

A Simplified Method for the Restoration of Severely Decayed Primary Incisors

Maryam Talebi¹, Iman Parisay²✉, Fatemeh Khorakian², Elham Nik³

¹Associate Professor, Department of Pediatric Dentistry, Dental Material Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

²Assistant Professor, Department of Pediatric Dentistry, Dental Material Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

³Assistant Professor, Department of Pediatric Dentistry, School of Dentistry, Bandar Abbas University of Medical Sciences, Bandar Abbas, Iran

Abstract

Objectives: Caries and dental trauma are common reasons for primary anterior teeth restorations in children. This non-controlled clinical trial was designed to evaluate crown restorations reinforced with a sectioned file post for the restoration of severely damaged primary maxillary incisors.

Materials and Methods: Thirty-eight primary maxillary incisors of 12 children (3-5 years old) with early childhood caries (ECC) received composite restorations with a custom-made post. The restorations were evaluated using the modified United States Public Health Service (USPHS) criteria. The percentage of acceptable restorations was reported.

Results: In this trial, the quality of marginal adaptation decreased after three and 12-month intervals. Recurrent carious lesions were observed during intervals. In terms of restoration retention, only one patient lost both the post and the restoration at the 12-month follow up.

Conclusion: The sectioned file post technique showed good retention and aesthetics for restoring severely damaged primary maxillary anterior teeth.

Keywords: Dental Caries; Tooth, Deciduous; Incisor; Dental Restoration
Journal of Dentistry, Tehran University of Medical Sciences, Tehran, Iran (2015; Vol. 12, No. 3)

✉ Corresponding author:

I. Parisay, Department of Pediatric Dentistry, Dental Material Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

Parisayi@mums.ac.ir

Received: 18 August 2014

Accepted: 25 December 2014

INTRODUCTION

Caries and dental trauma are common reasons for primary anterior teeth restorations in children [1]. Severely damaged incisors may lead to difficulty in speech, decreased masticatory efficiency, abnormal tongue habits, subsequent malocclusions and psychological and self-esteem problems [2].

In addition to problems for the patient, the restoration of severely decayed primary maxillary incisors poses a challenge for pedodontists. These teeth usually have short and narrow crowns; thus, only a small surface is available

for bonding and the enamel is inherently difficult to acid etch due to its aprismatic nature [3].

There are several methods mentioned in the literature for the restoration of severely decayed primary anterior teeth, such as direct and indirect techniques, use of metal posts [4,5], biological posts [6,7], composite resin posts and core restorations [8], reinforced composite and glass fiber posts [9-12] and custom-made orthodontic wire posts [13,14]. These methods have several advantages and disadvantages.

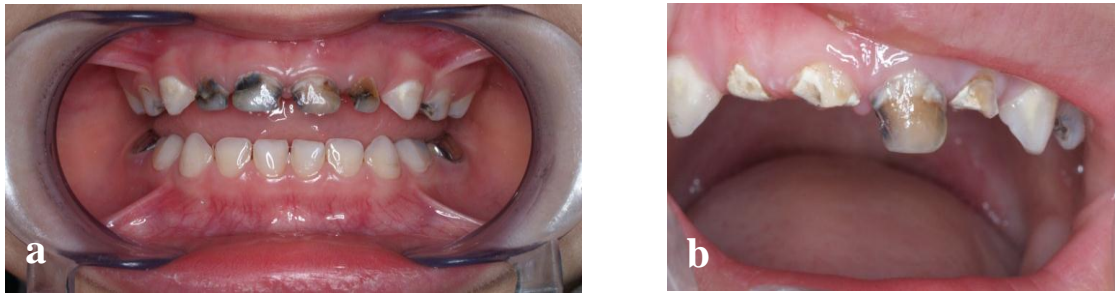


Fig. 1. (a) Carious maxillary anterior teeth. (b) Endodontically treated teeth temporarily restored with reinforced zinc oxide eugenol

For example, prefabricated posts and omega – shaped stainless steel orthodontic wires are simple, quick and cheap, but their adaptation is not always ideal. Polyethylene fiber and glass fiber-reinforced composite posts have optimal properties in terms of elasticity, translucency and adaptation. Biological posts are natural but they require creation of a tooth bank [5,9-12,15,16].

In the current study, we introduce a custom-made sectioned endodontic file post as the retentive part for the restoration of severely damaged primary anterior teeth because of its accessibility and simplicity of fabrication for dentists as well as its affordability. A 12-month clinical follow-up of this method was also conducted.

MATERIALS AND METHODS

For this non-controlled clinical trial, 12 healthy children (five boys and seven girls), who were referred to the Pediatric Dentistry Clinic of Mashhad University of Medical Sciences were selected. They were between 3-5 years old with no history of mental or medical disorders. Furthermore, the selection of teeth was based on the following criteria:

- 1-Primary maxillary anterior teeth with ECC or fracture due to trauma involving more than three-fourths of the crown
- 2-Sound root structure and no caries in the root dentin
- 3-No mobility
- 4-No trauma from the occlusion, as in cross bite, deep bite, etc.

5-No abnormal oral habits

6-Normal root formation with a sufficient amount of root structure present (at least two-thirds)

7-No subgingival caries

The ethics committee of Mashhad University of Medical Sciences approved the study protocol. Full detailed treatment plans were explained to the parents or guardians of each child and then a written consent was obtained. During the process, uncooperative children with poor oral hygiene were excluded from the research. Subsequently, periapical radiographs of the teeth to be treated were obtained. During the study, a total of 38 primary maxillary incisors of the selected 12 children received composite restorations with a custom-made intracanal post. The teeth were endodontically treated and then the canals were obturated with zinc oxide eugenol cement (ZOE, Golchay, Tehran, Iran). Afterwards, they were temporarily restored with reinforced ZOE cement (Zonalin, Kemdent, Wiltshire, UK) (Fig. 1). Due to extensive crown damage, it was necessary to use intracanal posts. Thus, at the second appointment, about 2 mm of the cement was removed from the coronal third of the canal. Next, a custom-made post was fabricated using a 4 mm K-file (K-file, Mani, Tokyo, Japan) (Fig. 2a); it was the largest file retained in the canal and was then sectioned and inserted into the canal in such a way that the incisal end of the sectioned K-file projected 2 mm above the cemento-enamel junction.

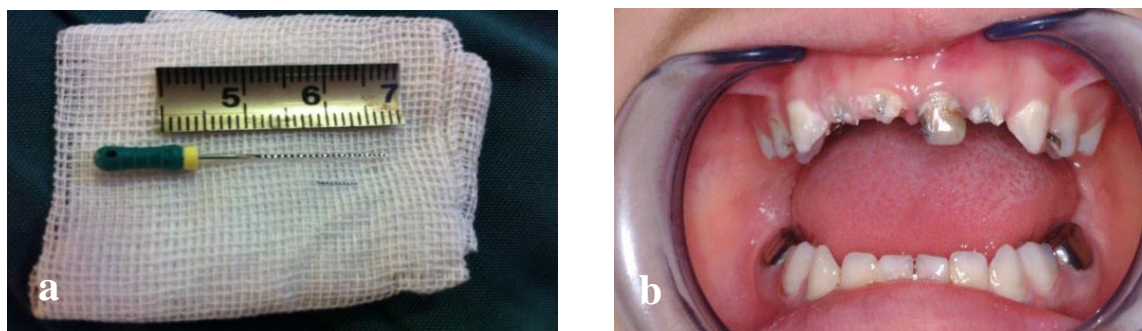


Fig. 2. (a) K-file custom-made post. (b) Teeth with cemented K-file post

This K-file post was selected because it provided optimal mechanical retention and support for the restorative material. Shade selection of the composite was done during the daylight hours. The root canal was conditioned with polyacrylic acid (Fuji, GC Corp., Tokyo, Japan) and then dried with air pressure. The sectioned file was cemented into the canal with a resin modified glass ionomer (Fuji II, GC Corp., Tokyo, Japan) and was subsequently covered with glass ionomer to mask its metallic shade (Fig. 2b). After the setting of the cement, a celluloid strip crown (3M ESPE, St. Paul, MN, USA) was adapted to the tooth and then the remaining coronal structure was etched with 35% phosphoric acid (Scotchbond etchant, 3M ESPE, St. Paul, MN, USA) for 20 seconds, and rinsed and dried for 30 seconds. Bonding agent (Single Bond Adper 2, 3M ESP3E, St. Paul, MN, USA) was applied and cured for 20 seconds with an LED light-curing unit (Blue phase, Ivoclar Vivadent, Schaan, Liechtenstein). The celluloid crown was perforated at the lingual aspect with a round diamond bur (Jota AG, Rüthi, Switzerland) to

discharge the excess composite.

Then, the crown was filled with the previously selected shade of nanofilled composite resin (Filtek Z350, 3M ESPE, St. Paul, MN, USA) and placed over the remaining tooth structure, and then the composite was cured with an LED light curing unit for 40 seconds from each aspect.

The excess composite at the lingual and gingival margins was removed with finishing and polishing burs (Jota AG, Rüthi, Switzerland). Occlusion was checked and after the removal of interferences, the final finishing and polishing of the restoration was performed with a polishing disc (Soflex, 3M ESPE, St. Paul, MN, USA) (Fig. 3).

The patients and their parents were instructed on proper oral hygiene and emphasis was placed on follow up. Clinical evaluation for several parameters was done at baseline and intervals of three and 12 months in accordance with the modified USPHS criteria (Table 1). In the modified USPHS criteria, the rating results of Alfa were acceptable, while the rating results of Bravo and Charlie were poor.

Table 1. Modified United States Public Health Service (USPHS) criteria

Category	Scores	Criteria
Retention	Alfa	No loss of restorative material
	Charlie	Any loss of restorative material
Secondary Caries	Alfa	No caries present
	Charlie	Caries present
Marginal Adaptation	Alfa	Closely adapted, no detectable margin
	Bravo	Detectable margin, clinically acceptable
	Charlie	Marginal crevice, clinical failure



Fig. 3. Final restoration

The percentages of acceptable marginal adaptation, restoration retention and recurrent caries at zero, three and 12 months and their 95% confidence intervals were reported using the SPSS version 11.5 software (Microsoft, IL, USA).

RESULTS

In this open label clinical trial, the quality of marginal adaptation decreased after three and 12-month intervals. At the three-month follow up, only four teeth had poor marginal adaptation that required correction; however, at the 12-month follow up, eight teeth had poor marginal adaptation. In terms of restoration retention, at the three-month follow up, 35 restored teeth remained intact and just two restored teeth were broken, but the posts remained in the canals. Just one patient lost both the post and the restoration.

At the 12-month follow up, only 30 teeth remained intact, six teeth had posts remaining, and two teeth had lost the posts and the restorations (Table 2).

Recurrent carious lesions were observed at three and 12 months. In one patient, recurrent carious lesions were observed around the margins of the restoration at the three-month follow-up. In eight teeth, at the 12-month follow up, recurrent carious lesions were observed around the margins of the restoration (Table 2).

DISCUSSION

Esthetic reconstruction of deciduous maxillary anterior teeth severely damaged by caries or trauma is challenging for pedodontics for several reasons such as loss of tooth structure, weak adhesion of the bonding agent to primary teeth and uncooperative children for whom these treatments are needed. However, retention of such restorations in endodontically treated teeth can be improved using an intracanal post [13] and different techniques and materials have been used to reinforce large root canals. Direct composite resin restorations reinforced with an orthodontic wire are simple and fast, but the wire adaptation into the canal is not sufficient [5,13,15].

Metallic posts are not expensive but an additional laboratory stage and high cost are the two major disadvantages of this method [3-5]. It also requires the usage of an opaque resin to mask the post, which may in turn compromise the final appearance of the restoration. Furthermore, the use of metal posts in primary teeth may pose additional problems during the course of natural exfoliation [17]. Another aesthetic option could be using biological posts made from extracted primary teeth [6,7].

Table 2. Evaluation of marginal adaptation, restoration retention and recurrent caries

Category	Modified USPHS criteria	0 month	3 months		12 months	
		N (%)	N (%)	%95 CI*	N (%)	%95 CI*
Marginal Adaptation	Acceptable	38 (100)	34 (89.5)	(79.7-99.2)	30 (79.0)	(65.9-91.8)
	Poor	0 (0)	4 (10.5)	-	8 (21.1)	-
Restoration Retention	Acceptable	38 (100)	37 (97.4)	(92.3-100)	36 (94.7)	(87.5-100)
	Poor	0 (0)	1 (2.6)	-	2 (5.3)	-
Recurrent Caries	Acceptable	38 (100)	37 (97.4)	(92.3-100)	30 (78.9)	(65.9-91.8)
	Poor	0 (0)	1 (2.6)	-	8 (21.1)	-

The disadvantages of this technique include the need for a tooth bank and parental and child donor consent as well as that of the recipients of such tooth fragments [6]. Moreover, this technique may not comply with today's cross-infection control policies [6]. The composite resin post method provides acceptable esthetic appearance, but the polymerization shrinkage of the composite may lead to retention loss of the post [7,18]. The use of prefabricated nonmetallic posts has become a preferred treatment modality [7,17,18]. The advantages of this technique are proper adaptation to the canal walls by the application of composite resin, adequate retention and stability [5,9-12]. In this study, we introduced a simple and cost-effective technique for restoring severely decayed maxillary anterior teeth. This method is affordable for patients, trouble-free for dentists and it does not require any laboratory work. Additionally, it can be done easily by sectioning a proper size endodontic K-file, which is available in any dental clinic. According to the results of this study, after 12 months of follow up, only two teeth lost post and restoration and in one case hard biting led to restoration fracture. Therefore, this method provides adequate retention for durable restoration of severely damaged primary incisors. In this study, the sectioned K-file was introduced 2 mm inside the canals until it reached the limit of the cervical third as described by Rifkin in 1983 [19]. A longer file length is not preferred because it may interfere with the eruption of the underlying permanent tooth during the final stages of resorption of the primary roots. In addition, in this technique we applied glass ionomer for masking the sectioned K-file in the core part of the post system and since there was enough composite resin around the core, no metal showed through the composite restoration and thus favorable esthetics was achieved. However, based on the results of this study and with regard to marginal adaptation, this variable worsened during the follow up intervals, prob-

ably due to the lack of enamel for bonding to the composite in severely damaged incisors.

Recurrent caries occurred in eight children with ECC, who had a high risk of dental caries. The absence of a proper preventive strategy could result in caries recurrence in this group. As oral hygiene and diet are critical factors in developing caries, one of the limitations of this study was that there was no control over the oral hygiene and diet of the children; thus, these factors could have influenced caries recurrence rates in our study. Another limitation was that no comparison was carried out between the type of teeth (central or lateral incisors), which may affect post retention because of differences in tooth morphology and tooth position in the dental arch; therefore, further investigational studies are recommended in this regard.

CONCLUSION

In this study, a strip crown restoration reinforced with a sectioned K-file intracanal post showed favorable retention and aesthetic results after 12 months of follow-up. Additionally, this method requires short chair time, which is ideal for pediatric patients and no laboratory work and is cost effective as well.

ACKNOWLEDGMENTS

We would like to acknowledge the financial support of the vice president of the Research Center of Mashhad University of Medical Sciences.

REFERENCES

- 1-Ripa LW. Nursing Caries: a comprehensive review. *Pediatr Dent.* 1988 Dec;10(4):268-82.
- 2- Ngan P, Fields H. Orthodontic diagnosis and treatment planning in the primary dentition. *ASDC J Dent Child.* 1995Jan-Feb;62(1):25-33.
- 3- Usha M, Deepak V, Venkat S, Garcia M. Treatment of severely mutilated incisors: a challenge to the pedodontist. *J Indian Soc Pedod Prev Dent.* 2007;25 Suppl:S34-6.

- 4- Rodrigues Filho LE, Bianchi J, Santos JF, Oliveira JA. Clinical evaluation of dental reinforcements by means of metallic posts with macroretentions. *J Dent Res.* 1996 May;75(5): 1056-330.
- 5- Eshghi A, Esfahan RK, Khoroushi MA. Simple method for reconstruction of severely damaged primary anterior teeth. *Dent Res J (Isfahan).* 2011 Oct;8(4):221-5.
- 6- Grewal N, Seth R. Comparative in vivo evaluation of restoring severely mutilated primary anterior teeth with biological post and crown preparation and reinforced composite restoration. *J Indian Soc Pedod Prev Dent.* 2008 Dec;26(4):141-8.
- 7- Ramires-Romito AC, Warderley MT, Oliveira MD, Imparuto JC, Correa MS. Biologic restoration of primary anterior teeth. *Quintessence Int.* 2000 Jun;31(6):405-11.
- 8- Mendes FM, De Bendetto MS, Dell Conte Zardetto CG, Wanderley MT, Correa MS. Resin composite restoration in primary anterior teeth using short post technique and strip crowns: A case report. *Quintessence Int.* 2004 Oct;35(9):689-92.
- 9- Memarpour M, Shafie F. Restoration of primary anterior teeth using intracanal polyethylene fibers and composite: an in vivo study. *J Adhes Dent.* 2013 Feb;15(1):85-91.
- 10- Metha D, Gulati A, Basappa N, Raju OS. Esthetic rehabilitation of severely decayed primary incisors using glass fiber reinforced composite: A case report. *J Dent Child (Chic).* 2012 Jan-Apr;79(1):22-5.
- 11- Jain M, Singla S, Bhushan B, Kumar S, Bhushan A. Esthetic rehabilitation of anterior primary teeth using polyethylene fiber with two different approaches. *J Indian Soc Pedod Prev Dent.* 2011 Oct-Dec;29(4):327-32.
- 12- Verma L, Passi S. Glass fibre-reinforced composite post and core used in decayed primary anterior teeth: a case report. *Case Rep Dent.* 2011;2011: 864254.
- 13- Morteda A, King NM. A simplified technique for the restoration of severely mutilated primary anterior teeth. *J Clin Pediatr Dent.* 2004 Spring;28(3):187-92.
- 14- Aminabadi NA, Farahani RM. The efficacy of a modified omega wire extension for the treatment of severely damaged primary anterior teeth. *J Clin Pediatr Dent.* 2009 Summer;33(4): 283-8.
- 15- Bayrak S, Tunc ES, Tuloglu N. Polyethylene fiber-reinforced composite resin used as a short post in severely decayed primary anterior teeth: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009 May; 107(5):e60-4.
- 16- Rallan M, Rallan NS, Navit P, Malhotra G. Modified intracanal post for severely mutilated primary anterior teeth. *BMJ Case Rep.* 2013 Apr 18;2013.
- 17- Motisuki C, Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. *Int J Paediatr Dent.* 2005 Jul;15(4): 282-6.
- 18- Ram D, Fuks AB. Clinical performance of resin-bonded composite strip crowns in primary incisors: a retrospective study. *Int J Paediatr Dent.* 2006 Jan;16(1):49-54.
- 19- Rifkin AJ. Composite post crowns in anterior primary teeth. *J Dent Assoc S Afr.* 1983 Apr;38(4):225-7.