

Microleakage in Immediate vs Delayed Post Space Preparation in Root Canals Filled with Bioceramic-based Root Canal Sealer

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ABSTRACT

Aim: The objective of this study was to compare the microleakage rate between immediate and delayed post space preparation in the root canal filled with the bioceramic-based root canal sealer by the fluid filtration technique.

Material and methods: Sixty extracted human mandibular premolars were used. The coronal portion was resected 12 mm from the apex, and the root canal was prepared with Mtwo NiTi rotary instruments to apical size 50/0.04 and filled with a matched-taper gutta-percha impregnated with bioceramic particles and a bioceramic-based root canal sealer. The samples were divided into two experimental groups ($n = 50$) and two groups of positive ($n = 5$) and negative control groups ($n = 5$). Twenty-five roots of the immediate post space preparation group were prepared post space immediately following completion of root canal obturation and 25 roots of delayed post space preparation group were kept for 7 days before preparation of the post space. Evaluation of the apical leakage was performed with a fluid filtration method under a 15 cm H₂O pressure.

Results: There was no significant difference ($p = 0.55$) in apical microleakage between immediate and delayed post space preparation groups.

Conclusion: In terms of apical microleakage, immediate and delayed post space preparation produced similar outcomes when the root canal filled with bioceramic-based root canal sealers by a single-cone technique.

Clinical significance: The timing of post space preparation does not affect the apical microleakage results when the root canal filled with bioceramic-based root canal sealers by a single-cone technique.

Keywords: Apical leakage, Bioceramic, Fluid filtration, Post space preparation.

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INTRODUCTION

Post space preparation is a standard procedure for the restoration of endodontically treated teeth. The process involves removing the filling materials from the coronal portion of the root canal. The rotary and heat instrument are a standard method to eliminate the root canal filling materials.¹ The Peeso reamer or Gates Glidden drill is used to prepare the size of the canal to fit the size of the post. The procedure generates heat and forces that interact with the remaining root canal filling material in the apical region can compromise the apical seal.²

Root canal filling is a necessary process to prevent recontamination of the canal that will lead to the success of the treatment.^{3,4} Gutta-percha point is the most common material used for root canal filling, but it does not provide an excellent seal to the canal wall. The root canal cement or sealer is required to seal the gap between each piece of the gutta-percha point and the root canal wall. The ideal root canal sealer should have several properties such as excellent adhesion with the canal wall, proper setting time, biocompatibility, bacteriostatic, insoluble in the tissue, easy removal, not stain the tooth, and sufficiently radiopaque.⁵ Zinc oxide eugenol-based and resin-based root canal sealers are currently used. Recently, a bioceramic-based root canal sealer is introduced for root canal obturation. TotalFill BC Sealer (FKG Denta SA, Switzerland) consists of tricalcium silicate, dicalcium silicate, calcium phosphates, colloidal silica, and calcium hydroxide.⁶ The vehicles of a premixed paste are water-free thickening. The radiopacifying agents are zirconium oxide. The material uses the moisture within the dentinal tubules for the

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complete setting reaction. The setting time is 4 hours. The pH of the sealer is higher than 12 due to calcium hydroxide produced during the setting reaction, which provides the antibacterial activity.⁷ The significant advantages associated with the use of bioceramic materials as root canal sealers are hydrophilic, biocompatible, bond with the dentin wall, high alkalinity, and osteoconduction.^{8,9}

The effect of the post space preparation procedure on the sealing ability of the remaining root canal filling is controversial. The classic study generally states that the timing of the post space preparation in the root canal filled with gutta-percha and zinc oxide eugenol-based sealer does not affect the sealing ability,^{10,11} whereas a more recent article showed that immediate post space preparation was better than delayed preparation.¹² Another study revealed the root canal was filled with gutta-percha and resin-based