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CASE REPORT

Rehabilitation of a Structurally Compromised Endodontically Treated Tooth with a Custom Cast Post and Core: A Case Report

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Abstract

Background: Successful rehabilitation of endodontically treated teeth depends largely on the amount of remaining tooth structure and the selection of an appropriate post system. Custom cast post and core restorations provide superior adaptation and retention in teeth with extensive coronal loss or flared canals.

Case Presentation: A 32-year-old female presented with a fractured maxillary left lateral incisor following trauma. Clinical and radiographic findings revealed an Ellis Class III fracture with significant coronal destruction and a diagnosis of irreversible pulpitis with asymptomatic apical periodontitis. Root canal treatment was performed followed by post space preparation while maintaining 5 mm of apical gutta-percha. A custom cast post and core was fabricated using an indirect technique and cemented, and the tooth was restored with a porcelain-fused-to-metal crown.

Conclusion: Custom cast post and core remains a reliable option for restoring structurally compromised endodontically treated teeth, providing adequate retention, strength, and long-term functional and esthetic rehabilitation.

Keywords: Dental Trauma, Endodontically Treated Teeth, Post and Core

Introduction

One of the most essential factors that determines the long-term prognosis of an endodontically treated tooth, is the remaining tooth structure. Rehabilitation of such tooth relies on location, presence of ferrule and amount of remaining dentinal walls.[1] The primary purpose of a post is to retain the core in addition to reinforcing the weakened tooth. Recent years have seen a rise in multiple post systems including glass posts, fiber-reinforced posts (FRC), carbon fiber posts and many more.[2] The custom-made cast post and core systems have been used since decades especially in severely worn-out teeth. They have an added advantage of better adaptability, higher retention and strength even though fabrication is cumbersome as compared to prefabricated post systems.[3] If a canal needs extensive preparation and is flared and wide throughout its length, a well-adapted custom made cast post is restoration of choice which helps withstand torsional load.[4] This case report demonstrates the restoration of a fractured upper lateral incisor restored with custom made cast post followed by full coverage crown.

Case Report

A 32-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of broken upper front tooth. The patient gave history of trauma two months back in the upper front region with a blunt object. Clinical examination revealed Ellis class 3 fracture in relation to #22 with more than 2/3rd of coronal structure loss (Figure 1a). A cold pulp sensibility test was performed using Endolce followed by heat test using

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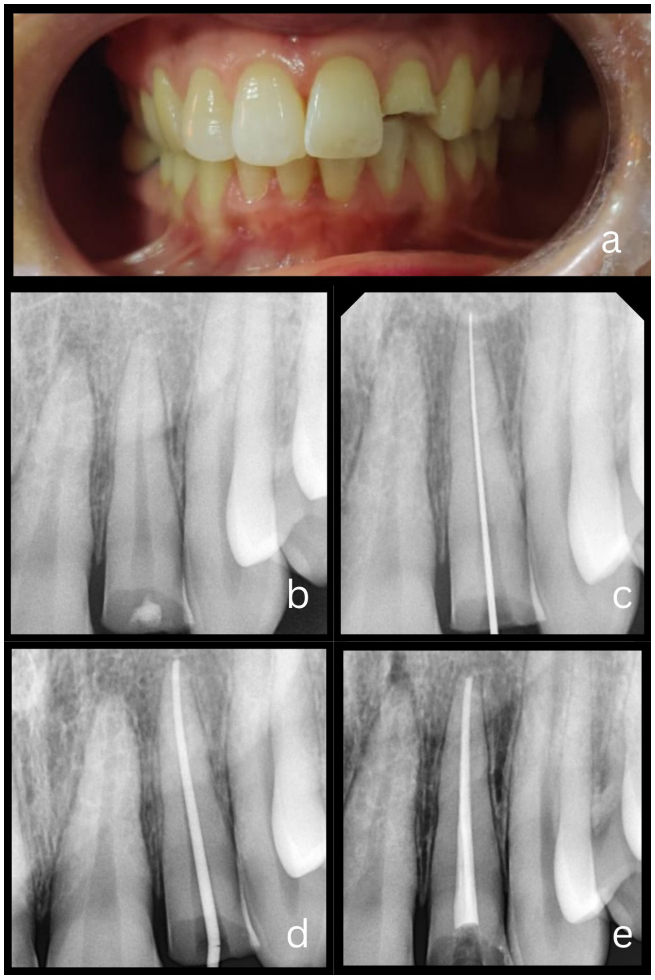

Figure 1: (a) Preoperative clinical image of #22. (b) Preoperative RVG of #22 (c) Working length radiograph (d) Master cone Radiograph (e) Post obturation radiograph showing 3-dimensional seal.

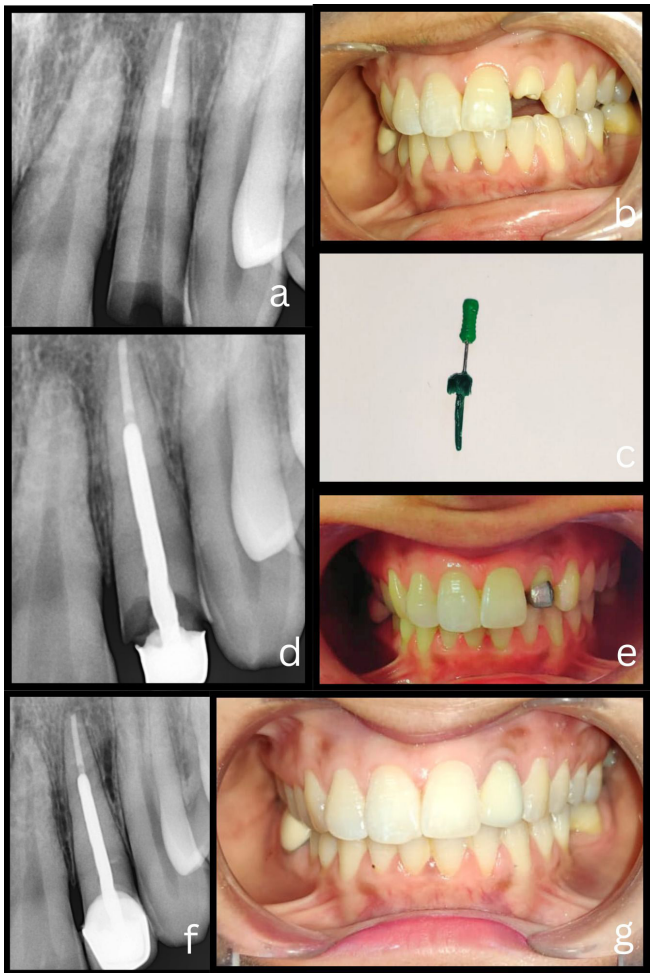

Figure 2: (a)Post space preparation confirmed using radiograph (b) clinical image showing crown preparation (c) Pattern taken using a pattern resin stick-assisted indirect technique (d and e) Metallic post cemented and confirmed radiographically (f and g) radiograph and clinical image post crown cementation.

a heated gutta-percha stick applied to the tooth surface which gave a negative response. Preoperative RVG revealed exposure of pulp in relation to #22 (Figure 1b). A diagnosis of irreversible pulpitis with asymptomatic apical periodontitis was established for #22.

The patient was advised to undergo Endodontic treatment followed by custom cast post and full coverage crown, as esthetic restoration was the major concern.

Local anesthesia with 2% Lignocaine and 1:200000 adrenaline (Lignox 2% A, Indoco Remedies Ltd., India) was administered and an access was prepared with high- speed handpiece bur (Mani Inc., Japan) under x2.5 magnification (Carl Zeiss Meditec AG,Germany). Patency was established using a 10-K Hand file (Mani Inc., Japan). The working length was recorded using an apex locator (Root ZX mini, J. Morita, Japan) which was then confirmed radiographically (Figure 1c). Biomechanical preparation was completed till size 30/0.06 (Jizai, MANI, India) along with copious irrigation using 2.5% NaOCl (Vishal Dentocare Pvt. Ltd., India) via 30-gauge side vented needle and ultrasonic activation with intracanal heating. The canal was sealed with premixed calcium hydroxide (Metapex, Meta Biomed Co., Korea) for 1 week and temporized using cavit.

The patient was recalled on one week, and medicament was washed out and master cone radiograph taken followed by obturation using zinc oxide eugenol- based sealer (SafeEndo EugeSeal, India) (Figure 1d and e). Post space preparation was then conducted using a peeso-reamer ranging from size #1 to #4 (MANI Inc., Japan) and the gutta percha was flattened using a hand plugger (GDC, India). The canal was prepared to retain 5 mm of gutta-percha for maintaining the periapical seal (Figure 2a). Cown preparation was done to create a core ferrule and a crown ferrule of with shoulder finish line on labial and chamfer on lingual surface (Figure 2b).

For taking the wax pattern for cast post, an indirect technique was implied. The post space was coated with separating media (Vaseline) and pattern wax (GC America,

Pattern resin was heated and shaped using wax instruments over a hand file (Figure 2c).

The pattern was then casted into a metal post & core which was cemented on the next visit luting GIC (GC Gold Label 1, GC Corp, Japan)(Figure 2d and e). An elastomeric impression was obtained using heavy-body and light-body impression materials. Shade selection for the porcelain-fused-to-metal (PFM) crown was performed under natural daylight. PFM crown was fabricated for teeth #22 and subsequently cemented using Type I glass ionomer cement (Figure 2 f and g).

Discussion

Restoration of endodontically treated teeth with significant coronal destruction continues to be a challenging aspect of restorative dentistry. Teeth that have undergone root canal therapy frequently present with compromised structural integrity due to caries, trauma, and loss of dentin during endodontic access preparation. Consequently, an effective post-endodontic restorative strategy is essential to re-establish mechanical strength and ensure long-term clinical success.[5]

Posts are commonly used in situations where insufficient coronal tooth structure remains to retain the core material. Successful restoration depends on the harmonious distribution of occlusal forces along the root while preserving the integrity of the remaining tooth structure. The choice of post is generally determined by the canal morphology, amount of residual dentin, esthetic considerations, and functional requirements.

Despite the growing popularity of fiber posts in contemporary restorative dentistry, custom cast post and core restorations remain a dependable option for teeth with extensive coronal loss or irregular canal anatomy.[6] Their ability to be fabricated according to the internal configuration of the root canal allows improved adaptation and retention compared with prefabricated posts. A recent retrospective cohort study by Ben Suleiman et al. (2024) reported favorable clinical outcomes for endodontically treated teeth restored with custom-made cast post-and-core restorations, suggesting that they remain a viable restorative option for structurally compromised teeth. [3]

Another important consideration in post selection is the morphology of the root canal. In cases where canals are flared or excessively wide, prefabricated posts may not achieve optimal adaptation, which can lead to increased cement thickness and reduced retention. Custom cast posts allow accurate replication of the canal anatomy and provide enhanced resistance to functional stresses. Additionally, their one-piece design integrates the post and core into a single structure, thereby minimizing the risk of core dislodgement and improving overall stability of the restoration.[7]

Recent systematic reviews have also compared the clinical performance of fiber posts and metallic posts. A systematic review and meta-analysis by Tsintsadze et al. (2022) reported survival rates of approximately 92.8% for glass fiber posts and 78.1% for metal posts, indicating that both systems can be reliable when adequate coronal tooth structure is missing.[8] Furthermore, another recent review evaluating post-endodontic restorations emphasized that the long-term success of these restorations is influenced not only by the post material but also by factors such as remaining tooth structure, ferrule effect, and appropriate restorative technique.

Preservation of the apical seal during post space preparation is also a crucial factor in treatment success. Maintaining approximately 4–5 mm of gutta-percha apically helps prevent reinfection and preserves the integrity of the root canal obturation. In addition, the presence of an adequate ferrule significantly improves fracture resistance and enhances the longevity of the restored tooth.[9]

In the present case, traumatic injury resulted in severe loss of coronal tooth structure, making direct restoration impractical. A custom cast post and core was selected to provide optimal adaptation and retention within the canal.[10] The final restoration with a porcelain-fused-to-metal crown restored both esthetics and function while protecting the remaining tooth structure.

Although primarily restorative in nature, this case also has relevance in forensic odontology. Dental restorations such as custom cast posts, cores, and crowns produce distinctive radiographic patterns that can aid in the identification of individuals.[11] The internal morphology and material characteristics of these restorations often remain preserved even under adverse conditions. Such features can be compared with ante-mortem dental records during forensic investigations. Therefore, detailed documentation of endodontic and restorative procedures contributes valuable information for forensic identification.

While the primary objective of this case was functional and esthetic rehabilitation, it also holds relevance from a forensic perspective. Restorative procedures such as custom cast post and core leave behind identifiable features within the root canal system that can be visualized radiographically. The configuration of the post, its extent within the canal, and the associated coronal restoration often create a pattern that is unique to the individual. In circumstances where conventional methods of identification are not feasible, such as in severely decomposed or burned remains, these dental characteristics can assist in establishing identity through comparison with prior dental records. Additionally, the resistance of metallic restorations to environmental damage further supports their usefulness in forensic analysis. Hence, careful recording of endodontic and restorative details can contribute meaningfully to identification procedures.[12]

Overall, this case highlights that custom cast post and core systems continue to be a reliable treatment modality for rehabilitating structurally compromised endodontically treated teeth when appropriate case selection and restorative principles are followed.

Conclusion

Custom cast post and core restorations remain a reliable option for rehabilitating structurally compromised endodontically treated teeth. When combined with adequate ferrule and proper restorative planning, they provide predictable functional and esthetic outcomes.

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