

Comparative Evaluation of Incremental Bulk Fills Composite Insertion Technique

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Abstract

Class II cavities were prepared in 120 intact maxillary premolars, The buccolingual extension of the cavities will be 4 mm and the gingival wall will be located in dentin/cementum (2 mm below the cementum-enamel junction/CEJ); the internal angles will be rounded and cavosurface margins will be finished with gingival margin trimmer. The samples were divided into four groups (n = 60), according to the material used; smart dentine replacement (SDR), SonicFill, X Tra Fill and Z350 XT, restored to a depth of 4 mm. Following thermocycling, samples were sectioned buccolingually and examined under a stereomicroscope. Seven samples from each group were coated with nail varnish except for approximately 1 mm around the tooth restoration junction. These samples were examined under stereomicroscope after staining with 2% buffered methylene blue dye. The remaining samples were examined under a scanning electron microscope for gap formation. The data were statistically analyzed using one-way ANOVA and post-hoc Bonferroni test.

Keywords

Adaptability, bulk-fill composites, micro leakage, incrementally filled composites

Aim

SDR showed the significantly best adaptability as compared to both SonicFill and X-Tra fill. However, significantly least adaptive capacity was seen in the incrementally filled group (Z350 XT).

Today, composite resins are considered materials of choice in restorative dentistry because of the increasing demand for high-quality esthetic results in everyday practice. Composite resins have undergone improvement in all areas, including aesthetics, wear and handling.

The main problem faced by composites is polymerization shrinkage and stresses which depends on multiple factors such as the configuration factor, composition of resin composites, material properties, and various incremental placement techniques.

However, this technique has many disadvantages: It is difficult to place the multiple increments leading to an increase in the arduousness of the task and the time it takes to complete it. If

not performed properly, placing multiple layers can result in polymerization shrinkage and marginal leakage.

In light of this, a group of new products were recently introduced, known as “bulk-fill composites.” These materials are recommended for insertion in a maximum 4-mm bulk due to their high reactivity to light curing.

Microleakage is a phenomenon in which oral micro-organisms, fluids and chemical substances are diffused through the interphase between tooth structure and restorative material. Fluids may progress through the dentin into the pulp, resulting in post-operative sensitivity, recurrent caries, pulpal inflammation and restoration failure.

Previous research has shown polymerization shrinkage can lead to bond failure and microleakage of resin composite restorations. Microleakage is a matter of concern because it leads to staining at the margins of restorations, recurrent caries, hypersensitivity and pulp pathology.

Hence, the aim of this in-vitro study is to compare the micro leakage of Sure Fil SDR (Dentsply), x-Tra Fil and Z350 XT composite resins.

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CAVITY PREPARATION

Class II slot cavities (on mesial) will be prepared with a round-nosed no.245 carbide bur (Dentsply/Caulk, Milford, DE, USA) at high-speed with air/water spray. The buccolingual extension of the cavities will be 4 mm; the gingival wall located in dentin/cementum (2 mm below the cementum-enamel junction/CEJ); the internal angles will be rounded and cavosurface margins will be finished with gingival margin trimmer.

RESTORATIVE PROCEDURES

The prepared teeth will be mounted in putty impression material (3M ESPE) to simulate clinical conditions and supporting structures as closely as possible. The teeth will be mounted three at a time to simulate proximal contact. Tofflemire metal matrix and retainer will be used for each tooth. Wooden wedge will be used to stabilize the matrix.

Teeth will be randomly divided into three groups of forty teeth each. The tooth surfaces will be prepared for bonding with a three-step adhesive (All-Bond 2® Dual-Cured Universal Adhesive System).

Firstly, the slot cavity preparation will be air-dried for 30 s, prior to the application of 37% phosphoric acid etching gel (Ivoclar

Vivadent) for 15 s before rinsing with water. Following a light drying with compressed air for 1 s, five consecutive coats of the primer (a mixture of All-Bond 2 Universal Dental Adhesive System) and All-Bond 2 Universal Dental Adhesive System Primer B will be applied with a saturated brush tip until the surface appeared glossy. The primer mixture will be lightly dried with compressed air for 2-3 s. A thin layer of bonding resin will be applied to the primed enamel and dentin.

Group I: Shade 'A' of surely SDR (DENTSPLY) resin will be used to fill the 4mm in cavities and polymerized from the occlusal aspect for 40s with the turbo-light emitting diode (LED).

Group II: Shade 'A' of x-Tra fill composite resin will be used to fill 4mm in cavities and polymerized from aspect for 40 s with the turbo-light emitting diode (LED).

Group III: Z350 XT (3M, Latin America) resin will be used to incrementally fill the cavities. Oblique increments of 2 mm will be placed, each layer polymerized from the occlusal aspect for 40 s with the turbo-light emitting diode (LED).

A Teflon coated composite filling instrument (DENTSPLY) will be used to insert and condense conventional resin composite.