

Enhancing Fracture Resistance in Coronal Structure of Endodontically Treated Teeth by Placing Horizontal Posts in Buccolingual Direction: Case Report

Dr. Sadashiv Daokar¹; Dr. Aishwarya Ranjalkar²; Dr. Kalpana Pawar³; Dr. Kshama Sarak⁴
 Professor & HOD¹; Postgraduate Student²; Professor³; Postgraduate Student⁴
 Department of Conservative Dentistry & Endodontics

Abstract:-

➤ *Aim:*

The purpose of this case report is to detail a procedure for fortifying the coronal structure of a tooth using horizontal fiberglass posts positioned buccolingually within a composite resin core post-endodontic therapy.

➤ *Methodology:*

Patients having carious premolar and molar teeth having caries on mesial and distal aspect of crown with radiographic interpretation as radiolucency involving enamel, dentin and pulp, which are indicated for pulpectomy and are having buccal and lingual/ palatal noncarious intact walls, were selected. Root canal therapy was carried out under rubber dam isolation. Space was created on buccal and lingual/ palatal wall, followed by horizontal post placement. Composite core buildup was carried out. Follow-up recorded.

➤ *Conclusion:*

This case report provides a comprehensive account of the insertion of horizontal posts in molars and premolars following endodontic treatment, aiming to strengthen the coronal structure and improve resistance against fractures.

Keywords:- *Fiberglass Posts; Fracture Resistance; Horizontal Posts; Coronal Structure; Endodontically Treated Teeth.*

I. INTRODUCTION

Teeth that have undergone endodontic treatment are often at a heightened risk of fracture due to their naturally compromised structural integrity stemming from prior decay and/or tooth preparation.

In the past, endodontists primarily concentrated on the microbiology of infected root canals and effective disinfection methods for this area. To achieve this goal, they used to sacrifice tooth structure to ensure direct access, allowing better reach for our instruments and irrigants into the

canal walls and accessory canals. However, research indicates that by minimizing the access opening and preserving the coronal tooth structure, especially near the cervical region, we can greatly enhance fracture resistance.

Research has demonstrated that the absence of one marginal ridge leads to a 46% reduction in tooth rigidity, while the absence of both marginal ridges results in a 63% decrease.⁽⁸⁾ For those following traditional access protocols, concerns regarding coronal flexure and potential fracture of remaining walls are addressed by advocating for immediate full coverage, with or without incorporation of a post and core.

Endodontists who favor conservative, narrower access openings acknowledge the potential technical limitations which may hinder the ability to reach and thoroughly instrument all parts of the canal walls for effective disinfection.

Reference literature indicates that endodontic failures are primarily associated with fractures rather than infection, implying that the traditional antimicrobial approach may require modification.

It's worth mentioning that irrigants and delivery systems have seen advancements in recent years.

In a 10-year survival study, a mere 7% of tooth loss was attributed to endodontic failure, with 36% resulting from root fracture.⁽⁹⁻¹²⁾ Conversely, proponents of the traditional access opening method among endodontists may find solace in recent research advocating for the utilization of horizontal posts to augment fracture resilience, potentially offering reassurance regarding fracture susceptibility.

Thus, the objective of this case report is to detail a procedure for fortifying the coronal structure of a tooth using horizontal fiberglass posts positioned buccolingually within a composite resin core post-endodontic therapy.

II. CASE REPORT

A. Case 1:

A 30-year-old man reported to the Dept. of conservative dentistry and endodontics presenting with a chief complaint of spontaneous sharp pain in the lower right back region of jaw since 1 week. He encountered thermal sensitivity and noted that the pain intensified during nighttime, hindering his ability to sleep. The pain aggravated on mastication and food lodgment. The lower right first molar showed tenderness on percussion.

➤ On Clinical Examination:

- Deep mesial and distal caries with 46.
- TOP +ve
- No H/O swelling, no sinus tract seen
- Probing depths were within normal limits.

➤ On Radiological Evaluation:

- Radiolucency seen involving enamel, dentin and pulp on mesial and distal aspect of crown
- PDL widening seen, Lamina dura intact.
- No periapical changes visible

➤ The Diagnosis was Symptomatic Apical Periodontitis.

The patient agreed to the root canal therapy treatment plan to salvage the tooth. However, due to financial constraints, he couldn't afford to immediately proceed with placing a post, core, and crown to prevent fracture, after covering the cost of the endodontic treatment. Instead, he opted to reinforce the tooth with two horizontal posts temporarily, intending to upgrade to permanent full coverage when financially feasible. During the initial treatment

session, the patient received anesthesia, and rubber dam isolation was successfully implemented. Three canals (mesiobuccal, mesiolingual, distal) were identified and cleaned to their respective working lengths. Irrigation was performed using 5.25% Sodium Hypochlorite, followed by the placement of Ca(OH)₂ in all canals as the intracanal medicament. The access opening was temporarily sealed with cotton and DentTemp (Waldent).

At the second visit, the tooth was asymptomatic; the canals were dry. Obturation was carried out using single cone technique.

Using a translucent glass fiber post system 2 cross-sectional holes were prepared through the remaining buccal and lingual walls. A double tapered post drill of size #1, was used.

Two glass fiber posts were fitted through the holes, traversing from the buccal and lingual walls. After the standard acid etching and prime bonding protocol for the coronal chamber, initially a flowable composite was syringed into the canal openings and over the pulpal floor. The same flowable composite was also used to cement the 2 horizontal posts in place.

The bulk of the chamber was then filled with posterior composite restoration encompassing the 2 horizontal posts. After curing, the extra protruding portions of the posts on the buccal and lingual surfaces were cut off, and the restoration was then smoothed and polished.

20 months follow-up revealed clinical and radiographic examination as an intact, asymptomatic and fully functioning tooth with no periapical changes.

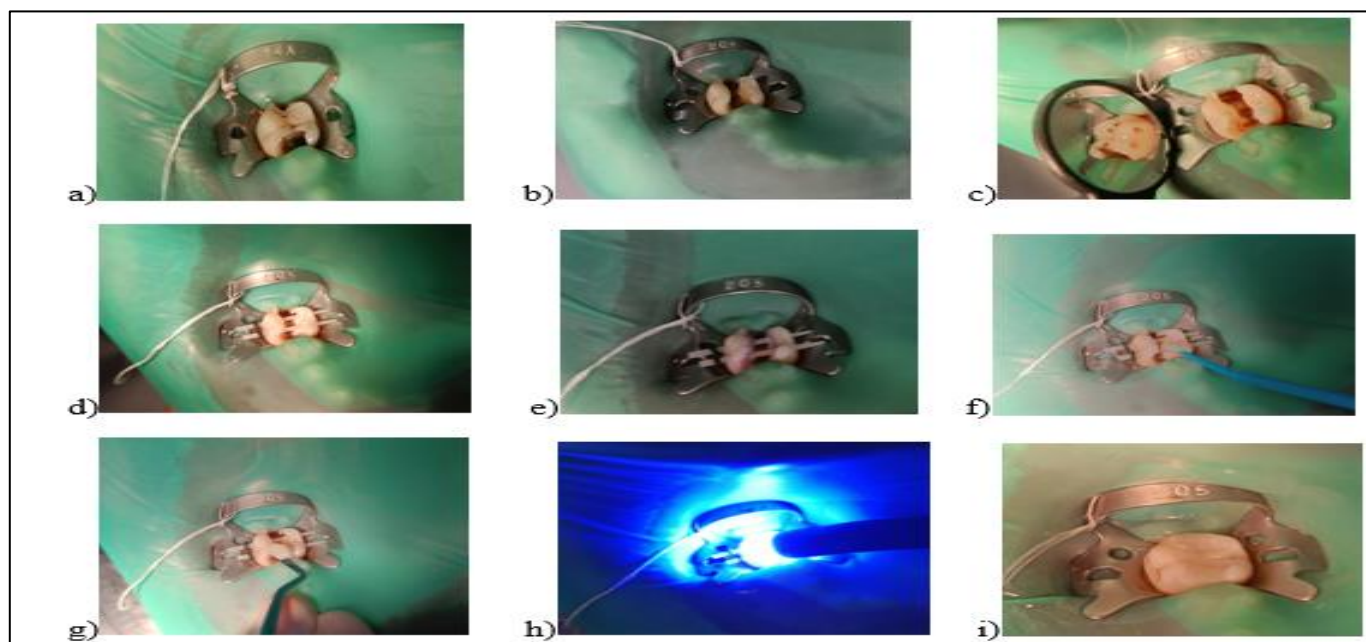


Fig 1: a) Preoperative Image; b) Occlusal View of Endodontically Treated Molar (46); c) Hole Preparation on Buccolingual Walls for Horizontal Post Placement; d) 2 Horizontal Post Placement; e) Etching; f) Bonding Agent Application; g) Posterior Composite Placement; h) UV Light Curing; i) Postoperative Image

B. Case 2:

A 24-year-old female reported to the Dept. of conservative dentistry and endodontics presenting with a chief complaint of spontaneous sharp pain in the upper left region of jaw since 2 weeks . She encountered thermal sensitivity and noted that the pain intensified during nighttime, hindering her ability to sleep. The pain aggravated on mastication and food lodgment.

The clinical and radiological examination showed similar findings as in Case 1 with 24 tooth number. Similar tender tooth with mesial and distal caries involving the pulp chamber indicated for pulpectomy was seen.

After completing the root canal treatment with 24, similar procedure as in case 1 was carried out for placement of 1 horizontal post in the bucco-palatal direction.

19 months follow-up revealed clinical and radiographic examination as an intact, asymptomatic and functioning tooth with no periapical changes.

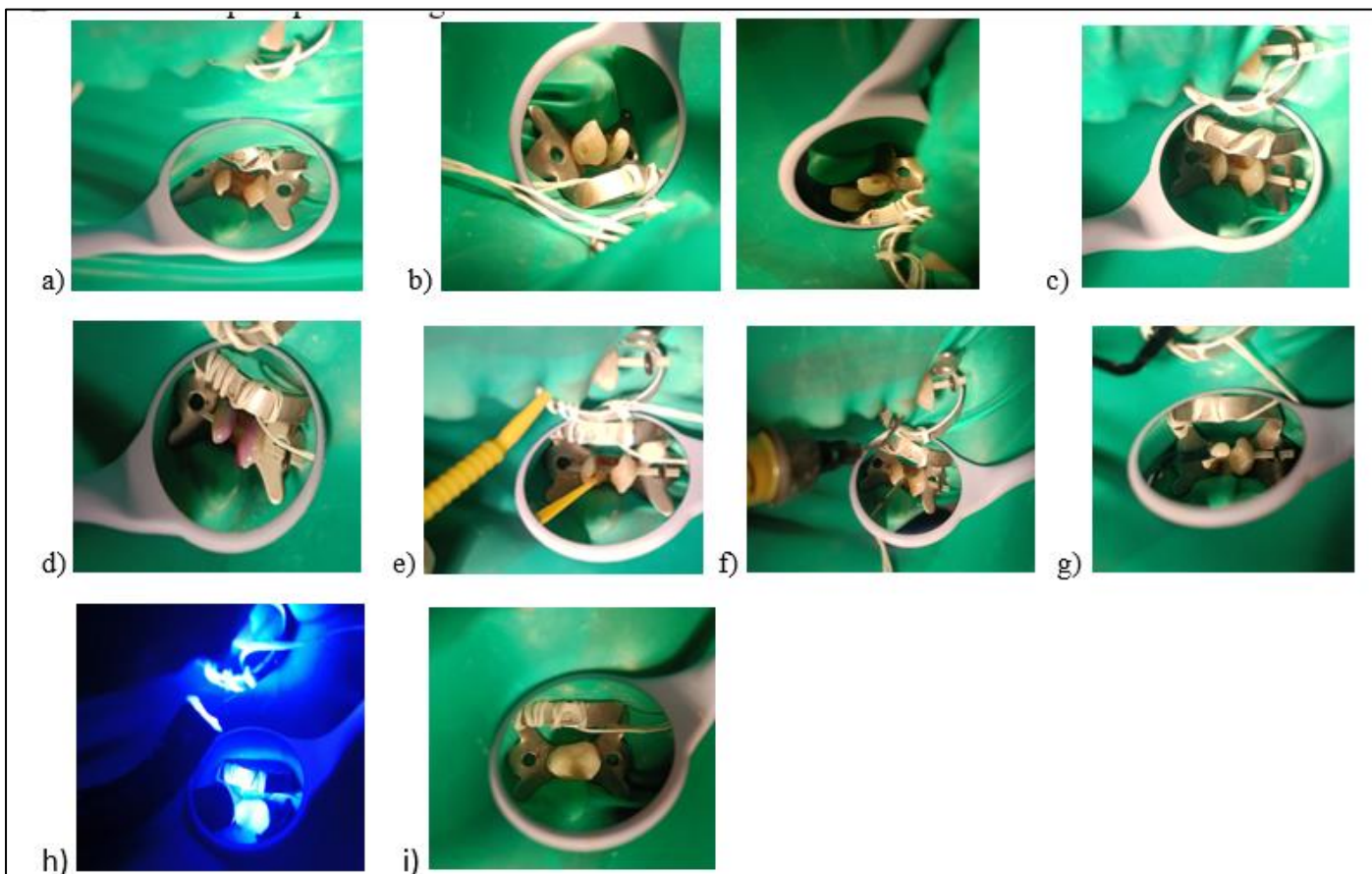


Fig 2: a)Occlusal View of Postendodontically Treated Tooth(24); b)Buccal and Palatal View of Hole Preparation for Horizontal Post Placement; c)1 Horizontal Post Placement; d)Etching; e)Bond Agent Application; f)Flowable Composite Application; g)Posterior Composite Placement; h)UV Light Curing; i)Postoperative Image

C. Case 3:

A 40-year-old man reported to the Dept. of conservative dentistry and endodontics presenting with a chief complaint of spontaneous sharp pain in the upper left back region of jaw since 1 week . He encountered thermal sensitivity and noted that the pain intensified during nighttime, hindering his ability to sleep. The pain aggravated on mastication and food lodgment.

The clinical and radiological examination showed similar findings as in Case 1 with the tooth number 26. Similar tender tooth with mesial and distal caries involving the pulp chamber indicated for pulpectomy was seen.

After completing the root canal treatment with 26, similar procedure as in case 1 was carried out for placement of 1 horizontal post in the bucco-palatal direction.

19 months follow-up revealed clinical and radiographic examination as an intact, asymptomatic and functioning tooth with no periapical changes.

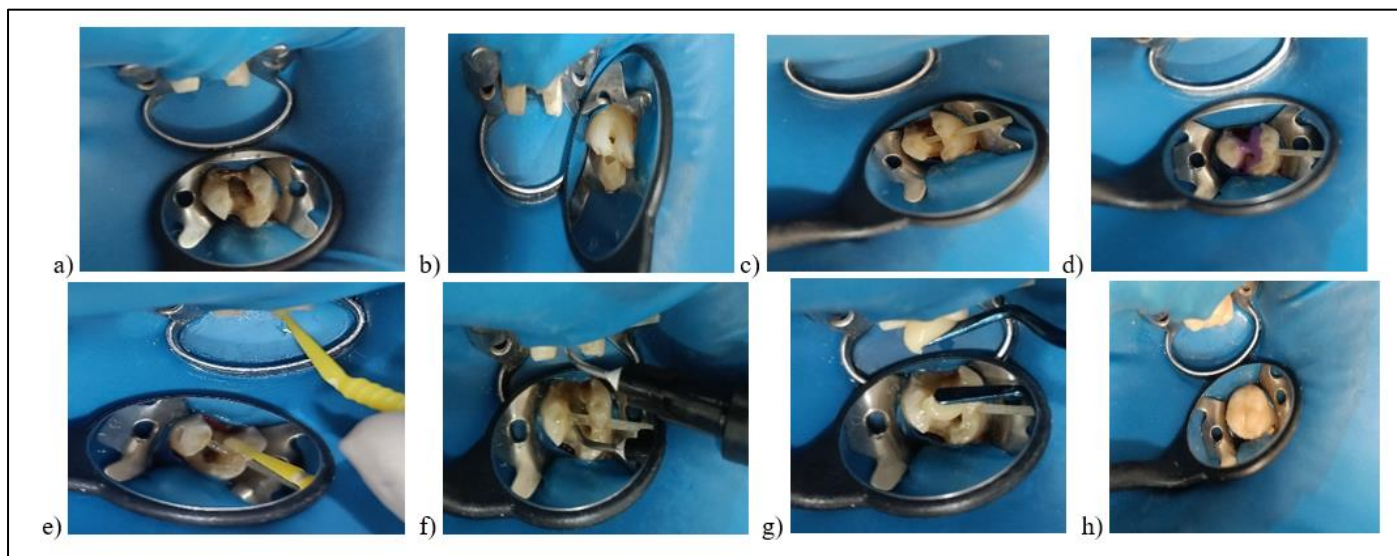


Fig 3: a)Occlusal view of Postendodontically Treated Tooth(26); b)Buccal view of Hole Preparation for Horizontal Post Placement; c)l Horizontal Post Placement; d)Etching; e)Bond Agent Application; f)Flowable Composite Application; g)Posterior Composite Placement; h)Postoperative Image

III. DISSCUSION

An obstacle for endodontists is persuading patients about the critical importance of immediate restoration following root canal therapy. The tooth is susceptible to fracturing from the time of endodontic treatment until the final restoration.^(1,2)

Incorporating horizontal posts immediately following endodontic therapy, while the rubber dam is still in place, may potentially reduce the likelihood of postoperative fractures. This procedure is typically swift and uncomplicated, often completed in under 30 minutes, and can be performed by either an endodontist or a general dentist at a minimal cost. The key prerequisite is the preservation of the buccal and lingual walls of the tooth.

Many patients face financial challenges in affording both root canal therapy and subsequent post-core-crown buildup, leading them to choose extraction instead. However, the cost-effectiveness of this treatment significantly surpasses alternatives like extraction followed by implant placement or post-core and crown buildup.

In this study, the holes created to accommodate the posts were shallower than 1 mm, ensuring that the structural integrity of the tooth remained uncompromised. This approach enhanced the tooth's capacity to withstand occlusal forces effectively.

The study conducted by Salameh et al. aimed to assess the fracture resistance and failure patterns of 90 mandibular molars that were restored using resin composites, both with and without fiber posts, while considering the number of remaining cavity walls. The conclusion drawn from the study was that the strength of endodontically treated mandibular molars, restored with composite resins, is predominantly influenced by the quantity of remaining cavity walls.

Additionally, the utilization of fiber-reinforced posts was found to optimize fracture patterns.⁽³⁾

Both Scotti et al. and Salameh et al. demonstrated that in comparison to a direct composite restoration, a composite restoration reinforced with glass fibers substantially enhanced fracture resistance. This improvement was consistent regardless of the orientation of the fibers—whether mesiodistal or buccolingual—or their form, such as a vertical post. Among the three orientations tested, the buccolingual direction was found to be the most effective option.^(3,4)

Karzoun et al. conducted an in-vitro study on endodontically treated premolar teeth, testing various restoration methods and subjecting them to loading using a universal testing machine (Instron Corp, Canton, MA). Their findings revealed that employing a composite resin core buildup along with a single horizontal fiberglass post positioned buccolingually resulted in a doubling of fracture resistance compared to restorations utilizing composite resin alone.⁽⁵⁾

Beltrao et al. conducted a study wherein they utilized only a single horizontal post in molars to achieve an increase in fracture resistance.⁽⁶⁾

Favero et al in 2015 conducted a study and concluded that fiberglass posts with resin composite significantly increased the fracture strength of endodontically treated molars. There is no effect on the fracture location.⁽⁷⁾

In a comparable in vitro study involving molars, Bromberg et al. conducted mesio-occluso-distal cavity preparations, followed by root canal therapy, and restoration using various filling techniques. Subsequently, the teeth underwent cycling before being fractured in a universal testing machine. The noteworthy findings indicated that teeth restored with direct composite resin along with two horizontal fiberglass posts experienced a remarkable 60% increase in

fracture resistance compared to teeth restored solely with composite resin.⁽⁸⁾

Introducing horizontal posts may provide a temporary advantage by enhancing fracture resistance, which proves especially advantageous for patients unable to afford immediate full-coverage restoration following root canal therapy. Subsequently, upon receiving full-coverage restoration, the horizontal post-core buildup can offer substantial retention, potentially obviating the necessity for a vertical post and core, with a crown alone being adequate.

IV. CONCLUSION

This case report provides a comprehensive account of the insertion of horizontal posts in molars and premolars following endodontic treatment, aiming to strengthen the coronal structure and improve resistance against fractures.

The objective of this case report was to substantiate the prolonged efficacy of employing horizontal post-core buildup as an alternative to full-coverage restoration subsequent to root canal therapy.

REFERENCES

- [1]. Pratt I, Aminoshariae A, Montagnese TA, et al. Eight-year retrospective study of the critical time lapse between root canal completion and crown placement: its influence on the survival of endodontically treated teeth. *J Endod* 2016;42:1598–603.
- [2]. Clark D, Khademi J. Modern molar endodontic access and directed dentin conservation. *Dent Clin North Am* 2010;54:249–73
- [3]. Salameh Z, Sorrentino R, Papacchini F, et al. Fracture resistance and failure patterns of endodontically treated mandibular molars restored using resin composite with or without translucent glass fiber posts. *J Endod* 2006;32:752–5
- [4]. Scotti N, Forniglia A, Tempesta RM, et al. Effects of fiber-glass-reinforced composite restorations on fracture resistance and failure mode of endodontically treated molars. *J Dent* 2016;53:82–7.
- [5]. Karzoun W, Abdulkarim A, Samran A, et al. Fracture strength of endodontically treated maxillary premolars supported by a horizontal glass fiber post: an in-vitro study. *J Endod* 2015; 41:907–12.
- [6]. Beltrao MC, Spohr AM, Oshima HM, et al. Fracture strength of endodontically treated molars transfixed horizontally by a fiber glass post. *Am J Dent* 2009;22:9–13.
- [7]. Favero FJ, De Melo TA, Stona D, et al. Strengthening effect of horizontally placed fiberglass posts in endodontically-treated teeth restored with direct resin composite. *Am J Dent* 2015;28:143–9.
- [8]. Bromberg CR, Alves CB, Stona D, et al. Fracture resistance of endodontically treated molars restored with horizontal fiberglass posts or indirect techniques. *J Am Dent Assoc* 2016;147:952–8.
- [9]. Boren DL, Jonasson P, Kvist T. Long-term survival of endodontically treated teeth at a public dental specialist clinic. *J Endod* 2015;41:176–81.
- [10]. Dammaschke T, Steven D, Kaup M, Ott KH. Long-term survival of root canal treated teeth: a retrospective study over 10 years. *J Endod* 2003;29:638–43.
- [11]. Zadik Y, Sandler V, Bechor R, et al. Analysis of factors related to extraction of endodontically treated teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;106:31–5.
- [12]. Ng YL, Gulabivala K. A prospective study of the factors affecting outcomes of non-surgical root canal treatment: part 2—tooth survival. *Int Endod J* 2011;44:610–25.