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3830 Single-step adhesives are semi-permeable membranes. III. Fluoride-releasing evidence

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Objectives: Unlike GICs or RM-GICs that are directly applied on dentin, fluoride-releasing (FR) composites require the use of adhesives for bonding to dentin. This study tested the hypothesis that formation of inhibition zones by bonded restorations in artificially-induced carious dentin lesions is related to the permeability of the dentin adhesives. **Methods:** A non-FR(NFR) self-etching primer, UniFil Bond [U; GC Corp.] and a FR single-step adhesive, Reactmer-Bond [R; Shofu] were used in combination with a NFR resin composite, Metafil CX [M; Sun Medical] or a FR restorative material, Reactmer Paste [P; Shofu]. Artificial caries were induced in these restorations, from which 120±10µm thick sections were prepared for polarizing light microscopy. Lesion areas recorded with digitized images 50µm away from the cavity walls were adjusted to represent the relative lesion sizes at the corresponding lesion depths of 100µm. Fluid conductance (µL/min) across resin-dentin interfaces was measured at 20cm hydrostatic pressure (hp), and by immersion in 4.8M calcium chloride at zero hp. They were expressed as percentages of fluid conductance that occurred in the corresponding acid-etched dentin. **Results:** Inhibition zones were observed in R-M and R-P, but not in U-M and U-P. Two-way ANOVA and Tukey-test revealed significant differences in the relative lesion sizes in these four groups. Both the adhesive type (P<0.001) and the type of restorative material (P=0.015) contributed to caries inhibition.

Dentin adhesive	Fluid conductance(%)		Relative lesion size (µm ²) [N=12-15]	
	20 cm hp	CaCl ₂ : 0 hp	NFR composite [M]	FR restorative [P]
NFR self-etching primer[U]	2.1±2.1 ^b	0.1±0.2 ^a	5793.7±234.7 ^a	5803.6±141.2 ^a
FR single-step adhesive[R]	8.9±5.7 ^c	7.6±2.1 ^c	4878.0±151.4 ^b	4622.5±181.7 ^c

Conclusion: It is concluded that permeability of the adhesive layers in bonded dentin affects the potential of caries inhibition by fluoride-releasing adhesives and restorative materials. A single-step adhesive is more permeable probably because of the absence of a comparatively more hydrophobic surface resin layer.

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