Effect of Cavity Configuration on Bonding of Self-etch Adhesive Systems to Cavity Floor Dentin

—Examination of Bonding Reliability—

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Abstract: Recently resin composite restoration has been applied in various clinical cases with the development and improvement of dental devices and materials. However, the fatal occurrence of polymerization shrinkage within a resin composite restorative is an important factor that affects the clinical prognosis of the restoration. The purpose of this study was to examine the effect of cavity configuration on the bonding reliability of two self-etch adhesive systems, i.e., an one-bottle all-in-one system; Clearfil Tri-S Bond (TS, Kuraray Medical), and a two-bottle self-etching primer system; Clearfil Mega Bond (MB, Kuraray Medical), to cavity floor dentin.

The occlusal enamel of extracted human molars was ground horizontally to expose a flat dentin surface. Five standardized cavities, i.e., Class I (4.0 mm long, 4.0 mm wide, 2.0 mm deep, C-value = 3.0), MO (1.7), MOD (1.0), MODB (0.7), and Flat (0.3), were prepared on the flat dentin surface (n = 10, each cavity). Every cavity was pretreated with either TS or MB, in accordance with the manufacturer’s instructions, and the same volume of universal resin composite restorative, Clearfil AP-X (Kuraray Medical), was placed into each cavity and then light cured. After storage in a moisture box at 37°C for 24 hours, restored tooth specimens were sectioned vertically into four quadrature stick form specimens (1.0 x 1.0 mm). The micro-tensile bond strengths (μ-TBS) of the stick specimens were then measured. The data of the μ-TBS obtained from the five types of cavities restored with two different adhesive systems were examined using Weibull analysis (n = 20).

Regardless of the system, the Weibull modulus of Class I (3.0) indicated the maximum value and that of Flat (0.3) indicated the minimum value. The Weibull modulus of the standardized cavity increased with decreasing C-value, and the value of MB was statistically greater than that of TS.

From the results, the bonding reliability of the cavity increased as the C-value decreased. The reliability of MB was superior to TS. However, that of MB was superior to TS only for Class I (3.0); there were no differences in the reliability between the two systems in the other four cavity configurations (1.7-0.3).

Key words: Weibull analysis, Cavity configuration, Micro-tensile bond strengths, C-value