

Aesthetic Dentistry for Pediatric Patients

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Abstract: Children with missing teeth have problems with self-esteem that can be improved through aesthetic dentistry and the dentists need to replace these teeth with an aesthetic maintainer. The aims of the study was to compare between the effectiveness of using two different types aesthetic cemented dental appliance for replacing prematurely lost primary maxillary incisor of pediatric patients. Twenty children aged 2 – 4 years old, with prematurely loss of one of the maxillary incisors were involved in this study. The children randomly divided into two groups: in the first group replace the missing tooth using fixed space maintainer, while in the second group replace the missing tooth using fixed acrylic bridge. The results were showed that the fracture was occur in 2 cases of 10 in fixed space maintainer those need to repair and recemented again, meanwhile no fracture was occur in acrylic bridge. Fixed space maintainer with good retention showed in 9 of 10 cases. Meanwhile all the acrylic bridges showed good retention. Significant higher parental satisfactions were received in acrylic bridge group than space maintainer group. So, The fixed acrylic bridge seems to be more successful in replacing missing anterior teeth compared to fixed maintainer and more satisfied by parents.

Keywords: Children, Primary, Teeth, Space, Acrylic

1. Introduction

Christensen and Field in 1994 mentioned historical evidence states that "space maintainers are not required for the loss of upper anterior teeth with the maintaining primary canines" [1]. However, Kapur et al. in 2005, reported that aesthetic rehabilitation of the primary dentition had a psychological benefit on the child's self esteem[2].

Premature loss of teeth due to trauma or dental caries is a common occurrence in children. Aesthetic restoration of such teeth considers to be challenging to the pediatric dentist. In case of premature tooth loss in anterior incisal segment there will result in minimum space loss and a linguodistal inclination of the teeth that causing a collapse of the anterior lingually and shift of midline [3]. Also may lead to parafunctional habits as well as altered behaviour including depression with poor friend circle and non-acceptable daily life style [4]. Mahmoud (2009) identified the negative effects of anterior tooth loss on patient's quality of life and there will be reduced confidence level among patients not having anterior teeth [5].

The aim of this study was to compare between the effectiveness of using two different types aesthetic cemented dental appliance for replacing prematurely lost primary maxillary incisor of pediatric patients.

2. Material and Methods

Twenty healthy children aged 2 – 4 years old of both gender, with prematurely lost one of the maxillary incisors before no more than ten days were involved in this study. The children randomly divided into two groups: the first group designed to replace the missing tooth using fixed aesthetic space maintainer with stainless steel band cemented on maxillary primary second molar, while the second group designed to replace the missing tooth as well as restoring the adjacent carious incisor(s) using fixed aesthetic acrylic bridge.

Full detailed treatment plans were explained to the children's parents and written consents were obtained for including the

children in this study. Instructions on oral hygiene and appliance maintenance were given to the parents.

a. Construction of aesthetic space maintainer:

Preoperative occlusal analysis was performed. Orthodontic bands (0.005inches*0.180inches) (3M ESPSE, United States) were adapted on the maxillary primary second molar of the same side followed by elastomeric impression (ORMAMAX, Italy) to make the working cast. 0.9 mm gauge wire was designed in U form and soldered to the band palatally. Small pieces of wire were bent like a hook to form a mesh in the edentulous region after point soldering with the main palatal wire. The acrylic deciduous maxillary incisor (match the color shade of tooth) are then placed and adjusted between the hooks, the occlusion was checked and the teeth was acrylised with tooth coloured cold cure acrylic. After trimming, finishing and polishing, the appliance is cemented with luting glass ionomer cement (RIVA, SDI, England) and occlusion checked for any premature contact (Figure 1).

b. Constructions of fixed aesthetic acrylic bridge:

Preoperative occlusal analysis was performed, then after impression was taken for maxillary arch using elastomeric impression material (ORMAMAX, Italy), working cast was performed. The shade color of the teeth was determined. The working cast 3D scanned using Activity 710 3D scanner (smart optics Sensortechnik GmbH, Germany). The design of the bridge carried out using Exocad Program (smart optics Sensortechnik GmbH, Germany). Acrylic block PMAA (Poly-methyl methacrylate) performed to the acrylic bridge using CAD/CAM machine (charlydental, Z.I. Fonlabour, France). After trimming, finishing and polishing of the bridge, the abutment tooth was isolated and air drying, the acrylic bridge was cemented with luting glass ionomer cement (RIVA, SDI, England) and occlusion checked for any premature contact (Figure 2).

For both groups, the parents were advised to control their children to avoid chewing of hard food and to maintain proper oral hygiene. First recall of patient done after 24 hours followed by recall visits every 3months. The patient

was satisfied seeing the lost teeth back. The parent was informed that the appliance will be removed by a dentist at an age of approximately 6 years, to prevent interference of erupting permanent successors. The patient was also advised to return immediately in case there was any problem with the space maintainer, including distortion or breakage.

During follow up study, clinical examination include: fracture (0=no fracture, 1=small fracture, 2=bulk fracture), retention (1=good, 2=fair, 3=poor) and the condition of gingiva. A gingival score on a scale of 0 to 3 was determined: 0=no inflammation; 1=mild inflammation; 2=moderate inflammation; 3=marked inflammation[6].

Each child's parent was asked to provide feedback for evaluating their satisfaction with the restorations. Criteria used included: (1) appearance; (2) color match; (3) durability; (4) ability to eat and (5) feasibility of teeth brushing. Each of these criteria were scored using the following scale: 1=very dissatisfied; 2=dissatisfied; 3=neutral satisfied; 4=satisfied; 5=very satisfied [7].

The data included in this study obtained from 6 months follow up visit.

The data were summarized and described using relative frequencies and percentages for categorical variables. When the outcome variables were categorical, Chi-Square test was used to examine differences between frequencies and t- test was used to compare between means for statistical significance. Data were analyzed using SPSS software, version 16.0 (SPSS Inc., Chicago, IL, USA) for Windows. Statistical significance was set at $p \leq 0.05$.

3. Results

Table (1) demonstrated the clinical parameters recorded at six months follow up visit to give the child and the parent sufficient time adapted with the appliance and be more familiarized with it. Concerning the presence or not of any fracture with the two types appliances, in fixed space maintainer fracture was occur in 2 cases (20%) those need to repair and recemented again, meanwhile concerning acrylic bridge no fracture of any cases was recorded. The difference was reached significant level at $p \leq 0.05$.

Concerning retention of the two appliances, fixed space maintainer with good retention showed in 90% (N=9) of cases with 10% (N = 1) case showed poor retention that need recemented properly. Meanwhile all the acrylic bridges showed good retention. The differences not reach significant level between the two types.

The gingival health around the fixed space maintainer was optimal in 30% (N=3) of the cases and showed mild inflammation characterized by a slight reddening of the tissue in 20% (N=2) of the teeth. The remaining 50% (N=5) had bleeding spontaneously or on probing, meanwhile concerning gingival health around the acrylic bridge; the gingival health was optimal in 50% (N=5) and mild inflammation with 20% (N=2). Only 10% (N=1) of the cases showed bleeding spontaneously or on probing with very poor hygiene—as evidenced by heavy plaque

accumulation at the time of examination. Concerning comparison between the two types of appliances, the differences reach significant level among only fracture and gingival inflammation parameters at $p \leq 0.05$.

Table (2) showed the data from the parental satisfaction survey. When comparing between the parental satisfactions for appearance, color match, durability, ability to eat and feasibility of teeth brushing of two appliances, except color match that's give the same parental satisfaction in both group, significant ($p \leq 0.05$) higher parental satisfaction were received for appearance, durability, ability to eat and feasibility of teeth brushing in aesthetic acrylic bridge group than fixed space maintainer group.

4. Discussion

To the best of author' knowledge, this is the first known clinical study reporting the clinical longevity of using fixed acrylic bridge for replacing prematurely loss primary maxillary incisor in young children. Even this type of space maintainer and / or aesthetic restoration is fixed, but the important point it will not restricted the growth because it was cantilever type of bridge. This study has its limitation, which is the sample size. This is understandable due to the cost of treatment. Aesthetic dental treatment in Iraq is not subsidized by the Iraqi Health System. This makes the burden of the cost on the parents.

Concerning the presence or not of any fracture with the two types appliances. The significant higher percentage of space maintainer appliance fracture may be because the presence of multiple points of union between metal and acrylic in addition of presence of soldering area. Mean while, the acrylic bridge formed from only one type of material; Poly(methyl methacrylate, which is strong, tough, and lightweight material [8].

Concerning retention of the two appliances, both appliances types showed high retention that's related to the properties of Riva luting glass ionomer cement used in cementation and it chemically bonds to metal substrates and the tooth. It has high flexural strength enhances longevity of a glass ionomer luting cement by withstanding mastication forces. Riva Luting's high flexural strength increases its durability in the oral environment and long term ability to retain indirect restorations. Also, Riva Luting has low solubility in the oral environment. This increases the material's ability to resist disintegration and wear caused by oral acidity[9].

The gingival health around the fixed space maintainer showed significantly higher inflammation than around the acrylic bridge. That's because the space maintainer considered being more bulk appliance and leading to food debris and plaque accumulation. So, repeated instruction and information about good oral hygiene and diet control were given to the parents at each recall visits.

The means of parental satisfaction were significantly ($p \leq 0.05$) higher for appearance, durability, ability to eat and feasibility of teeth brushing in aesthetic acrylic bridge group than fixed space maintainer group, these related to the advantages of fixed aesthetic CAD/CAM acrylic bridge

which considered to be color stable with minimal bulkiness not cause food and plaque accumulation and easily to clean to maintain good oral hygiene and sufficient strength to withstand force of mastication in addition to the minimal chair-side dental work that reduce visits and time need the child set on dental chair.

5. Conclusion

Replacement of the missing incisors with fixed acrylic bridge appliance provides a reasonable treatment option for preschool children with prematurely loss primary incisor. In the present study, the simple technique in fabrication of the appliance allows it to be used in daily clinical practice with greater success both to the child and parent in establishing a positive attitude and satisfaction in relation to function and aesthetics in replacement of the missing anterior tooth. So, the pediatric dentists should always search and develop the easier the more effective way to restore any defect in child teeth.

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Figure 1: (A) Preoperative image demonstrate the edentulous area of prematurely loss maxillary left central incisor. (B) The fixed aesthetic space maintainer cemented with orthodontic band on maxillary left primary second molar. (C) and (D) postoperative final aesthetic replacement of lost tooth.

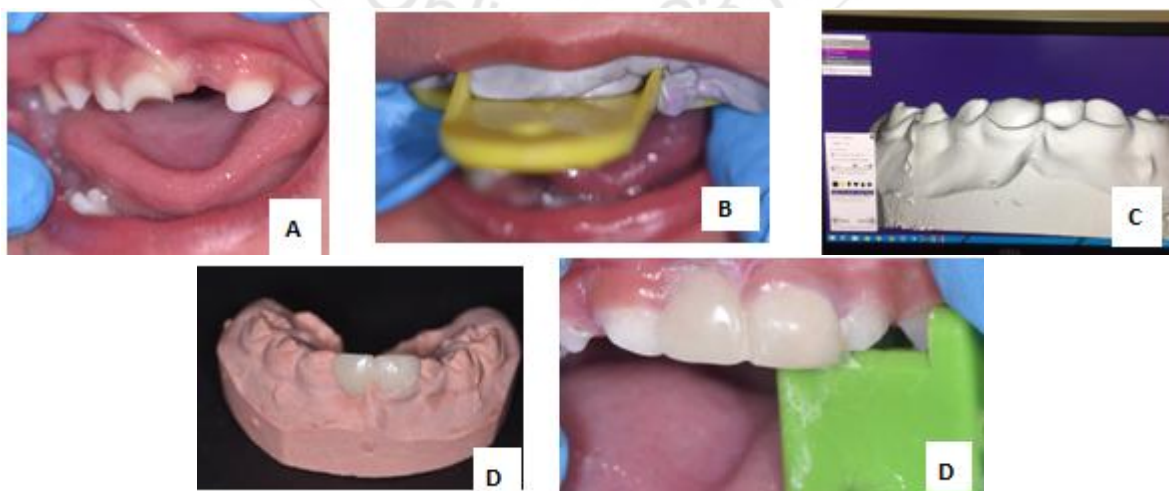


Figure 2: (A) Preoperative image demonstrate the edentulous area of prematurely loss maxillary right primary central incisor and carious maxillary left primary central incisor. (B) Impression taking for maxillary arch (C) Bridge designed by Exocad program, (D) the Final zirconium bridge in working cast. (E) cementation of aesthetic acrylic bridge.

Table 1: Demonstrated the differences between the fixed space maintainer and fixed acrylic bridge concerning clinical parameters.

Clinical Parameter	Fixed space maintainer No. (%)	Acrylic bridge No. (%)	Chi – square	P - value
Fracture	2 (20%)	0 (0%)	4.5	0.03*
Appliance retention	9 (90%)	10 (100%)	2.0	0.15
Gingival inflammation	7 (70%)	2 (20%)	3.6	0.05*

* Significant difference at $p \leq 0.05$.

Table 2: Demonstrated the differences between the fixed space maintainer and fixed acrylic bridge concerning parents' satisfaction.

Parameters	Space maintainer (Mean \pm SD)	Acrylic bridge (Mean \pm SD)	t - test	p- value
Appearance	2.7 \pm 0.1	4.8 \pm 0.1	3.08	0.00*
Color match	3.6 \pm 0.2	3.6 \pm 0.1	0.00	1.000
Durability	3.3 \pm 0.7	4.8 \pm 0.3	7.45	0.00*
Ability to eat	1.7 \pm 0.2	3.0 \pm 0.2	3.77	0.00*
Feasibility of teeth brushing	1.7 \pm 0.1	4.6 \pm 0.2	4.27	0.00*

* Significant difference at $p \leq 0.05$.

