Distal Shoe Space Maintainer for the Premature Loss of Primary Second Molar in a 5-Year-Old Patient: A Case Report

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Abstract

Uneventful loss of deciduous second molar, afore the eruption of first permanent molar could lead to unadorned malocclusion due to undesired loss of space in the arch, tipping, crowding of the dental arch and many other dental problems. So, to avoid further occlusal complications, it is desirable to place a space maintainer after successful extraction of the carious primary molar. This case report describes the removal of a primary mandibular second molar, followed by delivery of a distal shoe appliance before the eruption of the first permanent molar.

Keywords: *Distal shoe, primary molars, permanent first molar, crown, eruption.*

Introduction

The idea of a device to maintain space loss due to premature exfoliation in the dental arch was first given by Davenport, in 1887.[1] Space maintainers are "the appliances used to maintain space or regain minor amounts of space lost, to guide the un-erupted tooth into a proper position in the dental arch". The two main types of space maintainers include fixed and removable. The distal shoe space maintainer, also called as Intra-Alveolar Appliance/Eruption Guidance Appliance is a fixed type of space maintainer, which was first developed by Gerber in 1964.[2] It was later modified by Croll in 1980.[3,4] It is primarily given in cases where there is premature exfoliation on the second primary molar, before the eruption of the permanent molar. Since this appliance helps in guiding the eruption of the first permanent molar, it is also called an Eruption Guidance Appliance.

Hicks, in 1973[5], first used cast gold to fabricate this appliance, but it soon grew out of popularity because of its increased cost. After 20 years, Gegenhiemer and Donly,[6] were the first to fabricate a laboratory-prepared distal shoe space maintainer which was already soldered to a stainless steel crown. The advantage of this was it was less time consuming, and the patient had to visit only twice. Clinically, the indications and contraindications as described by Hicks in 1973 are [5]:

Indications:

- Premature loss or extraction of the second deciduous molar before the eruption of first permanent molar.
- Advanced root resorption and periapical bone destruction of the second primary molar before the eruption of first permanent molar.
- A primary second molar with advanced caries that is non-restorable.
- Ectopic eruption of the permanent first molar.
- Ankylosis of the primary second molar.

Contraindications:

- Inadequate abutments due to multiple loss of teeth.

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- Poor patient/parental cooperation.
- Missing permanent first molar.
- Systemic diseases that affect healing such as Diabetes Mellitus.
- Cardiac anomalies that require antibiotic prophylaxis before dental treatment.

The motive of this article is to describe the management of a premature exfoliation of mandibular deciduous second molar due to extensive caries before the eruption of the permanent first molar using the Roche variety of a distal shoe space maintainer.

Case Report: A male child aged 5 years visited the Department of Paediatric and Preventive Dentistry, with a chief complain of pain in his left lower back tooth region (Fig 1). A proper history revealed that the patient had recurrent pain and swelling concerning the same since 1 month. Medical history was non-conclusive. Dental history showed the patient had previously visited the department for pulpectomy procedure.

Figure 1. 5-year-old patient with pain on the left lower back tooth region

Clinical intraoral examination showed grossly decayed primary mandibular second molar on the left side (75) and a carious primary first molar (74). (Figure 2) The permanent first molar of the same side is yet to erupt. Radiographic examination concluded the perforation of the pulpal floor, inter-radicular radiolucency and root resorption with respect to 75. (Figure 3)

Thus, it was decided that 74 was to be restored using Glass Ionomer cement and 75 was to be extracted and instead a distal shoe space maintainer was to be adapted. The procedure was explained to the parents and informed consent regarding the number of visits and the procedure was taken before the start of the procedure.

Figure 2. Intra-oral examination of 74, 75

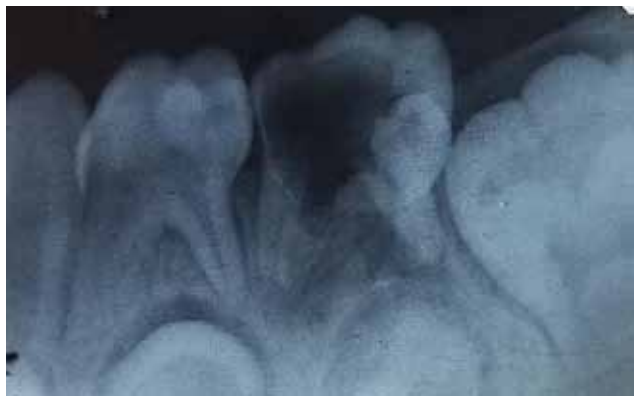

Figure 3. Radiographic examination of carious 74, and grossly decayed 75

Procedure: The primary first molar (74) was excavated for caries and restored using Glass Ionomer Cement. Eventually, it was prepared for a stainless steel crown. After tooth preparation, the crown was adapted and an alginate impression was made. Eventually, the stainless steel crown was taken out and correctly fitted into the impression and stabilised using thin 21 gauge wires, which was poured using dental stone and die stone. (Figure 4) A temporary crown using tooth coloured acrylic was fabricated chair-side and delivered to the patient. Patient was recalled after 4 days.

Figure 4. Alginate impression made and crown seated. Cast poured using die stone with adapted crown.

The distal shoe appliance was fabricated using a 19 gauge stainless steel wire. The Roche variety of distal shoe appliance was fabricated. It consists of a horizontal part of the wire spanning the space and a vertical sub-gingival extension which would be seated approximately 1 mm below the medial most aspect of the first permanent molar. The length of the loop was calculated extending from the distal-most aspect of 74 up to the mesial aspect of the un-erupted permanent first molar using a radiograph. The sub-gingival extension on the loop was scanned using the same IOPA. The wire component of the appliance was fabricated using pliers and soldered to the stainless steel crown.

During the following appointment, the deciduous mandibular second molar (75) was extracted under local anaesthesia and a prior antibiotic coverage. After haemostasis was achieved, the fabricated appliance was seated on the primary first molar and its sub-gingival extension was pushed into the extraction socket with gentle digital pressure. It was seated in such a way that the gingival loop lightly grazes the mesial marginal ridge of the un-erupted permanent first molar. After the position was confirmed using a radiograph, the appliance was cemented in place using Luting type of Glass Ionomer cement (Figure 5). Recall appointments were scheduled after one week, one month and then after every 3 months.

Figure 5. Radiographic and intra-oral images to confirm placement of the appliance.

Discussion

The primary second molar is a crucial tooth in the mixed dentition for the sole reason that it guides the permanent first molar by providing a path for an eruption. The distal surface of deciduous second molar helps to guide the eruption of permanent first molar which has a mesiooccclusion pattern of eruption. Hence, it is very important to preserve the deciduous second molar until the eruption of the permanent first molar. Extraction of the same should not be taken up unless indicated. As a result of premature loss of primary second molar, there could be loss of arch perimeter, which would eventually need complicated orthodontic intervention. The criteria of a successful placement of distal shoe space maintainer is judged by the successful guidance of the un-erupted permanent first molar into the dental arch with no or minimal glitch with the space maintainer, as suggested by Baroni et al[7] and Quidemat et al[8].

Conclusion

The major concern for a paediatric dentist is to try and save the primary second molar before the eruption of the permanent first molar. In extreme situations when that cannot be achieved, there are no other solutions except to extract it. Thus, as a subsequent treatment plan, the fabrication of an eruption guiding appliance is the safest and the best way to prevent crowding and malocclusion. It is cost-effective, less time consuming and patient-friendly method of space management. After the eruption of the permanent first molar, the appliance could either be removed or modified into a crown and loop type of space maintainer by just removing the sub-gingival extension of the loop. Hence, the distal shoe appliance is the best way to prevent serious dental malformations that could occur due to inadvertent early loss of primary second molar.

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Ethical Permission: Approved

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