

Biomimetic post: A case report

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ABSTRACT

Introduction: Intraradicular retention and stability in severely compromised anterior teeth, is an important factor for functional reconstruction of such teeth. Most commonly used posts are custom or prefabricated. The prefabricated posts include glass fiber, carbon fiber, metal or ceramics. However, till date none of the available posts meet all the biological requirements. This study is a biological approach for restoration of extensively damage teeth. **Case Report: (Clinical Consideration):** A “biological” restoration technique using dental fragments and adhesive materials is described. These fragments were obtained from extracted human teeth which had been previously sterilized and shaped to be used as intraradicular posts. **Conclusion:** The use of dentin post is an alternative technique for reconstruction of extensively damaged teeth as it provided the excellent adhesion, strength to remaining tooth structure, and retention to the crown.

Keywords: Biological posts, Biological restoration, Dentin posts, Extracted human teeth

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INTRODUCTION

A tooth with extensive damage is one that has lost substantial structure which could be as a result of caries, previous restoration failures, fractures or even procedures related to endodontic treatment. For restoration of teeth with insufficient coronal tooth structure, posts are needed for retention and stability of core. The material from which the post is constructed plays a crucial role in the biomechanical performance of root canal treated teeth. Various custom made and prefabricated metal post have been used in past [1]. The demand for esthetics has now led to the development of ceramic fiber reinforced composite (FRC) posts. Although clinical prospective and retrospective studies on fiber posts have reported encouraging results, some studies have questioned the mechanical properties of FRC posts, reporting rigidity values similar to or even higher than metal posts [2, 3]. The flexural strength of fiber and metal posts is found to be 4 and 7 times higher, respectively, than root dentin [4]. Ten-year evaluation study for glass fiber–supported post endodontic restorations has reported a high annual failure rate, with the risk of failure being much higher in anterior teeth [3]. Similarly, because of high modulus of elasticity and stiffness; use of ceramic posts may be associated with catastrophic fractures of the root [5].

Therefore, even though the esthetic posts look promising, an ideal post material with all the required properties has yet to be explored.

No commercially available posts fulfill all the mechanical and biological requirements. Resilience is a property unique to dentin and is one of the major factors for use of dentin posts. These posts also provide excellent adhesion and does not promote any additional stresses within the tooth [6].

This case report discusses the use of dentin post made from extracted tooth for treatment of compromised anterior teeth.

CASE REPORT

A 45-year-old female patient reported to the department of conservative dentistry and endodontics MRDC, Faridabad with the chief complaint of decayed teeth in upper front region since four months. On clinical examination, it was found that 11, 12 and 13 were proximally carious and the associated gingival was inflamed (Figure 1a). Intraoral periapical radiograph revealed carious involvement of pulp irt 11, 12, and 13 with associated periapical radiolucency irt 12 (Figure 1b).

Proposed treatment plan included endodontic treatment; followed by crown lengthening and intraradicular biological posts irt 13, 12 and composite buildup irt 11. Intraradicular biological posts would be made from root cuttings of extracted and properly sterilized canines. The patient was informed about the pros and cons of biological restoration and the treatment was started with patient's consent for the proposed treatment plan.

All the carious tissue and unsupported enamel was removed and endodontic treatment was done irt 11, 12, and 13 (Figure 1c). Then the patient was referred to the department of periodontics for crown lengthening irt 12, 13 (Figure 1d). The post space preparation was done irt 13, 12 using Peeso Reamer drills till #3 (Figure 1e) and indirect impression of the post space was made using condensation silicone (Figure 1f).

The making of dentin posts: After pouring the plaster model, wax patterns were made by molding wax in the post spaces. Extracted canines to be used for construction of posts were autoclaved at 121°C for 15 minutes (Figure 2a). The crown portions of extracted canines were sectioned using a diamond disk and the roots were sectioned mesiodistally along the long axis of the tooth (Figure 2b). Each part of the root was cut to form biological posts, using the wax patterns as references orienting shape, thickness and length of dentin posts (Figure 2c).

Adaptation and cementation of posts to root canals: After the intraradicular posts had

been cut and suitably adapted to the plaster model ; they were then conditioned with 37% phosphoric acid for

30 seconds (Figure 2d), followed by the washing, drying, and application of the adhesive system (ADPER SINGLE BOND 2, 3M ESPE, CA, USA) (Figure 2e). The posts were taken to the plaster model, along with composite so as to adapt to the canal walls (Figure 2f). After confirming the satisfactory adaptation of the posts to the canals, through clinical and radiographic analysis (Figure 3a), cementation of biological posts was done using ParaCore resin cement along with core buildup (Figure 3b).

Once the posts were cemented; tooth preparation for PFM crowns irt 13 and 12 was done. Impression was recorded using addition silicone and sent to the lab for fabrication of crowns. Composite buildup was done irt 21 and crowns cemented irt 12 and 13 (Figure 3c).

DISCUSSION

Nowadays with the advancing technology more and more dentists aim at preserving the natural or using

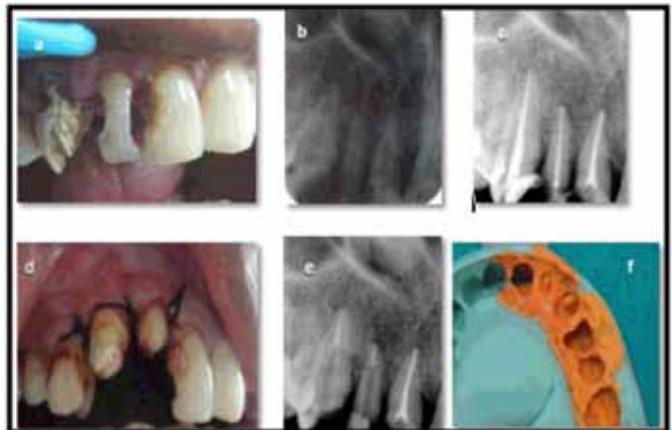


Figure 1: (a) Proximal caries irt 13, 12, and 11, (b) IOPA reveals caries involving pulp irt 13, 12, (d) Crown lengthening irt 13, 12 (e) Post space preparation irt 13, 12 ; (f) Post space Silicone impression recorded.



Figure 2: (a) Selected canine teeth, (b) Mesiodistally sectioned roots, (c) Wax patterns of involved canals and biological posts ready after cutting, (d) Etching done using 37% phosphoric acid, (e) Bonding agent applied, (f) Biological post relined with composite.



Figure 3:(a) Dentin post trial (radiographic view), (b) Post cemented using ParaCore resin cement, (c) Clinical picture showing cemented post and core buildup done irt 13, 12, (d) PFM Crowns cemented irt 13, 12 and composite buildup irt 11, (e) Radiographic view after cementation of crowns.

materials that closely mimic the natural tooth structure. These restorations are commonly known as biological restorations [7, 8]. Recently, a few reported cases that used dentin as a post have shown successful outcomes [6, 9, 10, 11].

In vitro studies have proved that when endodontically treated teeth were restored with dentin posts, they exhibited better fracture resistance in comparison with those restored with FRC posts [12, 13].

In the present case study, the proximal caries involved more than 50% of the coronal tooth structure irt 13, and 12. A treatment plan that allowed intraradicular reinforcement was required in order to provide retention and stability to the crowns. Hence it was decided to use dentin posts as it provides excellent adhesion to resin and canal walls, and also has similar modulus of elasticity as that of the canal, thus attaining the monoblock system. Biological intraradicular posts were used which were made from freshly extracted canines obtained from the department of oral and maxillofacial surgery. The extracted teeth were cleaned and sterilized by autoclaving at 121°C for 15 minutes.

Patient's consent is most important as the use of extracted teeth from another person has a psychological impact, so foremost the consent was taken from the patient.

Careful assessment of the patient's occlusion should be done for premature contacts or any interferences in protrusive movements, factors that may lead to failure of the technique.

Advantages include the excellent results in terms of its functional value as it minimizes the stresses on the canal walls along with excellent adhesion to the canal walls, Modulus of elasticity being similar aids in strengthening of the root, presenting resilience comparable to the original tooth. Another major advantage is that in comparison to commercially available posts, it is an economical option for the patient because of its low cost [6].

Dentine posts do have a few limitations such as technique sensitivity and patient's refusal to accept a tooth fragment obtained from another patient.

CONCLUSION

The present case study reported the successful use of dentin posts for anterior teeth. However, further studies are required to measure the adhesion, function, and long-term behavior of these biological posts.

Author Contributions

Swati Sanghi – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Arundeeep Singh – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Dax Abraham – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Ravjot Ahuja – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Neha Juneja – Substantial contributions to conception and design, Acquisition of data, Drafting and revising the article critically, Final approval of the version to be published

Kanika Malik – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Swati Sharma – Substantial contributions to conception and design, Acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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