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Three-year clinical evaluation of two nano-hybrid giomer restorative composites

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Abstract

Purpose: To evaluate the clinical performance of two nano-hybrid giomer restorative composites; Beautifil II and Beautifil Flow Plus F00 with FL-Bond II adhesive system in class I posterior restorations during three-year period.
Materials and methods: Twenty patients joined this study with age ranging from 20 to 35 years. Each patient has to present two permanent upper or lower molars of the same side requiring new class I restorations of primary carious lesions to be restored by both tested materials. Two clinicians examined the twenty patients with 40 restorations (20 for each restorative material) clinically using Modified USPHS/Cvar & Ryge Criteria for direct restoration for a period of three years with an examination interval 6 months.
Results: Data was collected and statistically analyzed using SPSS version 18. Friedman's test showed no significant changes to all modified USPHS criteria for each material during the three-year evaluation period. Fisher's exact test showed no significant changes between materials in postoperative sensitivity, recurrence of caries or retention of restoration. The significant changes recorded were after three years period follow up between the two materials; Beautifil flow plus F00 has significantly better marginal adaptation ($P < 0.01$), marginal discoloration ($P = 0.01$), surface roughness ($P = 0.01$) and surface morphology ($P < 0.01$) versus Beautifil II.
Conclusion: Beautifil Flow Plus F00 (zero flow) restorative material achieved clinically better significant acceptable results than Beautiful II after three years of service in conservative class I cavities.

Keywords: Clinical evaluation; Class I; Beautifil II; Beautifil Flow Plus F00

1. Introduction

Composite restorations have become the most popular tooth colored direct filling materials. It has good esthetic, physical and mechanical properties compared to other direct esthetic restorative materials [1]. However, detected recurrent caries have been identified as a primary cause for replacement of directly placed resin composite restorations [2]. Restoration replacement is destructive for teeth containing a tooth colored restorations as it can result in an increase in cavity size by up to 37% [3].

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Table 1
Materials used in the study.

Giomer material description	Material name	Composition	Manufacturer & website
A nano-hybrid composite with fluoride release and recharge	Beautifil II	*Base resin*: Bis-GMA (7.5 wt%)/TEGDMA (5 wt%) resin *Filler*: Multifunctional glass filler and S-PRG (Surface Pre-Reacted Glass-ionomer) filler based on fluroboroaluminosilicate glass. *Filler loading*: 83.3 wt% (68.6 vol%) *Particle size range*: 0.01–4.0 μm *Mean particle size*: 0.8 μm DL-Camphorquinone	Shofu, Kyoto, Japan. www.shofu.com
A flowable nano-hybrid composite with fluoride release and recharge	Beautifil Flow Plus. F00	*Base resin*: Bis-GMA (15 wt%)/TEGDMA (13wt%) resin *Filler*: Multifunctional glass filler and S-PRG filler based on fluroboroaluminosilicate glass. *Filler loading*: 67.3 wt% (47.0 vol%) *Particle size range*: 0.01–4.0 μm *Mean particle size*: 0.8 μm DL-Camphorquinone	
A self-etching fluoride releasing two step adhesive system	FL-Bond II	*Primer*: Carboxylic acid monomer, Phosphonic acid monomer, 6-MHPA, Water, Solvent, Photo-initiator *Adhesive*: HEMA, UDMA, TEGDMA, 40% fluoride releasing and recharging S-PRG filler, Photo-initiator.	

Bis-GMA: bisphenol-A-diglycidyl methacrylate; TEGDMA: triethyleneglycol dimethacrylate; 6-MHPA: 6-methacryloxyhexyl 3-phosphonoacetate; HEMA: 2-hydroxylethyl methacrylate; UDMA: urethane dimethacrylate; S-PRG filler: Surface pre-reacted glass-ionomer filler.

It was found that; conventional glass ionomer (GI) has the ability to inhibit the initiation and progression of recurrent caries' [4]. This has stimulated scientists to develop a hybrid of composite and GI. Compomer and Resin modified glass ionomer (RMGI) have been developed to hybridize the advantages of both, the good mechanical properties, esthetic and hydrophopocity of composite added to anticariogenic activity and chemical bonding to tooth structure of GI advantages. However, properties of RMGI and compomer were still far from that of composite restoration [5,6].

Thus, Giomer material has been introduced as the true hybridization of glass ionomer and composite resin, containing surface pre-reacted glass ionomer (S-PRG) filler particles within a resin matrix. Giomer combines the fluoride release, recharge of GIs and the esthetics, physical and handling properties of composite resins [7].

Literature search reveals several clinical studies conducted on giomers in class V and in class I, II lesions over a period of 1–8 years with good clinical performance [8–13]. Yap et al. [13] found that a giomer, after polishing with Sof-Lex disks, had a smoother surface than a glass ionomer, and one that was comparable to that of a compomer and a resin composite. Jyothi et al. [14] reported that Beautifil II (a second giomer generation) had superior surface finish compared to RMGIC (Fuji II LC) in non-carious cervical lesions in one year clinical study. Moreover, a clinical study [15] has reported no significant difference between Beautifil II giomer restorative material and a conventional resin-based composite material. These results encouraged the manufacturer[1] to develop flowable giomer materials with different viscosities. Beautifil Flow Plus F00 is one of the flowable giomer products which claimed by the manufacturer to have favorable adaptation, effortless delivery with the strength, durability and aesthetics equal to or better than hybrid composites.

The current study offered the opportunity to clinically compare two nano-hybrid giomer restorative materials employing the same composition but with different fillers percentage. Both materials depend on multifunctional glass filler and S-PRG filler based on fluroboro-alumino silicate glass with particle size range from 0.01 to 4.0 μm. The filler content are 83.3 wt% (68.6 vol%) in Beautifil II and 67.3 wt% (47.0 vol%) in Beautifil Flow Plus F00.

The research null hypothesis was that there is no difference in the clinical performance of Beautifil II and Beautiful Flow Plus F00 in conservative class I cavities.

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