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Chairman : Kwang-Shik Bae (Professor, Seoul National University)
17:30~19:00 (Grand conference room, 3rd floor)

CE2

Direct Composite Resin Restoration: Mechanical properties of the adhesive layer vs. shrinkage stress of polymerizing composite resin

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In order to understand the dentin bond effectiveness, the topic of “the influence of the shrinkage stress from the polymerizing composite resin and the counteracting mechanical properties of the stress-absorbing adhesive layer on the dentin bond strength” has been evaluated in my laboratory.

Micro-mechanical retention within the demineralized dentin surface through the formation of a resin-reinforced hybrid layer has generally been accepted as the mechanism for bonding adhesive resins to dentin. As the component overlying the hybrid layer, the adhesive layer may help to preserve the integrity of the hybridized dentin, protect it from polymerization shrinkage stresses, act as a stress absorbing layer, and contribute to improving and maintaining the bond strength. Higher tensile bond strength and improved marginal leakage with increasing thickness of the adhesive layer were ascribed to the improvement of stress distribution within the bonded assembly. Even with the viscoelastic strain capacity of the adhesive layer, as the adhesive layer has the lowest stiffness and has been regarded as the “weakest link” within the bonded complex, the shrinkage stress from the polymerizing composite resin has been assumed to induce premature debonding of certain areas in the adhesive joint. Therefore, the initial mechanical variables, such as the degree of conversion and the strength, of the adhesive layer might be considered as a potential determinant of the bond strength in current dentin bonding systems.

In the presentation, data will be presented for suggesting the influence of the flaws included by incomplete solvent evaporation, the low initial mechanical properties of the adhesive layer resisting the shrinkage stress from the polymerizing composite resin, and subsequent gap or crack formation on the bond strength. The clinical procedures for increasing initial mechanical properties of the adhesive layer and reducing the detrimental shrinkage stress from the polymerizing composite resin will be discussed to improve the effectiveness of the dentin bonding system.