



Case Report

Rehabilitation of weak marginal ridges in endodontically treated teeth: Enhancing strength and longevity with horizontal fibre post

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Abstract

Endodontically treated teeth are often structurally compromised, making them vulnerable to fractures. Traditional vertical post systems provide retention but require invasive canal preparation, increasing the risk of root fractures. Horizontal fibre post, however, offer a minimally invasive alternative by reinforcing weakened structures and evenly distributing occlusal forces. This case report presents a case where horizontal fibre post and composite resin build-up were used for post-endodontic rehabilitation. The approach enhanced fracture resistance, retention, and aesthetics while preserving natural tooth structure. This technique demonstrates a promising and cost-effective alternative to traditional systems, ensuring long-term durability and function in compromised teeth.

Keywords: Horizontal fibre post, Endodontically treated teeth

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1. Introduction

Teeth that have undergone endodontic treatment exhibit a higher risk of biomechanical failure compared to teeth with intact pulp vitality. Cusp fractures are predominantly observed in premolars due to their anatomical configuration, unfavourable crown-to-root ratio, and susceptibility to shear and compressive stresses.¹ The quality of coronal reconstruction directly influences the efficacy and durability of endodontic therapy.^{2,3} Parameters for an acceptable restoration include adequate anatomy, function, proximal contact, and occlusal stability.³ Coronal damage from dental caries, extensive dentin removal, prolonged use of sodium hypochlorite, EDTA, and over-instrumentation are some of the causes of tooth fractures.^{2,4} A single marginal ridge loss causes a 46% reduction in tooth rigidity, while the loss of two marginal ridges causes a 63% reduction in tooth rigidity.⁵ Studies conducted in vivo and ex vivo have shown encouraging outcomes using a novel horizontal fibre post concept in endodontically treated teeth.^{6,7}

In clinical practice, horizontal fibre posts offer effective method for restoring function and aesthetics in endodontically treated teeth. Research has demonstrated that these posts provide improved fracture resistance, long-term stability, and enhanced aesthetic outcomes compared to traditional vertical post systems.⁸ Horizontal fibre post enhance stress distribution and fracture resistance while preserving the natural tooth structure. Unlike bulky metallic or ceramic restorations such as crowns, or onlays, they eliminate the need for additional procedures like laboratory fabrication and impressions, offering a minimally invasive, cost-effective, and aesthetically superior solution.

2. Case Report

A 22-year-old female presented with spontaneous pain in the upper right back teeth (14 and 15). The pain worsened with hot beverages and posture changes, such as bending, but was relieved by medication. Her medical history was non-contributory. On clinical examination, a previously attempted access cavity, misoriented mesiodistally instead of

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buccolingually, caused significant structural damage, including the loss of both marginal ridges (**Figure 1A**). Radiographs revealed radiolucencies near teeth 14 and 15, indicative of pulpal involvement, along with widening of the periodontal ligament and significant periapical radiolucency around tooth 14 (**Figure 1B**). A diagnosis of symptomatic apical periodontitis was made. The patient was informed about the treatment options and provided written consent. At the first visit, local anaesthesia (1.8 mL lignocaine with 1:80,000 epinephrine) was administered. The access cavity was refined, and the buccal and palatal canals of both teeth were located (**Figure 1C**). Working lengths were confirmed using an apex locator (Root ZX mini, J. Morita 4th gen apex locator) and radiograph (**Figure 1D**). Biomechanical preparation was performed with the ProTaper system, and irrigation was done with 5.25% sodium hypochlorite and 17% EDTA, activated ultrasonically. Calcium hydroxide was used as an intracanal medicament for 14 days. At the next visit, the canals were irrigated, the medicament was removed, and obturation was completed using the single-cone technique with AH Plus sealer (**Figure 2A, B**).

For post-endodontic rehabilitation, the tooth was etched with 37% phosphoric acid, and a bonding agent was applied. Composite resin was used to rebuild proximal walls and raise the floor height (**Figure 3A**). Using a periodontal probe, reference points for horizontal fibre post placement were marked halfway along the occlusogingival height (**Figure 3B, C**). Holes of 1 mm diameter were drilled into the buccal and lingual walls, and horizontal fibre posts were placed and cemented with flow able composite (**Figure 3D**). The remaining space was restored with bulk-fill posterior composite. Protruding post ends were trimmed and sealed with composite to prevent contamination. The restoration was polished to optimize function and aesthetics.

At the 1-year follow-up, the tooth showed no clinical or radiographic signs of pathology, and the patient reported satisfactory functionality (**Figure 4A, B**).

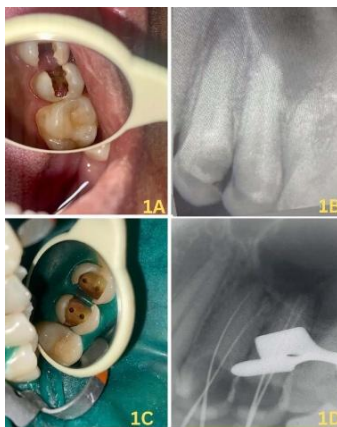


Figure 1: (A) Clinical Pre-op, (B) Pre-op IOPAR, (C) Access cavity with Buccal and palatal canals, (D) Working length determination.



Figure 2: (A) Mastercone fit, (B) Immediate Post-Op

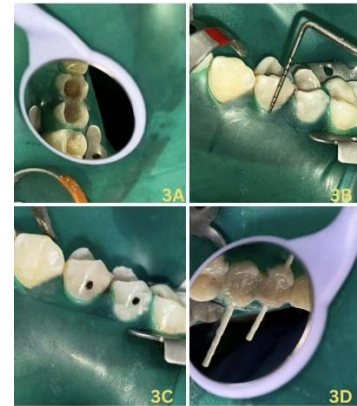


Figure 3:(A) Proximal wall build up with composite, (B) Use of Williams probe to mark reference point, (C) Reference point marked halfway along occlusogingival height and hole of 1mm drilled, (D) Fiber post placed horizontally via holes stabilized using flow able composite.



Figure 4:A, B 1 year follow up with satisfactory functionality clinical as well as radiographic.

3. Discussion

Endodontically treated teeth are prone to structural weakening and subsequent fractures, especially when a significant amount of tooth structure is lost during the root canal treatment or due to caries. Cusp fractures are particularly common in premolars, where the crown-to-root ratio is unfavourable, and shear and compressive forces are higher. In presented case, the use of horizontal fibre posts provided an effective solution for reinforcing the treated teeth. The post not only increased the fracture resistance of

the teeth but also helped in restoring their function and aesthetics.

The composite resin build up further enhanced the tooth's structural integrity, ensuring proper occlusal contact and proximal contact with adjacent teeth. Sharma et al., 2023 highlighted the superior biomechanical performance of horizontal fibre posts in rehabilitating molars with large mesio-occlusal-distal (MOD) cavities. The results suggested that horizontal fibre posts enhance fracture resistance, with minimal deformation and stress concentration, making them a reliable option for post-endodontic restoration in mandibular molars.⁹ Bromberg et al., 2016 concluded that endodontically treated molars restored with horizontal fiberglass posts and composite resin offer fracture resistance similar to that of only restorations, outperforming indirect inlays or direct Composite restorations alone. This suggests horizontal fiberglass post that provide a reliable alternative for reinforcing molars after endodontic treatment.⁵ Karzoun et al., 2015 concluded that horizontal glass fibre posts significantly enhance the fracture resistance of endodontically treated maxillary premolars with MOD cavities, offering a reliable reinforcement method. The addition of a horizontal post improved fracture resistance when compared to conventional resin composite restorations.¹⁰

Rana V et al., 2023 introduced a cast model method for fabricating acrylic templates, this method facilitates precise placement of two horizontal fiber glass posts in a buccolingual direction, enhancing fracture resistance in endodontically treated teeth and providing an efficient and cost-effective alternative to vertical post systems.⁶ However, in our case report, we achieved equally good results without employing the cast model method, using a Williams probe to accurately mark the point for post placement, simplifying the procedure while maintaining effectiveness. Mudunuri et al., 2024 concluded that horizontal fibre placement, including the novel horizontal bucco palatal fibre (HBF) technique, significantly reinforces endodontically treated maxillary premolars. The HBF group exhibited fracture resistance values comparable to intact teeth, suggesting it as an effective and conservative alternative to full-coverage restorations.¹¹ Hence, all the above findings support the use of horizontal fibre posts as a favourable reinforcement strategy, especially in teeth with extensive structural loss, ensuring successful clinical outcomes. Hence the integration of horizontal fibre posts into the restorative protocol for endodontically treated teeth provides enhanced fracture resistance, functional stability, and long-term reliability.

4. Conclusion

Horizontal fibre post provide a minimally invasive, effective solution for reinforcing endodontically treated teeth with compromised structure. By enhancing fracture resistance and distributing stress evenly, they preserve natural tooth structure and eliminate the need for complex procedures. In

the presented cases, this approach successfully restored function, aesthetics, and stability, with follow-ups showing no complications. Horizontal fibre posts are a reliable alternative to traditional methods, ensuring durable and cost-effective outcomes in post-endodontic rehabilitation. Future research and clinical trials could further validate their application and expand their use in a wider range of clinical scenarios.

5. Source of Funding

None.

6. Conflict of Interest

None.

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