Comparison of the Fracture Resistance and Fracture Patterns of Root-Filled Maxillary Premolars Restored with Different Post Systems and Composite-Based Post Space Restorations: An in Vitro Study

Journal of Dental Research, Dental Clinics, Dental Prospects • Article • 2026 •
DOI: 10.34172/joddd.44391

Abidin, Sulhi [a]; Radzi, Hanna Nadhirah Mohd [a]; Daud, Muhamad Sharifuddin Mat [b]; Ahmad, Norfaezah [a]; Nadzirin, Izzuddin Ahmad [c]; +1 author

[a] Department of Prosthodontics, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, Pahang, Kuantan, 25200, Malaysia

Abstract

Introduction: Root-filled teeth are structurally and biomechanically weakened, and the choice of post-endodontic restoration is important. This study compared the fracture resistance and fracture patterns of root-filled maxillary premolars restored with different post systems and composite-based post space restorations. Methods: One hundred extracted maxillary second premolars were endodontically treated and randomly allocated to five groups (n = 20): metal post (group A), fiber post (group B), flowable composite resin in the post space (group C), fiber-reinforced composite resin

in the post space (group D), and composite resin restoration without post with a glass ionomer orifice barrier (control, group E). All the specimens received a standardized mesio-occluso-distal (MOD) cavity preparation with preservation of the buccal wall and were restored with nanohybrid composite before axial loading in a universal testing machine to determine fracture resistance. Meanwhile, fracture patterns were classified under a stereomicroscope. Results: Mean (± standard deviation) fracture resistance values were metal post (896.26 ± 335.55 N), fiber post (1046.64 ± 336.65 N), flowable composite resin (937.94 ± 323.83 N), fiber-reinforced composite resin (799.90 ± 244.43 N), and control (973.54 ± 357.33 N), with no statistically significant differences between the groups (P = 0.175). Metal and fiber post groups predominantly exhibited favorable, restorable Class 2 fractures, whereas flowable composite resin, fiber-reinforced composite resin, and control groups mainly demonstrated Class 3 or Class 4 fractures. Conclusion: Root-filled teeth restored with or without posts exhibited similar fracture resistance. Fiber and metal posts, however, produced more favorable fracture patterns, suggesting that posts can influence failure mode even without increasing overall fracture strength.

Author keywords

Endodontics; Fiber post; Metal post; Prosthodontics; Root canal; Tooth fracture

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Fundamental Research Grant Scheme for Research Acculturation of Early Career Researchers (FRGS-RACER)	RACER19-028-0028	

Funding text

The first author received the Fundamental Research Grant Scheme for Research Acculturation of Early Career Researchers (FRGS-RACER), grant number RACER19-028-0028.

Corresponding authors

Corresponding author G.S.S. Lin