Comparative evaluation of adaptation and fracture resistance of CAD-CAM fabricated zirconia posts in endodontically treated teeth

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Abstract

Post plays a crucial role in reinforcing final restoration in endodontically treated teeth (ETT). The appropriate selection of the post system is crucial for enhancing the clinical success of the restored tooth. This study aims to evaluate the adaptation, fracture resistance, and fracture patterns of ETT restored with different post systems, specifically zirconia posts, cast metal posts (CMP), and anatomically customised fibre-reinforced composite (FRC) posts. Twenty-four human premolars were randomly allocated into four groups. The teeth were root canal treated and prepared to receive zirconia, CMP, and anatomically customised FRC posts. All the samples were subjected to adaptation evaluation, fracture resistance test, and fracture pattern analysis. One-way ANOVA showed a statistically significant difference in mean adaptation between the groups ($p < 0.001$). Post-hoc Bonferroni analysis suggested that the adaptation values were statistically significant among

zirconia and CMP ($p < 0.001$), and in zirconia and FRC ($p = 0.007$). Regarding fracture resistance, one-way ANOVA presented a statistically significant difference among the groups ($p = 0.001$). Post-hoc Bonferroni analysis reported a significant difference in fracture resistance in zirconia and control ($p = 0.001$), CMP and FRC ($p < 0.001$), and FRC and control. The categorical analysis of fracture patterns revealed no statistically significant differences among the zirconia, CMP, and FRC post systems. Zirconia posts show lower adaptation than CMP and FRC posts. However, their fracture resistance is comparable to CMPs and FRCs. Fracture patterns were generally consistent across the different post systems; however, the control group exhibited a significantly different pattern, highlighting the influence of post presence on fracture behaviour. © The Author(s) 2025.

Author keywords

CAD-CAM post; Endodontically treated teeth; Milled zirconia post; Post and core; Zirconia post

Indexed keywords

EMTREE drug terms

zirconium oxide

EMTREE medical terms

adaptation; article; clinical article; cohort analysis; computer aided design/computer aided manufacturing; controlled study; fracture; human; pilot study; premolar tooth; surgery; tooth; tooth root canal

Chemicals and CAS Registry Numbers

Unique identifiers assigned by the Chemical Abstracts Service (CAS) to ensure accurate identification and tracking of chemicals across scientific literature.

zirconium oxide	1314-23-4, 53801-45-9

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