

# Biomimetic Post: An Innovative Approach to Reinforce Mutilated Maxillary Central Incisor - A Case Report

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DOI: <https://doi.org/10.52403/ijrr.20231059>

## ABSTRACT

Ideal functional reconstruction of severely compromised anterior teeth is still a challenge for restorative dentistry. In this context a “Biomimetic Post” serves as a homologous solution for intraradicular rehabilitation of a fractured endodontically treated tooth by virtue of its biomimetic property. This case report highlights the successful esthetic and functional rehabilitation of maxillary central incisor through the preparation and adhesive cementation of a “Biomimetic Post”. A male patient aged 18 years presented with a traumatic dental injury sustained to the maxillary left central incisor. Conventional root canal therapy was initiated and apexification with mineral trioxide aggregate was done. Radicular post space was prepared and dentin post was fabricated from a freshly extracted, intact human canine. After checking for the adaptation of dentin post, it was cemented with glass ionomer cement. Follow up was done at regular intervals of three months.

**Keywords:** Anterior tooth, Esthetic restoration, Intraradicular rehabilitation, Biomimetic post.

## INTRODUCTION

Traumatized anterior teeth require attention in terms of function and aesthetics and have

both social and psychological bearing on the patient.[1] For clinicians, morphofunctional recovery of extensively damaged anterior tooth is an arduous task. For the ideal coronal reconstruction of an endodontically treated tooth, better intracanal retention and stability of coronal restoration can be achieved using various posts systems made up of metal, glass or ceramics.[2] However, even with all the advances in the field of adhesive dentistry, no such restorative material exists that can reproduce the mechanical and biological requirements of natural dentition. The only material that can have all these properties is none other than dentin itself.[3] Biologic restoration is a procedure to restore fractured tooth structure with natural tooth material.[4] On account of its biomimetic property, a dentin post can form an ideal biological alternative to restore an extensively damaged tooth.[5] With resiliency of a dentin post being similar to that of natural tooth, no additional stresses are experienced on dentinal walls.[2] Apart from being economical, the adhesion between the biologic post, cementing agent and tooth structure enables the clinician to attain a monoblock

system.[5] This case report describes the rehabilitation of a mutilated maxillary central incisor using an allogeneous dentin post derived from maxillary canine.

### CASE REPORT

An eighteen-year-old male patient reported to the Department of Conservative dentistry and Endodontics with a complicated crown fracture in permanent maxillary left central incisor due to trauma 5 years back (Figure 1a).



Figure 1(a)- Pre-operative Clinical view

Medical history was non-contributory and dental history was of previous root canal treated tooth in relation to 21. Clinical examination revealed discoloured 21 with no tenderness on percussion and no mobility. The periapical radiograph revealed presence of excessively flared root canal

with a foreign object in the root canal space and severe dentin loss in the coronal tooth structure (Figure 1b).

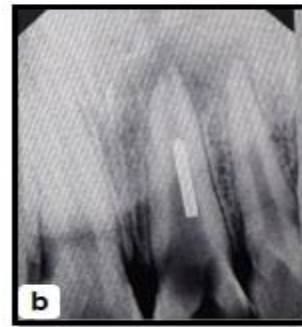


Figure 1(b)- Pre-operative Radiographic view

Treatment planning of re-treatment followed by apexification and rehabilitation with dentin post was suggested. After agreeing upon the proposed treatment with biologic post, a informed consent was obtained from the patient. After the retrieval of foreign object, circumferential filing with #90 H-file was done and standardized irrigation protocol using 3% sodium hypochlorite with sonic activation. Calcium hydroxide was packed for two weeks. On recall the patient was asymptomatic and apexification with mineral trioxide aggregate (Angelus, Londrina, Brazil) was done forming an apical plug of 4mm (Figure 2).

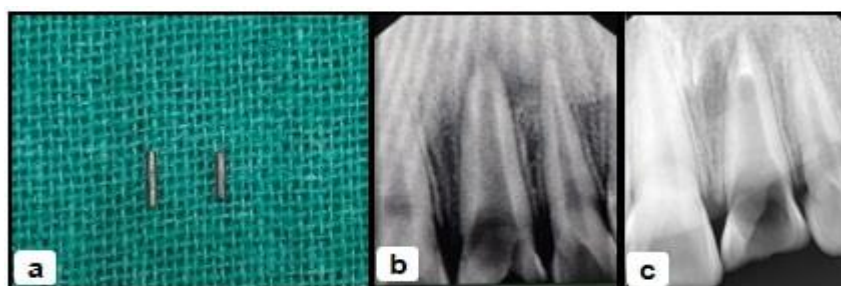


Figure 2- (a) Fractured instrument (b) IOPA radiograph after removal of foreign object (c) post-space preparation after obturation with MTA

### Post Space Preparation and Impression

The radicular post space was prepared using Peeso reamers (Mani Inc., Japan) till size #3 while preserving the 4 mm of apical seal. Impression of the post space was made using polyvinyl siloxane impression material (Flexceed, GC Dental Products Corp., Japan) (Figure 3a).

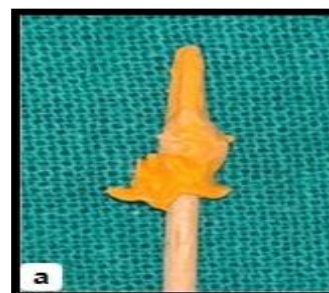


Figure 3- (a) Polyvinyl siloxane impression of post space

### Fabrication of Biological Post

A freshly extracted, intact maxillary canine tooth was selected (Figure 3b)



Figure 3- (b) Freshly extracted maxillary canine

and autoclaved for 15 minutes at 121°C. Using a diamond disc, the tooth was then divided bucco-lingually along its long axis. The form, thickness and length of the post were determined by the silicone impression of the post space as a guide. The pulp space in the dentin post was cleaned and filled with flowable composite. (Figure 3c and d)



Figure 3-(c) Biological post and core made from sectioned maxillary canine (d) IOPA radiograph of the prepared biologic post

### Adaptation and Cementation of Post to Root Canals

The contoured dentin post was checked in the prepared post space for its adaptation. Following successful clinical and radiographic adaptation of the biological post (Figure 4),



Figure 4- Verification of adaptation of the biological post (a,b) clinically and (c) radiographically

the post was cemented in the root canal using type 1 glass ionomer cement (GIC) (GC Gold Label 1 Luting and lining, GC Corp., Japan) followed by core build-up

with flowable composite (Brilliant NG, Coltene Whaledent Inc., USA). (Figure 5&6).



Figure 5- Radiographic view following post-cementation of biologic post



Figure 6- Modification of core with direct composite build up

### Crown Preparation and Cementation Procedures

Crown preparation was done for porcelain fused to metal (PFM) crown. Impression was made with polyvinyl siloxane impression material. The final finishing and polishing were done with finishing burs and occlusal interferences were removed. PFM was fabricated and cemented with GIC (GC Gold Label 1 Luting and lining, GC Corp., Japan) (Figure 7).



Figure 7- Clinical view post-cementation of crown

### DISCUSSION

The term “Biological restoration” was introduced by Santos and Bianchi in 1991.[4] Biologic post in damaged teeth helps to retain root canal dentin and leads to better force distribution along the root surface, which exhibits outstanding results in terms of its functional value by reinforcing the tooth structure.[2]

Dentin post shares similar physical characteristics as root dentin, including viscoelastic behaviour, compressive strength and thermal expansion.[6] Uniform stress distribution is produced when a dentin post joins the root dentin to form a

micromechanical homologous unit. Due to the dentin post's comparable elasticity to that of the root dentin, it acts as a shock absorber by permitting a small portion of the stresses to be distributed to the tooth.[2] Ambica *et al.*[7] and Kathuria *et al.*[8] in their study concluded that dentin posts show more fracture resistance than carbon fibre posts and glass fibre posts.

Extra-oral fabrication of dentin post requires skill and may be time-consuming. To facilitate the process, intracanal impressions can be made using acrylic resin pattern, wax or polyvinyl siloxane impression material and can be used as a guide to shape the dentine post according to the internal morphology.[9] In the current case report, polyvinyl siloxane material was used.

After extraction of the intact maxillary canine used for the preparation of dentin post, the tooth was thoroughly cleaned and autoclaved for 15 minutes at 121°C and 15 pounds pressure to meet all biosecurity requirements. The biomechanical characteristics of dentine are preserved in the freshly extracted teeth, although autoclaving may slightly change the dentine's micro hardness.[9]

Ideally, the cements for post-cementation must provide better bonding to dentin post and root dentin with gap free interface to provide adequate strength. GICs have the ability to interact chemically and micro-mechanically with tooth structure. They also have better viscoelastic properties for maintaining the bond integrity than stiffer resin cements, post-maturation hygroscopic expansion using the residual water source to counteract initial setting shrinkage and

allow gap elimination between the post, cement and dentin, and fluoride release. Additionally, unlike resin cements, GIC does not require the creation of hybrid layers or access to light for optimal bond strength.[10] Therefore, in this case GIC is used to cement dentin post with root dentin. Biological post system being economical, may also serve as an alternative for the patients with lower socio-economic status.[9]

## CONCLUSION

Alternative treatment options, such as biologic posts, can be used in the cases with excessively flared root canal or in cases involving extensive coronal dentin loss since they biomechanically strengthen the remaining tooth structure, additionally producing esthetic outcomes.

### Declaration by Authors

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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How to cite this article: Shreshtha Sharma, Sachin Gupta, Shikha Jaiswal, Rudhra Koul. Biomimetic post: an innovative approach to reinforce mutilated maxillary central incisor - a case report. *International Journal of Research and Review.* 2023; 10(10): 472-476. DOI: <https://doi.org/10.52403/ijrr.20231059>

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