International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Rehabilitation of a Severely Mutilated Premolar by Crown Lengthening using Glass Fibre post: A Case Report

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Abstract: ***Dental caries is a significant public health issue, affecting approximately 3.6 billion people worldwide, especially in developing countries. This chronic condition can lead to severe tooth damage, complicating restorative efforts. A case report describes the restoration of a mutilated maxillary premolar in a 13-year-old boy using a glass fibre reinforced post and crown lengthening technique. The treatment involved endodontic therapy to remove carious tissue, followed by the insertion of a glass fibre post for enhanced retention and crown lengthening to provide adequate support. Glass fibre posts offer advantages such as better stress distribution and resistance to corrosion compared to metal options. This approach represents a promising alternative in pediatric dentistry for restoring severely damaged teeth.***

Keywords: glass fibre post, crown lengthening, rehabilitation, pediatric dentistry

1. Introduction

Dental caries remains a significant public health concern in many developing nations despite the long-term implementation of numerous preventive programs and measures. Globally, approximately 3.6 billion individuals (48% of the population) have dental caries affecting their permanent teeth.[1] Dental caries is a chronic infectious condition that can affect individuals of all ages, including infants, children, adults, and the elderly.

A mutilated tooth is characterized by significant structural compromise, where the remaining tooth structure is less than the volume of tooth loss, often due to factors like long-standing caries, trauma, or excessive cavity preparation. This condition complicates the retention of prosthetic restorations following endodontic therapy, as the loss of structural integrity leads to increased susceptibility to biomechanical failure compared to vital teeth. When a substantial amount of coronal structure is missing, a post and core restoration is indicated to provide adequate retention for the core restoration.

Various types of root canal posts are utilized in pediatric dentistry, including orthodontic thread-shaped posts for stability, metallic posts with macro retention for strong anchorage, composite posts for aesthetic bonding, biological posts made from natural materials, and fiberglass posts known for their favourable mechanical properties and aesthetics, all aimed at effectively supporting the restoration of mutilated teeth[9].

In these glass fibre posts have been specifically designed for the repair of severely decayed teeth. These posts consist of unidirectional glass fibres embedded in a resin matrix, which enhances the strength of the dowels without compromising their modulus of elasticity. One significant advantage of glass fibre posts is their ability to distribute stresses over a broad surface area, thereby increasing the load threshold.[9] A glass fibre reinforced post offers enhanced light transmission through the root and surrounding gingival tissues, providing significant aesthetic benefits. Additionally, these fibre-reinforced posts mitigate the corrosive reactions that can occur with prefabricated metal alloy posts.[10]

Crown lengthening can be effectively combined with the use of glass fibre posts for the treatment of badly mutilated teeth. This approach is particularly beneficial for teeth that have undergone endodontic treatment and require additional support for restoration. This surgical technique enhances the retention of restorations, such as crowns and posts, by providing a stable tooth structure, while also addressing aesthetic concerns like short or uneven teeth.

This case report details a step-by-step procedure for restoring severely mutilated permanent maxillary premolar using a glass fibre reinforced intracanal post.

2. Case Presentation

A 13-year-old male patient presented to the Department of Pediatric and Preventive dentistry, KVG Dental College and Hospital, Sullia with the chief complaint of decayed tooth in upper front teeth region. (Fig.1 and Fig.2) Patient's medical history was non-contributory. On intraoral examination, permanent dentition was present with an extensive coronal loss irt 24.

Figure 1: Preoperative

Figure 2: Preoperative

An intraoral periapical radiograph irt 24 showed widening of PDL space with absence of any periapical pathosis. (Fig.3)

Figure 3: Diagnostic IOPA irt 24

As tooth 24 was severely damaged and required additional reinforcement to support an aesthetic crown prosthesis, it was decided to employ a glass fibre reinforced post with a composite core. This approach would provide a strong foundation for the subsequent fabrication and cementation of a porcelain fused metal crown.[11,12]

The treatment plan was explained to the child's parents along with, its advantage and drawbacks, other treatment option and consequence if treatment was not carried out.

Based on clinical and radiological findings the treatment plan was divided into the following steps:

Endodontic phase

Gross carious lesions were removed with a no.330 round carbide steel bur. Unsupported enamel was not removed so as to preserve as possible.[13] The pulp chamber was opened and working length determination done by taking a IOPA with a no.10 K file. The pulp tissue was extirpated using no.10 – no.35 K files. After irrigation with copious amount of 2.5% NaOCl and normal saline, the root canal was dried using paper points. A thick mix of Endoflas paste was then condensed with lentulospiral into the canal. The obturated material was then allowed to set for 10 minutes.

Creating space for post

After obturation of premolar, to a suitable depth, a 4mm length of coronal portion of the root filling was removed (2-3mm below the CEJ) using a thin straight fissure bur. All visible Endoflas cement on the walls of the post space was removed.

Post insertion

For each canal a post of corresponding size is trial fit for proper fitting and proper length. The post was placed to a distance of 3mm into the canal and the length was adjusted, such that it extends 2mm outside the canal. Any excessive length of the post was cut with a diamond bur under water coolant.

Then the prepared cavity was acid etched for 15 seconds with a 37% phosphoric acid gel, rinsed, dried and 2 coats of dentin adhesive single bond (3M) was applied according to the manufacturer's instructions.

The tip of flowable composite tube was placed 2-3mm below the CEJ and the composite was injected. The glass fibre post was then inserted into the canal with cotton pliers. It was then light cured according to the manufacturer's instructions. (Fig 4,5,6)

Figure 4: Post insertion irt 24

Figure 5: Post insertion irt 24

Figure 6: Post insertion irt 24

Crown lengthening

Following the placement of a glass fibre post, crown lengthening was performed to increase the available supragingival tooth structure and provides adequate ferrule effect for the final restoration.(Fig.7,8,9,10)

The surgery procedure was performed in the following sequence:

- Incision using a No. 15 blade: internal-bevel incision (Fig. 7)
- Secondary intrasulcular incision (Fig.8)
- Removal of gingival collar (Fig. 9)
- Full-thickness mucogingival flap reflection
- Removal of gingival collar and root instrumentation, followed by positioning and suture of the soft tissue flaps (Fig.10)

Figure 7: Internal-bevel incision done irt 24

Figure 8: Secondary intrasulcular incision done irt 24

Figure 9: Removal of gingival collar irt 24

Figure 10: Suture of the soft tissue flaps irt 24

Shade selection was done. Porcelain-fused metal crowns were cemented using luting glass ionomer cement. (Fig.11)

Figure 11: Post operative

3. Discussion

The principal objective of pediatric operative dentistry is to restore damaged teeth to healthy function.[14] The high failure rate of restorations is often due to insufficient tooth structure available to support them. Additionally, the poor adhesion of bonding agents to the enamel and dentin of primary teeth, compared to that of permanent teeth, can compromise the final restoration.[7]

Different resin materials and techniques have been used for reinforcing root canals. The use of intracanal posts in endodontically treated teeth improves the retention of a definitive restoration. A custom made 'omega wire extension' placed inside the root cavity and fixed with a composite resin is another alternative. Though it is easier and inexpensive technique but does not get an adequate adaptation to the canal wall, which may lead to radicular fracture on excessive masticatory forces.[7,15]

There are a variety of root posts used in pediatric dentistry. A resin composite post building up directly[16], resin composite short post placement[17], alpha or omega shaped orthodontic wires[18,19], stainless steel pre-fabricated posts, nickel-chromium cast posts with macro retentive elements, natural teeth from a tooth bank or reinforced fibres.

Regardless of the post system used, the teeth should first be treated endodontically and root retention should fill about 1/3 of the root length.[16]

The development of the fibre reinforced composite technology has brought a new material into the realm of metal-free adhesive aesthetic dentistry.[20] Different fibre types such as glass fibres, carbon fibres, Kevlar fibres, vectran fibres, polyethylene fibres have been added to composite materials.[21]

Carbon fibres prevent fatigue fracture and strengthen composite materials, but they have a dark colour, which is undesirable esthetically.[21] Kevlar fibres made of an aromatic polyamide, increase the impact strength of composites but are unaesthetic and hence their use is limited.[22] Vectran fibres are synthetic fibres made of aromatic polyesters. They show a good resistance to abrasion and impact strength, but they are expensive and not easily wielded.[22] Polyethylene fibres are esthetic but their flexural strength is less as compared to glass fibre reinforced composite posts. The biological posts require the availability of a tooth bank and are still subject to new studies for future conclusions.[23]

Glass fibre reinforced composite resin posts (GFRC) are new to the pediatric world and can be used as an alternative to the other post systems. The properties of fibre - reinforced posts are dependent on the nature of the matrix, fibres, interface strength and geometry of reinforcement.

In this case, a new GFRC material composed of densely packed silanated E glass fibres in a light curing gel matrix has been used.

The advantages of this material over the older fibres are:

1) Greater flexural strength (1280 MPa) over 650 MPa of the older fibres.
2) Fibers do not fray; hence ease of handling.
3) Fibers are arranged parallel in a unique interpenetrating polymer matrix (IPN) and hence can be used in high stress bearing areas.
4) They can bond to any type of composites.
5) Fibre surfaces can be re- activated.

Studies state that a higher retention strength was observed with glass fibre posts, followed by orthodontic "γ" wire posts and composite posts. Other factors include better bonding of these posts to cementing media, good adaptation to the root canal, and the fact that these posts offer better light transmission, which enhances the polymerization of resin at the apical region during the cementation procedure.

The fibre post technique offers certain advantages:-

1) Employs fibre posts that are ready to use.
2) Provides homogenous mechanical and chemical bonding of all components.
3) Reduces the risk of root fracture, since its modulus of elasticity is similar to that of root dentine and its diametric tensile strength is low.
4) Presents no potential hazards of corrosion and hypersensitivity.

4. Conclusion

The number of endodontic procedures has increased steadily in the past decade with highly predictable results. Therefore, restoration of teeth after endodontic treatment is becoming an integral part of the restorative practice in dentistry. The treatment described in the case report is simple and effective and represents a promising alternative for rehabilitation of grossly destructed premolar. This technique of glass fibre-reinforced composite resin post and core and crown lengthening has shown promising results and has presented the pediatric dental world with an additional treatment option.

References

[1] Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990– 2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 392: 1789–8583.

[2] Alkarimi, H.A.; Watt, R.G.; Pikhart, H.; Jawadi, A.H.; Sheiham, A.; Tsakos, G. Impact of Treating Dental Caries on Schoolchildren's Anthropometric, Dental, Satisfaction and Appetite Outcomes: A Randomized Controlled Trial. BMC Public Health. 2012, 12, 706-9.

[3] Motisuki C (Department of Paediatric Dentistry, Araraquara Dental School, University of São Paulo State, Araraquara, São Paulo, Brazil. cmotisuki@yahoo.com.br), Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. Int J of Paediatr Dent 2005 Jul;15(4):282-286.

[4] Naumann M, Blankenstein F, Dietrich T: Survival of glass fibre reinforced composite post restorations after 2 years-an observational clinical study. J Dent. 2005, 33:305-312. 10.1016/j.jdent.2004.09.005

[5] Sorensen JA, Martinoff JT: Intracoronal reinforcement and coronal coverage: a study of endodontically treated teeth. J Prosthet Dent. 1984, 51:780-784. 10.1016/0022-3913(84)90376-7

[6] Assif D, Gorfil C: Biomechanical considerations in restoring endodontically treated teeth . J Prosthet Dent. 1994, 71:565-567. 10.1016/0022-3913(94)90438-3

[7] Mortada A (Department of Pedodontics and Preventive Dentistry, Faculty of Oral and Dental Medicine, Cairo University, Cairo, Egypt. amortada@yahoo.com), King NM. A simplified technique for the restoration of severely mutilated primary anterior teeth. J Clin Pediatr Dent 2004 Spring; 28(3):187-192

[8] Wanderley MT (Department of Orthodontics and Pediatric Dentistry, University of São Paulo, Brazil), Ferreira SL, Rodrigues CR, Rodrigues Filho LE. Primary anterior tooth restoration using posts with macroretentive elements. Quintessence 1999 Jun;30(6):432-436.

[9] Sharaf AA. The application of fiber core post in restoring badly destroyed primary incisors. J Clin Pediatr Dent 2002 Spring;26(3):217-224.

[10] Akkayan B, Gülmez T: Resistance to fracture of endodontically treated teeth restored with different post systems. J Prosthet Dent. 2002, 87:431-437.

[11] Afraa S, Raghad H, Ayam K, Aeshah H. Restoration of Primary Anterior Teeth with Glass Fiber-Reinforced Post and Core: 3-Year Follow-Up Case Report. Case Rep Dent. 2021 May 10;2021:5537437. doi: 10.1155/2021/5537437. PMID: 34046232; PMCID: PMC8128620.

[12] Mehra M, Grover R. Glassfiber Post: An Alternative for Restoring Grossly Decayed Primary Incisors. Int J Clin Pediatr Dent 2012;5(2):159-162.

[13] Chunawalla, Yusuf & Zingade, Shweta & Bijle, Mohammed Nadeem & Ahmed, Nadeem & Thanawalla, Elisha. (2011). Glass Fibre Reinforced Composite Resin Post & Core In Decayed Primary Anterior Teeth – A Case Report. 2. 55-60.

[14] Bayrak S, Tunc ES, Tuloglu N, Turkey S. 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;107:e60-4.

[15] Usha M (Department of Pedodontics and Preventive Dentistry, V. S. Dental College and Hospital, V. V. Puram, Bangalore 560 004, Karnataka, India. ushy_mohandas@rediffmail.com), Deepak V, Venkat S, Gargi M. Treatment of severely mutilated incisors: A challenge to the pedodontist. J Indian Soc Pedod Prev Dent 2007;25 Suppl:S34-36.

[16] Grosso FC. Primary anterior strip crowns .A new technique for severely decayed anterior primary teeth . J Pedod 11:375-384,1987.

[17] Judd PL, Kenny DJ , Johnston DH, Yacobi R. Composite resin short-post technique for primary anterior teeth. J Am Dent Assoc 120:553-555,1990.

[18] Mathias RS, Kramer PF, Imparato JCP, Guedes-Pinto AC, Operative and restorative dentistry. Guedes-pinto AC, Pediatric Dentistry, 1st edition Sao Paulo: Santos ,1997:569-607.

[19] Issao M, Guedes-pinto AC, Pediatric dentistry manual,1st Edition, Sao Paulo: Pancast,1978:132-134.

[20] Meiers JC, Kazemi B, Donadio M. The influence of fiber reinforcement of composite on shear bond strengths to enamel. J.Prosthet Dent 2003,89:338-393.

[21] Vitale MC, Caprioglio C, Matrignone A, Marcheisu U, Botticelli AR. Combined technique with polyethylene fibers and composite resins in restoration of traumatized anterior teeth. Dent Traumatol 2004;20:172-177.

[22] Berrong JM, Weed RM, Young JM. Fracture resistance of kelvar- reinforced poly(methyl methacrylate) resin:a preliminary study. Int. J Prosthodontics 1990;3:391-395.

[23] Galassi MAP ,et al. Reabilitacao de dentes deciduous anteriores :relato accompantamanto de um caso clinic. J .Bras Odontoped Odont Bebe 2:175-178,1999