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## Polyethylene fiber–reinforced composite resin used as a short post in severely decayed primary anterior teeth: A case report

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The case report presented here is of a 4-year-old girl with severely decayed maxillary anterior teeth. After root canal treatment, the primary maxillary central and lateral incisors were reinforced using polyethylene fiber–reinforced composite resin short posts and restored using celluloid strip crowns. The technique described here offers a simple and effective method for restoring severely decayed primary anterior teeth that reestablishes function, shape, and esthetics. (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;107:e60-e64)

Despite the fact that it is largely preventable, dental caries is the most common chronic disease of childhood.<sup>1</sup> Caries in very young children, known as early childhood caries, may be defined as at least 1 carious lesion affecting a maxillary anterior tooth in a pre-school-age child.<sup>2</sup> Until very recently, the only treatment option for early childhood caries was extraction of the affected primary anterior tooth, which resulted in severe coronal destruction.<sup>3</sup>

The early loss of primary anterior teeth may result in reduced masticatory efficiency, loss of vertical dimension, development of parafunctional habits (tongue thrusting, speech problems), esthetic-functional problems such as malocclusion and space loss, and psychologic problems that can interfere in the personality and behavioral development of the child.<sup>4,5</sup> The availability of an easy-to-perform technique capable of providing efficient, durable, and functional restorations would enhance the management of patients presenting with decayed maxillary primary anterior teeth.<sup>5</sup> Restorative treatment options mentioned in the literature include direct and indirect techniques using prefabricated crowns, as well as biologic and resin composite restorations.<sup>6-8</sup> In cases where teeth are severely decayed, endodontic treatment and placement of intracanal posts or retainers become necessary before crown restoration.<sup>9</sup> Posts may be constructed of a variety of materi-

als, including resin composite, metal, and biologic material.<sup>5,9-12</sup>

In recent years, various types of fiber reinforcement have come into widespread use as an alternative to cast or prefabricated metal posts in the restoration of endodontically treated teeth.<sup>13</sup> The advantages of using reinforced fiber to construct an intracanal post include resin composite crown reinforcement, translucency, and relative ease of manipulation.<sup>14</sup>

The present report describes the case of a 4-year-old girl with severely decayed maxillary anterior teeth that were restored using polyethylene fiber–reinforced composite resin short posts.

### CASE REPORT

A 4-year-old girl was referred to our pediatric dental clinic for the management of severely decayed primary maxillary anterior teeth (Fig. 1).

The child's medical history was noncontributory. Clinical and radiographic examinations were conducted to establish a treatment plan (Figs. 1 and 2). The decision to restore the teeth using composite resin crowns with fiber-reinforced posts was based on the extensive damage that had occurred to the tooth structure. The treatment plan was explained to the child's parents, and their written consent was obtained before treatment.

Treatment was implemented in 2 phases, with root canal treatment performed in phase 1 and the construction of the restoration in phase 2. Owing to the patient's age, separate sessions were required for each restoration.

The patient was anesthetized (Ultracain D-S, Istanbul, Turkey), and the working length of the canal was determined using a no. 15 K-file. Canals were prepared up to a no. 30 K-file using a step-back technique, irrigated with 2.5% sodium hypochlorite and dried with paper points. The coronal two-thirds of the canals were obturated with a calcium hydroxide-iodoform paste (Metapex; Meta Biomed Co., Cheongju City, Korea), and a thin layer of resin-modified glass-ionomer

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Fig 1. Initial intraoral appearance of severely decayed primary anterior teeth.



Fig 2. Initial radiographic appearance of severely decayed primary anterior teeth.

cement sealer (Fuji IX; GC Corporation, Japan) was placed inside the canals to isolate the filling material.

Intracanal short posts were constructed using 10-mm lengths of 2-mm-wide Ribbond (Ribbond, Seattle, WA). Root canal walls and remaining dentin surfaces were etched with 37% phosphoric acid (Etch-37 with BAC; Bisco, Schaumburg, IL, USA) for 15 s, washed for 30 s, and then gently air dried. Excess water was removed, and an adhesive system (Ed Primer II A&B; Kuraray Medical, Tokyo, Japan) was applied to the canal in 2 consecutive coats using a microbrush and then gently air-dried to evaporate the solvent. The Ribbond was wetted with Single Bond adhesive (3M/ESPE, St. Paul, MN) and protected from exposure to light until ready for use. A dual-curing resin cement (Panavia; Kuraray Medical) was used to lute the Ribbond post. To increase the amount of reinforcing material and reduce the amount of cement, the prepared length of Ribbond reinforcing fiber was folded and inserted into the canal, with the protruding ends of the Ribbond folded back into the canal to fill it with the greatest volume of tape possible. The Ribbond was adjusted



Fig 3. Polyethylene fiber after condensation inside the primary left lateral incisor canal.

such that it extended 2 mm outside of the canal and was cured for 20 s using an LED curing unit (Elipar Free Light II; 3M/ESPE) (Fig. 3). The post was covered with flowable composite (Aelite Flo; Bisco), and the coronal restoration was completed using resin composite (Grandio; Voco, Cuxhaven, Germany) and celluloid strip crowns (Strip Crown Form-Pedo; 3M/ESPE). Excess composite was removed through small holes punched in the palatal surfaces of the strip crowns, which had been preselected based on tooth mesial-distal width measurements. After polymerization of the buccal and palatal surfaces, the celluloid crown form was removed by inserting the sharp tip of an explorer between the crown form and the polymerized resin composite at the gingival margin. The occlusion was checked, and the final finishing and polishing was performed using diamond burs (Accurata; G+K Mahnhardt Dental, Thurmansbang, Germany) and Sof Lex Pop On discs (3M/ESPE) (Figs. 4 and 5).

After the restoration was completed, the patient and her parents were once again instructed on proper dietary and oral hygiene habits as well as the importance of periodic dental visits for the preservation of the primary dentition.

**DISCUSSION**

The principal objective of pediatric operative dentistry is the restoration of damaged teeth to healthy function. To this end, endodontic techniques facilitate the maintenance of pulpally compromised primary teeth, reducing the potential for the unwanted sequela of their unplanned extraction.<sup>15</sup>

Optimal dental treatment planning requires accurate assessment of the outcome of any required endodontic treatment.<sup>16</sup> In the case of pulpally involved primary teeth, the possibilities of root fracture and apical periodontitis and the effects on the permanent successors after root canal treatment should be taken into account before treatment. Indeed, complications such as root



Fig 4. Final appearance after the reconstruction of severely decayed primary anterior teeth.



Fig 5. Final radiograph showing endodontic treatment, Ribbond short posts, and restored primary anterior teeth.

fractures after restorative procedures are often mentioned as strong negative factors against efforts to restore and preserve endodontically treated teeth<sup>17</sup>; however, root fractures may have more to do with substandard restorations and poor material choices than with the endodontic procedure per se.<sup>17</sup> Numerous cross-sectional studies have tried to identify risk factors for apical periodontitis, another possible outcome of endodontic treatment. Both the presence and the quality of root fillings and the quality of coronal restorations

have been associated with the development of apical periodontitis.<sup>18-20</sup> However, there is no general agreement regarding the relationship between root canal posts and apical periodontitis. Tronstad et al.,<sup>19</sup> Hommez et al.,<sup>21</sup> and Genc et al.<sup>22</sup> found no association between the presence of root canal posts and apical periodontitis. The presence of preoperative root canal infection (apical periodontitis) was recently defined as a key confounding factor in endodontic treatment outcome.<sup>23</sup> Minor concerns about the effects of primary endodontic therapy on permanent successors often lead to unnecessary tooth extraction and replacement space maintainers, although there is little evidence regarding the negative effects of root canal treatment of a primary tooth on the permanent successor.<sup>24</sup> Permanent tooth defects after endodontic treatment of a primary predecessor may be attributed to the status of the pulp before endodontic treatment.<sup>25</sup> Taking into account these factors, in the present case, in which no preoperative root canal infection was observed, a positive outcome may be expected, with good healing and function of a severely damaged primary anterior teeth restored using polyethylene fiber-reinforced resin short posts and no damage to their permanent successors.

The use of intracanal posts and cores enables more extensive reconstruction of destroyed anterior primary teeth to solve functional and esthetic problems without interfering with root resorption<sup>26</sup> and to improve the retention of definitive restoration following endodontic treatment.<sup>10</sup> There are various materials available for this objective: prefabricated posts, metal posts, orthodontic wire posts, biologic posts, composite posts, and fiber-reinforced posts.<sup>3,5,12,27,28</sup>

Prefabricated posts are fast, cheap, and easy to use,<sup>29</sup> but they do not take into account the individual shape of the root canal, and their adaptation is not always ideal.<sup>30</sup> Although metal posts with macro retention are indicated for the reinforcement of primary teeth that present with wide canals and little remaining dentin,<sup>3</sup> because of their color metal posts do not meet the esthetic demands of direct resin composite restorations.<sup>5,27</sup> Moreover, the use of metal posts in primary teeth may pose problems during the course of natural exfoliation.<sup>5</sup>

The use of omega-shaped stainless steel orthodontic wire as an intracanal post is also a simple, quick, and effective technique for restoring primary anterior teeth.<sup>28</sup> However, the wire is unable to adequately adapt to the canal form, because it is not an exact copy of the canal. This may lead to radicular fracture as a result of excessive masticatory forces.<sup>3</sup>

Biologic posts are made from natural elements, but they require the creation of a tooth bank.<sup>3</sup> The need for a tooth bank and for parental and child agreement by



both donors and recipients of tooth fragments represent distinct disadvantages to the use of biologic posts,<sup>12</sup> and the technique may not comply with the stringent cross-infection control policies required in the 21st century.<sup>5</sup>

Composite resin posts provide satisfactory esthetics; however, there is a risk of a loss of retention owing to polymerization contraction.<sup>9,11,31</sup>

Reinforced polyethylene fiber is a recently developed material reported to have clinical advantages over traditional post core material.<sup>5,13,14</sup> Compared with metal posts, the elasticity of reinforced polyethylene fiber is closer to that of dentin.<sup>14</sup> The use of reinforced fiber, such as Ribbond, as an intracanal post offers a solution that is both esthetic and simple,<sup>3,26</sup> because restorations can be completed in only 1 session, without a laboratory phase.<sup>3</sup> Considering these advantages, Ribbond was chosen as the post material in the case reported here.

In constructing the short posts, Ribbond was placed to fill only the cervical one-third of the canals. Regardless of the type of post used, endodontically treated primary teeth should only be filled to approximately one-third of the root length to avoid interfering with the process of permanent tooth eruption.<sup>3,5</sup>

Resin-bonded composite strip crowns are the first choice of many clinicians for the restoration of primary incisors, mainly because of the superior esthetics and the ease of repair should the crown subsequently chip or fracture.<sup>31</sup> Polyethylene fibers have been shown to adapt well to composite, facilitating crown reconstruction.<sup>3</sup> In the case presented here, the crown was restored using composite resin and a celluloid strip.

## CONCLUSION

As seen in the case reported here, the use of polyethylene fiber-reinforced composite resin as a short post offers an alternative to conventional treatment for the reconstruction of severely decayed primary anterior teeth. However, long-term clinical studies are needed to evaluate the effects of the prolonged use of Ribbond in pediatric dentistry.

## REFERENCES

- Mouradian WE. The face of a child: children's oral health and dental education. *J Dent Educ* 2001;65:821-31.
- Milnes AR. Description and epidemiology of nursing caries. *J Public Health Dent* 1996;56:38-50.
- Viera CL, Ribeiro CC. Polyethylene fiber tape used as a post and core in decayed primary anterior teeth: a treatment option. *J Clin Pediatr Dent* 2001;26:1-4.
- Ngan P, Fields H. Orthodontic diagnosis and treatment planning in the primary dentition. *ASDC J Dent Child* 1995;62:25-33.
- Motisuki C, Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. *Int J Paediatr Dent* 2005;15:282-6.
- Croll TP. Bonded composite resin crowns for primary incisors: technique update. *Quintessence Int* 1990;21:153-7.
- Aron VO. Porcelain veneers for primary incisors: a case report. *Quintessence Int* 1995;26:455-7.
- Busato AL, Loguercio AD, Barbosa AN, Sanseverino Mdo C, Macedo RP, Baldissera RA. Biological restorations using tooth fragments. *Am J Dent* 1998;11:46-9.
- Mendes FM, De Benedetto MS, del 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;35:689-92.
- Grosso FC. Primary anterior strip crowns: a new technique for severely decayed anterior primary teeth. *J Pedod* 1987;11:375-84.
- Judd PL, Kenny DJ, Johnston DH, Yacobi R. Composite resin short-post technique for primary anterior teeth. *J Am Dent Assoc* 1990;120:553-5.
- Ramires-Romito AC, Wanderley MT, Oliveira MD, Imparato JC, Corrêa MS. Biologic restoration of primary anterior teeth. *Quintessence Int* 2000;31:405-11.
- Qualtrough AJ, Mannocci F. Tooth-colored post systems: a review. *Oper Dent* 2003;28:86-91.
- Rocha Rde O, das Neves LT, Marotti NR, Wanderley MT, Corrêa MS. Intracanal reinforcement fiber in paediatric dentistry: a case report. *Quintessence Int* 2004;35:263-8.
- Hunter ML, Hunter B. Vital pulpotomy in the primary dentition: attitudes and practices of specialists in paediatric dentistry practising in the United Kingdom. *Int J Paediatr Dent* 2003;13:246-50.
- Chugal NM, Clive JM, Spångberg LS. A prognostic model for assessment of the outcome of endodontic treatment: effect of biologic and diagnostic variables. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2001;91:342-52.
- Spångberg LS. Is endodontic treatment passé? *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;106:465-6.
- Odesjö B, Helldén L, Salonen L, Langeland K. Prevalence of previous endodontic treatment, technical standard and occurrence of periapical lesions in a randomly selected adult, general population. *Endod Dent Traumatol* 1990;6:265-72.
- Tronstad L, Asbjørnsen K, Døving L, Pedersen I, Eriksen HM. Influence of coronal restorations on the periapical health of endodontically treated teeth. *Endod Dent Traumatol* 2000;16:218-21.
- Kirkevang LL, Ørstavik D, Hörsted-Bindslev P, Wenzel A. Periapical status and quality of root fillings and coronal restorations in a Danish population. *Int Endod J* 2000;33:509-15.
- Hommez GM, Coppens CR, De Moor RJ. Periapical health related to the quality of coronal restorations and root fillings. *Int Endod J* 2002;35:680-9.
- Genc Y, Gulsahi K, Gulsahi A, Yavuz Y, Cetinyurek A, Ungor M and et al. Assessment of possible risk indicators for apical periodontitis in root-filled teeth in an adult Turkish population. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;106:e72-7.
- Chugal NM, Clive JM, Spångberg LS. Endodontic treatment outcome: effect of the permanent restoration. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007;104:576-82.
- Goering AC, Camp JH. Root canal treatment in primary teeth: a review. *Pediatr Dent* 1983;5:33-7.
- Camp JH, Barrett EJ, Pulver F. Pediatric endodontics: endodontic treatment for the primary and permanent dentition. In: Cohen S, Burns RC, editors. *Pathways of the pulp*. St. Louis: Mosby.; 2002. p. 797-844.
- Ferreira MC, Kummer TR, Vieira RS, Calvo MC. Short resin-

- posts bonding to primary dentin. Microleakage and micromorphological in vitro study. *J Clin Pediatr Dent* 2007;31:202-6.
27. Grandini S, Goracci C, Tay FR, Grandini R, Ferrari M. Clinical evaluation of the use of fiber posts and direct resin restorations for endodontically treated teeth. *Int J Prosthodont* 2005;18:399-404.
28. Mortada A, King NM. A simplified technique for the restoration of severely mutilated primary anterior teeth. *J Clin Pediatr Dent* 2004;28:187-92.
29. Kern SB, von Fraunhofer JA, Mueninghoff LA. An in vitro comparison of two dowel and core techniques for endodontically treated molars. *J Prosthet Dent* 1984;51:509-14.
30. Chan FW, Harcourt JK, Brockhurst PJ. The effect of post adaptation in the root canal on retention of posts cemented with various cements. *Aust Dent J* 1993;38:39-45.
31. Ram D, Fuks AB. Clinical performance of resin-bonded composite strip crowns in primary incisors: a retrospective study. *Int J Paediatr Dent* 2006;16:49-54.

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