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Case Report on the application of a functional space maintainer in pediatric dentistry

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Abstract

This case report details the clinical application of a space maintainer in pediatric dentistry to address premature tooth loss. A 7-year-old patient presented with early loss of a primary molar due to dental caries, posing a risk for space loss and subsequent malocclusion. After thorough examination and assessment, a fixed unilateral space maintainer was chosen to preserve the arch length and guide the eruption of the permanent successor. The procedure, follow-up evaluations, and outcomes over a 12-month period are documented, highlighting the effectiveness of the space maintainer in preventing space loss and ensuring proper dental development. This report underscores the importance of timely intervention and the role of space maintainers in pediatric dental care.

Keywords: Pediatric Dental, Lingual Holding, Arch Space Transpalatal Arch

Introduction

Dental crowding is defined as malalignment of teeth in the upper or lower arch. It can be classified according to the time of appearance as primary, secondary, and tertiary.[1] Primary crowding is generally of genetic origin, where there is a discrepancy between the tooth size and arch size. Secondary crowding is acquired and occurs due to premature loss of primary teeth, especially molars, which in turn leads to consequent loss of arch length. Tertiary crowding, also known as late lower incisor crowding, can occur toward the end of the peak of mandibular growth (Proffit et al., 2018)

Crowding in the permanent dentition due to premature loss of deciduous teeth is one of the most common problems encountered by patients (Jitesh and Mathew, 2019).[2] Dental crowding may have damaging effects on oral health, such as difficulty maintaining optimal oral hygiene, which may later lead to periodontal problems, aesthetic concerns and the development of low self-esteem, and the prevention of an ideal occlusion (Caplin et al., 2015, Anthony et al., 2018, Proffit et al., 2018). To prevent malocclusion, specifically in patients with potential future secondary crowding, the best option is to maintain arch space by placing a space maintainer (Wright and Kennedy, 1978). Space maintainers of all types are commonly used in the maxillary and mandibular arches to help maintain arch length following extraction of a deciduous tooth and to minimize the need for any orthodontic treatment in the future (Bijoor and Kohli, 2005).

The term space maintenance was first used in 1941 by (Brauer, 1941) and described as the process of maintaining space in a dental arch previously occupied by a tooth or a group of teeth. Hence; a space maintainer is a device that can be fixed or removable and is mainly utilized to maintain the space created by the lost deciduous tooth or teeth until the eruption of their successors (Singh et al., 2020). This is achieved by inhibiting the migration of the teeth adjacent to the edentulous span toward it, thus allowing normal eruption of the permanent successor (Gianelly, 1995).[3]

Although fixed space maintainers, such as band-loop space maintainers, crown-loop space maintainers, lower lingual holding arch space maintainers, transpalatal arch space maintainers, and Nance appliances, are used more commonly, different types of removable partial dentures have also been used.

Traditionally, the treatment of choice for mandibular space loss is the placement of a Lingual arch space maintainer. An alternative appliance which may be considered for use is the fixed functional lingual arch space maintainer. The purpose of this case report was to present a novel fixed functional lingual arch space maintainer with its advantages. over the more conventional lingual arch space maintainer, and encourage clinicians to prescribe its use in certain clinical conditions.

Case Report 1

A 7-year-old boy reported to the Department of Paediatric and Preventive Dentistry of SRM Kattankulathur Dental college with a complaint of pain in the lower right and left back tooth region for the past 10 days. The pain was severe, throbbing,non radiating pain. The patient also has decay in 51,61,64.

On radiographic examination, it revealed that carious radiolucency involving enamel, dentin and pulp with resorption seen in the distal 1/3rd root of both 75 and 85.

From the clinical and radiographical examination it was diagnosed as chronic irreversible pulpitis in 64, 75, 85 and dental caries in 51,61

Considering the age and the diagnosis where, the treatment plans for the patient was pulpectomy to be done in 64with SS crown. Extraction of 75 and 85 followed by the space maintainer as the root length was not more than 2/3rd length .Extraction of 51 and 61 had to be done.

Patient's guardian was explained about the treatment plan and they were unwilling for extraction of 51,61. Hence, extraction of both 75 and 85was done under L. A (2% lignocaine with 1:80,000 adrenaline) and haemostasis was achieved. The patient was asked to report after five days for review.

Model analysis was done to assess the space, the available space was 7.2mm; considering the age and dental status of the child it was suggested for fixed functional lingual arch with respect to 75 and 85.

Appliance Fabrication:

In the first step, banding was done in permanent first molars followed by routine impression making and pouring of cast. In the same appointment, another impression was made without the bands. Fabrication of the wire component, finishing and polishing of the space maintainer was done.

The fabricated lingual arch was placed in the second cast. An acrylic tooth was used as a pontic. It was trimmed and customised to replace the missing tooth/teeth. Occlusion was examined with the opposing cast after stabilising the acrylic tooth with modelling wax.

In the final step, pontic was acrylised to the wire component of the space maintainer using cold cure acrylic material. Finishing and polishing was done for the appliance after removing it from the cast and then was checked in patient's mouth. After correcting any occlusal interferences, the appliance was cemented using Type I GIC. Patient was asked to report next day for immediate Post Op review.

Patient was recalled after one month for the first review and every three months for subsequent reviews. Parents were emphasised regarding the importance of recall visits as the eruption of permanent teeth will be masked by the acrylic component. Oral hygiene instructions were given to the patient and parent and the need for extra care was highlighted. Fluoride application was planned for subsequent visits.

Fig 1: Represents the Pre-OP of both Maxilla and Mandible

Fig 2: a, b, c, d represents the Post OP of both maxilla and mandible

Discussion

The untimely loss of primary teeth might result in muddled vertical and horizontal occlusal relationships in both primary and permanent dentitions.[4] Owing to this, it is essential to maintain the space created by primary teeth until the eruption of permanent successors.[5] Due to various factors, premature loss of primary teeth remains to be a prevailing problem which in turn results in disrupting the arch integrity and untowardly changing the alignment of permanent successors.

Immediate provision of a space maintainer is the safest way to eliminate or reduce some of these difficulties.[6]

Space maintainers can either be removable or fixed, functional or non functional and unilateral or bilateral. The selection of the appliance is tailored depending upon the need of the situation. Fixed space maintainers, if properly designed, are not harmful to the oral tissues, require less patient compliance than removable space maintainers, and are more suitable for longer periods of

space maintenance.[7] Band and loop space maintainer and lingual arch space maintainer are two of the most commonly used space maintainers owing to their vast application in different clinical scenarios, ease of fabrication, less chair side time and patient acceptance.[8] However, both these space maintainers lack in providing masticatory function and do not prevent supra-eruption. The present case report shows the incorporation of a pontic to replace missing teeth in the conventional appliances. The advantages of this appliance are prevention of supra-eruption of opposing teeth, aiding in masticatory function, prevention of abnormal tongue habits and less chances of wire distortion or slippage due to distribution of occlusal forces on the pontic.[1] The drawback associated with the use of this appliance is the need for extra care in maintenance of hygiene under the acrylic flange. Hence, patient selection plays a vital role in determining the success of the appliance and must be avoided in patients with very poor oral hygiene and those with low compliance. However, if it does happens, the appliance can be temporarily de-banded until the tissue heals.[9] Additionally, the eruption of permanent tooth cannot be visualized directly due the acrylic component. Therefore, long-term and frequent follow-ups using radiographs should be done. Removing the appliance periodically for clinically inspecting the tissue under the appliance and for sign of eruption of permanent successor should be undertaken.[1] The appliance can be re-cemented after the clinical inspection. Parents/ caregivers must be made aware regarding the drawbacks of the appliance and the importance of future review visits must be emphasized. The patient in the present paper was recalled after one and three months for follow up and patients did not report any tissue irritation or discomfort with the appliance while eating. The appliance did not cause food lodgement or interfere with oral hygiene maintenance of the patient. Fixed space maintainers are commonly used in unilateral and/or bilateral premature loss of primary teeth. However, these conventional fixed space maintainers do not aid in mastication and prevention of supra-eruption. Functional fixed space maintainers can be planned to aid in function, for patients who have to wear the appliance for longer periods and if the parents insist on replacement of missing teeth. Though frequent follow up is needed to monitor the erupting permanent successor, functional space maintainers can be appraised as good alternative to conventional space maintainers

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