CASE REPORT

Glass Fibre Reinforced Composite Resin Post & Core In Decayed Primary Anterior Teeth – A Case Report.

Yusuf K. Chunawalla,[1] Shweta S. Zingade,[2] Bijle Mohammed Nadeem Ahmed,[3] Elisha A. Thanawalla[4]

ABOUT THE AUTHORS

1. Dr. Yusuf K. Chunawalla
Professor & Head, Department of Pedodontics & Preventive Dentistry,
M.A. Rangoonwala College of Dental Sciences & Research Centre, Pune

2. Dr. Shweta S. Zingade
PG Student, Department of Pedodontics & Preventive Dentistry,
M.A. Rangoonwala College of Dental Sciences & Research Centre, Pune

3. Dr. Bijle Mohammed Nadeem Ahmed
PG Student, Department of Pedodontics & Preventive Dentistry,
M.A. Rangoonwala College of Dental Sciences & Research Centre, Pune

4. Dr. Elisha A. Thanawalla
PG Student, Department of Pedodontics & Preventive Dentistry,
M.A. Rangoonwala College of Dental Sciences & Research Centre, Pune

Corresponding Author:

Dr. Bijle Mohammed Nadeem Ahmed

Email: nbijle@yahoo.co.in

Abstract

Dental caries is the singled most common chronic childhood disease. In early childhood caries there is early carious involvement and gross destruction of maxillary anterior teeth. This case presents the clinical sequence of rehabilitation of maxillary anterior primary teeth. Endodontic treatment was followed by the placement of a new fibre post, glass fibre reinforced composite resin post. The crown reconstruction was done with strip crowns.

KEYWORDS: Anterior restoration, Post, Glass Fibre Reinforced Composite Resin.

Introduction

Early childhood caries is a rampant dental disease that affects mostly young children. The American Academy of Pediatric Dentistry defines ECC "as the presence of 1 or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger"[1]. Clinical examination of this condition discloses a distinctive pattern. The teeth most often involved are the maxillary central incisors, lateral incisors and the maxillary and mandibular 1st primary molars[2,3].The maxillary primary incisors are the most severely affected with deep carious lesions usually involving the pulp. In extreme cases, ECC can even lead to total loss of the crown structure[4, 5].

Earlier, the most pragmatic treatment was to remove the involved teeth. However, the importance of preserving the integrity of the anterior teeth can be realized from the fact that loss of these teeth can lead to space loss, masticatory deficiency, phoenetic challenges, lack of pre-maxilla development and resulting malocclusion, development of para- functional habits and mainly psychological problems that interfere with the personality and behavior of the child[2-10]. Restoring the primary anterior teeth to its previous function, form and esthetics presents a challenge to the Pediatric Dentist. The children who require this treatment are usually the youngest and least manageable group of patients.

In addition to that, technical problems of primary incisors have to be faced. These teeth have short and narrow crowns leaving only a small surface for bonding, a pulp chamber that is relatively large to the crown size and enamel which is inheritantly difficult to etch due to its aprismatic structure[11, 12]. Because of the reduced coronal structure, direct restorative procedures do not always give satisfactory results. Shape, function and form can be better restored by means of prosthodontic techniques. Various studies have shown that post and cores can be used to overcome this problem. The introduction of fiber posts in 1990 provided the dental profession with the first true alternative to cast/ prefabricated posts, pins and orthodontic wires.

Presented herewith is a clinical case report of an ECC patient, whose dentition was restored with Glass fibre reinforced composite resin posts(GFRC), a new generation of fiber posts.

CASE REPORT

A 4 year old, male patient reported to the Department of Pedodontics and Preventive Dentistry, M. A. Rangoonwala College of Dental Sciences and Research centre, Pune with a chief complaint of decayed upper front teeth. Patient's medical history was non-contributory. Patient's mother gave a history of breast feeding for 1 year after which the child was bottle fed for 2 years. The milk contained sugar and the child went to sleep with the bottle in his mouth. Intra-oral examination revealed a complete set of deciduous dentition. It was observed that 55, 54, 52, 51, 61, 62, 64, 65, 74, 75, 84 and 85 were affected by dental caries. Intra-oral periapical radiographs revealed pulp involvement with 54, 52, 51, 61, 62, 64 and 74. (Fig.a)

TREATMENT PLAN

Diet analysis, counseling and oral prophylaxis were undertaken. 54, 64 were grossly carious and were indicated for extraction followed by a Nance palatal space maintainer. 74 were indicated for extraction due to resorption of the distal root as observed on the intra-oral periapical radiograph. The extraction was to be followed by a band and loop space maintainer.

52, 51, 61, 62 were indicated for pulpectomy, followed by glass fibre reinforced composite resin posts and strip crowns. 55, 65, 75, 84 and 85 presented with pit and fissure caries and were indicated for composite resin restorations.

TREATMENT PROGRESS

The treatment plan was divided into 2 phases for 51, 52, 61 & 62:-Phase 1- endodontic phase & Phase 2- construction of the restoration.

PHASE ONE: The Endodontic Phase

An infraorbital block was administered for 61, 62 & labial & palatal infiltration was carried out for 51, 52. Rubber dam isolation was carried out. Gross carious lesions were removed with a no. 330 round carbide steel bur (S.S. White, N.J USA). Unsupported enamel was not removed so as to preserve as possible. As Muller De Vaan, a Prosthodontist, stated, our objective should be "perpetual preservation of what remains, rather than meticulous reconstruction of what is lost." The pulp chamber was opened & working length determination IOPA was taken with a no. 8 K-file pulp tissue was extirpated using no.8 – no.30 K-files (Mani INC, JAPAN). After irrigation with copious amounts of 2.5% NaOCl & Normal Saline, the root canal was dried using paper points. A thick mix of zincoxide eugenol paste was then condensed with lentulo-spiral into the canal. The obturated material was allowed to set for 10 minutes. (Fig. b,c,d)

PHASE TWO: The Construction of Restoration

The post space was prepared in the second appointment, 3 days after the endodontic treatment was completed. The post space was created by removing approximately 4mm of ZnOE material using a thin straight fissure bur with rubber stopper attached to a contra-angle handpiece. The diameter of the straight bur used was less than the root canals .All visible ZnOE cement on the walls of the post space was removed. The post-space was air dried & a 1 mm base of glass ionomer cement(Fuji 2, GIC Corp, Tokyo, Japan) was placed to isolate the obturated material from the rest of post space. (Fig.e)

The prepared post space was then cleaned with saline , air- dried & acid – etched with 37% phosphoric acid (Prime Dental , Thane , India) for 15 seconds. This space was rinsed and air dried with oil-free compressed air. A light cured bonding agent (3M ESPE, M.N, USA) was brushed on the etched surface & uniformly dispersed by a compressed air blast. It was then light cured with (StarlightPro, Mectron LED Light, Italy) for 20 seconds.

The GFRC post was then cured for 20 seconds in order to gain rigidity, before insertion into the post space. Light cured flowable composite resin (3M ESPE, MN, USA) was then inserted into the canal chamber after which the GFRC post was inserted .The fiber post & composite were then cured together for 60 seconds. The coronal portion of the glass fibre reinforced composite post was splayed to increase the surface area for the retention of the core. (Fig. f)

The coronal enamel was then etched for 20 seconds, rinsed with water & air dried followed by application of bonding agent – which was then light cured. The coronal post was then covered with the flowable composite for core build –up , followed by light curing it for 60 seconds.

An appropriate strip crown (3M ESPE, MN USA) was then selected & trimmed (to the cingulum) to create an arched interproximal margin to accommodate the interdental papilla. The strip crown was then filled with composite resin & placed on the tooth. The composite resin was cured for 60 seconds . The strip crown was then peeled off with a sharp explorer.

The final finishing & polishing was done with finishing burs(Jota, Swiss Precision). Occlusal interferences in normal & paranormal mandibular movements were removed & post – operative radiographs were taken as a final step.(Fig. g)

DISCUSSION

Esthetic restoration of primary teeth has long been a special challenge to pediatric dentists. Conventional glass ionomer restorations have demonstrated high failure rates in the primary dentition.[15]

Figure a: Pre-Operative intra oral photograph

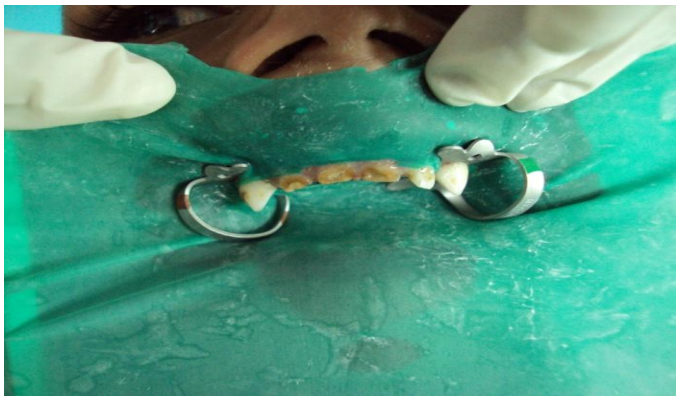

Figure b: Rubber dam isolation done

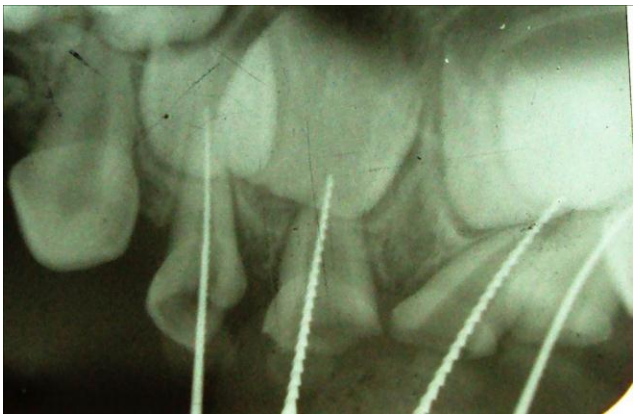

Figure c: Working length determination: IOPA

Figure d: Obturation completed: IOPA

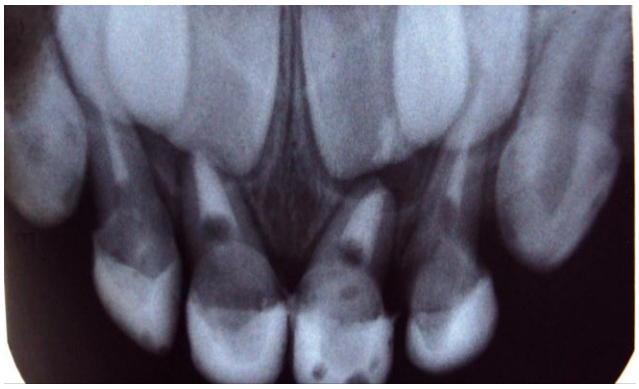

Figure e: Removal of 3mm zinc oxide eugenol for post space creation

Figure f: Post insertion followed by core build-up

Figure g: Post- operative intra oral photograph

When there is severe loss of coronal tooth structure, the use of posts placed inside the canal after endodontic treatment will give retention, provide stability to the reconstructed crown[17],and withstand masticatory forces in function.[13]

There are a variety of root posts used in pediatric dentistry. A resin composite post building up directly,[18] resin composite short post placement[19], alpha or omega shaped orthodontic wires[20,21], stainless steel pre fabricated posts[22,23], nickel- chromium cast posts with macro retentive elements[24], natural teeth from a tooth bank[15] or reinforced fibers.[13]

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.[6, 18]

The development of the fibre reinforced composite technology has brought a new material into the realm of metal-free adhesive esthetic dentistry.[25]Different fiber types such as glass fibers, carbon fibers, Kevlar fibers, vectran fibers, polyethylene fibers have been added to composite materials.[26]

Carbon fibers prevent fatigue fracture and strengthen composite materials, but they have a dark colour, which is undesirable esthetically.[26, 27, 28] Kevlar fibers made of an aromatic polyamide, increase the impact strength of composites but are unaesthetic and hence their use is limited.[29] Vectran fibers are synthetic fibers made of aromatic polyesters. They show a good resistance to abrasion and impact strength, but they are expensive and not easily wielded.[26] Polyethylene fibers are esthetic but their flexural strength is less as compared to glass fiber reinforced composite posts.[30] The biological posts require the availability of a tooth bank and are still subject to new studies for future conclusions.[31]

Glass fiber 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 fiber- reinforced posts are dependent on the nature of the matrix, fibers, interface strength and geometry of reinforcement.

In this case, a new GFRC material composed of densely packed silanated E glass fibers in a light curing gel matrix (ever Stick, Stick Tech Ltd, Turku, Finland) has been used.

The advantages of this material over the older fibers are:-

1) Greater flexural strength (1280 MPa) over 650 MPa of the older fibers.
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 fiber posts, followed by orthodontic "γ" wire posts and composite posts.[32] 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.[33]

The fiber post technique offers certain advantages:-

1) Employs fiber 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.

CONCLUSION

This method of Glass Fibre Reinforced Composite Resin post and core for restoring teeth affected by ECC has shown promising results and has presented the pediatric dental world with an additional treatment option.

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