

Removable Distal Shoe Space Maintainer: A Case Report

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Abstract

Space maintenance is an integral part of preventive dentistry. Despite all possible measures of preserving the primary teeth, loss of space remains to be a frequent problem in pediatric dentistry, resulting in disturbance of arch integrity and unfavorably affecting the alignment of permanent successors. Space maintainers (SMs) are distinctive appliances used for space maintenance that occurred due to premature loss of primary teeth. This article presents an unique, modified removable nonfunctional SM that offers several benefits over the traditional appliance. This appliance is easy to fabricate, omits band adaptation and intra gingival distal extension in children and also helps to restore the functional harmony. There are various designs of distal shoe space maintainers for premature loss of deciduous second molar in a growing child. Further research needs to be done regarding clinical implications such as effectiveness, longevity etc., of removable distal shoe space maintainers.

Keywords: Space Maintainer (SM), Primary Molars, Distal Shoe Space Maintainer.

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INTRODUCTION

The child's dentition is a dynamic entity, individual and always changing in nature. 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.[1] The sequelae of premature loss of deciduous molar may include: ectopic eruption of the permanent molar, tipping into the space required for the eruption of the second premolar resulting in its impaction or discrepancy in arch length and tooth size, additionally, molar relationships may subsequently be altered. [2] 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 using space regainers. 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. [3] In growing children, the distal surface of the primary mandibular 2nd molar guides the eruption of permanent mandibular 1st molar in its place. Among all the space maintainers, distal shoe appliances help in control of the path of eruption and prevents undesirable mesial migration of the unerupted tooth. 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, as introduced by Gerber¹ and extended by Croll is a valuable part of the pediatric dentist's armamentarium, because in those cases where the second primary molar is lost prematurely, it helps guide the first permanent molar into place. In 1973, Hicks outlined in detail the indications and contraindications for the distal shoe appliance, as well as the diagnostic and systemic considerations. Hicks preferred fabrication of a cast gold appliance, although appliances with attachments soldered to stainless steel crowns or bands were clinically acceptable. Twenty years later, Gegenheimer and Donly described the fabrication of a laboratory-processed distal shoe appliance soldered to a stainless-steel crown that required 2 visits by the patient. [4] The first was for preparation of the tooth serving as a retainer for the crown and transfer impression for appliance fabrication. Another crown was temporarily cemented and, when the appliance was fabricated and returned from the laboratory, a radiograph was exposed to verify position of the permanent molar before extraction of the nonrestorable primary second molar and immediate cementation of the appliance. [5]

The purpose of this case report is to reintroduce the technique and present its clinical use allowing the permanent molar to erupt into proper position.

CASE REPORT

A female child aged 4 years reported to the Department of Pedodontics and Preventive Dentistry at the Oxford Dental College, Bangalore, with the chief complaint of pain and recurrent swelling in primary mandibular molars on left and right side. Clinical examination revealed infected root stump of maxillary left central incisors and loss of mandibular left second primary molar respectively.

(Fig. 1, 1a, 1b). Radiographic examination revealed dental caries involving pulp in relation to primary mandibular left second and right first molar indicating pulp necrosis. There was an infected tooth root in the upper left central incisor region which was decided to be extracted and the proper's space maintainer was cemented in the anterior region to restore speech and function. The pulpectomy procedure was performed on the primary mandibular right first molar. The primary mandibular second molar was restored with a stainless-steel crown after pulpectomy. Since the patient in this article was young and already lost the primary mandibular 2nd molar on his first visit to the department,

a non-invasive approach to maintain the space until the permanent tooth comes was selected after taking thorough history and evaluating parents and patient's compliance, expectation towards the treatment outcome.

Technique:

An alginate impression is taken of the patient's mandibular arch and a working model is produced. The appliance is made with an acrylic extension reaching the elevation distal to the extraction site (Fig: 2a, 2b, 3). This extension was adjusted chairside; overextension was preferred to under extension. Fabrication was done with a cold-cure acrylic using the salt and pepper technique. A minimum amount of wire clasps was used for retention of the appliance. Adam's clasps and 3/4 clasps were recommended (Fig: 3); In this case, the appliance was used as an interim treatment until the eruption of the permanent mandibular first molar (Fig:5a, b). The patient was followed up at 6 months and one year after insertion of the removable nonfunctional distal shoe space maintainer. The patient was given reverse band and loop space maintainer at one year follow up after the eruption of permanent mandibular first molar. This removable distal shoe space maintainer should be worn full time, for 24 hours a day. Oral hygiene and care of the appliance have been discussed with the parent.



Figure 1, 1a, 1b: Occlusal view showing infected root stump of maxillary left central incisors and loss of mandibular left second primary molar respectively



Figure 2a, 2b: Occlusal view showing maxillary groper's appliance and Removable distal shoe space maintainer in mandibular arch



Figure 3: Occlusal view at 6 month follow up showing signs of eruption of mandibular permanent first molar



Figure 4a, 4b: Occlusal view showing complete eruption of permanent mandibular 1st molar and reverse band and loop appliance cemented



Figure 5a, 5b: Mandibular cast was scrapped to make space for acrylic resin to apply pressure on the soft tissues around the mandibular molar area

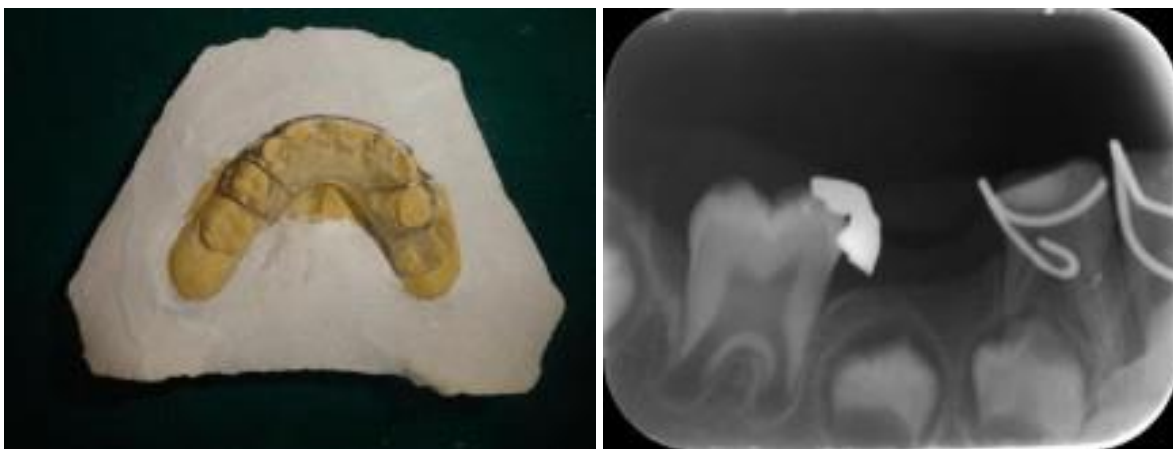


Figure 6a, 6b: Acrylic resin plate showing extent of the distal shoe space maintainer clinically and radiographically

DISCUSSION

Mandibular permanent first molars have a mesioocclusal eruption pattern, guided by the distal surface of the primary second molar. If the primary second molar is lost prematurely, the permanent first molar may erupt in a more anterior position leading to midline shifts, space loss and crowding. [6,7]

In this case report a removable distal shoe space maintainer was used over traditional intragingival distal shoe space maintainer because of certain disadvantages of the latter. First and foremost, disadvantage of traditional distal shoe appliance being the requirement of local anesthesia and a surgical incision, technically difficult procedure, the patient must be under close scrutiny while the appliance is in place, there is no allowance for inaccuracy in the measurement or fabrication and the appliance needs to be changed once the first permanent molar erupts until the eruption of second premolar, entailing several appointments for the follow up.[8,9] One more concern to consider while recommending distal extension intra gingival distal shoe space maintainer is damage to succedaneous tooth. Malformed succedaneous tooth is seen in some cases due to trauma to the follicle caused by improper placement

of the gingival extension of the appliance or traumatic extraction of ankylosed primary molar. [1,10] Intra gingival distal extension space maintainer is also contraindicated in medically compromised patients due to risk of infective endocarditis, blood dyscrasias, congenital heart defects, a history of rheumatic fever, diabetes or generalized debilitation. [11]

The traditional distal shoe space maintainers also require banding of the primary mandibular 1st molar and maintaining excellent oral hygiene including brushing of the soft tissues in contact with the appliance in order to avoid inflammation. Some young children may be compliant in wearing the device but not in cleaning the appliance or underlying tissue resulting in tissue decay, irritation and hyperplasia in the extension area or gingiva around the band. Hence, follow ups are essential in these cases.

To overcome above mentioned cons the removable distal extension space maintainer appliance is recommended. The use of removable appliance during the formation of the anterior occlusion where physiologic movement of the maxillary and mandibular canines in a distolabial direction occurs [Rapp and Demiroz, 1983] proven to be beneficial. Canine

movements in the lower arch take place primarily during eruption of the permanent lateral incisors, while in the maxilla during eruption of the permanent central incisors. Immobilization of a primary canine by a fixed space-maintaining appliance could, therefore, prevent the physiologic tipping of this tooth. Carroll and Jones [1982] included in their appliance design acrylic pressure ridges, created by making 2mm deep x 2mm wide grooves in the plaster model in the area of the unerupted first permanent molar. They also adapted lead foil around the distal end of the appliance so that it could be viewed radiographically. As per this author's experience, a clinical approximation without pressure ridges suffices to allow and guide the permanent molar to eruption; however, scientific research evidence is still in a primitive stage for this technique.[12] The same technique had been followed for this case.

In young children, anterior teeth loss has a wide-ranging effect on the child's psyche. It is very important to restore all functions such as mastication, speech, abnormal oral habits including the aesthetics of the child by replacement and prosthetic management, when these teeth are lost. The permanent successors may be proclined after early loss of deciduous maxillary anterior teeth and therefore, the arch length or perimeter is increased. Problems related to speech may result in absence of maxillary anterior teeth, the lingual sides of which are required by the tongue for certain phonations. Usually, it affects sounds such as 's', 'z' and 'th'. [13]

The strongest factor for the placement of an anterior esthetic appliance is a parental desire. There is no strong evidence suggesting that the early loss of the maxillary incisors will cause undesirable effects on the growth and development of the child. However, considerations have to be given regarding the speech problems, masticatory inefficiency, abnormal oral habits, an unesthetic appearance, which follow the loss of anterior teeth at an early age.[14] In this case report, banding of primary maxillary molars was done using glass ionomer cement which is biocompatible, cost effective for groper's appliance which will be able to function before the permanent teeth erupt without interfering with the normal eruption process. As the mandibular appliance in the present article is removable, it did not inhibit growth and ceased to fit whenever there was any change in the dentition, as proven true during all the follow up visits. [15]

CONCLUSION

The contemporary and inventive design of the non-functional SM is simple and easy to fabricate, non-invasive and requires less chair side time which helps in more patient acceptance and involvement in the process. Further research is needed to determine the appliance's efficacy and success in clinical situations involving premature loss of mandibular primary molars.

Clinical Significance:

This unique modified removable nonfunctional SM offers several advantages and proven to be effective, and also omits band adaptation in uncooperative or young children and helps restore the integrity of the oral cavity.

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