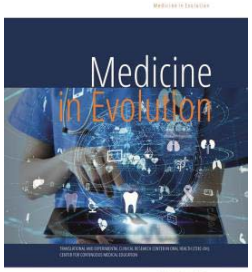
Therapeutic Management in Early Loss of Primary Anterior Teeth



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Abstract

The aim of this study was to present two different therapeutic options of space management in the anterior region.

Material and methods: The working protocol for the fabrication of a removable and a fixed space maintainer was described for a clinical case of a child who had prematurely lost all upper temporary incisors because of advanced cavities. A silicone key was used to position the teeth in the acrylic base.

Results and discussions: Restoring the integrity of the dental arches has a positive impact on the patient's psychological welfare. Compared to the removable space maintainer, the use of a fixed space maintainer eliminates the patient's compliance factor, even though both are well tolerated.

Conclusions: Since the loss of anterior teeth does not cause as much space deficit as in the posterior region, restoring the integrity of the dental arches is essential in preventing tongue interposition and the onset of other bad oral habits.

Keywords: early loss of anterior teeth, space maintainer, palatal plate, primary teeth

INTRODUCTION

In paediatric dentistry, early loss of temporary teeth is a very common problem and is usually caused by dental trauma, caries and hypodontia [1].

The loss of front teeth can have a negative impact on the children's quality of life, and the treatment is usually challenging. A developing child can suffer significant functional and emotional impairment caused by the missing teeth on the arch [2].

There is a wide range of treatment options when the upper incisors are missing and many clinicians opt for a Gropper appliance (a fixed aesthetic space maintainer), a fibre-reinforced pontic prosthesis, a removable partial denture designed specifically for children [3,4], or even dental implants and bridges in permanent teeth severe hypodontia cases [5]. For removable appliances, there is essentially one design with various modifications [6]. It is important that paediatric dentures are carefully planned and executed to accommodate the changing oral structures in growing children [1]. Dentures are often used to prevent psychological, speech or swallowing problems in preschool children with significant tooth loss [7].

Among the disadvantages of prosthodontic options are the increased resorption of the alveolar bone and periodontal problems of the remaining teeth [5].

When the oral rehabilitation in these children is achieved using space maintainers, these appliances replace one or more temporary teeth and their primary function is to maintain the space for the permanent successors. They can also restore the shape and the function of the dental arch to prevent future malocclusions [8,9].

The main advantage of a fixed appliance over a removable one is the elimination of the patient's compliance factor. The aesthetic component of the fixed appliance improves the patient's acceptance [10]. The removable space maintainers cover a large area of oral tissue, which sometimes leads to irritation and discomfort. However, removable space maintainers are cost-effective, and with proper patient and parent counselling and adequate motivation, removable space maintainers are a viable treatment option [11].

Aim and objectives

The aim of this article was to present a complete workflow and clinical application of a fixed and a removable space maintainer designed similar to an orthodontic plate with acrylic teeth to restore the integrity of the dental arches in a growing patient.

MATERIAL AND METHODS

We present the case of a patient with the loss of temporary teeth in the anterior region because of advanced cavities which led to pulpal complications. In the first phase, an alginate impression was taken using Hydrogum 5 (Zermack). Two dental casts were poured from class IV white hard plaster, one for the removable space maintainer and one for the fixed space maintainer.

For the removable space maintainer, a palatal plate was fabricated, with four Stahl clasps made of Ø 0.7 mm wire. A wax model was made on the dental cast. The base of the wax plate had to be precisely adapted to the dental cast and acrylic teeth replacing 5.2, 5.1, 6.1, 6.2 were mounted in the anterior region. An impression of the dental cast was taken with Zetalabor putty silicone in order to obtain a silicone key.

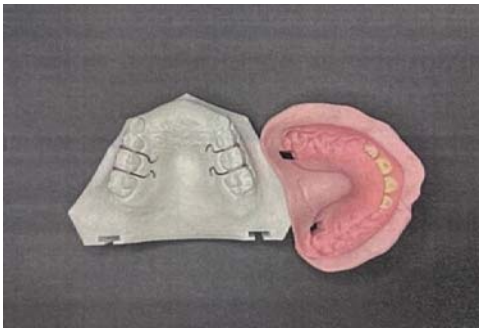

Figure 1. Positioning the anterior teeth in the silicone key

Figure 2. Fabricating the acrylic base

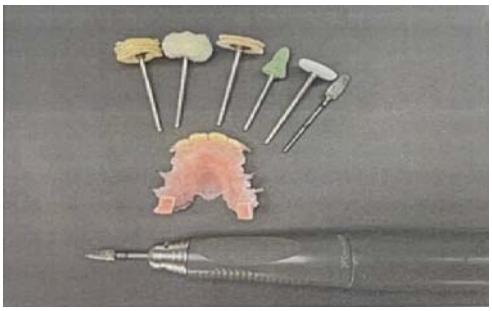

Figure 3. The tools used in the polishing phase

The thermobaropolymerization of the acrylic base was followed by the finishing and polishing phase using special burs, stones and polishing brushes (Figure 3).

The acrylic base was cut posteriorly to suppress the patient's gag reflex (Figure 4). The base can also be fitted with a median expansion screw when there is a space deficit in the upper arch or the transverse expansion of the maxilla is needed.

Figure 4. Upper removable space maintainer

To fabricate a fixed space maintainer, two orthodontic bands have to be cemented on the first permanent molars. The bands must fit properly on the teeth in order to provide good stability and retention for the appliance.

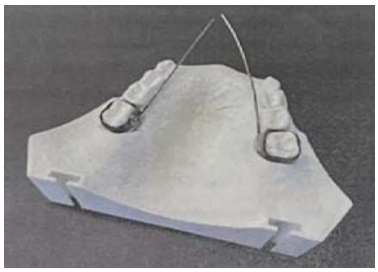

Figure 5. Welding the wire arms to the orthodontic bands

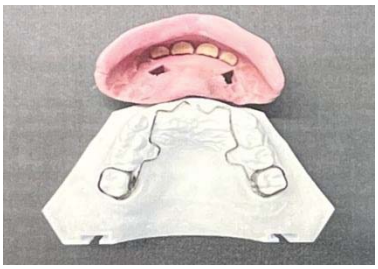

Figure 6. The silicone key

Two wire extensions were welded to the middle third of the palatal surface of the orthodontic bands (Figure 5). The wire extensions had to be adjusted at approximately 1 mm away from the marginal periodontium, following the contour of the palatal surface of the crowns of the temporary molars. Activation loops are placed on each side to compensate for the growth of the maxilla. The wire is bent in the anterior region to create mechanical retentions for the acrylic base segment, which will accommodate the aesthetic component (the acrylic teeth). The acrylic base segment, the silicone key (Figure 6) and the attachment of the acrylic teeth of the upper fixed space maintainer (Figure 7) were fabricated following the same steps as for the removable space maintainer.

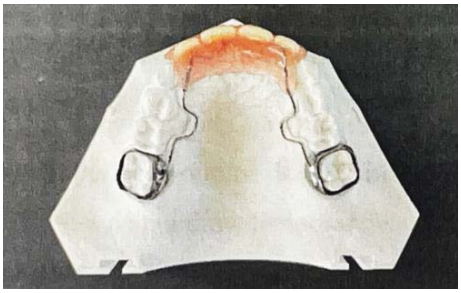

Figure 7. Upper fixed space maintainer

DISCUSSIONS

One of the main reasons for the premature loss of maxillary anterior teeth in school-aged children is dental trauma, which is a psychological burden for both the patient and the parents. The treatment option in this case is to use a space maintainer, which can be either fixed or removable, in order to preserve the space and to restore the aesthetic function [10].

In a study case, Da Silva et. al found that the application of space maintainers led to good results in both clinical cases in terms of phonetic, functional and aesthetic restoration; the visual improvement had a positive effect on the children's self-esteem, as shown by the visible change in behaviour in the social environment, shortly after the patients received the fixed appliances [12].

In adolescents, the loss or the absence of permanent front teeth at an early age has an important psychological impact. When a permanent tooth is lost, the teeth adjacent to the gap have a tendency to tip mesially or distally, causing a space deficit. The child's cooperation in wearing removable space maintainers and attending recall visits play an important role in regaining the space on the arch. Fixed appliances offer several advantages over removable ones, including less discomfort, lesser need for patient's compliance and more control over tooth movement in all three spatial directions. For these reasons, a short course of treatment with fixed appliances — such as the modified fixed 2 x 3 appliance — followed by a fixed functional space maintainer may be the best course of action [13].

Waggoner and Kupietzky state that parental desire is the primary motivator for applying cosmetic appliances in the anterior region. There is little evidence that a child's growth and development are significantly affected by the early loss of upper incisors, although space conditions, speech development, masticatory function and tongue habits may be somewhat influenced [14]. Options include fixed or removable appliances, both of which may or may not have a functional component [3, 10]. The child's stage of dental development, the missing teeth, the affected dental arch, the status of the teeth adjacent to the missing teeth, appliance maintenance and modifiability, the patient's compliance, among other considerations, all play a role in the selection of the appliance [10]. The goal of prosthetic therapy should always be to ensure optimal phonation, masticatory performance, aesthetics and occlusal stability. These elements give the child more self-confidence and contribute to their acceptance [15].

Domínguez and Aznar conducted a study using removable prostheses to promote proper development of the upper and lower jaw in two children who received removable acrylic dentures with a special S-shaped metal handle (loop) that guided the eruption of the first permanent molars [7]. These prostheses were modified as the children grew. By replacing missing teeth, several oral functions were restored, upper and lower jaw development was promoted, and each child was able to harmoniously develop socially and psychologically [7].

Along with constantly evolving technologies, digitally designed space maintainers also appeared. Guo et. al conducted a study in which he used a new version of the 3Shape software, so that the frames and artificial teeth were designed in the same design mode, thus achieving a complete integrated design [16]. According to the authors, there are few studies reporting the use of CAD/CAM for the design and fabrication of removable space maintainers in paediatric dentistry, this method being able to overcome the problems associated with traditional manufacturing – cost and lack of cooperation from children, as well as the size of intraoral scanners, as they are sometimes too large for use in the primary dentition [16].

Normally, dental implants as a tooth replacement option are limited to individuals who have completed their craniofacial growth and development. The placement of implants in children or teenagers is avoided as it could lead to various adverse effects, including possible damage to developing dental structures, difficulty in dental eruption of the adjacent teeth and limitations in multidimensional growth of the craniofacial skeleton [1].

Furthermore, the functional and aesthetic results of oral rehabilitation are only temporarily acceptable. However, in a small number of paediatric patients, congenitally suffering from severe syndromic hypodontia and oligodontia such as ectodermal dysplasia, conventional prosthetic rehabilitations are inadequate. Kramer, Baethge and Tschernitschek reported the case of a boy with ectodermal dysplasia who had extended oligodontia and was treated with implants in the anterior mandible at the age of 8 years; the implants were functionally loaded and resulted in high patient satisfaction. The authors recommend the early placement of dental implants in children with severe hypodontia [1].

According to the results of Nadelman et. al in a study on speech disorders, children who lost anterior teeth had a higher risk of speech distortion than children without tooth loss ($p=0.005$), but with a low certainty of evidence, because of the small sample size. They concluded that the consequences of space loss for the deciduous dental arch require further investigation [17].

In general, most studies show that children's self-confidence improved after treatment with removable orthodontic appliances or space maintainers that restored the morphofunctional and aesthetic integrity of the dental arches [2, 5, 10, 17].

CONCLUSIONS

Both fixed and removable space maintainers offer good oral rehabilitation for the growing patient. These appliances are well tolerated by patients and fulfil the current aesthetic criteria, having a positive effect on the patients' psychological status.

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