3131 How Can Nanoleakage Occur in Self-etching Adhesives that Demineralize and Infiltrate Simultaneously?

F.R. TAY[1], N.M. KING[1], K.M. CHAN[1], **C.K.Y. YIU**[1], and D.H. PASHLEY[2], [1]The University of Hong Kong, Hong Kong SAR, China, [2]School of Dentistry, Medical College of Georgia, USA

This study examined the extent of silver-uptake using ammoniacal silver nitrate in three two-step, self-etching primers (Imperva Fluoro Bond, Shofu; UniFil Bond, GC, ABF system, Kuraray) and one single-step, self-etching adhesive (AQ Bond, Sun Medical) bonded to dentin and four poly(HEMA) resins used as controls. Flat dentin surfaces were bonded with these adhesives, sectioned into 0.8 mm thick slabs, coated with nail varnish except for the bonded interfaces, and immersed in 50 wt% $AgNO_3$ for 24 h. Four types of poly(HEMA) resins were made: 100% HEMA; 90% HEMA-10% water; 75% HEMA-25% water, all polymerized with TBBO at 50ºC for 6 h; 100% HEMA polymerized at 25ºC for 30 min. After developing, undemineralized, unstained, epoxy resin-embedded sections were prepared for TEM. Nanoleakage patterns were observed in all bonded specimens. Fine segregated silver particles and reticular silver-staining patterns were found within the thin hybrid layers created by the three self-etching primers. For the single-step, self-etching adhesive, heavy silver deposits were identified within the hybridized complex formed by this adhesive within the smear layer, the underlying intact dentin and in the adhesive layer. Increasing amounts of silver uptake were observed in poly(HEMA) specimens containing more water, or that were polymerized at 25ºC for a short-time instead of 50ºC for 6 h. Silver uptake in hybrid layers formed by self-etching adhesives in sound dentin represent areas of increased permeability within a polymerized resin matrix in which water is incompletely removed, resulting in regions of incomplete polymerization and/or hydrogel formation. Thus, nanoleakage is not necessarily caused by disparities between the depths of demineralization and resin infiltration. (Supported by the Faculty of Dentistry, HKU and grant DE06427 from NIDCR)

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