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Restorative Strategy for Endodontically Treated Molars with Horizontal Posts-A Case Series

**Dr. S. Anitha Rao^{1*}, Dr.N. Sridevi², Dr.B.Pradeep Kumar³, Dr.V.Aravind Reddy⁴,
Dr.Koduru Jahnavi⁵, Dr.Dodda Sree Satya Gayathri⁶**

1.Professor and HOD, Department Of Conservative Dentistry And Endodontics, Mamata Dental College, Khammam – 507002

2.Professor, Department of Conservative Dentistry and Endodontics, Mamata Dental College, Khammam – 507002

3.Reader, Department of Conservative Dentistry and Endodontics, Mamata Dental College, Khammam – 507002

4.Senior Lecturer, Department of Conservative Dentistry and Endodontics, Mamata Dental College, Khammam – 507002

5.Pg 3rd Year, Department Of Conservative Dentistry And Endodontics, Mamata Dental College, Khammam – 507002

6.Pg 3rd Year, Department of Conservative Dentistry And Endodontics, Mamata Dental College, Khammam – 507002

ABSTRACT

In recent years the endodontic community has had ongoing vigorous dialogue regarding the extent of access cavity, loss of structural integrity of tooth and its impact on what is left of the original tooth structure, leading to a higher occurrence of fracture. Immediate full coverage with/without using a post and core is considered the most effective approach to minimize fractures but is often delayed by the patients leading to fracture of tooth. In-vitro studies research indicates that composite restorations strengthened with horizontally oriented fiberglass posts can withstand tooth fractures significantly. These cases report present placement of posts horizontally rather than conventional vertical placement in endodontically treated teeth to reinforce the remaining coronal tooth structure.

Keywords: Endodontically treated teeth, Horizontal post, Flowable composite, MOD Cavity, Fracture resistance

*Corresponding Author Name: Dr. S. Anitha Rao

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INTRODUCTION

To conserve the existing tooth structure is the primary goal of endodontic treatment.¹ ETT are at increased risk of fracture because of coronal destruction by caries, excessive removal of dentin during therapeutic procedures, trauma, previous restorations, prolonged use of sodium hypochlorite and EDTA and endodontic over instrumentation, there seems to be direct relationship between the quantity of remaining tooth walls and fracture resistance.²

The loss of structural integrity of cusps and ridges and the complete removal from roof of the pulp chamber during endodontic access affect tooth function because of cusp deflection, which may lead to a higher occurrence of fractures.³ The prognosis in teeth that have undergone endodontic therapy is contingent not only on apical seal but also on the coronal sealing of the canal thereby reducing leakage of oral fluids and bacteria into the periradicular areas.⁴

Unlike bulky metallic or ceramic restorations such as crown or onlays, they eliminate the need for additional procedures like laboratory fabrication and impressions, offering a minimally invasive cost effective, and esthetically superior solution⁵. One of the major challenges in restoring deep carious lesions with mesio-distal extension is the significant reduction in fracture resistance compared to that of an intact tooth.⁶ Studies indicate that the loss of a single marginal ridge reduces tooth rigidity by nearly 46%, whereas the loss of both marginal ridges results in an approximate 63% reduction.

Though numerous treatment modalities and restorative approaches are available in dental practice for coronal rehabilitation of teeth that have received root canal therapy such as use of post and core, partial crowns, direct composite resins, and amalgam or ceramic restorations the selection of the best restoration is still debated. In addition to providing function, esthetic and marginal sealing, the chosen restoration needs to safeguard whatever is left of the tooth structure⁸. A widely used post-root canal procedure involves placing a glass fiber post combined with resin composite that is bonded adhesively, aimed at improving resistance to fractures.⁹

This case report describes the use of horizontal posts to enhance fracture resistance in severely weakened endodontically treated molars in two patients. The cases were done after obtaining Ethical clearance (EC/IRB NO: MDC-R- 088515) from Institutional ethical committee Mamata Dental College, Khammam.

CASE REPORT 1

40-year-old women reported to the department presented primarily complaining of dislodged restoration in her lower left back tooth region since four months. (Figure- 1a) She reported having undergone root canal treatment with respect to tooth 37. On clinical examination teeth

were asymptomatic with no pain, swelling, mobility and on radiographic examination there are no periapical changes visible. Based on remaining tooth structure present treatment was planned to place horizontal posts followed by crown. Procedure was thoroughly explained to the patient to save the teeth. After obtaining consent from the patient.

At first visit, two cross-sectional holes were created through the remaining buccal and lingual walls using no.2 round bur. Size 2 fiber posts were placed through the holes. After standard acid etching and prime bonding protocol for coronal chamber the fiber posts were placed (Figure- 1b) Flowable composite was utilized to secure the horizontal posts in position. (Figure- 1c) the main space inside the root chamber was restored with posterior composite material, enveloping both horizontal posts. After setting, the extra protruding portions of the posts on the buccal and lingual surfaces were cut off, and the restoration was finished by smoothing and polishing the surfaces. (Figure- 1d) A postoperative radiograph was obtained following the luting of the fiber post (Figure- 1e). After one month follow up patient was given crown irt 37. (Figure- 1f)

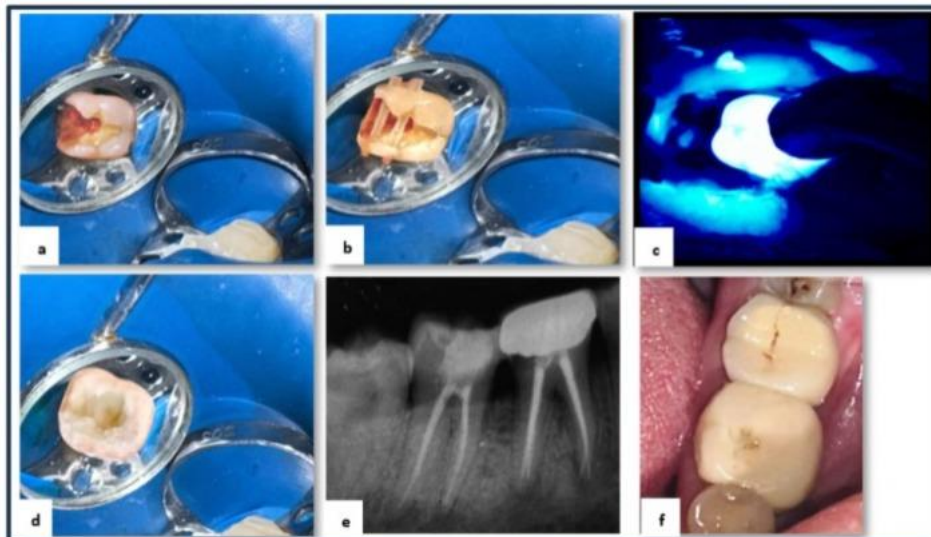


Figure 1

Case Report 2

HORIZONTAL POST WITH TEMPLATE

A 17-year-old female patient reported to our department presented with a primary complaint of persistent, sharp pain in her lower right back tooth region since one week. On clinical examination an extensive carious lesion was identified irt 45,46. Radiographic examination reveals radiolucency involving enamel, dentin and pulp on mesial and distal aspects of the crown irt 45, 46 and distal surface involving pulp irt 45, 46 and diagnosed as Symptomatic irreversible pulpitis irt 45,46.(Figure- 2a) Based on remaining tooth structure present root canal was planned irt 45,46 and two place two horizontal posts irt 46 In an effort to preserve

and maintain the tooth, The patient received a thorough explanation about the treatment process intended to preserve the teeth. After obtaining consent from the patient.

During the first appointment, the patient received local anesthesia (1.7 mL lignocaine with 1:80,000 epinephrine), followed by placement of a rubber dam for isolation. Access to the tooth was gained, and four canal orifices (mesiobuccal, mesiolingual, distobuccal, and distolingual) were identified. The working length was determined with an apex locator and confirmed by intraoral periapical (IOPA) radiograph. The canals were cleaned and shaped using a crown-down method with 3% sodium hypochlorite and 17% EDTA as irrigants. Calcium hydroxide was used as the intracanal medicament, and the access cavity was sealed with a temporary filling.

In the second visit, the coronal temporary restoration was taken out, and the canals were irrigated with 3% sodium hypochlorite to eliminate the calcium hydroxide and for root canal cleaning and obturation was completed with bioceramic sealer and single-cone gutta-percha points. (Figure- 2b)

A model mockup was fabricated to create a template that would help identify and precisely locate the post placement site. Holes were drilled in the cast, and fiber post-trial fitting was performed on the acrylic template made on the master cast. (Figure- 2c). Template try-in was done in patient mouth (Figure- 2d) and with the help of acrylic template holes were drilled using no. 2 round bur through the remaining buccal and lingual walls (Figure-2e). Two glass fiber posts were then inserted through these holes, extending from the buccal to the lingual aspect (Figure- 2f). After completing the standard acid etching and priming protocols for the coronal chamber, a flowable composite resin was applied and injected into the canal openings and over the pulpal floor (Figure- 2g). The chamber was then filled with posterior composite resin to restore the area surrounding the two horizontal posts. Excess portions of the posts that extended beyond the buccal and lingual surfaces were trimmed off, and the restoration was subsequently polished to a smooth finish (Figure – 2h). The patient was scheduled for a follow-up visit 21 days after the procedure. (Figure- 2i).



Figure 2

DISCUSSION

The tooth is vulnerable to fracture during the period from endodontic treatment to final restoration¹⁰.

In case of MOD class II cavities, weak cuspal support can lead to a detrimental impact on teeth integrity, initiated by microcracks and flexural movement of the cusps. Providing enhanced support for the cusps is key to addressing this problem and strengthening the tooth's resistance against fractures⁸. Instantly reinforcing the tooth with horizontal posts after endodontic treatment, while the rubber dam remains on, could lower the risk of fracture following the procedure. Fiber posts can be used due to their favorable physical properties⁸. Teeth that have undergone endodontic treatment may be strengthened using horizontal fiber posts that extend from the buccal side to the lingual wall¹⁰.

Horizontal post supports MOD cavities by enhancing fracture resistance for premolar and molar teeth compared with prepared MOD cavities and cavities with composite restorations and teeth with root canal posts. Root canal posts provide only retention without offering structural support, making horizontal posts preferable when the aim is to fortify the prepared cavity and restoration against fracture⁸.

Mechanically, the junction between the vertical post, core, and crown often carries certain intrinsic risks. Creating and placing vertical posts can produce vertical stresses that result in microcracks, fracture lines, or strip perforations, and the removal of extra dentin in crucial regions can further compromise the tooth's strength. Hence, subjected to horizontal fracture¹⁰.

The advantages of using horizontal posts are minimally invasive, as the posts are inserted through less than 1 mm depth of dentin. Fast chairside placement (within 30 minutes), ideal for single-visit endodontics (simple and efficient). Especially beneficial when lab-fabricated crowns are delayed¹.

Salameh et al (2006) and Scotti et al (2016), stated that when compared with a direct composite restoration, a composite restoration with fiber post significantly increased fracture resistance^{11,12}. Bromberg et al (2016) and Borges et al (2021) applied two horizontal posts for molars; one runs through the mesial axial wall and the other through the distal axial wall; these two posts reported a significant increase in fracture resistance^{2,9}. So, in the present case scenarios two horizontal posts were placed in molars. In a case report Rana et al (2023) used template method for horizontal post placement, which was used in the second case of our present case series¹.

In the present case, the diameter of the holes created for post placement was kept under 1 mm, which maintained the structural integrity of the tooth and enhanced its ability to bear functional loads. The cementation of horizontal posts to fill the buccal and lingual prepared holes should be carried out following stringent clinical protocols. In the present cases cementation of the horizontal posts was done after following strict clinical guidelines with the help of flowable composite under rubber dam isolation.

Using a horizontal post may temporarily help patients who cannot afford full-coverage crowns after root canal therapy. Eventually, the horizontal post-core buildup can provide sufficient retention.

Karzoun et al (2015) tested fracture resistance on endodontically treated premolar teeth restored in a variety of ways found that incorporating a single horizontal fiberglass post running buccolingually as a core build-up nearly doubled the fracture resistance compared to a composite resin core alone¹³. Mergulhao et al. (2019) Reported that the addition of horizontal posts, when used in composite restorations, significantly lessen the incidence of catastrophic fractures in endodontically treated teeth. in ETT¹⁴. Abdulrab et al. (2023) found that the placement of horizontal posts increases the resistance of endodontically treated teeth and decreases the occurrence of fractures that cannot be restored¹⁵. Alghauli et al (2025) stated that Endodontically treated teeth (ETT) demonstrated better outcomes when both horizontal posts and composite restorations were used together compared to composite restoration alone and compared with unrestored cavities or composite restorations without support⁸.

CONCLUSION

Drawing from the favorable outcomes seen in multiple *in vitro* studies and published case reports, this approach was applied in a clinical setting; however, further clinical trials are needed to thoroughly establish the effectiveness of the horizontal post technique. The present case series offers detailed insight into the placement of horizontal posts in molars after endodontic therapy, with the goal of reinforcing the coronal structure and enhancing fracture resistance.

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