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Case Report
Permanent First Molar

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Sonal Appliance an innovative space maintainer in the management of early loss of first permanent molar: A Rare Case Report

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Introduction: In preventative and interventional dentistry, keeping deciduous teeth until their natural exfoliation is critical. An early tooth or group of teeth loss might have a variety of effects. The first molar is the largest tooth in the mouth, it carries the most occlusal stress, and it affects the vertical distance between the mandible and the maxilla. Adolescent patients who have lost a permanent first molar (PFM) require early space maintenance. **Case report:** In this case report a successful use of a modified distal shoe appliance was made in a patient whose 1st permanent molar was lost before the eruption of 2nd permanent molar. In circumstances when the permanent first molar is lost before the emergence of the permanent mandibular second molar, a unique device is described in this publication. The distal extension of a normal distal shoe appliance was extended distally along with a fixed bilateral appliance, a modified band and loop, and other components in this design. **Conclusion:** For individuals with bilateral molar loss, a modified distal shoe appliance is a promising option.

Keywords: Tooth Extraction, Permanent First Molar, Premature Loss of Multiple Deciduous Molars, Space Maintainer

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Introduction

The first molar is the biggest tooth in the mouth, carries the most occlusal load, and affects the occlusal height, the vertical distance between the mandible and maxilla, and aesthetic proportions. They are also regarded as the greatest source of anchoring for shifting the teeth since they have the largest root surface area (Mostafa Rezaie et al. 2018). [1-2] Early space maintenance and function restoration are required when a teenage patient loses a permanent first molar.[2]

Primary dentition plays a very important role in a child's development and growth, in terms of speech, chewing, esthetics, but most importantly guiding the eruption of permanent teeth. However.[3] Early loss of primary teeth is inevitable in case of extensive dental caries and trauma. The premature loss of primary molars causes loss of arch length, increased overbite, dental malposition, impaction, arch symmetry, and alteration in eruption. For this preservation of the dental arch's length plays an important role.[4]

The FPM erupt early, making it more likely that it may develop dental cavities and require extraction before the age of 15. Early FPM loss can cause the dental arches to shift, with the local function being affected, teeth drifting, and opposing teeth continuing to erupt. [3-4]

Therefore, in such cases, we must prevent space loss. Preservation of the space can eliminate or reduce the need for prolonged orthodontic treatment. When the first premolar has not yet erupted or extracted, it possesses the greatest complications related to the choice of treatment option for the space maintainer [4-5]. Distal shoe appliance was first introduced by Garber to guide the eruption of the FPM in the dental arch. In the case of early loss of FPM and several primary molar teeth, the conventional distal shoe cannot be used. The modified distal shoe has recently been the focus of several studies.[6]

This case report describes a conservative, interim appliance design by combining 3 space maintainers: lingual arch (Gandhi JM. et al 2023) [7], modified band n loop (Zaidan SM. Et al. 2022) [8] and Intra-alveolar appliance (Dadpe MV. Et al 2023) [9] after the loss of permanent first molar in an adolescent dentition.

The second permanent mandibular molar's unerupted vertical eruption course was guided by the appliance's intra-alveolar projection, which was inserted into the socket. This appliance was simple and effective, and space loss was controlled relatively easily.

Case Report

A 13-year-old female with no relevant systemic history reported to the Department of Pediatric Dentistry with pain in the lower right permanent first molar. On clinical examination 46 was grossly decayed with the least coronal structure remains, 36 with occlusal caries and over retained 75, 63, 54 and 55 **[Figure 1]**.

Orthopantomograph (OPG) is advised to diagnose the eruption stage of 47. It showed that 46 had root stumps and 47 had 7.5 stages of nolla stage of development and F stage of development (Demirjian's age assessment index). Also diagnosed that congenitally missing all 3rd molars and 12, deeply impacted 13 with abnormal path of eruption. **[Figure 2]**

Figure 1: Preoperative Intraoral Photographs

Figure 2: Preoperative OPG

The procedure and the treatment plan were explained to the patient and written informed consent was obtained. Treatment planned direct composite restoration for 36. Whereas a root stump of 46 and retained 75 was extracted. Each quadrant was treated in separate appointments. Preparation of dental arch was done for the placement of Sonal appliance. Design-dependent requires the abutment teeth to have adequate structure This appliance was intended to remain in place until the patient's occlusion is enough to receive a permanent prosthetic replacement or an implant.

Figure 3: Sonal Appliance Design

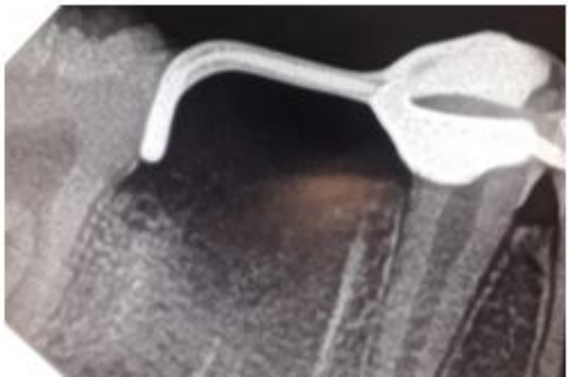

Figure 4: IOPAR before cementation

Treatment protocol extraction was done under antibiotic coverage. After 14 days of post-extraction, stainless steel banding was done on 36 and 45. Alginate impression was taken and bands were transferred to the impression and securing the band with the paper pins. Cast was poured and the appliance using 19-G and 22-G SS wire. A length of 12 cm (19-G wire) was taken to design the lingual arch and distal shoe using a single wire. Starts from the 36-tooth wire and passes lingually with anterior front rest on the cingulum of four lower incisors.

After that touch the band of 45 and give a 180-degree bend at that end to prepare the distal extension. The distal extension was calculated radiographically. A 22-G SS wire bent "S" pattern touched the middle third of the distal crown wall of 34 and adapted with the band 36. Wire bend can be cut as soon as the left lower 2nd premolar erupts. Finally, all the components were soldered [Figure 3].

Before cementation, an appliance trial using intraoral periapical radiographs was conducted to examine passive contact between the appliance and the mesial end of the permanent 2nd molar [Figure 4].

Glass ionomer cement GC FUJI type 1 was used for luting this appliance. [Figure 5] Post cementation OPG advised for confirmation of proper fitting of the appliance. [Figure 6] The recall visits were planned every two months to check the condition of the appliance and the eruption of teeth.

Figure 5: Sonal Appliance Cementation

Figure 6: Post Cementation OPG

Discussion

Primary dentition plays a very important role in a child's development and growth, in terms of speech, chewing, esthetic, and most importantly guiding the eruption of permanent teeth. However early loss of primary teeth is inevitable in case of extensive dental caries and trauma. The premature loss of primary molars causes decreased arch length, increased overbite, dental malposition, impaction, arch symmetry, and alteration in eruption. For this preservation dental arches play an important role. [10] The FPM emerges early, making it more vulnerable to dental decay and maybe needing extraction before the age of 15. The early loss of FPM can lead to changes in the dental arches which include diminished local function, drifting of teeth and continuous eruption of opposing teeth (Supraeruption). [11]

However, in specific cases i.e., loss of several primary and permanent molars, the usual space maintainer cannot be used. In such type of cases if left untreated there will be mesial drift of teeth in space. Therefore, it is desirable to have an affordable method that requires a minimum level of patient cooperation and can maintain the space till further treatment. For this, the use of a modified distal shoe space maintainer was planned for treatment. [12] Thus, by taking the anchorage from the remaining teeth, a fixed bilateral appliance with an intra-alveolar appliance on one side and a band a loop space maintainer on the other side and connecting lingual arch was made as an appliance, named "Sonal appliance".

By putting this appliance space loss due to mesial drifting of the permanent 2nd molar could be prevented. However, in this appliance, we have incorporated a distal shoe, modified band and loop and lingual arch as space maintainers.

In this case, we need to combine these 3 types of appliances in a single appliance because we need to maintain 3 spaces at a time, space loss due to loss of FPM before eruption of SPM, lower arch integrity, and thirdly retained 2nd primary molar before natural eruption of 2nd premolar in its space. Thus, this is a new appliance named as "Sonal appliance" for maintaining the space when multiple loss of teeth are in the arch. It is more acceptable to the children as it is fixed, stable and are space maintainer in there, as compared to removable appliances. Removable appliances have many drawbacks such as patients' cooperation, risk of fracture or losing the appliance.[13]

The success criteria of a distal shoe space maintainer, as defined by Baroni et al8 and Qudeimat9, is the successful guidance of the unerupted permanent tooth in the arch with no problems associated with the appliance. The other factors to be considered, include a long-range plan for space management in a growing child whose occlusion will need surveillance through three developmental stages: the primary, the mixed and the permanent dentition. It has been demonstrated that the appliance has high patient compliance and is simple to clean and maintain.[14-15]

Conclusion

In paediatric dentistry, the dentist's priority is to benefit the kid as much as possible while minimising pain, gaining their cooperation, and spending the least amount of time at the chairside. In this case modified space maintainer named "Sonal Appliance" was given in which 3 space maintainers were combined, which was well accepted by the child. This new appliance Sonal appliance helps in guiding the eruption of SPM, when there loss of FPM in the mandibular arch.

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