

Inclination change of endodontically treated teeth

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Inclination change of endodontically treated teeth with post core crown



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ABSTRACT

Introduction: Endodontically treated teeth (ETT) are structurally and aesthetically compromised. Most tooth structure loss is caused by caries and also access cavity when the tooth undergoes endodontic treatment or preparation for the final restoration. Full coverage crowns are used to improve fracture resistance and ensure long-term success rates of endodontically treated teeth. Tooth inclination correction is also performed on maloccluded teeth to eliminate trauma occlusion and distribute bite force to all teeth. The proximal anatomy of the restoration and the contact area should be designed to maximize arch continuity and to minimize food impaction. Post-core was used to compensate for the loss of structure due to preparation for the intentional inclination change with zirconia crown.

Case Illustration: A 35-year-old male patient came to the Department of Conservative Dentistry, Universitas Trisakti Dental Hospital. He was referred for endodontic treatment. Clinical examination showed a right maxillary first molar with extensive caries on distal with an inclination more towards the palatal direction. The soft tissues around the tooth appeared normal. Periapical radiography showed normal apical tissues. The endodontic treatment procedure was done under 4.3x magnification. Biomechanical preparation was carried out using heat treated rotary files followed by 5.25% NaOCl, saline, and 17% EDTA irrigation with sonic activation for 1 minute. Obturation was performed using a single cone technique and bioceramic sealer. Fiber post was placed on palatal canal followed by core build up with dual cure core material. Preparations for palatal reduction of between 3 - 4 mm to change the inclination more towards the buccal direction. Zirconia was the material of choice for the crown in this particular case. Cementation of the crown was done using self-etch self-adhesive dual cure resin cement. At 3 months follow-up, the tooth showed favorable results clinically and radiographically with absence of symptoms.

Conclusion: Post core crown can be used to change the inclination of maxillary first molar.

Keywords: Endodontic treatment, inclination change, zirconia crown, maxillary first molar, post core crown, contact area.

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INTRODUCTION

Advancements in the field of dentistry have allowed individuals to maintain the functionality of their teeth for a prolonged duration, possibly throughout their lifetime.¹ Fractures in teeth that have undergone endodontic treatment are frequently encountered in clinical practice and can stem from various causes. Relevant predisposing variables include the access cavity prior to endodontic therapy and the loss of coronary structure brought on by caries cavities. Endodontically treated teeth (ETT) are structurally and aesthetically compromised. Most tooth structure loss is caused by caries and also access cavity when the tooth undergoes endodontic treatment or preparation for the final restoration. Biomechanical characteristics of teeth with ETT differ greatly from those of vital teeth. Configuration, isthmus width, and cavity depth are important

variables that influence fracture risk.^{2,3}

ETT that exhibit significant restorations and coronal structure destruction are typically rebuilt using post and core, and then prosthetic crown restoration. Expanding the coronal third of the root canal space is considered as a crucial step in the application of fiber posts and endodontic therapy.^{4,5} In order to increase fracture resistance and guarantee the long-term success rates of ETT, full coverage crowns are utilized.⁶ Tooth inclination correction is also performed on maloccluded teeth to eliminate trauma occlusion and distribute bite force to all teeth.⁷ Arch continuity should be maximized and food impaction should be minimized by designing the contact area and the proximal anatomy of the restoration.⁸ Post-core was used to compensate for the loss of structure due to preparation for the intentional inclination change

with zirconia crown. Restorations should enable practitioners to more accurately recreate the natural contours of damaged and tilted teeth. Proper preparation plays a crucial role in influencing the load-bearing capacity of the restoration. With increased restoration thickness, sufficient preparation can reduce stress within the restoration.^{6,7,9}

CASE ILLUSTRATION

A 35-year-old male patient came to the Department of Conservative Dentistry, Universitas Trisakti Dental Hospital. He was referred for endodontic treatment. Clinical examination showed a right maxillary first molar with extensive caries on distal with an inclination more towards the palatal direction. The soft tissues around the tooth appeared normal. No tenderness on percussion and no mobility was observed. Periapical



Figure 1. (a) and (b) **Pre-Operative** clinical image of right maxillary first molar (c) **Pre-operative** periapical radiograph showing radiolucency that extends disto-occlusal and has reached the pulp (d) and (e) **Post-Operative** clinical image endodontic treatment continued intentional inclination change with post-core crown restoration and (f) **Post-operative** periapical radiograph showing radiopaque images along the mesiobuccal and distobuccal canals and the apical 1/3 of the palatal root canal filled with gutta perca, 2/3 of the palatal root length was filled with fiberpost material. There was a radiopaque image on the crown showing a zirconia crown restoration.

radiography showed normal apical tissues. Diagnosis of previously initiated therapy on tooth 16 was made. The endodontic treatment procedure was done under 4.3x magnification. Root canal treatment was done under rubber dam isolation. Biomechanical preparation was carried out using heat treated rotary files followed by 5.25% NaOCl, saline, and 17% EDTA irrigation with sonic activation for 1 minute. The obturation was carried out employing a single cone technique along with a bioceramic sealer. Subsequently, a fiber post was positioned in the palatal canal, and a core build-up was performed using dual-cure core material. Preparations for palatal reduction of between 3 - 4 mm to change the inclination more towards the buccal direction. Zirconia was the material of choice for the crown in this particular case. Cementation of the crown was done using self-etch self-adhesive dual cure resin cement. At 3 months follow-up, the tooth showed favorable result clinically and radiographically with absence of symptoms.

DISCUSSION

Endodontic treatment (ET) failure and tooth fracture are frequent outcomes in teeth with extensive tissue destruction. Regardless of the level of quality of the root canal procedure, combining it with a proper coronal restoration increases the probability that the treatment will be successful. Success rates of 83.33% were achieved when sufficient root canal treatment was combined with proper coronal restoration. However, 58.33% of cases were the outcome of inadequate coronal restoration and adequate root canal treatment. Therefore, inadequate restorative treatment or periodontal issues are typically the cause of clinical failures rather than the effects of root canal treatment.³ Indirect restorations are used to obtain a tight, well-positioned contact area and anatomically contoured proximal surface. Interproximal food impaction can result in periodontal disease, recurrent caries, and discomfort during mastication. Furthermore, inadequate contact can result in tooth movement and dental arch instability.^{6,7,9}

For a molar to change inclination, the full-crown restorative material selection is essential. Zirconia and lithium disilicate glass-ceramic, high-strength ceramic materials, have become increasingly popular in the development of various all-ceramic systems. This trend aligns with the growing preference for restorations that are both aesthetically pleasing and biocompatible. Zirconia has a greater flexural strength (>1000 MPa) than lithium disilicate (approximately 400 MPa), so monolithic zirconia crowns' fracture resistance might be suitable for molar restoration.⁷ Given the restoration of the tilted occlusal surface, it is inevitable to encounter excessive load correction; therefore, a force of 100 N was chosen for the current study.⁷ The interproximal contact in the natural dentition is recommended to be a bean area of 1.5–2 mm rather than a point. The contact area is located at the proximal plane's transitions between the middle and buccal third in a bucco-lingual direction and between the middle and occlusal third in a cervico-occlusal direction. Furthermore, it is important to replicate the proximal surface's contour in both directions while maintaining the natural gingival embrasure, occlusal, buccal, and lingual.^{7,8}

CONCLUSION

Post core crown can be used to change the inclination of maxillary first molar. When considering post-core crown restoration, it is advisable to take into account tooth roots with an inclination of less than 30°, occlusal preparation parallel to the bite plane, and minimal oblique force loading.

CONFLICT OF INTEREST

There is no conflict of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDINGS

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AUTHORS CONTRIBUTION

Riesta Paluvi Kusuma Dewi: Writing-original draft preparation. Tien Suwartini: Supervision, reviewing, and editing. Dina Ratnasari: Supervision, reviewing, and editing. All authors have read and approved this version of manuscript.

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