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Original Article

# Fracture strength of ultrathin occlusal veneer restorations made from CAD/CAM composite or hybrid ceramic materials

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ABSTRACT

*Purpose:* This study compared the fracture strengths and failure modes of ultrathin (0.3-mm) occlusal composite or hybrid ceramic veneers.
*Methods:* Sixty extracted maxillary molars were sectioned to remove the entire coronal structure 4 mm occlusal to the cementoenamel junction (CEJ), leaving a flat area of exposed dentin and peripheral enamel. Standardized occlusal veneers with a central fossa thickness of 0.3 mm were milled from a computer-aided design (CAD)/computer-aided manufacturing (CAM) composite (Paradigm MZ100), a resin nanoceramic (Lava Ultimate), and a hybrid ceramic (Vita Enamic) ($N = 20$). Each occlusal veneer was cemented with a self-adhesive resin cement (RelyX Unicem) on the prepared teeth. The restored teeth were loaded vertically to determine the fracture strength. Strength values were statistically analyzed using one-way analysis of variance (ANOVA) and Scheffe's post hoc test (significance level 0.05). The mode of failure of each specimen was classified and the correlation between fracture strength and failure mode was analyzed using Spearman's rank-order test.
*Results:* The fracture strengths (mean ± standard deviation) were 2416 ± 640, 1752 ± 676, and 1777 ± 697 N for Lava Ultimate, Paradigm MZ100, and Vita Enamic, respectively. Lava Ultimate had significantly higher fracture strength than the other two materials ($p < 0.05$); the fracture strengths of Paradigm MZ100 and Vita Enamic were not significantly different. No correlation between fracture strengths and failure modes was found within each material. Most specimens (48 out of 60) fractured in the restoration without involving tooth structures.
*Conclusions:* The fracture strength of ultrathin occlusal veneers made from the novel ceramic hybrid matched the strength of CAD/CAM composite. The highest strength was found with the resin nanoceramic material.


## 1. Introduction

Excessive loss of coronal tooth structure or severe tooth wear is not uncommon in the general population [1]. The multifactorial etiology of tooth wear is associated with dietary habits, medical conditions, and/or oral habits that lead to attrition, abrasion, and erosion of the enamel and dentin [2]. The destruction of tooth structure has been a significant concern as it affects musculoskeletal harmony, occlusal stability, oral comfort, esthetics, and overall the patients' satisfaction with their dentition [3,4].

Restorative treatment of severely worn dentition may involve multiple full-coverage restorations, crown lengthening, and elective tooth devitalization [5]. Traditionally, these procedures require removal of healthy tooth tissues to accommodate the preparation design. A conservative approach to restore tooth surface loss using direct resin composite restorations has utilized adhesive concepts to preserve tooth structures [6]. Although pragmatic, direct composite restoration of tooth wear is not an ideal treatment option considering its limitations in terms of esthetics and durability.

Ceramic materials have the desired esthetics and durability. However, the feasibility of their application in thin conservative preparations depends on their fabrication options and fracture properties. Recent advances in CAD/CAM (computer-aided

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