

# BIODYNAMIC CORONO-RADICULAR RESTORATION & REINFORCEMENT OF MAXILLARY INCISORS

Arora V,<sup>1</sup> Bansal P,<sup>2</sup> Arora P,<sup>3</sup> Fahmi MK,<sup>4</sup> Alshammrani AS,<sup>5</sup> Alzahrani FS<sup>6</sup>

1. Professor & Head, Endodontics Division, Department of Restorative Dental Sciences, Faculty of Dentistry, Taif University, Taif, SAUDI ARABIA.
2. Assistant Professor, Department of Conservative Dentistry & Endodontics, Subharti Dental College, Meerut, Uttar Pradesh, INDIA.
3. Associate Professor, Prosthodontics & Oral Implantology Division, Department of Restorative Dental Sciences, Faculty of Dentistry, Taif University, Taif, SAUDI ARABIA.
4. Assistant Professor, Chairman, Department of Restorative Dental Sciences, Faculty of Dentistry, Taif University, Taif, SAUDI ARABIA.
5. Associate Professor, Dean, Faculty of Dentistry, Taif University, Taif, SAUDI ARABIA.
6. Assistant Professor, Department of Pedodontics & Preventive Dentistry, Faculty of Dentistry, Taif University, Taif, SAUDI ARABIA.

## Abstract

In restorative dentistry,corono-radicular reconstruction of endodontically treated teeth is still a challenge.Inspite of the availability of varied commercially available posts,none of them possesses all the required biological and mechanical properties. In this context, a biodynamic post and core by virtue of its biomimetic properties serves as a homologous recipe for the corono-radicular rehabilitation of a fractured tooth.This case report describes the esthetic and functional reconstruction of maxillary central and lateral incisors through the preparation and adhesive cementation of biodynamic dentin post and cores made from extracted human teeth. Subsequently, central and lateral incisors were restored with full coverage restorations. Thus,biodynamic post and cores may serve as good alternatives to conventional systems by preserving internal dentine walls, providing excellent adhesion,biomechanics and resilience similar to natural tooth structure.

**Keywords:** Biodynamic, Biological dentin post, Intra-radicular, Post and core, Reinforcement.

## Introduction

Mutilated anterior teeth lead to functional,esthetic & psychological problems,thus compromising patient's overall quality of life.Posts are often required for restoring such teeth having insufficient coronal tooth structure to retain a core for definitive final restoration.<sup>1</sup> Various types of posts available are made of metal, resin, fibers, composites, ceramic etc. but each one has its own merits and demerits.<sup>2,3</sup>

Since the material of the post plays a vital role in the biomechanical performance of the endodontically treated tooth,the post material should have physical properties such as modulus of elasticity,compressive strength,thermal expansion as well as esthetics similar to dentin<sup>3</sup> and most importantly it should bond to root dentin as well.<sup>1</sup> These teeth often have compromised pericervical dentin (PCD) which also needs reinforcement for the long term functional stability and fracture resistance of the teeth.<sup>4,5,6</sup> Although, scientific and technological advancements in the restoratives and adhesives have taken place,but till date there is no material that has proved to be as effective as the natural tooth structure keeping in consideration mechanical and biological properties.

However, the only material that can substantiate all these properties can be none other than dentin itself.The term "biological restoration" was coined that is based on adhesives in conjunction with extracted human teeth parts for restoration and reinforcement.<sup>7</sup> The pioneer published research describing the use of extracted tooth fragments as restorative materials was by Chosack and Eidelman(1964).<sup>8</sup> Ramires R *et al* (2000) utilised human teeth as natural post & crown in patients.<sup>9</sup> A few other reported cases and in vitro research studies utilizing dentin as post material have also shown promising and successful outcomes.<sup>10-18</sup> However,the probability of human dentin to serve as a post and core material needs to be clinically investigated further.

In our article, we have used the term "biodynamic" as we believe that this term is more appropriate and explains both positive aspects of such restorations – biological as well as mechanical.

This case report presents a case of esthetic and functional rehabilitation of severely mutilated central and lateral incisors using homogenous dentin fragment obtained from freshly extracted natural tooth,luted and reinforced with dual cure composite.

## Case report

A 22 year old male patient reported with a chief complaint of fractured upper left central and lateral incisors with the history of trauma at the age of 12 years.His medical history was not significant. The concerned teeth were asymptomatic and did not respond to both electric and heat test. On clinical examination, Ellis class III fracture was present in tooth number 21 and 22. [Figure 1]



Figure 1: Preoperative photograph showing Ellis class III fracture.

Radiographic evaluation revealed periapical radiolucency in both the teeth. [Figure 2]

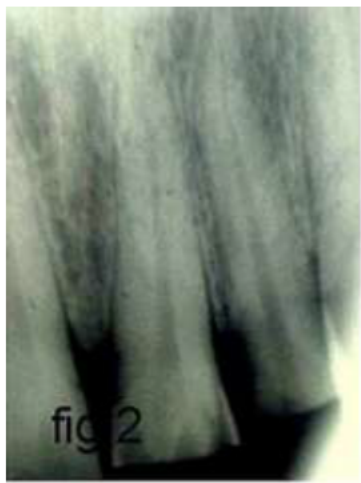


Figure 2: Preoperative radiograph.

Diagnosis of pulpal necrosis with asymptomatic apical periodontitis in relation to 21 and 22 was established. Root canal therapy followed by restoring both maxillary central and lateral incisors with intra-radicular biodynamic post and core made from the extracted natural teeth was planned. After agreeing upon the proposed treatment, a consent form was duly signed. In addition, the patient was explained that the post and the core would be obtained from natural, extracted teeth that had been previously sterilized by autoclaving in accordance with biosecurity standards.<sup>19</sup>

Under rubber dam isolation, access cavity preparation was done with the help of Endo access bur and refined with Endo Z bur (Dentsply, Maillefer Ballaigues, Switzerland). After initial estimation with the apex locator Raypex 6 (VDW GmbH, Munich, Germany), working length was radiographically determined with initial binding files ISO# 25 K-file (Dentsply, Maillefer Ballaigues, Switzerland) in both the canals. Canal debridement and cleaning was performed using step back technique and apical preparation was done till master apical file size # 40 K-file. Copious irrigation with 5.25 % sodium hypochlorite was done between each file used and finally with 17% EDTA before obturation. Canals were obturated with gutta-percha and AH plus sealer using lateral compaction technique. [Figure 3]

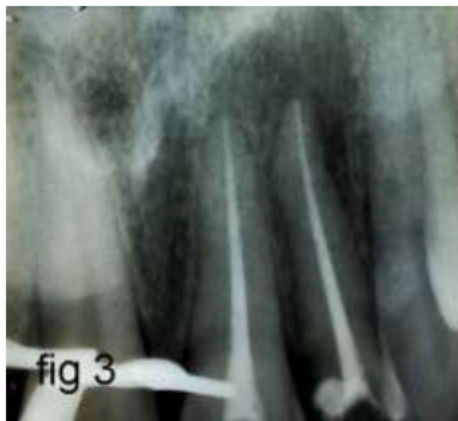


Figure 3: Post obturation radiograph

In the next appointment, minimal post space was prepared using peeso reamers after leaving 5 mm of gutta percha in the apical region. [Figure 4]

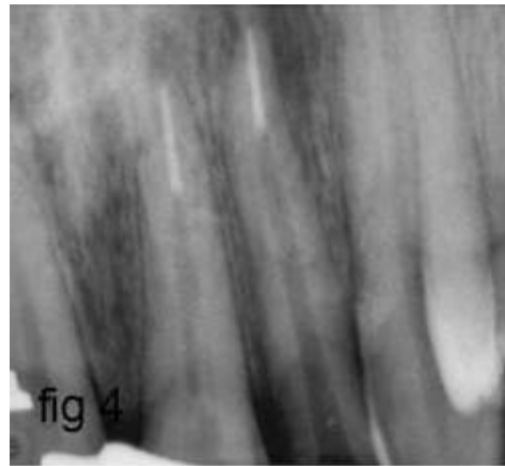


Figure 4: Radiograph after post space preparation

This was followed by impression of the post space with addition silicone impression material and positive replica was prepared in die stone. Dentin post and core was fabricated of an extracted central incisor natural human teeth after sterilisation -autoclaving at 121°C for 15 minutes using high speed handpiece and disc mounted in a slow speed handpiece. [Figure 5]



Figure 5: Post and core prepared from extracted tooth

After separation of the crown portion, the root was sectioned mesiodistally along the long axis of the tooth by using a diamond disk. Post and core was tried in and adjusted according to the post space in the cast. A final radiograph was taken to check the perfect seat of the dentin post and core. Subsequently, the inner portion of the maxillary central incisor canal was conditioned with 37% phosphoric acid for 15 seconds. Next, wash the canal with water for 15 sec and dry the canal with paper points. The adhesive was applied and cured. The dual-cured resin cement (RELY XTM U200, 3M ESPE) was applied to the inner portion of the canal with the help of a Lentulo spiral and to the surface of the dentinal post, which was then inserted into the canal of maxillary central incisor under



constant digital pressure until the cement polymerization. [Figure 6,7]

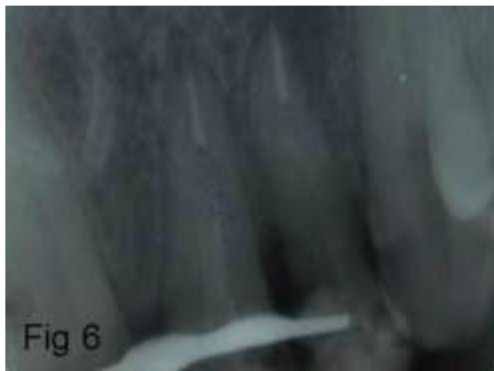


Figure 6: Radiograph showing biodynamic post and core in position



Figure 7: Luted post and core

Patient was recalled after one week for initial follow up. As there were no signs of discomfort, tooth preparation was done for PFM crown. Later on, PFM crowns were luted. [Figure 8]



Figure 8: Crown cementation.

The patient follow up was done for one year and there was decrease in radiolucency and gingival and other tissues were normal.

### Discussion

The term biological “restoration” was coined by Santos and Bianchi (1991) to describe a technique that uses adhesive materials with placement of pre-shaped parts of freshly

extracted human teeth<sup>7</sup>. This alternative technique can be carried out predictably, quickly and is inexpensive.

The use of biological posts fabricated from natural teeth present a feasible option for the reinforcement of root canal and has advantages such as decreased dentin stress on canal walls, preservation of structure of the internal dentin, biocompatibility, enhanced tooth strength and retention in comparison to the posts available in the market, resilience like the original tooth and good adhesion to the structure of the tooth and composite resin and less cost.<sup>9-18</sup> Most importantly tly ,biological restorations with modulus of elasticity being same as that of the tooth to be restored resonate same like natural tooth in stressful situations.<sup>16</sup> Considering all these features of such post and core, we have coined a better term “biodynamic” to describe such post and cores as they share the same biomechanics with the tooth in all static and dynamic situations.

As these biodynamic post and cores are made of predominantly dentinal structure taken from freshly extracted teeth, they have similar anisotropic structure as that of compromised tooth structure to be restored. Similar structure might lead to absorption and dissipation of stresses in similar manner like normal tooth. This approach by virtue of monoblock formation can also reinforce pericervical dentin which gets compromised during access preparation, cleaning and shaping as well as with use of the irrigants.<sup>4-6,20</sup> However, the biomechanical properties of these biodynamic restorations are yet to be determined for the long term clinical use.

Ambica K *et al* compared the fracture resistance under static and fatigue loading of endodontically treated teeth restored with fiber-reinforced composite posts and experimental dentin posts milled from human root dentin by using computer-aided design/computer-aided manufacturing<sup>16</sup>. Results suggested that human dentin can serve as post material under static and fatigue loading. Kathuria A *et al* in another study concluded that biological posts have higher fracture resistance comparison to the carbon Fiber & Glass Fiber posts. Few other authors in different parts of globe have also successfully used extracted teeth as post and core materials for restoring and reinforcing compromised teeth.<sup>10-15</sup> The reason might be that the physiomechanical properties of dentin post are same as root dentin leading to uniform distribution of stress by monoblock formation and reinforcement of pericervical dentin.<sup>4-6,20</sup>

Taking in account all the advantages of dentin post, proposed treatment to restore both maxillary central and lateral incisors included intraradicular biodynamic post and core was made from the extracted natural teeth.

The method of using biodynamic post and core for mutilated teeth has shown promising results. Furthermore, it proved to be a cost effective alternative as it is possible to reuse precious biological tissues which are discarded as bio-waste most of the time.

The use of natural extracted teeth for biodynamic restorations does have some limitations like patient acceptance, difficulty in retrieval in case of retreatment, availability of teeth with similar structure and tooth color.<sup>18</sup> Furthermore, longevity of biodynamic post and core system used to restore an endodontically treated tooth is affected by many factors like design, length, diameter of root, cementation and quality and quantity of remaining tooth structure.<sup>18</sup> Biologic post and core is dentin, which can be used for root canal reinforcement but, further long term clinical studies are required on this subject to better understand biomechanics.

Lastly, it is predicted that using the CAD CAM systems, it will be possible to engineer these post and core more precisely and predictably in future.

### Conclusion

Within the limitations, it seems that biodynamic dentin post and core offer excellent esthetic, functional advantages to achieve the morphofunctional restoration and rehabilitation of severely mutilated teeth. This case report presents management of a fractured endodontically treated teeth with biodynamic dentin post and core. These Post and core have excellent esthetic, functional & psychosocial effects. However, further studies are needed to evaluate the fracture resistance, adhesion & long term mechanics of these post and cores so as to better address the positive attributes and limitations of this technique and to recommend it as more acceptable for both dentists and patients.

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**Corresponding Author**

**Dr. Vipin Arora**  
Professor & Head,  
Endodontics Division,  
Department of Restorative Dental Sciences,  
Faculty of Dentistry,  
Taif University, Kingdom of Saudi Arabia  
Email Id: - vipinendodontist@gmail.com