

CASE REPORT

ESTHETIC REORIENTATION OF TRAUMATISED MAXILLARY RIGHT CENTRAL INCISOR BY A NOVEL, FLEXIBLE POST SYSTEM AND CORE RECONSTRUCTION

Dr. Aditya Keshav^{1*}, Dr. Shuaib Khan², Dr. Anagha Shankar Narayan³, Dr. Anjana Murali⁴

¹ BDS, Associate Fellow- The American Academy of Implant Dentistry; Consultant Implant Dentist, Bengaluru , Karnataka, India

² PG Diploma in Conservative Dentistry and Endodontics; Consultant Endodontist and Aesthetic Dentist, Bengaluru, Karnataka, India

³ BDS; D A Pandu Memorial RV Dental College; Bengaluru, Karnataka, India

⁴ BDS, MPH; University of Massachusetts, United States of America

**Author of Correspondence: Dr. Aditya Keshav, BDS, Associate Fellow- The American Academy of Implant Dentistry; Consultant Implant Dentist, Bengaluru, Karnataka, India*

Email: adityakeshav@live.in

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ABSTRACT

Objectives- Preservation of natural teeth through restorative dentistry and endodontics remains a foundational aspect of dental therapy worldwide, especially in the maxillary anterior region where esthetics and facial form are paramount. This case report aims to highlight an effort to rehabilitate a maxillary right central incisor with substantive coronal damage by using an “out-of-the-box” approach to ensure minimally invasive treatment while achieving optimal outcomes. **Clinical Considerations-** The complexity of clinical presentation, alongside factors such as tooth viability, treatment duration, cost, and patient preference, necessitates a tailored plan. Thorough evaluation is essential to restore teeth as close as possible to their original form, function, and esthetics, within applicable limitations. In this case, we preferred redoing endodontic therapy using a bioceramic material as sealer, followed by restoration with a new, slightly flexible fibre post system (Biolight Plus) to alter the post’s angle of emergence, and completion with a multi-layered all ceramic post endodontic restoration.

Conclusion- Innovative, customised treatment strategies which can take advantage of currently available flexible fibre post systems, and all ceramic crowns can aid in preservation of the affected natural tooth while combining esthetic and functional rehabilitation with successful and predictable treatment outcome.

Introduction

Natural teeth are designed to function optimally within the oral cavity. However, due to factors such as dental caries, trauma, genetic malformations, and increasing esthetic or functional demands, endodontic treatment may be necessary at times to address these issues. Endodontically treated teeth, however, do not retain the same functional efficiency as intact natural teeth owing to the structural alterations they undergo during treatment. Nonetheless, when appropriately restored, these teeth can help maintain much of the oral architecture and function.

The restoration of badly mutilated teeth presents a challenge to clinicians. Treatment decisions must take into account the choice of materials, the extent of intervention required, harmony with adjacent hard and soft tissues, duration of treatment, patient expectations, and financial constraints. While multiple treatment modalities exist, endodontic treatment followed by a post and core-supported restoration remains a highly favored option where indicated. This approach is less invasive, more economical, and offers greater flexibility in the management of unforeseen or adverse clinical scenarios [1].

A post and core system is defined as “a restorative procedure in which a post is placed within the root canal to aid in the retention of a core that replaces lost coronal tooth structure, thereby providing support for a definitive prosthetic crown.” These systems are used to reinforce and restore severely compromised teeth to allow placement of a full-coverage crown [2]. Over time, post and core systems have evolved from wooden posts to metal, and more recently to fiber-reinforced and CAD/CAM milled ceramic systems [3]. Among these, fiber post systems are now preferred due to their ease of use, range of availability and affordability in diverse clinical scenarios, especially for anterior teeth, subject to sufficient availability of remaining coronal tooth material [4,5].

Different types of fibre posts are available, viz., glass fibre post, resin fibre post, carbon fibre post, etc., to name a few, in different dimensions. A recent advancement in this area is the multifibre post system, such as Biolight Plus, which consists of braided, reinforced fasciculated micro glass

fibers. These systems are particularly useful for reconstructing the coronal structure of endodontically treated teeth—especially maxillary anterior teeth—with minimal tooth preparation [6,7]. Maxillary anterior teeth play a crucial role in facial aesthetics and expression. Any pathological or traumatic compromise to these teeth can significantly affect a patient’s appearance and psychosocial well-being, necessitating timely and esthetically sound restorative interventions [8,9]. This case report describes the clinical management of a patient who presented with a dislodged Richmond crown, and outlines the steps undertaken to restore the affected anterior tooth to optimal esthetic and functional form by modifying the angle of the post emergence from the orifice and subsequent core buildup and full coverage zirconia crown restoration.

Case Description

A 32-year-old male patient presented to our general practice dental office with a chief complaint of dislodged Richmond Crown from the maxillary right central incisor (Tooth Number 11- FDI system; Tooth Number 8- Universal Numbering System; Universal Numbering system has been used in this case report). A full and detailed case history was obtained from the patient in which he gave a history of Chronic Gastroenteritis and was on corrective medication for the same at the time. He disclosed that he had been using Vape for the last several years and is trying to quit the habit. No other contributory medical or social history was noted.

Upon eliciting a dental history, the patient reported that he had experienced a traumatic injury to the tooth in question almost 20 years ago and the same was endodontically treated and a Richmond Crown delivered as the final restoration. He also stated that he further started orthodontic therapy in a university dental institution in India 7 years ago but discontinued the treatment after 4 years of compliance due to long treatment duration and frequent change of treating professionals.

On Clinical Examination, there was 1-1.5mm of clinical crown structure available, periodontal probing depths were within normal limits with no clinical mobility, no tenderness on percussion or palpation and no frank fracture lines were noted. Surrounding soft tissue and dento-alveolar structures exhibited normal health status. Other findings included deep dentinal caries in teeth numbers 1, 16 and 17, a dislodged

restoration was observed on tooth number 31. Ellis class 1 fracture was present on tooth number 9.

An intra-oral periapical radiograph was obtained using a RVG sensor- Orikam Nanopix 1- APS CMOS, 16 bit, 201p/mm True Resolution with a USB 2.0 interface with Ip68 Data protection (Manufactured by Changzhou Sifary Medical Technology Co.Ltd.; No.99 Qingyang Road, Xuejia Town, Xinbei District, Changzhou City, 213000 Jiangsu P.R. China) and associated software on a Windows 10 enabled PC. The X-ray was shot using a Orikam HyperLight Dental X-Ray Unit- 0.4mm Focal Spot, Exposure time range of 0.02 to 2 sec and Tube Current of 2.5mA (Manufactured by Orikam Healthcare India Pvt. Ltd.; #9753, 3rd Floor, Arogyam Building, Subhash Nagar, Gurgaon 122001).

The resulting radiograph showed a root canal system obturated till 5mm above the apex and empty middle and cervical third of the root canal system, most likely prepared to house the dowel aspect of the Richmond Crown, with approximately 3mm of total remaining coronal structure upto the cemento-enamel junction. The periapical area displayed a frank breach of the lamina dura with an irregularly shaped rarefaction measuring about 5mm*5mm, suggestive of a chronic periapical lesion.

The present clinical scenario can be classified as an Esteves Correia Class II [10] , i.e., Moderate Prognosis and devised the following treatment plan:

- 1) Endodontic Retreatment of Tooth Number 8
- 2) Crown Lengthening for Tooth Number 8
- 3) Functional and esthetic rehabilitation for Tooth Number 9
- 4) Post and core buildup for Tooth Number 8 using Biolight Plus post system for Tooth Number 8
- 5) Full coverage Milled and Layered Zirconia Crown for Tooth Number 8
- 6) Intermediate Restorations for Tooth Number 8 between various stages of treatment

A complete informed consent was obtained from the patient before start of treatment, including a consent for photography and sharing the same.

Treatment Protocol

Day 0: Initial Assessment and Start of Treatment.

Patient examined and assessed as mentioned above.

Key findings are as follows: (Fig 1)

1. Dislodged Richmond crown of tooth number 8. Graded as Esteves Correia Class II.
2. Ellis class 1 fracture of tooth number 9.
3. Deep dentinal caries in teeth number 1,16,17.
4. Dislodged restoration in tooth number 31
5. Orthodontic Findings - Anterior deepbite, lingually tipped Tooth No. 8, Labially tipped Tooth No.9, Crossbite of the distal aspect of Tooth no.11 with mesial aspect of Tooth no. 21, Angle's class 1 molar relation

The following diagnosis was made:

1. Previous endodontically treated tooth number 8 with asymptomatic apical periodontitis.
2. Tooth number 9: normal pulp.
3. Tooth number 1,16,17 and 31: reversible pulpitis with normal apical tissue.
4. Chronic generalised gingivitis.
5. Angle's class 1 Malocclusion

The following treatment was rendered on day 0:

Oral prophylaxis was performed followed by initiation of repeat endodontic therapy under local anaesthesia (2% lignocaine, 1: 80,000 adrenaline. Lignox 2% A. Manufactured by Kilitch Drugs India Ltd, Maharashtra, India) and was temporarily restored with a Temporary Restorative Material- NeoTemp (Manufactured by Orikam Healthcare India Pvt Ltd, Gurugram, Harayana- 122001, India). Since the patient was already anaesthetised and in order to reduce the overall treatment duration, crown lengthening surgery up to an extent of 2mm all around the tooth was carried out using a surgical scalpel to establish a ferrule on the remaining tooth structure.

Thereafter, a polycarbonate temporary crown was affixed using Templute temporary luting cement (Manufactured by Prime Dental Products Pvt Ltd, Maharashtra, India) to temporarily mimic a clinical

crown without accounting for the shade or size of the tooth for immediate and initial rehabilitation as per patient's request.

Day 1: Composite restoration done on tooth number 9 (Fig 2)

Since aesthetics was our prime concern in this clinical scenario, we decided to restore and enhance tooth number 9 beyond its original contours to compensate for the size and shape discrepancy noted between the two central incisors when the Richmond crown was in place of tooth number 8. Thus, the Ellis class 1 fracture on tooth number 9 was restored with composite after selective etching under strict rubber dam isolation, followed by the enlargement of the mesial contour of the tooth to compensate for the size and shape discrepancy noted. Shade matching was achieved by placing and curing a small button of composite on the labial surface of tooth number 9.

The following shades of composite were used to obtain an adequate aesthetics:

1. A2 shade of RestoFill light cured composite - Radiopaque (Manufactured by Anabond Stedmen Pharma Research (P) Ltd - 117 Siriya Kattoor, Thiruporur Taluk, Chengalpattu District, Tamil Nadu - 603108, India).
2. Translucent Shade, Tetric N-Ceram Filling Material (Manufactured by Ivoclar Vivadent AG, Benderstr. 2, 9494 Schaan, Liechtenstein).

Tooth number 8 was checked for gingival healing, the temporary crown and temporary orifice restoration were removed, root canal system irrigated with 0.9% isotonic saline solution. Thereafter, the same temporary crown was re-cemented post closure of the root canal orifice with temporary restorative material.

Day 3: Obturation of tooth number 8.

Rubber dam application was done to achieve complete isolation and to prevent contamination of tooth number 8. Temporary crown and orifice restoration were removed. Walls of the root canal system were refined, and the tooth was checked

for absence of any discharge, upon confirmation of which, the canal was dried using paper points of adequate size. It is pertinent to note that this root canal system previously held an obturation and there was clear evidence of root canal system preparation using step back technique, given the flare of the root canal system.

Master apical gutta percha cone (#50-2%) was selected corresponding to the master apical file size, which was confirmed by master apical cone radiograph and apical tug back. (Fig 3) A bioceramic material- Bioroot RCS (Manufactured by Septodont, Saint-Maur-des-Fosses, France.) was employed as sealer. The obturation was completed using lateral condensation technique and was followed by searing off of the butt end of the Gutta Percha cones using a flame heated hand plugger. A temporary restoration was placed after covering the orifice with a small teflon plug. The patient was kept under observation for 1 week and recalled on day 10.

Day 10: Post and Core on tooth number 8 and First Impression.

The patient had an anterior deep bite and a lingually tilted maxillary central incisor (tooth #8), where the lower incisors interfered with the insertion path of a standard rigid post. Rather than using a traditional custom cast metal post and core to alter the angle, a slightly flexible Biolight Plus post system was selected.

The Biolight Plus system features multiple fiber strands bundled within a sleeve, allowing customizable placement tailored to canal dimensions. To accommodate the patient's wide, previously prepared root canal, two post bundles (sizes 9 and 6) were used. Additionally, the system bonds to dentin via resin cement, reinforcing the tooth and lowering root fracture risks compared to cast posts in thin-walled canals. (Fig 4)

After isolating the area, the temporary restoration was removed. A Peeso reamer was used to remove root canal filling material up to 5 mm short of the apex, carefully preserving the surrounding dentin. Radiographic verification confirmed the depth, after which the canal was cleaned and dried with paper points to ensure optimal polymerization.

Both fiber post bundles were trial-fitted, removed, sanitized with surgical alcohol, and dried. They were then silanated using Silan (PPH CERKAMED) and allowed to air dry. Finally, a layer of bonding agent

(StedBond, Anabond Stedmen Pharma) was applied separately to each post.

Self-adhesive resin cement (3M™ RelyX™ U200 Automix) was injected directly into the canal. Post bundle No. 9 was inserted immediately, followed by bundle No. 6 placed distally to achieve a tight fit. Prior to light-curing, a stainless-steel needle holder secured both bundles at the orifice level while they were tilted facially, aligned with tooth #9 as a reference. Following light-curing, the excess fiber bundle length was trimmed using surgical scissors to roughly half the coronal height of tooth #9. Core build-up material (ParaCore, Coltene Whaledent) was then applied, contoured, and a proper ferrule was prepared to accommodate a final zirconia crown. (Fig 5)

Two-stage putty-wash impressions of the upper and lower arches were taken alongside a wax bite registration and forwarded to the dental laboratory. Tooth shade was documented using the Vita Shade guide and supported by photographs to ensure proper aesthetics. On Day 12, a pre-final crown was seated using temporary cement (TempLute, Prime Dental Products) to allow 2 weeks for gingival healing and to evaluate any necessary aesthetic or functional adjustments.

Day - Day 24: Final Impressions and corrections

The patient reported back with a concern of contact between the prosthesis and his lower anterior natural teeth. The temporary crown was removed atraumatically since it was only cemented with a temporary cement. Requisite modifications to the crown preparation were carried out and another single stage Putty-Light body combination impression was made. A bisque trial (Fig 6) of a multi-layered zirconia crown was requested to suggest any corrections as required in the final prosthesis and the same was delivered on Day 23. All suggestions from the patient and our own observations were passed on to the laboratory for further processing.

Day 25: Final Cementation of Crown for Tooth Number 8 (Fig 7)

The glazed final crown was checked for fit of margins, centric and eccentric contacts and esthetics. Upon approval by the patient and

meeting our satisfaction, the same was bonded using self-adhesive resin cement (3M RelyX U200) and tack cured for 5 seconds all around, excess cement was removed using an explorer and floss. Final curing was performed for 20 seconds all around and finally checked and verified to ensure no discrepancy.

Ten month follow up was within normal limits with good soft and hard tissue health and no intervention was deemed necessary at that point. (Fig 8)

Conclusion

Clinical situations involving the anterior esthetic zone often demand a high degree of precision to deliver optimal results. While most situations may be straightforward, not all are ideal and necessitate a less conventional, novel and innovative approach for delivering the required care. The above clinical scenario is one such instance where any other modality of treatment would have resulted in a less than acceptable outcome for the patient. This technique, although not ideal, saved a lot of time & money and also resulted in a marked esthetic transformation for the patient.

Disclosure Statement

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Clinical Significance

The clinical technique put to use in this case report highlights the possibility of using braided, reinforced fasciculated micro glass fiber posts to alter the angulation of emergence of the post, which was conventionally done using a cast post and core technique employing base metal alloys to decrease the chances of root fracture and treatment duration, improve esthetics and longevity of treatments delivered to patients.

Disclaimer

The technique employed in this clinical case report has not been previously studied or evaluated for long term clinical outcomes. However, it was employed because of various factors under consideration and has since been stable. The same was explained to the patient and

consent was obtained before performing this procedure.

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Figures



Fig 1: Pre Operative Photograph and Pre Operative Radiograph



Fig 2: Post Operative picture of Day 0 showing soft tissue management and Tooth Number 9 restored and resized. Note the temporary crown on Tooth Number 8

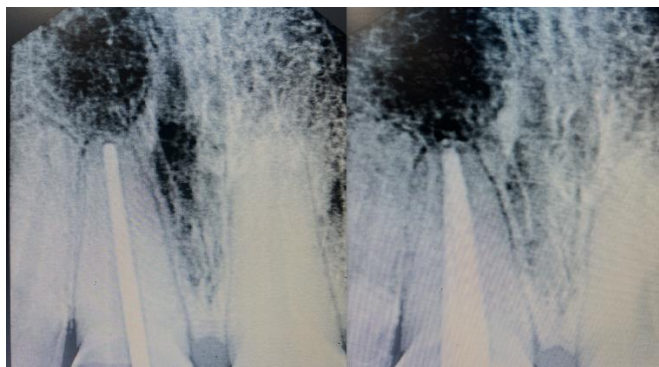


Fig 3: Master Apical Cone and Obturation Radiographs



Fig 6: Final two stage impression and Bisque Trial with corrections marked



Fig 4: Check radiograph with post; Bundles of Biolight Plus posts bent labially to achieve adequate occlusal clearance for the core.



Fig 7: Post Operative radiograph immediately after crown cementation and Final restoration



Fig 5: Tooth Number 8 after core build-up showing enough occlusal clearance obtained.



Fig 8: 10 month post operative radiograph and Clinical Photograph. Note the healing of the periapical region.