

## Rehabilitation of Anterior Missing Teeth with a Fibre-Reinforced Adhesive Bridge in Paediatric Patients: Case Series

Ayşe Günay, DDS, PhD<sup>1</sup>, Sema Çelenk, DDS, PhD<sup>2</sup>, Abdullah Emre Karaali, DDS<sup>3</sup>, Buket Ayna\*, DDS, PhD<sup>4</sup>, Ezgi Eroğlu, DDS<sup>5</sup>

<sup>1</sup>Assistant, Department of Paediatric Dentistry, Faculty of Dentistry, University of Dicle, Diyarbakır, Turkey

<sup>2</sup>Professor, Department of Paediatric Dentistry, Faculty of Dentistry, University of Dicle, Diyarbakır, Turkey

<sup>3</sup>Hatay, Turkey

<sup>4</sup>Associate Professor, Department of Paediatric Dentistry, Faculty of Dentistry, University of Dicle, Diyarbakır, Turkey

<sup>5</sup>Assistant, Department of Paediatric Dentistry, Faculty of Dentistry, University of Dicle, Diyarbakır, Turkey

### Case Report

\*Corresponding author

Buket Ayna

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**Abstract:** In the early period, tooth loss may occur for congenital reasons or because of trauma or decay. Different treatment alternatives for aesthetic rehabilitation of tooth loss include removable partial prosthesis, fixed prosthesis, dental implant and partial prosthesis fixed with resin (Maryland bridge). As fibre-reinforced composites (FRC) are materials which do not include any metal, the mechanical and aesthetic properties are extremely good. Our aim in this study is to rehabilitate with FRC tooth loss in the paediatric patients who are still developing and growing. In this 5 case series of paediatric patients, it was provided to aesthetic and functional rehabilitation of anterior tooth loss with a fibre-reinforced adhesive bridge applied with a minimally invasive technique which did not require any extra sessions. And it was presented a 1-year-follow up. Fibre-reinforced adhesive bridge can be considered an inexpensive, conservative, aesthetic treatment alternative which can be applied in a single session for single or multiple missing teeth in the anterior region of young patients who have not yet completed skeletal and dentoalveolar growth and development.

**Keywords:** Fibre-reinforced composites, missing teeth.

### INTRODUCTION

In paediatric patients who are still developing and growing, the rehabilitation of missing teeth presents challenges to the clinician. In the early period, tooth loss may occur for congenital reasons or because of trauma or decay. Of these reasons, the most common cause of anterior tooth loss is trauma resulting in avulsion.

Different treatment alternatives for aesthetic rehabilitation of tooth loss include removable partial prosthesis, fixed prosthesis, dental implant and partial prosthesis fixed with resin (Maryland bridge) [1].

There are various difficulties for the clinician in the use of traditional methods for prosthetic compensation of tooth loss. These may be seen as the need to cut teeth on either side of the gap, the need for more than one treatment session, that the repairs do not have a long lifespan, dependence on the experience of the laboratory technician and the high costs. The preference of clinicians is for materials which can be applied in a single session with a direct method in the restoration of an area without teeth, thereby removing the majority of these difficulties [2].

The application of dental implants is not recommended for children who have not completed growth and development as there could be several

complications as the dental implant may behave like an ankylosing tooth and may not adapt to the continuing growth and development process [3,4].

Developments in adhesive technology and the development of polyethylene fibres which can be attached with new and stronger composite materials have rendered it possible to have a more aesthetic prosthesis which can be directly attached to the teeth next to the lost tooth with no need to cut the supporting teeth [5].

As fibre-reinforced composites (FRC) are materials which do not include any metal, the mechanical and aesthetic properties are extremely good. The material has a biocompatible, colourless, translucent structure, is resistant to wear and has low friction factors. It is available in lengths and various widths [6]. This material is used in periodontal splinting, orthodontic retention, the construction of

temporary bridges, to reinforce a fixed bridge, prosthetic repair, endodontic treatment and tooth strengthening procedures [7].

In this case series of paediatric patients, it was aimed to provide aesthetic and functional rehabilitation of anterior tooth loss with a fibre-reinforced adhesive bridge applied with a minimally invasive technique which did not require any extra sessions.

## **CASE REPORTS**

### **Case 1**

A 12-year old male patient presented at the Paediatric Dental Department of Dicle University Dental Faculty because of aesthetic deterioration caused by the avulsion of the left upper central tooth as a result of dental trauma one year previously (Figure 1). From the anamnesis it was determined that the patient had no systemic disorder and the trauma had occurred as a result of a fall when running. Taking the patient's age into account and that skeletal and dentoalveolar development was still ongoing, it was decided to create a fibre-reinforced adhesive bridge for aesthetic rehabilitation until the time that an implant or fixed prosthetic restoration could be applied. Therefore, it was firstly felt that there was a need to create a more practical form of the left upper central tooth with a strip crown. By modifying the strip crown with scissors, composite (Bisco, Aelite All Purpose, Schaumburg, USA) was added inside and polymerisation was achieved with an LED light device (Elipar FreeLight II, 3M Espe, USA). Then the form of the tooth obtained was modified to be compatible with the tooth gap and the contours of the neighbouring tooth. The aesthetic problem created by the difference between the neighbouring tooth and the gingival level was removed using pink kompommer. In this way a groove was opened to be able to place the polyethylene fibre material in the lingual middle third of the body of the prepared composite resin. The polyethylene fibre material (Ribbond; Ribbond, Seattle, WA, USA) was placed within the tooth made from composite resin. One end of the fibre material was extended to the coronal third of the left upper central tooth canal, to which canal treatment had previously been applied, and thus it was aimed to increase the strength by support from within the canal.

The lingual surfaces of the adjacent teeth were cauterised for 15 seconds with 37% phosphoric acid. Then the phosphoric acid was removed by washing with water for 15 seconds and the tooth was then air-dried. A self-etching adhesive system (Clearfil SE Bond, Kuraray, Kurashiki, Japan) was applied to the prepared area according to the manufacturer's instructions and polymerised for 10 secs with an LED light device (Elipar FreeLight II, 3M Espe, USA). The lengths of the end sections of the fibre material which was left exposed were cut with special scissors according to the lingual surfaces of the adjacent teeth. Before applying

the fibre to the tooth, it was wet with bonding material (Clearfil SE Bond, Kuraray, Kurashiki, Japan) and polymerised with an LED light device, and was then adapted to the adjacent teeth together with hybrid composite resin (Bisco, Aelite All Purpose, Schaumburg, USA) and polymerised with an LED light device for 40 secs. The composite surfaces were corrected with composite finishing burrs (Mani; Diaburs, Tokyo, Japan) and the polishing procedure was applied with composite polishing discs (Sof-Lex, 3M-ESPE, Germany) (Figure 2).

### **Case 2**

A 13-year old female patient presented with aesthetic complaints due to a missing right upper central tooth. The patient was systemically healthy and it was determined from the anamnesis that there was avulsion of the right upper central tooth as the result of a fall from a bicycle 3 years previously. In the intraoral examination, the gap was seen to have narrowed due to the length of time without a tooth. (Figure 3). As a result of consultation with the Orthodontics Department, it was decided to apply orthodontic treatment with widening of the toothless gap. After the orthodontic treatment, recovery of the aesthetic appearance was planned to be applied with a polyethylene fibre adhesive bridge until the time of implant or fixed prosthetic restoration. The right upper central tooth form was obtained with strip crown and restoration with polyethylene fibre was completed in the same order and the same manner as described in Case 1 (Figure 4).

### **Case 3**

A 12-year old female patient presented at the Orthodontics Department of Dicle University Dental Faculty with aesthetic complaints associated with the congenital absence of the lower left central and lateral teeth (Figure 5). During ongoing treatment for the correction of other existing orthodontic problems in the Orthodontics Department, it was decided to complete the appropriate restoration by opening the tooth gap. When the orthodontic treatment was completed, the patient was referred to our clinic for aesthetic restoration of a single tooth space in the lower left anterior region. Taking into consideration that dentoalveolar development was still ongoing in the patient, it was decided to apply a polyethylene fibre adhesive bridge, as in the previous cases. All the stages were applied as described in detail for Case 1 (Figure 6).

### **Case 4**

A 12-year old female patient presented at our clinic with aesthetic complaints caused by the absence of teeth in the right upper anterior region. The patient was systemically healthy and from the trauma anamnesis it was determined that the right upper lateral and canine teeth were avulsed as a result of a traffic accident 2 years previously. In the intraoral

examination, a non-complicated crown fracture was observed in the right upper central tooth (Figure 7). After all the evaluations, aesthetic rehabilitation was planned with a polyethylene fibre adhesive bridge and the stages of restoration were applied in the same order and same manner as described in Case 1. As the vitality test applied to the right upper central tooth had a positive result, the fractured part was restored by the application of composite resin only (Figure 8).

### Case 5

A 12-year old female presented with the complaints of a missing tooth and mis-shapen teeth. From the anamnesis it was determined that the patient had been diagnosed with ectodermal dysplasia and the absence of teeth was congenital. In the intraoral examination, the right and left upper lateral teeth were seen to be missing. The left upper lateral tooth space was observed to have narrowed due to the time which had elapsed. Microdontia was determined in the central and lateral teeth of the lower anterior region (Figure 9). Following intraoral and radiographic evaluations, it was planned to restore to the extent allowed by the gaps by applying a polyethylene fibre adhesive bridge to the right upper lateral tooth gap until the appropriate age for restoration, to provide smile aesthetics by making the left upper canine tooth similar to the lateral tooth and to apply composite resin restoration of the lower anterior teeth. The polyethylene fibre adhesive bridge was applied as described for Case 1. After completing the restorations of the other teeth with composite resin, finishing and polishing procedures were applied (Figure 10).



Fig-1: Initial image of Case 1



Fig-2: Final restoration of Case 1



Fig-3: Initial image of Case 2



Fig-4: Final restoration of Case 2.



Fig-5: Initial image of Case 3



Fig-6: Final restoration of Case 3



Fig-7: Initial image of Case 4



Fig-8: Final restoration of Case 4



**Fig-9: Initial image of Case 5**



**Fig-10: Final restoration of Case 5**

## DISCUSSION

In the treatment of anterior region tooth loss, there are alternative treatment options such as implants, removable prosthesis, traditional bridges and adhesive bridges made with associated minimally invasive preparation principles [8].

Developments in implant-supported restorations have provided a conservative solution to single tooth gaps. However, this treatment option may not always be able to be applied because of the high costs, the requirement for a surgical operation and that it may not be indicated for every case [9].

Experimental studies have reported that complete osseointegration of dental implants in patients who have not completed growth and development do not mimic normal tooth eruption movements and therefore, in patients with ongoing dentoalveolar development of the jaw, the application of an implant results in infraocclusion [10,11]. According to the results of these types of experimental studies, dental implants should not be applied to young patients until completion of the growth and development pattern. In the current series of patients, implants were not considered as dentoalveolar development was ongoing [3,12]. Therefore, implant treatment was not applied in these patients and to reduce these disadvantages to a minimum, it was decided to apply a fibre-reinforced adhesive bridge.

The main advantages of a fibre-reinforced adhesive bridge are that it can be completed in a single session, does not apply loading on the supporting teeth which would cause damage, it can be shaped to provide interdental space oral hygiene and repair does not require any complicated technique or material [2]. In addition to the low cost, there are other positive features including that there is no metal support causing colour change in the adjacent teeth, aesthetic results can be

obtained by using materials of the same colour as the teeth and if there is a future request for removal this demand can be met [13]. However, there are the disadvantages of limited load-bearing capacity and it requires very careful, detailed work [14, 15].

The most debated point of these types of restorations is the resistance of the adhesive bridge to chewing forces [16]. However, even if there is a fracture in a polyethylene fibre reinforced adhesive bridge, it does not become completely unusable. In addition, there is a possibility that the fractured part can be easily repaired [2]. From a 3-year clinical follow-up, Unlu *et al.* reported that fibre-reinforced adhesive bridges have an acceptable success rate [17]. Taking these advantages and the relatively more acceptable disadvantages into consideration, fibre-reinforced adhesive bridges were applied to the patients in this series.

Buyukhatipoglu *et al.* presented a case of the restoration of missing upper incisor teeth with treated fibre-reinforced composite. Throughout a 2-year follow-up period, no problems were reported in respect of aesthetics, function, phonetics or loss of placement and it was stated that the treatment could be easily accepted [18].

Zarow *et al.* reported that 2 cases restored with fiber-reinforced composites gave acceptable results in 2-year follow-up [19]. In the current patient series, at the end of a 1-year follow-up period, no fracture, breakage or colour change was observed in the fibre-reinforced adhesive bridge of any patient.

According to the results of 5-25 year follow-up periods, the success rate of metal structure adhesive bridges has been reported as 76%, while this rate is 93% in FRC restorations [20]. The restorations in the current cases were seen to function successfully in the mouth at the end of one year.

## CONCLUSION

At the follow-up examination at the end of 1 year, no fracture, breakage or colour change was observed in the fibre-reinforced adhesive bridge of any of the current patients. Fibre-reinforced adhesive bridge can be considered an inexpensive, conservative, aesthetic treatment alternative which can be applied in a single session for single or multiple missing teeth in the anterior region of young patients who have not yet completed skeletal and dentoalveolar growth and development.

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