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Retention of a resin-modified glass ionomer adhesive in non-carious cervical lesions. A 6-year follow-up

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Summary *Objectives*. The purpose of this study was to evaluate the clinical retention of a new resin-modified glass ionomer cement based adhesive combined with a hybrid resin composite or a poly-acid modified resin composite in non-carious cervical lesions during a 6-year period.

Methods. The resin-modified glass ionomer adhesive (Fuji Bond LC), was placed in 73 cervical lesions, 36 with a universal hybrid resin composite (Tetric Ceram) and 37 with a poly-acid modified resin composite (Hytac). Fifty-one in lesions with sclerotic dentin and 22 in non-sclerotic ones. Of the sclerotic lesions 38 were slightly roughened with a diamond bur before conditioning. The restorations were evaluated with slightly modified USPHS criteria every six months during a 6-year period.

Results. All except six restorations were evaluated during the 6 years. Twelve (17.9%) were lost, four Tetric Ceram (11.8%) and eight Hytac (24.2%) ($p<0.05$). Four were found in non-sclerotic lesions (20.0%) and eight in sclerotic lesions (17.0%). The differences between the sclerotic and non-sclerotic and the roughened and non-roughened lesions were not significant.

Conclusions. The resin-modified glass adhesive showed a superior clinical retention combined with the resin composite material, with an annual failure rate of 2%.

Introduction

Adhesive techniques have been developed to such an extent that they are now involved in most clinical procedures. During the last years several new bonding agents using different conditioning, priming and bonding steps have been developed, which produce high bond strengths.[1] Bonding to dentin has become more reliable since the introduction of amphiphilic monomers in primers, which can infiltrate moist demineralized dentin surfaces. They polymerize within the collagen network and produce a resin-reinforced or hybrid layer.

Glass ionomer cements (GIC) have the important property to adhere to enamel and dentin and release fluoride.[2] Although measurements of in vitro bond strengths reveal much lower values for

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GIC than for resinous based adhesive systems, evaluations in non-carious cervical lesions, also called abrasion/erosion or abfraction, of glass ionomer cement restorations showed good long-term retention.[3] Improved modifications, the resin-modified glass ionomer cements (RMGIC) were introduced in 1988. Addition of light-curing resin components led to a higher resistance to early moisture contact and desiccation, and higher mechanical characteristics.[4,5] RMGIC were used first as bases or restoratives,[6,7] and in1995, a modern RMGIC was developed as dentin-enamel adhesive. After pretreatment of the cavity with a weak polyalkenoic acid, self adhesion of the adhesive is obtained by both a micromechanical interlocking by a submicron hybrid layer (0.5–1 μm) and a chemical bond through ionic bonds between the carboxyl groups of the glass ionomer and calcium of hydroxyapatite that remains around the collagen.[2,8] Kemp-Scholte and Davidsson[9,10] showed that a material with enhanced flow and reduced elastic modulus may function as a stress-absorbing layer and improve marginal sealing. Resin composites have a higher Youngs modulus of elasticity which result in a relative high remaining contraction stress compared to poly-acid modified resin composites (PMRC) and RMGIC.

The purpose of this study was to evaluate the clinical performance of the RMGIC adhesive in combination with a universal hybrid resin composite and a poly-acid modified resin composite in cervical non-carious lesions. The hypothesis to be tested was that RMGIC adhesive/PMRC restorations showed better retention rates then the ones placed with the RC.

Materials and methods

A total of 73 class V restorations were placed in 35 patients (11 men and 24 women) with a mean age of 58 year (range 34–84), who needed dental treatment of cervical non-carious (abrasion/erosion) lesions. The restorations were placed in the non-retentive lesions, mainly localized in dentin without any intentional enamel involvement. The RMGIC adhesive Fuji Bond LC (GC International, Tokyo, Japan) was used with a universal hybrid resin composite (Tetric Ceram, Vivadent, Schaan, Liechtenstein) in 36 lesions and a poly-acid modified resin composite (Hytac Aplitip; ESPE, Seefeld, Germany) in 37 lesions (Table 1).

Pre-operatively the lesions were categorized by the operator compared to lesion models in terms of depth of the lesion (superficial, moderate, deep) and the area of the dentin surface estimated as sclerosic tissue (none, $<50\%$, $>50\%$) as shown in Table 2[11,12] Part of the lesions were at random slightly roughened with a diamond bur before conditioning (Table 2). The lesions were cleaned with a polishing paste and/or rinsed and dried preoperatively when necessary. The adjacent gingiva was retracted by gingival retraction instruments or celluloid matrix bands when necessary to secure unrestricted contamination free access to the field. No bevel was placed. The lesions were conditioned with an aquous solution of 20% polyacrylic acid with 3% aluminium chloride (GC Dentin conditioner, GC Corp) for 10 s, rinsed thoroughly and gently air dried in order to be able to keep a slightly wet dentin surface. The adhesive was next applied on the conditioned lesion surface strictly according to the manufacturer's instructions. Two drops of liquid and one level spoonful of powder were dispensed in a disposable dish for 10 s mixed and applied with a brush and light cured for 10 s. The lesions were randomly divided in two groups and restored with the resin composite or the poly-acid modified resin composite. Patients with two similar sized and located lesions received a restoration of both restoratives. The restorative materials were in most cases placed in two increments using a selected composite instrument (Hu Friedy). Every increment was light cured for 40 s with a well controlled light-unit (Luxor, ICI,

Table 1 Composition of the material studied.

Components	Lot no.	Composition
Fuji bond LC conditioner	230161	20% polyalkenoic acid, 3% aluminium chloride
Adhesive powder liquid		Fluoro-alumino-silicate glass Polyalkenoic acid, 2-hydroxyethyl methacrylate, dimethacrylate, camphoroquinone, water
Tetric Ceram	819432	Bis-GMA, urethane dimethacrylate, TEGDMA, Bariumglass, ytterbium trifluorid, Ba-Al-Fluorosilicate glass, high dispersed silica, additives, catalysts and stabilizers, pigments
Hytac	29243/30825	Bimethacrylates, CaF-fluoroglass, silicic acid, yttrium trifluorid, complex fluoride, amine, camphorquinone