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CASE REPORT

DISTAL SHOE SPACE MAINTAINER IN MAXILLARY ARCH- CASE REPORT

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ABSTRACT

The distal shoe space maintainer remains an acceptable standard of care, with an extension subgingivallyto a location mesial to the unerupted first permanent molar. This extension serves as a guide for the erupting first molar, and prevents mesial "drifting" of that tooth. Upon eruption of the permanent first molar, the subgingival extension is removed; bacteria might adhere to the extension.

INTRODUCTION

The child's dentition is a dynamic entity, individual and always changing in nature[1]. Primary dentition plays a very important role in guiding the eruption of permanent teeth and also in chewing, appearance, prevention of bad habits and speech. Preservation of the primary dentition until the normal time of exfoliation is one of the most important factor involved in preventive and interceptive dentistry. The premature loss of second primary molar before the eruption of permanent first molar can create a significant arch space/tooth size discrepancy.

The causes for loss of deciduous teeth can be deep dental caries, trauma or congenital absence, which may present significant problems for growing child[2]. Premature loss of primary teeth results in space loss as reported in early 20th century by Stallard, Lyons, Willet and others[3]. About 51% of the prematurely lost first primary and 70% of prematurely lost second primary molars result in a loss of space and consequent malposition of a permanent tooth in that quadrant [4].Space maintenance is critical in the developing dentition, and often affects the future dental needs of a pediatric patient.

Several approaches have been recommended as treatment modality for this early loss; firstly allow the permanent molar to erupt and if it erupts mesially regain the space. However this modality may not be feasible if the space loss is greater to be corrected with a simple removable appliance. Also a removable partial denture or a reverse band and loop can also be used, however it has been observed that the unerupted tooth may migrate far mesially and erupt beneath these appliances. On the other hand the distal shoe appliance helps in control of the path of eruption and prevents undesirable mesial migration of the unerupted tooth[5]. Hence it is an appliance of choice used to preserve the space and guide the erupting molar in its place. The distal shoe space maintainer remains an acceptable standard of care, with an extension subgingivally to a location mesial to the unerupted first permanent molar. This extension serves as a guide for the erupting first molar, and prevents mesial "drifting" of that tooth. Upon eruption of the permanent first molar, the subgingival extension is removed; bacteria might adhere to the extension[6].

Some contraindications like certain medical conditions such as blood dyscrasias, immunosupression, congenital heart disease, patients with poor oral hygiene and many more[7]. Conventional design poses a variety of problems in cases of bilateral loss of second deciduous lower molars. It is required to modify the conventional designs for comfort, co-operation and success.

Active eruption of first permanent molar beings as early as 4 ½ years of life and continues until they are in full occlusal contact, i.e. 6 ½ to 7 years of age. Depending upon when the

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deciduous second molar is lost during this eruption time the space loss and space needs also vary. Earlier the tooth loss greater the space management problem. In the maxillary arch the permanent first molars initially erupt distally from the arch until the cusp tip enters the mouth and then swings mesially to contact the distal surface of deciduous second molar, hence there is no need of a distal shoe appliance.

However in the mandibular arch, the distal crownsurface of deciduous molar is essential for guidance for eruption of first permanent molar, it's premature loss leads to severe space loss and tipped position due to mesial eruption pathway of permanent molar.

CASE REPORT

A 4.5-year-old boy reported to the Department of Pedodontics and Preventive Dentistry with a chief complaint of pain in the upper left back teeth region since one week. Clinical examination revealed deep carious lesion and revealed grade 2 mobility [Fig- 1] the associated IOPA radiograph showed furcal radiolucency with varying degree of external root resorption [Fig-2]. It was decided to extract upper left second deciduous molars. Distal shoe or intraalveolar eruption guidance appliance type of space maintainer was indicated in the present case

Fig- 1

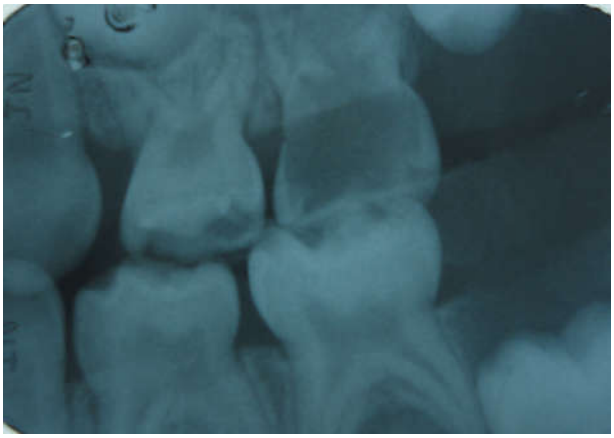

Fig- 2

The primary second molar served as a guide on the working model for calculating the horizontal length of distal extension. The vertical depth of intra-alveolar projection was calculated radiographically, and a cut was made in the cast and wire components were adapted using 19-gauge wire.[Fig-3]

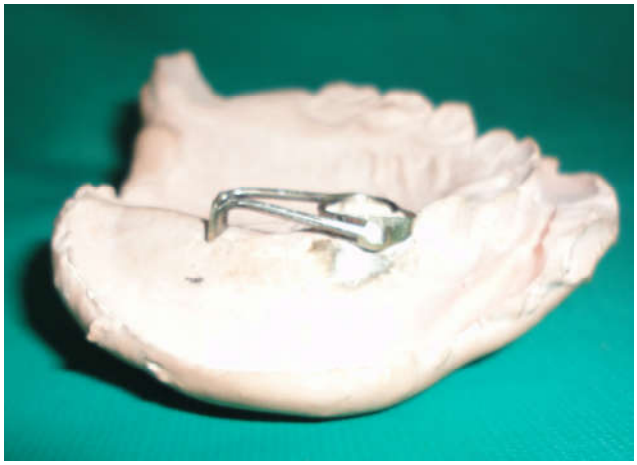

Fig-3

After extraction under antibiotic coverage, the intra-alveolar projection of the appliance was placed in the socket so as to touch and guide the vertical eruption path of the unerupted permanent maxillary left first molar [Fig-4,Fig-5]. Periapical radiographs were taken to check the passive contact between the mesial end of the permanent first molar and the appliance before cementation [Fig-6]. The recall visits were planned after every two months to check the condition of the distal shoe appliance, supporting teeth and status of eruption of permanent teeth.

Fig-4

Fig-5

The recall after 10 months showed signs of eruption with pre eruption bulge around it. It was then decided to remove the modified distal shoe appliance and the patient was closely monitored during the recall visits. After one year, the upper left permanent first molar erupted.

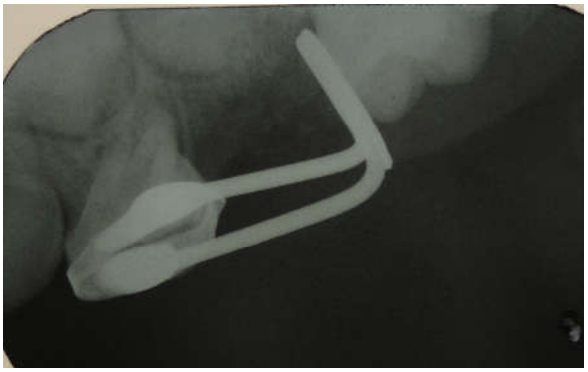

Fig-6

DISCUSSION

Teeth may be lost due to trauma, ectopic eruption, congenital disorders, premature resorption due to arch length deficiency and further more; dental caries is the most common reason for the premature loss of deciduous teeth[8]. Premature loss of the primary second molar prior to the eruption of the permanent first molar is often a challenging problem to the dentist in managing the developing dentition. Holding space to allow the teeth to erupt and to prevent impactions is valuable. The distal shoe space maintainer remains an acceptable standard of care, with an extension subgingivally to a location mesial to the unerupted first permanent molar. This extension serves as a guide for the erupting first molar, and prevents mesial "drifting" of that tooth[9].

Because the eruption of maxillary and mandibular first permanent molars differ. The design and placement of the appliance differ for the maxillary and mandibular arches. The maxillary first permanent molar erupts in a distal and facial direction until it meets muscular resistance. It then erupts in a mesial direction until contact is made with the distal surface of the second primary molar[10]. Hence this appliance is not advised in the maxillary arch. But in this case due to the eruption of permanent maxillary 1st molar was guiding along distal surface of 2nd deciduous molar, it was decided to place a distal shoe due to change erupting pattern of maxillary permanent molar[Fig-2]. Distal shoe space maintainer was the most demanded appliance to prevent space lose and also to preserve the arch integrity.

In contrast in case of mandibular arch the 1'st permanent molar erupts in a lingual and mesial direction using the distal surface of the 2nd primary molar as the buttress to guide into position. Hence the design of the distal extension of the appliance should have a slight lingual position over the crest of the alveolar ridge in order to engage the mesial contact area of the 1'st permanent molar. This consideration is important in preventing the erupting permanent molar from slipping contact with the appliance, resulting in rotation of both the molar and the appliance. The occlusal radiograph is helpful in checking the facio-lingual placement of the gingival extension.

The decision regarding the length of the horizontal bar is confronting to the dentist. The best approach is if the 2'nd primary molar is present it can serve as a guide on the working model until the fabrication of the appliance. If it is missing then the mesio-distal width of the contra lateral side can be taken. The gingival extension of the appliance should be constructed to extend about 1mm below the mesial marginal ridge of the first permanent molar. A good preoperative radiograph that is slightly underexposed will show the thickness of the over lying soft tissues which will aid in determining the depth of the grove to be cut in the working model in indirect techniques[10].

In 1929 Willett presented the first space maintainer with a distal extension for the premature loss of primary second molar. Since the abutment teeth need to resist the strong eruption force of the lower first permanent molar he covered both the first primary molar and the canine teeth together in a casting which extended distally as a "shoe," hence the name distal shoe for this appliance. The distal extension consisted of an L- shaped bar with an intra-alveolar extension which was soldered to the crown[11,12]. In 1942 Roche modified the distal extension with a V shaped intra-alveolar extension. The V shape offers a broader surface area and helps prevent rotations. Also it holds a greater chance of success if the unerupted tooth is positioned buccally or lingually in the arch.

CONCLUSION

A dentist has to constantly evaluate the dental space requirements during the transition from primary to permanent dentition in a growing child. The space loss can lead to problems such as crowding, ectopic eruption and impaction. Many factors have been discussed in the literature regarding distal shoe appliance, however the longivity and failure have not been discussed. With the knowledge that is provided in the literature regarding the of pattern of eruption and sequence the clinician can design an appropriate appliance for maintaining the space for premature loss of deciduous second molar. The ultimate goal is to develop a perfect and healthy occlusion in permanent dentition.

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