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Research paper

Two-body wear of dental restorative materials[☆]

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ABSTRACT

Aim: The aim of this *in vitro* study was to determine the two-body wear resistance of modern direct dental restorative materials.

Methods: Eight standardized specimens were prepared from 14 dental restorative materials (nano-, micro-, hybrid-, macrofilled composites; compomer, silorane, ormocer); a veneering composite (*Sinfony*) and enamel were used for reference. Vickers hardness (HV) and inorganic filler weight were determined. Specimens were subjected to mastication simulation using a mastication simulator (50 N, 1.2×10^5 cycles, 1.2 Hz) in a pin-on-block design and simultaneous thermal cycling (600 cycles, 5/55 °C, 2 min/cycle). Steatite balls were used as antagonists. Vertical substance and volume loss were determined using cast replicas and a 3D laser scanning device. Means and standard deviations were calculated, and statistical analysis was performed using one-way ANOVA and the Games–Howell test for post hoc analysis ($\alpha = .05$).

Results: HV ranged between 19 and 76; inorganic filler weight ranged between 44% and 88%. Significantly lowest vertical substance and volume loss were detected for the microfilled composite *Heliomolar*; enamel yielded similar vertical substance and volume loss. Intermediate wear was found for the other microfilled and hybrid composites as well as the silorane and the ormocers. Significantly highest wear was found for the macrofilled composite *Quixfil* and the compomer *Compoglass F*.

Discussion: Within the limitations of an *in vitro* study, the findings indicate similar wear behaviour for silorane- and ormocer-based dental restorative materials. However, correlations between HV, filler content, and wear resistance were poor.

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1. Introduction

Due to their excellent aesthetic properties, dental composite materials gain steadily increasing importance and popularity for the restoration of class I and II defects. The wear behaviour of dental composites has continuously been

improved over the years; however, limited wear resistance is still regarded as one of the greatest problems of direct posterior resin restorations (Jandt and Sigusch, 2009). With regard to this aspect, clinical long-term studies have revealed that particularly in extensive posterior restorations (van Nieuwenhuysen et al., 2003) and in patients with abnormal

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