Evaluation of Bond Strength, Marginal Integrity, and Fracture Strength of Bulk- vs Incrementally-filled Restorations.

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Abstract

PURPOSE: This study evaluated the effect of application technique and preparation size on the fracture strength (FS), microtensile bond strength (μTBS) and marginal integrity (MI) of direct resin composite restorations.

MATERIALS AND METHODS: Conservative (5 × 2 × 2 mm) or extended (5 × 4 × 2 mm) preparations below the cementoenamel junction were performed in 140 human maxillary premolars (n = 70 per group). After adhesive application (XP Bond), half of each group was restored with the bulk technique (one 4-mm increment of Surefill SDR Flow plus one 1-mm horizontal capping layer of TPH3 [Spectrum TPH3 resin composite]) and half incrementally (TPH3 in three horizontal incremental layers, 1.5 to 2 mm each), all using a metal matrix band. After storage (24 h at 37°C), the proximal surfaces of each tooth were polished with Sof-Lex disks. For FS measurement, 60 restorations were mounted in a universal testing machine and subjected to a compressive axial load applied parallel to the long axis of the tooth, running at a crosshead speed of 0.5 mm/min. For μTBS testing, 40 teeth were longitudinally sectioned to obtain resin-dentin bonded sticks from the cavity floor (bonded area: 0.8 mm²). Specimens were tested in tension at 0.5 mm/min. The external marginal integrity of both proximal surfaces was analyzed using SEM of epoxy resin replicas. The μTBS, marginal integrity, and fracture resistance data were subjected to two-way ANOVA, and Tukey’s post-hoc test was used for pair-wise comparisons (a = 0.05).
RESULTS: Fracture resistance, microtensile bond strength, and marginal integrity values were not statistically significantly affected by application technique or preparation size (p = 0.71, p = 0.82, and p = 0.77, respectively).

CONCLUSIONS: The use of a bulk-fill flowable composite associated with a conventional resin composite as a final capping layer did not jeopardize the fracture strength, bond strength to dentin, or marginal integrity of posterior restorations.

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