

An Esthetic and Functional Fixed Posterior Space Maintainer-A Case Report

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Abstract

Introduction

Early loss of a deciduous tooth is one of the major causes for development of malocclusion. Space maintainers are the appliances that are custom-made by the dentist to prevent the space loss and its further complications. Sometimes esthetics is also a concern along with function and space management in posterior region. Fiber-reinforced composite (FRC) retained space maintainer solves all these requirements efficiently and effectively. Although, the technique is very simple and the appliance is very comfortable inside the oral cavity. Here is a case of premature loss of posterior deciduous tooth which was replaced by FRC retained esthetic functional space maintainer. The appliance was found to be esthetically and functionally satisfactory inside the oral cavity till the last visit (1 Year).

Keywords: Space maintainer, Fiber-reinforced composite, Esthetic.

Introduction

The occurrence of space loss following premature loss of a primary molar was first described in 1887. Certain adverse effects of space loss been reported are; tooth material arch length discrepancy, crowding of the dental arch, ectopic eruption and impaction of the permanent tooth, tipping of the first permanent molar, crossbite formation and centre line discrepancies. When a primary tooth is lost before its shedding time, the teeth adjacent to the missing tends to drift into the space resulting in the space loss required for the proper alignment of the succedaneous teeth, thereby resulting in crowding and other types of malocclusion.¹ In the situation where a posterior primary tooth is lost before schedule, the drifting of adjacent teeth into the space occurs, thus space

management in such a situation is an important concern for a Pedodontist.

The premature loss of an anterior tooth definitely results in an unaesthetic smile similarly loss of primary molar too is a concern not only for difficulty in biting but even esthetics. If the primary molars are lost at the age of 2 to 4 years, there is an increase demand for esthetic as the child starts attending the play school and thus the peer group comes into play. Loss of tooth at this age, apart from the functional problems associated with it, may result in psychological trauma to the child. The problem may become serious and deep seated and may result in an imbalanced emotional development of the child. Along with this the teeth adjacent to the edentulous space may drift into the space, although to a lesser extent increasing the potential for developing malocclusion at a later stage.² Numerous appliances have been introduced by various investigators for the space management in case of early loss of a primary tooth. It can be removable or fixed; unilateral or bilateral; and functional or non-functional. The selection of the appliance also depends upon various factors: the child's stage of dental development, the dental arch involved with the missing tooth and the status of the teeth adjacent to the lost tooth.

Fiber-reinforced composites (FRC) has presented newer option of fabricating adhesive, esthetic, and metal-free tooth replacements even in the case of molar teeth. The two main components of FRC are fibers and resin matrix. The resin matrix acts as a carrier, protector, and load-splicing medium around the fibers. To improve the mechanical properties and behavior of composite resins specifically-oriented filler materials, such as glass fibers, aramid fibers, carbon/graphite fibers, and ultra high molecular weight polyethylene fibers have been introduced.³

Technique

A 5-year-old girl reported to the Department of Pedodontics and Preventive Dentistry with the chief complaint of missing tooth in the right lower back teeth region. The parents reported with the history of tooth extraction due to grossly decayed 3 days back. On clinical examination it was found that the mandibular right primary first molar was missing and the extraction socket was healed uneventfully (Fig.1).

A fixed esthetic functional space maintainer was planned for the replacement of missing first deciduous molar. A strip of FRC resin (Fig. 2A) was cut approximately of the length equal to the distance from the distal surface of class II mesio-occlusal cavity of second deciduous molar to the full circumference of the deciduous canine. The cavosurface margin of the Mesio-occlusal class II cavity and all the surfaces of the canine were etched with 37% phosphoric acid (Fig. 3A). After 15 seconds the teeth were completely washed and dried (Fig. 3B). A white chalky appearance was seen on all the etched surfaces. The bonding agent was applied and cured as per manufacturer's instructions (Fig. 3C). A thin layer of flowable composite was placed over the surfaces of the canine and in the cavity of second deciduous molar following which the FRC strip was adapted (Fig. 3D & 3E). One end of the FRC strip was seated from the base of the cavity in right lower second deciduous molar and the other end was wrapped around the circumference of right lower deciduous canine (Fig. 3F & 3G). Once the strip was placed in position it was cured using a light curing unit. The inner surface of composite tooth made was applied with bond and light cured (Fig. 3H & 3I). Finally, the composite tooth was luted on to the bridge with the help flowable composite in the missing space and light cured completely (Fig. 3J). The occlusion was checked for any premature contact.

The composite tooth was prepared with the help of the rubber base impression of Stainless steel crown chosen according to the appropriate size measured mesio-distally the missing space and then finishing and polishing of the tooth was done (Fig. 2B & 2C). Hence, the desired appliance was fabricated (Fig. 4A). Occlusion was again checked to correct any pre-mature contact if present (Fig. 4B). The patient was recalled after 1 week to check the integrity of the appliance in the mouth Occlusion was again checked to correct any pre-mature contact if present (Fig. 4C). The appliance was found to be satisfactory both functionally as well as esthetically. The patient was kept on 3 months regular recall visits and the appliance was found to be functioning well inside the oral cavity till the last visit (9 months).

Discussion

Early loss of a deciduous tooth is a major cause for malocclusion in permanent dentition. This occurs mainly due to the teeth adjacent to the missing deciduous tooth tend to drift into the space resulting in tooth material arch length discrepancy thereby leading to malocclusion. To overcome these various space maintainers have been designed and introduced. They can be either a removable or fixed; functional or nonfunctional and unilateral or bilateral space maintainers. The design and selection of space maintainer to be used depends upon the need of the situation.⁴

In a case where a posterior tooth is prematurely lost, functional space maintainer is the one most commonly employed. A fixed appliance like the one used in this case is almost free from all such shortcomings. Fixed esthetic space maintainers to replace a prematurely lost posterior tooth have also been done earlier. The most commonly used technique involves the adaptation of stainless steel bands on the second deciduous molars and a wire soldered to them joining the two bands. The wire was adapted such

that it runs close to the all the surfaces of all teeth. An additional wire attachment was soldered to this wire which extends over the edentulous space and holds the pontic in place. This technique is although very complicated and takes ample amount of time.⁵

The material used for the fabrication of a fixed esthetic functional space maintainer in the present case was FRC resin. Fiber reinforced composite resin has been extensively used in fixed partial dentures, periodontal splints, and in orthodontic treatment as a retention splint but it is newly introduced in Pediatric Dentistry.⁶ Fiber reinforced composite resin have also been used in the past to replace missing teeth.⁷ In pediatric dentistry they have been used in the fabrication of space maintainers for the anterior segment. Kargul et al⁵ in their clinical trial concluded that the glass fiber reinforced composite resin space maintainers, used in the case of missing one or more primary molars functioned well during a short period. Kirzioğlu and Ertürk have also showed similar results in their study.⁸ Some clinical advantages of such space maintainers have been enlisted by various investigators such as: (1) the provided cost and time savings; (2) did not require a cast model; (3) did not require a second visit; (4) easy to apply; (5) provided reliable adhesive bonding; provided long-term retention; (6) were used when there was an indication of metal allergy; (7) were easy to clean; (8) had a natural feel and (9) were esthetic. Thereby eliminating periodontal problems associated with conventional fixed space maintainers.^{6,9,10} When compared to the conventional fixed space maintainers (using bands and wires) the appliance is more esthetic without the use of metal. McDonald and Avery have instructed that the band and loops should be taken out once a year to check clinically, clean, and apply fluoride to the tooth. Fiber reinforced composite resin does not require these annual steps.¹¹

In the current case, a composite tooth was fabricated using the rubber base impression of corresponding sized Stainless steel crown to replace the lost primary deciduous first molar (Fig. 2). The exact morphology of the tooth was thus attained. Wijlen PV reported two cases in which a missing permanent tooth was replaced using FRCR and a free hand composite build up. The advantages of this technique are: (1) the procedure can be finished in single appointment, (2) better patient compliance and (3) reduced the cost of the appointments, (4) inter-dental spaces may be carved to facilitate access for oral hygiene, (5) repairs can be made directly, without the use of any complicated techniques or materials and (6) control of the complete procedure remains with the operating dentist. Adjustments can be made to the design, esthetic details and occlusal and soft-tissue relationships immediately or in a limited time during follow-up appointments.¹⁰ The technique used in this current procedure is very easy, simple and the results are very esthetic and functionally satisfactory. More clinical research is required with larger number of samples to assess the long-term success of the appliance.

Conclusion

As the loss of an anterior tooth at younger age may result in psychological trauma to the child, even the loss of posterior tooth can do so. The problem thus becomes more serious and may result in an imbalanced emotional development of the child. Premature loss of a deciduous tooth may also result in drifting of adjacent teeth leading to space loss. Thus, to address the functional and esthetic problem associated with the loss of a posterior tooth, the present appliance was placed in the posterior segment using a simple technique with an esthetic and functionally satisfactory result.

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Legends Figure

Fig.1: Pre-operative mandibular occlusal views

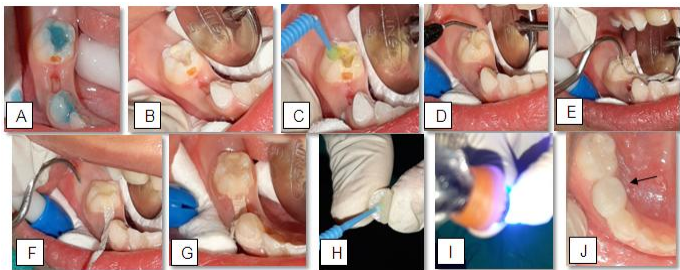


Fig.2: Preparatory Phase



(A). Fiber Reinforced Composite-FRC (3mm), (B). Rubber-Base impression made with S.S Crown of 84 and (C). Composite tooth made by Light cure.

Fig.3: Step by step fabrication of the space maintainer



A. Etched, B. Washed & Dried, C. Bond applied & light cured for 20 sec, D. Flowable Composite filled in the cavity, E. Placement of FRC, F & G. FRC adapted on 83 &85 and light cured for 40 sec, H & I. Bond applied on the inner surface of tooth made up of composite, light cured for 20 sec, and J. finally luted with the help flowable composite in the missing space and light cured completely.

Fig.4: Post-operative view



(A) Occlusal view, (B) Lateral view in occlusion & (C) Follow up Lateral view after 1 week.