Original Article

Published on 27 12 2010

Nagaveni N. B
Radhika N. B.

Virtual Journal of Orthodontics

Interceptive orthodontic correction of ectopically erupting permanent maxillary first molar. A case report.

Author affiliations:

Contributors:

1. Dr. Nagaveni N. B.
Assistant Professor,
Department of Pedodontics and Preventive dentistry,

2. Dr. Radhika N. B.
Orthodontist
Pune, Maharashtra

Department and Institution
Department of Pedodontics and Preventive dentistry,

College of Dental Sciences
DAVANGERE – 577004
Karnataka, India

Corresponding author:

Dr. NAGAVENI N. B. M.D.S.,
Assistant Professor, Department of Pedodontics and Preventive dentistry,
College of Dental Sciences,
Davangere – 577004, India
E-mail: nagavenianurag@gmail.com
Phone: +91 9448929585

To cite this article:
Nagaveni N. B. Radhika N. B.

Interceptive orthodontic correction of ectopically erupting permanent maxillary first molar. A case report.

Virtual Journal of Orthodontics [serial online] 2010 December

Dir. Resp. Dr. Gabriele Floria
 ISSN-1128-6547 NLM U. ID: 100963616
OCoLC: 40578647

Abstract:

During clinical practice, one can come across different developmental disorders pertaining to eruption of teeth. Ectopic eruption of the permanent maxillary first molar is one of the developmental disorders relating to tooth eruption. Permanent maxillary first molar in instances of otherwise ideal occlusion, may be located too far mesially in its eruption resulting in resorption of the distal root of the primary second molar. An 8½-year-old girl reported for routine checkup. Intraoral examination revealed that maxillary left permanent first molar was erupting ectopically. Periapical radiographic examination also confirmed the diagnosis of ectopic eruption. Severe distal root resorption of primary second molar was evident due to ectopic molar, strongly indicating some intervention. The condition of ectopic eruption of permanent molar was successfully corrected using the Modified Humphrey's appliance. The permanent first molar completely erupted in normal occlusion with no other further damage occurring to the primary second molar.

KEY WORDS
Ectopic eruption, Humphrey's appliance, Molar distalization, Permanent maxillary first molar.

Introduction

Variety of eruption disorders are seen during the transitional dentition period, in children. Ectopic eruption of the permanent maxillary first molar (PMFM) is most frequently found such phenomenon to be stressed in contemporary pediatric dentistry.[1,2] It can be defined as an abnormal eruption of the permanent molar, which is placed too far mesial and also causing premature, atypical resorption of primary molar in an abnormal fashion.[2]

Its prevalence varies from 2 to 6% depending on the population studied.[3,4] In cleft palate patients, a higher prevalence of 25% has been reported.[5] Siblings of affected children experience this incidence five times greater than the general population.[6] This anomaly was observed more frequently in boys than in girls.[3,4] The exact cause of ectopic eruption of PMFM is not well understood and is considered to have multifactorial etiology.

Pulver[7] listed some factors like abnormal large size of the maxillary primary first and second molars, posterior position of the maxillae in relation to the cranial base, abnormal angulation of the path of eruption of the PMFMs, smaller maxillae and delayed calcification of some affected permanent first molars as possible responsible factors. Heredity is another reported factor.[7]

Clinically ectopic eruption of the PMFM can be suspected when there is a unilateral or bilateral delay in the emergence of the PMFM or an eruption path in which the distal cusps are emerging before the mesial cusps.[7,8] Radiographically this pathology can be best diagnosed from periapical or bitewing radiographs. On radiograph, it appears as superimposed image and impacted in the distobuccal root of the primary second molar.

Two types of PMFM ectopic eruption are described in the literature: [3,8] reversible ("jump" type) and irreversible ("hold" type). If the permanent molar spontaneously corrects itself and erupts to occlusion, the reversible type is present. In the irreversible type, the permanent molar remains in the locked position until treatment is provided or premature exfoliation of the primary second molar occurs spontaneously. Young[9] found a prevalence of 3.2% children with one or more ectopically erupting first molars in that 66% of the cases were self correcting "jump" cases. Bjerklin and Kurol[3] reported 60% of reversible types in total prevalence of 4.3% ectopic eruption. In a recent study, 69.4% of the ectopic PMFM self corrected spontaneously.[8]

Lack of timely intervention can cause loss of the primary second molar, mesial tipping and rotation of the permanent molar, unfavorable occlusion and space deficiency for the second premolar.[10] Pediatric dentist must be aware of this condition because by diagnosing this eruption disorder and intercepting it before the primary second molar has been lost, he/she can prevent a space loss of 6-8 mm in that quadrant. The treatment objective is to move the ectopically erupting molar distally from the tooth it is resorbing, in order to regain space and correction of mesial tipping of the permanent molar to allow normal eruption. Several techniques for the correction of the ectopically positioned PMFM have been reported and they range from orthodontic band and springs,[11-16] deimpactors,[17] e elastomeric separator,18 cervical traction19 and helical springs

to Croll's bilateral band and wire appliance[20] and Grim's removable Hawley's appliance with spring.[21] However, each technique has various disadvantages. Robert Humphrey in 1962[22] was the first to describe Humphrey's appliance in distalizing the PMFM. It is a fixed appliance consisting of band on second primary molar with soldered 'S' shaped wire and its free end engaging in occlusal pit of the first permanent molar.

Humphrey's appliance has many advantages compared to other techniques.[23] It can be successfully used even in teeth with tight contacts where separators cannot be placed. In addition to this, appliance can be left in place until the permanent molar reaches occlusion, and it does not jeopardize the integrity of the epithelial attachment. If any adjustments are needed, it may be made directly in the child's mouth with a How plier or Bird-beak plier or the appliance can easily be removed as a band and loop space maintainer. It can then be adjusted and recemented. No special instruments are needed. The only disadvantage is the required chair and laboratory time for its fabrication.

The aim of this article is to present a case of ectopically positioned PMFM which was successfully corrected using the Humphrey's appliance.

Case report

An 8½-year-old girl reported to the Department of Pedodontics and Preventive Dentistry, College of Dental Sciences, Davangere, India for routine checkup.

Intraoral examination revealed that mesial cusps of maxillary permanent left first molar were locked under the distal part of primary second molar (Figure 1). Only occlusal one third was visible. The primary second molar was asymptomatic and did not exhibit any mobility. Patient had not experienced any pain or discomfort in relation to that tooth. On contra lateral side permanent first molar was erupted in normal position (Figure 1). Primary right first molar had been extracted due to caries. Suspecting the ectopic eruption of the first permanent molar, a periapical radiograph was taken which confirmed the ectopic eruption (Figure 2). Resorption of distobuccal root of the primary second molar was also evident (Figure 2). The case was planned for distalization of permanent molar using the Humphrey's appliance. An advantage of this appliance is that the basic design of this appliance can be incorporated into a Nance

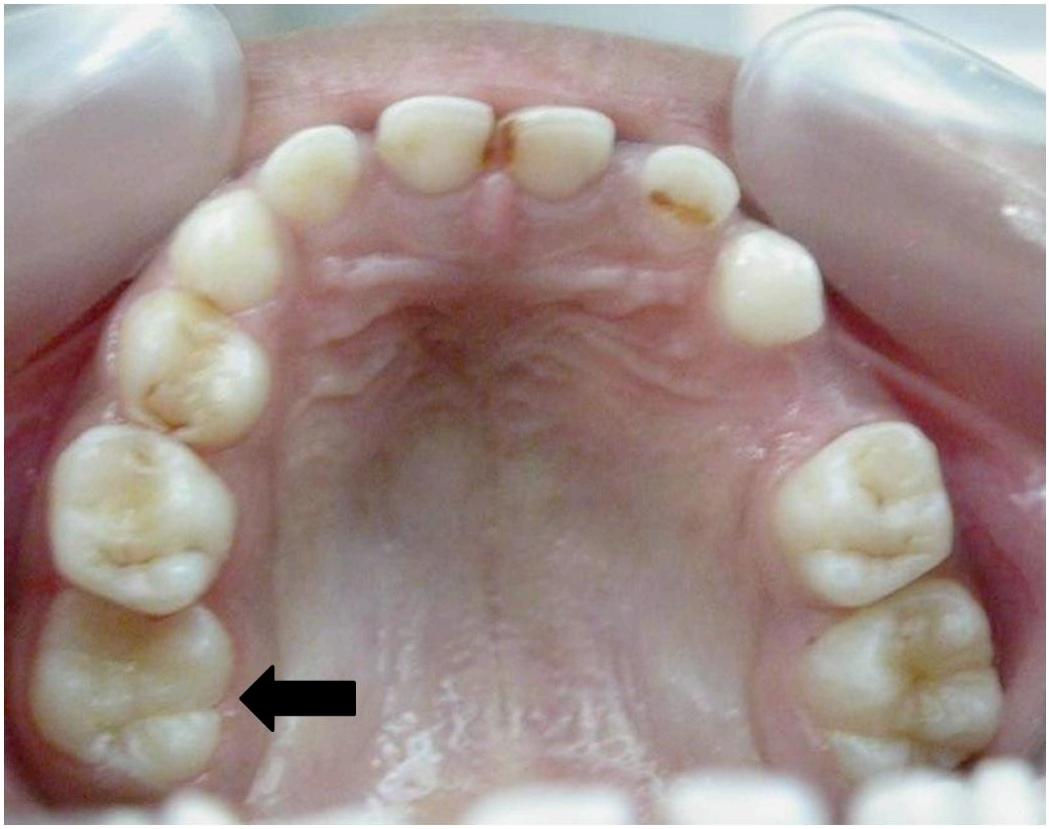

Figure 1: Intraoral photograph (mirror view) of 26 in ectopic eruption (arrow)

Figure 2. Radiograph showing ectopic eruption of 26.
See also associated distal root resorption of the primary second molar (arrow)

holding arch if additional appliance stability is desired or if leeway space must be preserved. In our case, as the primary right first molar was extracted, instead of giving band and loop space maintainer, fabrication of Humphrey's appliance incorporated with a Nance holding arch was decided to gain the advantage of enhanced anchorage to distalize the ectopic permanent molar as well as to maintain space for the contra lateral erupting first premolar.

In the first visit, band was adapted to the primary right and left second primary molar. An alginate impression was made and with the band placed in the impression a model was poured. In the laboratory 0.006 inch wire was adapted and soldered to the buccal surface of the band after giving an S shaped loop in the wire (Figure 3).

The appliance was cemented. The free end of S shaped wire was placed in small preparation made in the mesial occlusal pit of ectopic molar and stabilized with composite restoration (Figure 4). This small preparation can serve as a point of force application. The appliance was activated by opening the S shape, every 2 weeks. The activation was made directly in patient's mouth using a bird-beak plier. Distal movement of ectopic molar was assessed both clinically and radiographically (Figure 5). After 3 months the entrapped molar was completely moved distally and erupted to normal occlusal level in the oral cavity (Figure 6 and 7). Later Humphrey's appliance was removed and on contra lateral side band and loop space maintainer was given to maintain space for the erupting first premolar.

Discussion

Ectopic eruption of PMFM, a developmental disorder in path of eruption was first described by Chapman in 1923.[24] It is a painless and often unrecognized condition, diagnosed during routine radiographic examination during the eruption of permanent molar, usually between 7 and 8 years of age.

Methods of grading the severity of ectopic eruption of PMFM have been reported in the literature.[25,26] Barberia-Leache et al[8] classified this problem into 4 grades according to the magnitude of the primary second molar distal root resorption.

Grade I: Mild – limited resorption to cementum or with minimum dentin penetration

Figure 3: Fabricated Humphrey's appliance which is incorporated into a Nance holding arch (above). S shaped loop of the appliance (below)

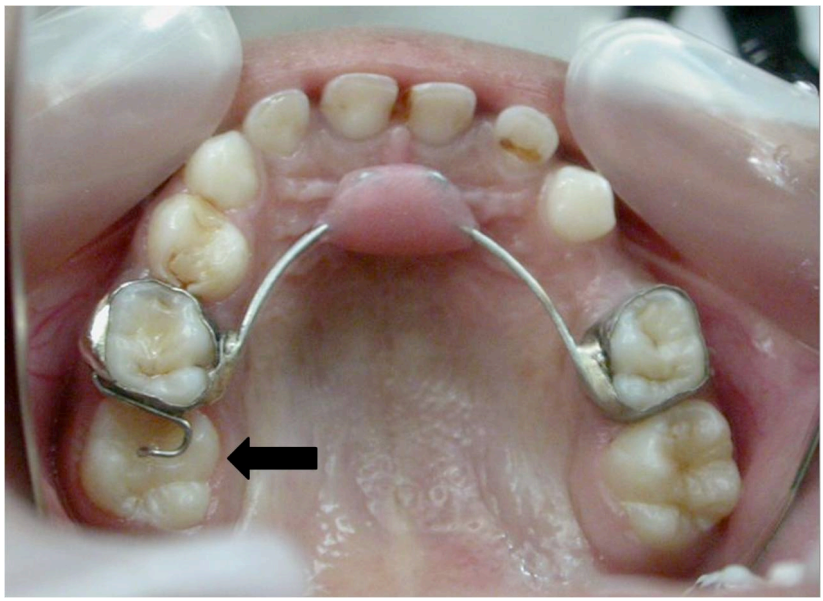

Figure 4: Cemented Humphrey's appliance. The free end of S shaped wire is engaging the occlusal pit of ectopic molar (arrow)

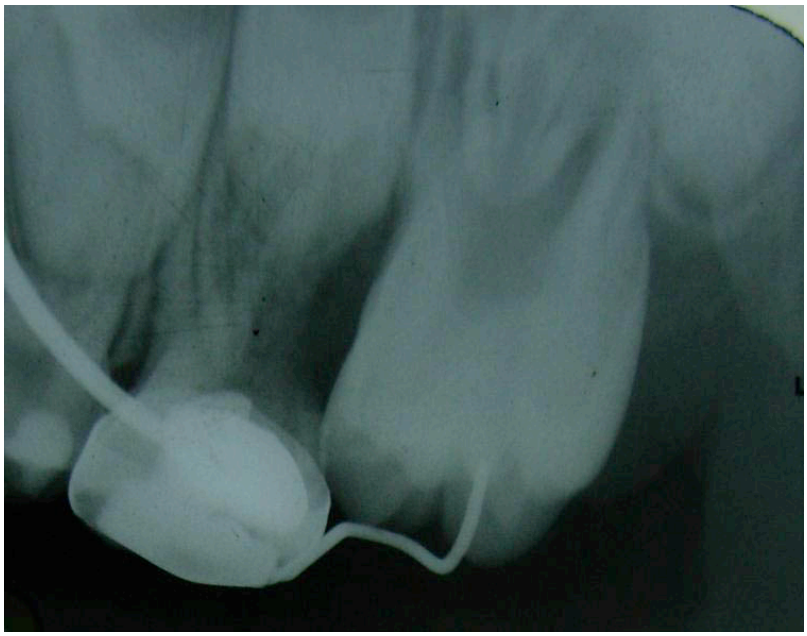

Figure 5: Radiograph showing some distal movement of ectopic 26

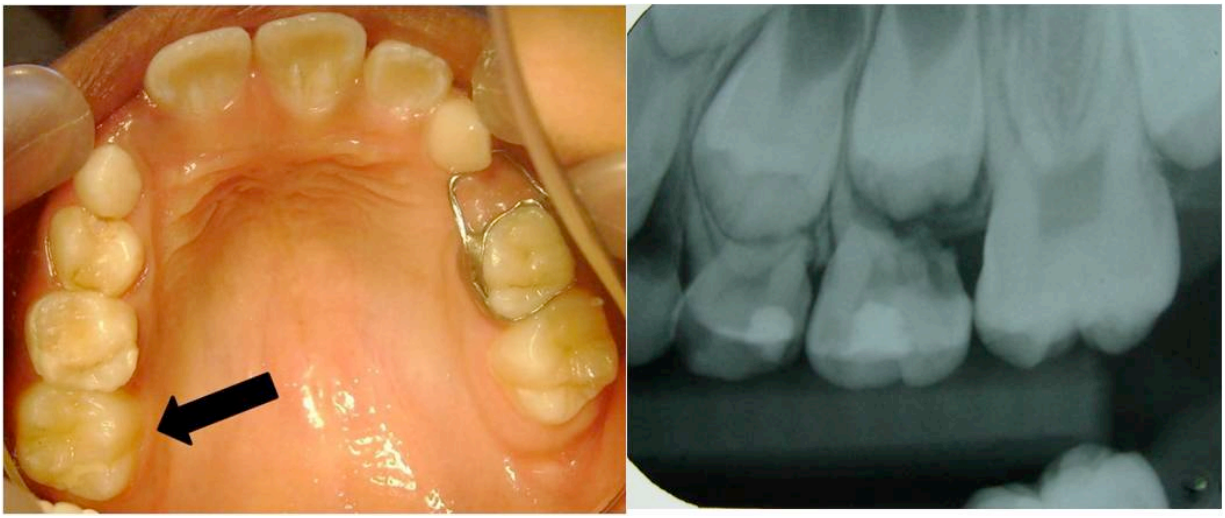

Figure 6. Post operative photograph (left) and radiograph (right)
showing complete distalization of 26 (arrow)

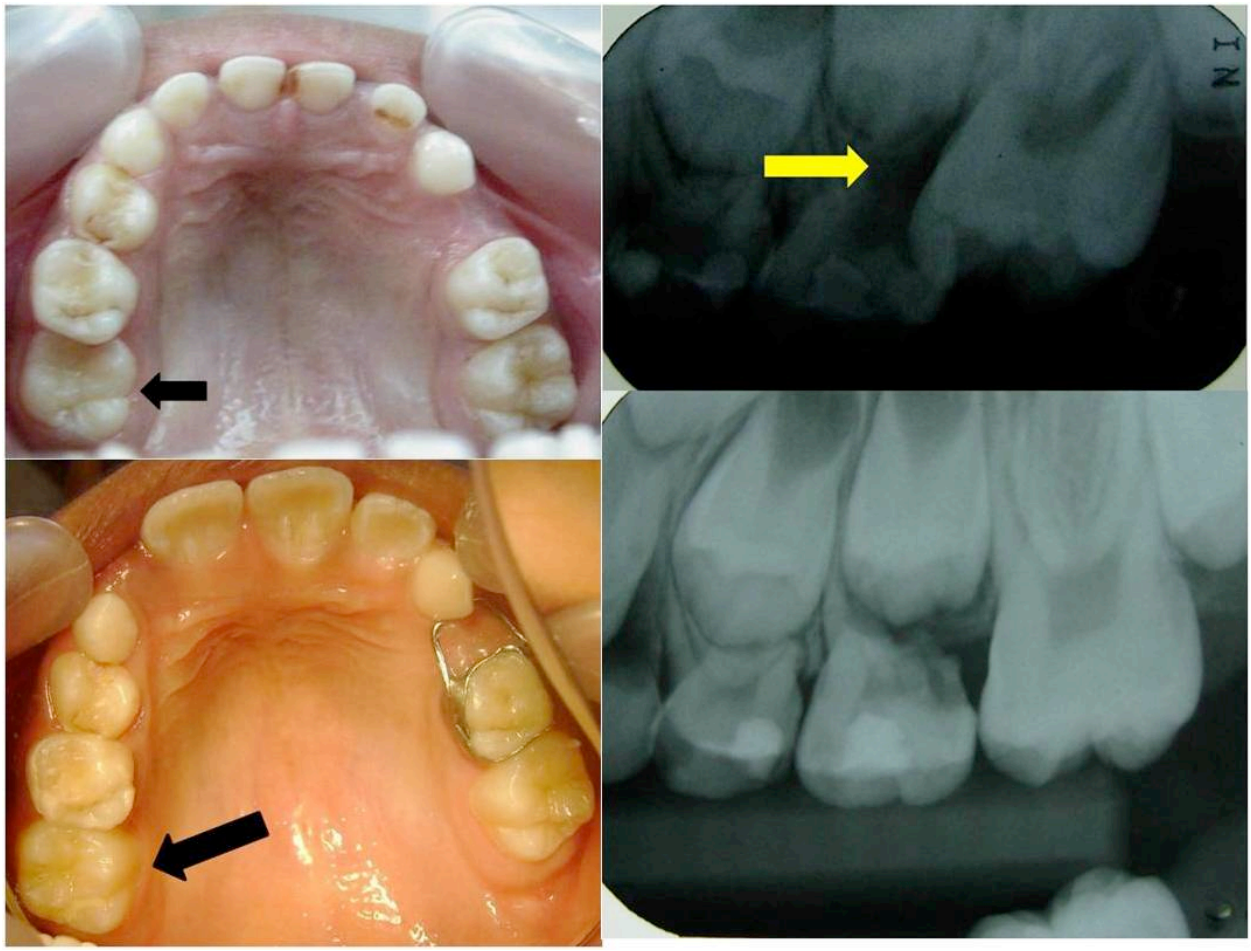

Figure 7: Pre (above) and post operative (below) photographs (left) and radiographs (right) of ectopic correction

Grade II: Moderate – resorption of the dentin without pulp exposition

Grade III: Severe – resorption of the distal root leading to pulp exposure

Grade IV: Very severe – resorption that affects the mesial root of the primary second molar

It has been reported that in most of the ectopic molars, the resorption on the primary molar was either severe or very severe. There was no significant correlation between the degree of primary molar resorption and the millimeters of permanent molar impaction because minute impaction sometimes caused severe resorption and relatively greater impactions give rise to lesser pathologic resorption. Regarding correction, grades I and II normally self corrected spontaneously and grades III and IV remain impacted. However, there was some self-corrected grade III cases and some grade I cases that stayed impacted.[8] In the case presented here, the primary second molar showed grade III resorption and permanent molar stayed locked strongly indicating definite treatment.

It is a challenging task for pediatric dentist to decide whether or not to treat a child with ectopic eruption of PMFM. Because this condition is sometimes self correcting and some authors suggested that it is better to observe before initiating any treatment.[3,8,9] In a study[8] of 509 children with ectopic eruption, it was found that most of the first permanent molars at risk were locked in distal parts of the second primary molars, at six years of age. At seven years, most of the permanent molars in children with reversible ectopic eruption became self corrected. Only few of the first permanent molars that were locked at the age of seven freed themselves later. It has been also shown that when middle or less of marginal border of a permanent molar is locked, usually will spontaneously correct.[8] However, if the complete marginal border is locked, usually does not self correct. It is recommended that a 3 to 6 months observation period is necessary if the resorption of the primary second molar is not too severe. From this finding and with other studies [3,9] it is concluded that the type of ectopic eruption can be reliably predicted at ages between 7 and 8 and those cases that self correct usually correct before 7 years of age. Thus based on this information, our case was considered as

irreversible type as the patient age was 8½ years and also the complete mesial marginal border of permanent molar was locked under the primary second molar with resultant grade III resorption of primary molar, an intervention with Humphrey's appliance was decided.

Although different methods have been suggested for distalizing the ectopic molar, each technique has various disadvantages.[11-21] When the brass separating wire and helical springs were used, potential existed for perforation of the epithelial attachment of the primary molar with a subsequent ingress of oral fluids, infection and loss of that tooth. Some authors have found that, it can be lost after distal movement is achieved, leading to displacement of permanent molar back to its ectopic position.[14,16] Elastomeric separators must be carefully used because they may dislodge in an apical direction, causing periodontal abscess. Some separators are not radiopaque, so it can be difficult to locate.[18] Considering all these disadvantages of above appliances, treatment with Humphrey's appliance was selected in the present case. Moreover, cross-arch anchorage may be necessary to prevent space loss of leeway space.[23] This cannot be obtained with other techniques described in the literature. An advantage of Humphrey's appliance is that the basic design of this appliance can be incorporated into a Nance holding arch if additional appliance stability is desired or if leeway space must be preserved.[23] Because of these added advantages, Humphrey's appliance was selected for correction of ectopically erupting permanent molar in our case.

This appliance usually takes 3 to 4 months to complete the distalization process, with the appliance being adjusted every 2-3 weeks.[2,22] In the present case, the total treatment time taken for distalizing of ectopic molar was 3 months. Some reports explains that, in general, resorption is stopped once the first permanent molar corrects its eruption path or after the treatment and secondary dentin is usually deposited in the area of resorption, obliterating the exposed dentin.[10,27] Kurol and Bjerklin[28] reported that most of resorbed primary second molars persisted until the normal exfoliation time. So these resorbed primary second molars may serve as excellent maintainers of space and function for a long time with a favorable influence on normal occlusal development. In our case too, although the primary second molar exhibited grade III resorption on radiograph before the treatment, it is still persisting as a natural space maintainer

without any damage or mobility after the treatment.

From this case report it was confirmed that, correction with Humphrey's appliance is highly effective in distalizing the ectopic permanent molar as well as to maintaining the space for erupting premolar by conserving the primary second molar.[23,24] This appliance made the permanent first molar to erupt in normal occlusion and did not cause any damage to the primary second molar. However, once during the treatment it required reinsertion/recementation of the appliance showing a disadvantage. This problem can be corrected by taking precautionary measures before the fabrication and cementation of the appliance. The band should be properly fitted over the tooth. The free end of 'S' shaped wire should properly engage the pit, otherwise using a small round bur, a shallow preparation can be made. The same pit should be properly etched and bonded to prevent loss of composite from the pit. Prior to bonding the dentist must evaluate the appliance for proper fit both clinically and on model cast. Once cemented the appliance should not interfere with occlusion and after bonding the excess cement should be removed to prevent gingival inflammation.

Conclusion

Humphrey's appliance is an effective interceptive treatment modality for the correction of ectopically erupting PMFM in children, during mixed dentition period with limited disadvantages. Although ectopic eruption sometimes is self correcting and some authors suggest observation before therapy but we suggest an early treatment with Humphrey's appliance before damage is done to the second primary molar and in turn its early loss in the oral cavity. More research including large sample size is required to evaluate the effectiveness of Humphrey's appliance comparing with other techniques.

References

1. Wei SH. Pediatric Dentistry: Total patient care. 1st ed. Philadelphia, Pa: Lea and Febiger; 462-3, 1988.
2. Sim JM. Minor tooth movement in children. St. Louis, CV Mosby Co; 28, 1972.
3. Bjerklin K, Kurol J. Prevalence of ectopic eruption of the maxillary first permanent molar. Swed Dent J 5: 29-34, 1981.

4. Kimmel NA, Gellin ME, Bohannan HM, Kaplan AL. Ectopic eruption of maxillary first permanent molars in different areas of the United States. ASDC J Dent Child 49(4): 294-9, 1982.

5. Carr GE, Mink JR. Ectopic eruption of the first permanent maxillary molar in cleft lip and cleft palate children. ASDC J Dent Child 32:179-88, 1965.

6. Bjerklin K. Ectopic eruption of the maxillary first permanent molar. An epidemiological, familial, etiological and longitudinal clinical study. Swed Dent J 100: 1-16, 1994.

7. Pulver F. The etiology and prevalence of ectopic eruption of the maxillary first permanent molar. ASDC J Dent Child 35(2): 138-46, 1968.

8. Barberia-Leache E, Suarez-Clua MC, Saavedra-Ontiveros D. Ectopic eruption of the maxillary first permanent molar: Characteristics and occurrence in growing children. Angle Orthod 75(4): 610-15, 2005.

9. Young DH. Ectopic eruption of the first permanent molar. ASDC J Dent Child 24: 153-62, 1957.

10. Kurol J, Bjerklin K. Ectopic eruption of the maxillary first permanent molars: a review. ASDC J Dent Child 53(3): 209-14, 1986.

11. Kennedy DB. A bonded appliance to correct ectopically erupting permanent molars. Pediatr Dent 7: 224-6, 1985.

12. Groper JN. A simplified treatment for correcting an ectopically erupting maxillary first permanent molar. ASDC J Dent Child 52: 374-6, 1985.

13. Hartmann C. A treatment for ectopically erupted first permanent molars. ASDC J Dent Child 51: 363-6, 1984.

14. Seow WK. The application of tooth separation in clinical pedodontics. ASDC J Dent Child 51(6):428-30, 1984.

15. Roberts MC. Treatment of ectopically erupting maxillary permanent first molars with a distal extended stainless steel crown. ASDC J Dent Child 53: 430-2, 1986.

16. Garcia – Godoy F. Correction of ectopically erupting maxillary permanent first molars. J Am Dent Assoc 105: 244-6, 1982.

17. Venn RJ. Ectopic eruption of permanent first molars: a clinical technique. J Pedod 10: 81-8, 1985.

18. Hirayama K, Chow MH. Correcting ectopic first permanent molars with metal or elastic separators. Pediatr Dent 14(5): 342-4, 1992.

19. Kurol J, Bjerklin K. Treatment of children with ectopic eruption of the maxillary first permanent molar by cervical traction. Am J Orthod 86: 483-92, 1984.

20. Croll TP. Correction of first permanent molar ectopic eruption. Quintessence Int 15: 1239-46, 1984.

21. Grimm SE. Treatment of ectopically erupting molars. J Clin Orthod 22: 512-3, 1988.

22. Humphrey WP. A simple technique for correcting an ectopically erupting first permanent molar. ASDC J Dent Child 29: 176-8, 1962.

23. Harrison LM Jr, Michal BC. Treatment of ectopically erupting permanent molars. Dent Clin North Am Jan 28(1): 57-67, 1984.

24. Chapman MH. First upper permanent molars partially impacted against second deciduous molars. Int J Oral Surg 9: 339-45, 1923.

25. O'Meara WF. Ectopic eruption pattern in selected permanent teeth. J Dent Res 41: 607-16, 1962.

26. Andlaw RJ, Rock WP. A manual of Pedodontics, 2nd ed. Edinburgh, UK: Churchill Livingstone; 138-40, 1978.

27. Gleerup A, Bjerklin K, Kurol J. Discriminant analysis in treatment evaluation of ectopic eruption of the maxillary first permanent molars. Eur J Orthod 17: 181-91, 1995.

28. Kurol J, Bjerklin K. Resorption of maxillary second primary molars caused by ectopic eruption of the maxillary first permanent molar. A longitudinal and histological study. ASDC J Dent Child 49: 273-9, 1982.