Influence of Cavity Configuration on the Adaptation and Marginal Leakage of Laminate Veneer Restorations Fabricated with Dental CAD/CAM CEREC 3

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Abstract: The CEREC computer-aided design/computer-aided manufacturing (CAD/CAM) system enables one-visit restorative treatment by means of chairside fabrication of all-ceramic restorations. The purpose of this in vitro study was to evaluate the adaptation and marginal leakage of CEREC 3 laminate veneers with different incisal and marginal preparation designs. Forty extracted human maxillary anterior teeth were divided into 4 groups (n = 10, each) and were prepared for labial veneers with two types of incisal preparation (window preparation and incisal overlap preparation) and two types of cervical margin location (enamel and dentin). Optical impression with a CCD camera was taken with a handheld technique from the powdered preparations. Ceramic veneers were fabricated and seated with a dual-cured resin cement (Panavia F2.0, Kuraray). Specimens were immersed in 0.2% basic fuchsin and stressed under a mechanical axial load cycle of 1.3 kgf, 98 cycles/min for 24 hours, and then cut linguo-labially through their center. Under a stereomicroscope, the cement thickness was measured at three points (cervical, central and incisal), and the presence of dye penetration within the ceramic-cement and cement-tooth interfaces was examined at two points (cervical and incisal). Results demonstrated that the mean cement thickness was less than 150 μm in all groups. The incisal overlap preparation groups showed significantly greater cement thicknesses at the incisal measuring point compared with the window preparation groups (p < 0.05; one-way analysis of variance and Bonferroni/Dunn test). The enamel margin groups showed less marginal leakage at the cement-tooth interface of the cervical measuring point than the dentin margin groups, irrespective of incisal preparation designs (p < 0.05; Kruskal Wallis and Mann Whitney tests). It was concluded that the incisal overlap preparation may cause increased cement thickness at the incisal area, and that the placement of enamel cervical margins may contribute to better seal of the cervical marginal area irrespective of different incisal preparation designs.

Key words: CAD/CAM ceramic restoration, Laminate veneer restoration, Adaptation, Marginal seal