appliance with chain elastic incorporated from occlusal button to distal extension

Figure 5. Follow-up at 1 month showing slight distalization of 36

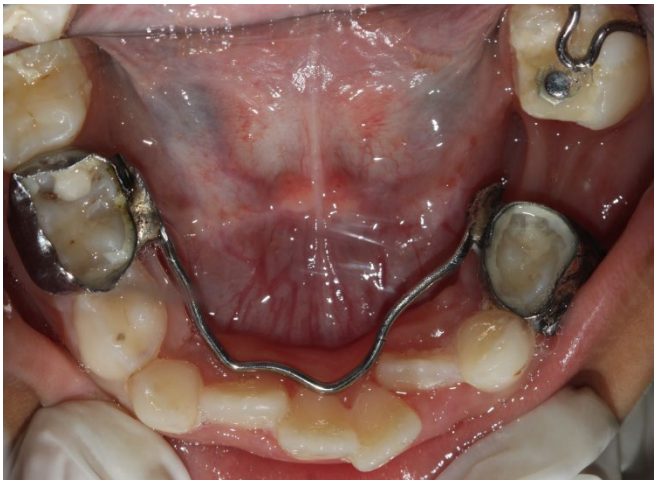

Figure 6. Follow-up at 3 months showing progressive distalization of 36

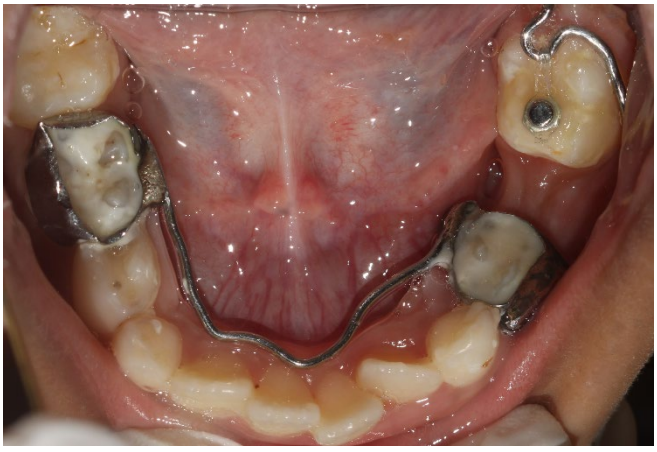

Figure 7. Follow-up at 6 months showing increased distalization of 36

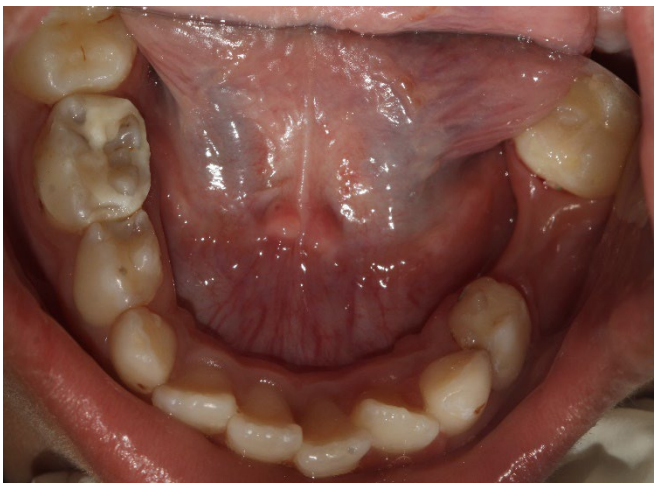

Figure 8. Follow-up at 9 months showing complete distalization of 36

Figure 9. Follow-up at 12 months with fixed functional space maintainer in relation to 75

Various modifications of Halterman appliance has been reported in the literature, where U bend was incorporated in the distal extension of the appliance.[7] Another author suggests a modification where a reverse band and loop appliance with a bonded button was placed on the permanent molar.[2] The use of a modified Halterman appliance is advantageous over other appliances in terms of fabrication and easy adjustments.

Huckaba's mixed dentition analysis was done in this case to assess for the space loss as the accuracy of this method of determining the width of the unerupted tooth is fair to good, depending upon

the quality of the radiographs and their position in the arch.[10]

In this case for the fabrication of a modified Halterman appliance, an occlusal button was placed as far mesially as possible: (a) to allow greater length of elastic chain to assist the disimpaction; and (b) to reduce occlusal trauma, because if the bonded button were placed more distally, it results in occlusal interference.[2]

Modification of Halterman appliance in the current case, was constructed by incorporating cross-arch anchorage as the pericemental area of abutment tooth in the same arch was not sufficient to distalize the first permanent molar. A similar case was reported for distalization of maxillary first permanent molars where primary molars 55, 65 presented severe root resorption hence cross arch anchorage was taken using molars 54, 64 for improving the stability of the appliance and to prevent further damage to the primary second molars.[5]

Once the appliance insertion was done, the patient was recalled after every month to assess the distalization. Complete distalization of molar was achieved by 9 months.

In this case, after 9 months, an impression was made and Moyer's mixed dentition analysis was done as all four lower incisors had erupted completely. The analysis revealed the presence of adequate amount of space. Since there is a congenitally missing premolar, a fixed functional space maintainer was inserted into the patient for the maintainance of space. It is often recommended for very young patients, especially in a growing child, until a fixed prosthesis is provided at the end of the growth period, where this could be modified or altered when necessary.[11]

A routine follow-up was scheduled every three months to monitor the establishment of the occlusion as the patient transitioned to permanent dentition.

CONCLUSIONS

In the present case, early diagnosis of the ectopic eruption of the first permanent molar was achieved which aided in early interceptive orthodontic treatment to prevent further complications. This case with the follow-up of one year shows that the modified Halterman appliance is effective in achieving distalization of ectopically erupting permanent molar in a mixed dentition period.

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Declarations

Acknowledgements: *Not applicable.*

Conflict of Interest Statement: A*uthors disclose no potential conflicts of interest.*

Ethics Statement: *Procedure was explained to the parents and written consent was obtained for the treatment and publication of the case report.*

Informed Consent: In*formed consent form was obtained from the parents of the child.*

Author contributions: *Conception and design: All Authors; Acquisition of data: All Authors; Interpretation of data: All Authors; Drafting article: All Authors; Revision artice: All Authors; Final approval: All Authors*

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