UNIVERSITÉ DE GENÈVE

MARGINAL ADAPTATION OF BULK FILLED DUAL CURED COMPOSITES

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Objectives: The aim of this in vitro study was to evaluate the marginal adaptation before and after cyclic fatigue of class II restorations with cervical margins in dentin restored with an experimental bulk fill dual cured composite resin with and without occlusal coverage with a light cured composite (Synergy D6, Coltène-Whaledent) in combination with a non-rinse conditioner/adhesive system (ParaBond, Coltène-Whaledent) with and without H_3PO_4 etching of enamel.

Materials&Methods: Thirty two class II box-shaped cavities were prepared in extracted human molars, bonded with the non-rinse conditioner/adhesive system and randomly divided in four equal experimental groups: A; Bulk filled dual cured composite resin,no H_3PO_4 enamel etching, B; Bulk filled dual cured composite resin + light cured composite resin as occlusal layer, no H_3PO_4 enamel etching, C; Bulk filled dual cured composite resin, H_3PO_4 enamel etching, D; Bulk filled dual cured composite resin + light cured composite resin as occlusal layer, H_3PO_4 enamel etching. Fluid simulation with the horse serum was performed during cavity preparation, restoration placement, finishing and stressing. SEM marginal analysis based on gold-coated replicas at the total margin length and at the 3 separate marginal segments: occlusal enamel, proximal enamel and cervical dentin, was performed before and after thermo-mechanical fatigue in a chewing simulator.

DESCRIPTION OF A GROUP	
GROUP A	dual curing composite resin bulk inserted without H_3PO_4 enamel etching
GROUP B	dual curing resin composite with light cured composite as occlusal layer without H_3PO_4 enamel etching
GROUP C	dual curing composite resin bulk inserted with H_3PO_4 enamel etching
GROUP D	dual curing resin composite with light cured composite as occlusal layer with H_3PO_4 enamel etching

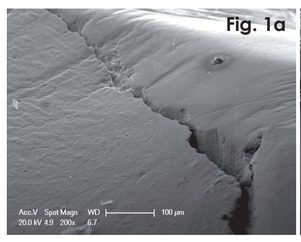


Fig. 1a Group A before loading

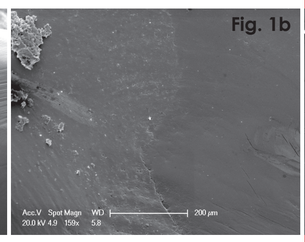


Fig. 1b Group A before loading

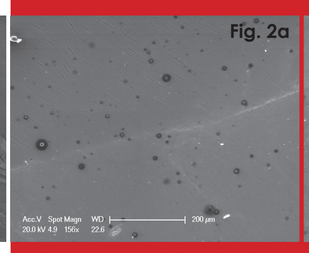


Fig. 2a Group B before loading

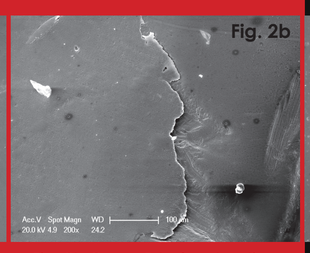


Fig. 2b Group B before loading

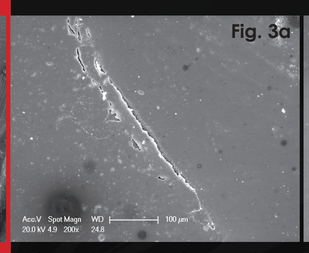


Fig. 3a Group C before loading

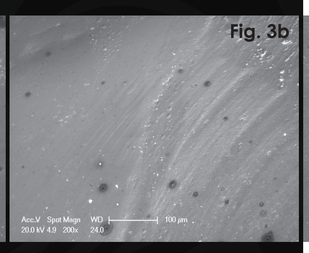


Fig. 3b Group C before loading

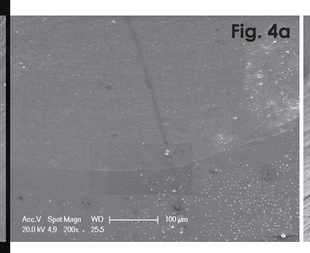


Fig. 4a Group D before loading

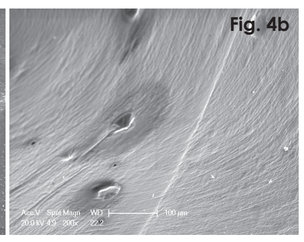


Fig. 4b Group B before loading

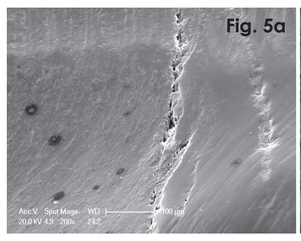


Fig. 5a Group A after loading

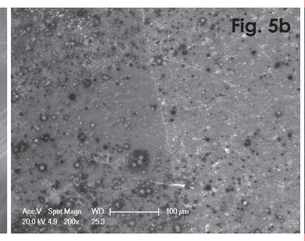
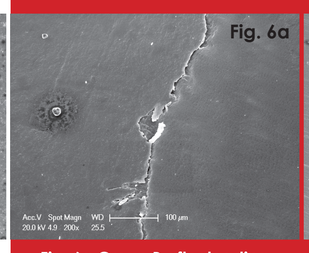


Fig. 5b Group A after loading



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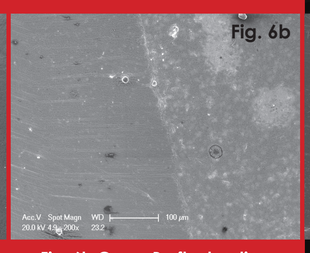

Fig. 6b Group B after loading

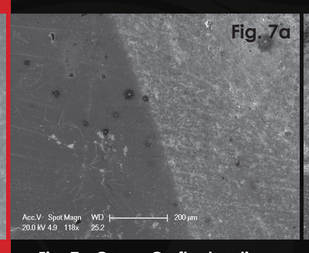

Fig. 7a Group C after loading

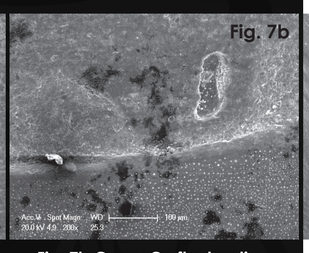

Fig. 7b Group C after loading

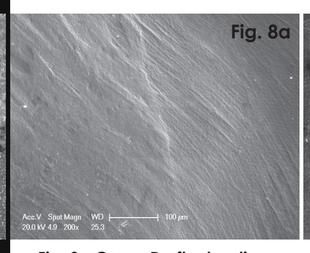

Fig. 8a Group D after loading

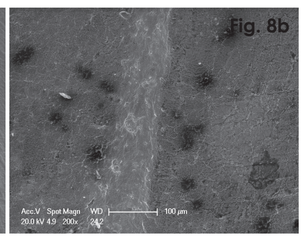

Fig. 8b Group B after loading

Results: At the total marginal length, significant differences were observed for percentages of „continuous margin“(CM) between groups, both before and after loading (ANOVA, p = 0.000). The highest %CM (mean ± SD) was observed in group D: 94.9 ± 5.3 before loading and 90.9 ± 6.0 after loading, followed by group C: 84.2 ± 5.8 before loading and 72.8 ± 6.9 after loading. At the occlusal and proximal segments significant differences were observed before and after loading, in contrast to the cervical segment where no significant differences were observed between the 4 groups.

Conclusions: Under the conditions of this in vitro study, the bulk filled dual cured composite resin with and without an occlusal layer of light cured composite resin in combination with a non-rinse conditioner/adhesive system and H3PO4 enamel etching showed promising results in respect to marginal adaptation in class II cavities subjected to thermo-mechanical fatigue. These findings make of these restorations a potential metal-free “amalgam substitute”.