Guest Editorial

Dentin Bonding – Is There a Future?

Dear Reader,

Adhesive dentistry has come a long way since the development of adhesive monomers by Dr. Oskar Hagger, which were first used by Kramer and McLean,[7] and acid etching of dental hard tissues by Dr. Michael Buonocore.[1,2] The availability of dentin adhesives has profoundly improved the quality of conservative work performed in pediatric and geriatric dentistry, prosthodontics, and lately, in endodontics. Today, we salute the commercialization of different classes of etch-and-rinse and self-etch adhesives. Simplified versions of these adhesives have made bonding simpler, faster, and more user friendly. They represent remarkable scientific and entrepreneurial achievements by research scientists, clinicians, and manufacturers. In all the words spoken and written on dentin adhesives, one theme constantly recurs: how long do these man-made bonds last? Can resin-dentin bonds remain intact in the hostile environment of the oral cavity?

Indeed, recent reports by our research colleagues around the world have shown that resin-dentin bonds are not as durable as we have perceived them to be, particularly when these bonds are made in the absence of surrounding enamel.[3] The hybrid layer, for example, was found to be susceptible to hydrolytic degradation, with the disappearance of the collagen fibrillar component over time in laboratory studies.[5,6] Such a phenomenon has recently been confirmed clinically, using bonded human primary teeth in function that were harvested upon exfoliation and examined ultrastructurally for the integrity of the collagen fibrils in the hybrid layer. In this study, what is intriguing is that dentin hybrid layers can disappear beneath bonded restorations with cavosurface margins that resided completely in enamel, in the absence of the influence of salivary and bacterial enzymes. We now understand that matrix metalloproteinases (MMPs) that are fossilized within the mineralized dentin can be released and activated during bonding procedures.[8] These endogenous collagenolytic enzymes represent the "Darth Vaders" of dentin bonding. They reside on the very collagen fibrils that are used for resin/composite retention. Their slow degradative enzyme activities are beyond the control of even the most astute and meticulous clinician. Reflecting on this latest insight into the degradation mechanism of resin-dentin bonds, one is compelled to ask, is there a future in dentin bonding?

Investigations on the use of synthetic inhibitors of MMPs have been active in other branches of medical science, in particular, research on neoplastic diseases. In periodontal tissue destruction, host-derived MMPs have long been recognized as tissue-destructive enzymes, and adjunctive MMP-inhibitor medication (Periostat®) has been shown to be effective in prevention of disease progression. Chlorhexidine, better known for its disinfecting properties, is also an effective inhibitor of MMP-2, -8 and -9 even at very low concentrations.[4] Using contralateral pairs of bonded and subsequently exfoliated primary molars in children, Dr. Josimeri Hebling (Faculty of Dentistry, UNESP, Araraquara, Brazil) has recently observed that disappearance of the collagen fibrils within the hybrid layer in the control primary molars occurred as early as six months in vivo. Conversely, collagen fibrils within the hybrid layer remained intact in the experimental primary molars that were pretreated with chlorhexidine prior to the placement of a simplified etch-and-rinse adhesive.

Thus, there appears to be a glimmer of hope. Can chlorhexidine or other synthetic, nontoxic MMP-inhibitors be the ultimate saviors of contemporary dentin bonding by improving the longevity of resin-dentin bonds? This practical question awaits clinical confirmation from research centers all over the world. We know that all clinicians are totally committed to the improvement of the quality of service delivered to their patients, and to the advancement of science in adhesive dentistry. We need the help of all our colleagues in this exciting arena of dentin bonding research. As we approach the Golden Jubilee of enamel etching in year 2005, let us work together and continue the legacy of the late Dr. Michael Buonocore, by not simply producing faster and more user-friendly adhesives, but toward improving the quality of resin bonds created in dentin.

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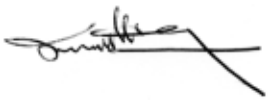

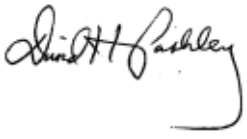

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