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Research paper

A multiparametric evaluation of post-restored teeth with simulated bone loss

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ABSTRACT

Endodontically-treated teeth are prone to fracture due to loss of tooth structure and altered mechanical behaviors. The stability and rigidity of post-restored teeth, particularly in cases involving periodontal destruction, has not been adequately investigated. This study examined the influence of post material on teeth with simulated bone reduction by a multiparametric evaluation. Sixty extracted premolars of similar sizes were endodontically treated then divided into six groups. Each group was restored with one of the combinations of three posts (a glass-fiber, a prefabricated titanium post, and a cast post) and two simulated bone conditions (2 or 6 mm below crown margins). After crown restorations, they were loaded with a 100 N force then the displacements were examined by the digital-image-correlation technique. Marginal integrity on the buccal and lingual crown margins was examined before and after the thermocycling. Finally, the teeth were loaded until failure to examine the strength and fracture patterns. The digital-image-correlation measurements revealed that tooth deformation was related to the support conditions, especially for the fiber post groups. The cast post groups showed less altered marginal integrity after thermomechanical loading than the fiber and titanium post groups did. In the fracture test, the fiber-post/reduced-support group exhibited inferior fracture strength. The reduced support significantly affected fracture strength and incidence of repairable root fracture. The marginal integrity was not correlated with tooth deformation, since the tooth flexed at the crest of the simulated bone. The root fracture resistance was determined mainly by post materials but was concurrently affected by the support conditions.

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1. Introduction

Endodontically-treated teeth present different responses to mechanical loads from intact teeth. The removal of pulp and

root dentin diminishes a protective feedback mechanism and reduces the stress-strain capacity of the teeth, compromising the root fracture resistance (Carter et al., 1983; Kishen et al., 2004). Investigations also show that the stability of teeth

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