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Fatigue of Tooth-colored Restoratives in Aqueous Environment

Yoshiko KAWAKAMI[1)], Fumio TAKESHIGE[1)], Mikako HAYASHI[1)] and Shigeyuki EBISU[1)]

1) Department of Restorative Dentistry and Endodontology, Osaka University Graduate School of Dentistry

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Abstract:
The purpose of this study was to investigate the interaction between mechanical and chemical fatigue in resin composites and dental ceramics, and the effects thereof on fatigue resistance of tooth-colored restoratives. To this end, the fatigue fracture resistance of restoratives under dry and aqueous conditions were analyzed by a dynamic fatigue crack propagation test using beam-shaped specimens with a precrack. Fatigue crack propagation characteristics were expressed by the correlation between fatigue crack growth rate (da/dN) and stress intensity factor range (ΔK). In addition, fatigue crack growth threshold (ΔK_{th}) was calculated. Following the fatigue test, a fractographic examination was performed using scanning electron microscopy. Fatigue crack initiation was retarded in resin composites under aqueous condition, but dental ceramics were susceptible to slow crack growth after crack initiation. SEM images of the fatigue facture surfaces reflected inorganic and organic filler particles of different sizes in composites and the bonding at crystal-glass interface in ceramics. It was concluded that water exerted different effects on the fatigue resistance of composites and ceramics.

Key words:
Fatigue, Dental ceramic, Resin composite

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