Bonding of One-step Self-etching Adhesive System to Demineralized and Remineralized Dentin

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Abstract: The purpose of this study was to evaluate the effectiveness of the additional application of HEMA solution to the adhesion of one-bottle self-etching systems to caries-affected dentin. Sound, artificial demineralized and remineralized dentin were used in this study. Demineralized dentin was created by immersion into a demineralization solution for 5 days. Remineralized dentin was created by immersion into a remineralization solution for 1 or 4 weeks after demineralization.

Clearfil Tri-S Bond (Kuraray Medical) was used for adhesion of resin composite to the dentin. The dentin surfaces were treated as follows: (A) in accordance with the manufacturer’s instructions (control), (B) after additional application of HEMA/propanediol solution for 60 seconds and application of Tri-S Bond in accordance with the manufacturer’s instructions (H group), and (C) after additional application of HEMA/propanediol solution for 60 seconds and application of Tri-S Bond using an agitation technique (H/A group). Resin composites (Clearfil AP-X) were built up incrementally in accordance with the manufacturer’s instructions. Specimens were stored in water at 37°C for 24 hours, after which the teeth were serially sectioned into multiple slices. The micro-tensile bond strength of the individual specimens was then measured in a universal testing machine at a crosshead speed of 1.0 mm/min. A confocal laser scanning microscope (CLSM) was used to evaluate the penetration of the primer into the dentin in each group.

There were no significant differences in the bond strength between sound and demineralized dentin groups in the control group. Bond strengths in remineralized dentin (both 1 and 4 weeks) were significantly lower than those in sound and demineralized dentin. Normal penetration of monomer into the dentin via dentinal tubules was observed in sound dentin. On the other hand, in the demineralized and remineralized dentin (both 1 and 4 weeks), the monomer hardly penetrated at all into dentin as it did in sound dentin. The bond strengths in the three groups (sound, 1-week and 4-week remineralized dentin), with the exception of the demineralized dentin, showed improvement by additional application of HEMA/propanediol. In this study, the further improvement of bond strengths by the application of HEMA/propanediol and performing of additional agitation technique was not accepted. In conclusion, it is suggested that HEMA/propanediol application might increase the bond strength in sound and remineralized dentin.

Key words: Remineralized dentin, Demineralized dentin, Micro-tensile bond strength