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Clinical comparison of a flowable composite and fissure sealant: A 24-month split-mouth, randomized, and controlled study

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ABSTRACT

Objectives: The aim of this clinical study was to evaluate the retention rate and caries-prevention effect of a flowable composite compared to a conventional resin-based sealant in a young population over a 24-month period.

Methods: Thirty-four patients, ranging in age from 16 to 22 years, diagnosed with at least 2 non-cavitated pit-and-fissure caries in the first and second molars were selected for this randomized split-mouth design trial. A total of 220 sealants, were placed in 117 upper molars and 103 lower molars. The teeth were sealed with a flowable resin composite (Tetric Evo Flow) or a sealant material (Helioseal F). Each restoration was independently evaluated in terms of retention and the presence of caries at baseline and at 1, 6, 12, and 24 months. Data were analyzed using non-parametric Mann–Whitney *U* and Friedman 1-way ANOVA tests at $p < 0.05$.

Results: Tetric Evo Flow showed complete retention with 100%, 95.5%, 93.8%, and 88.5% at 1, 6, 12, and 24-month evaluations, respectively, while Helioseal F retention rates were 98.1%, 95.5%, 94.8%, and 85.4%, respectively, for the same evaluation periods. At the 24-month recall, 4 (4.2%) total losses were observed in subjects treated with Tetric Evo Flow and 2 total losses (2.1%) for Helioseal F, respectively. No significant differences were observed between the materials in retention rates or caries incidence for each evaluation period ($p > 0.05$).

Conclusion: Placement of flowable composite as fissure sealants in the younger population seems to be as effective as conventional fluoride containing fissure sealants for the prevention of fissure caries.

Clinical relevance: The use of a flowable composite as a fissure sealant material, in conjunction with a total-etch, single bottle adhesive, yielded better retention than did the conventional fluoride containing resin-based fissure sealant over a 24-month period in young patients.

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1. Introduction

Although the field of dentistry has shown outstanding scientific advances in restorative materials and innovative prevention techniques over recent decades, dental caries remains a highly prevalent pathology worldwide.[1,2] Although fluorides are highly effective in preventing caries on smooth surfaces, they are not equally effective in protecting occlusal surfaces.[3] Reasons for this include the ''morphology of occlusal pits and fissures that make mechanical cleaning difficult and facilitate the retention of bacteria, nutrients, and debris''.[4] Therefore, a specific barrier between the tooth surface and the oral environment is needed to avoid the development of caries. One of the most appropriate and cost effective treatments for the prevention of occlusal caries in children and adolescents at high risk is the application of pit-and-fissure sealants.[4–10]

Pit-and-fissure sealants were introduced in the 1960s as an efficient caries prevention method and have shown high retention rates.[11,12] Most of the sealant materials used today are resin-based composite adhesives with a main component of Bis-GMA, which allows the addition of filler particles to the sealant composition, considerably increasing their wear resistance.[7]

It is assumed that the residual bacteria in biofilm that remain in the fissure after thorough cleaning, do not survive under a properly applied sealant or cannot multiply if they do survive.[13,14] Therefore, the retention rate becomes a determinant of their effectiveness as a caries prevention measure. Otherwise, a partial loss of the sealant material inherently leads to the occurrence of marginal leakage and, hence, to caries development underneath the sealant.[15] A sealant is rarely retained completely over the tooth's lifetime and must be reapplied. It has been previously reported that retention rates of sealant materials at a rate of 74–96%[16] and 79–92%[6] after one year.

There are several possible variables that contribute to the retention of the sealant material, such as; ''enamel properties, surface treatment procedure, and skill of the operator''.[17,18] Undoubtedly, the type of sealant material, its viscosity and flow, as well as the wear resistance of the material are major factors contributing to retention and caries prevention.

Several materials and techniques have been developed to enhance the longevity of pit-and-fissure sealants, including the use of flowable composite resins as pit-and-fissure sealants.[15,19,20] The use of flowable restorative systems in dentistry has increased, mainly because of their beneficial properties, such as ''low viscosity,[21] low modulus of elasticity,[21,22] and ease of handling''.[23] These properties may even allow the materials to be successfully placed in ultraconservative preparations with retention rates similar to those of conventional resin pit-and-fissure sealants.[19]

Although fissure sealants have shown excellent efficacy in prevention of occlusal caries in both children and adolescents,[4,6] there seem to be few research studies comparing the retention and caries prevention efficacy on pits and fissures with a flowable resin-based composite in a young population under long-term clinical conditions.

Therefore, the aim of this clinical study was to evaluate the retention rate and caries-prevention effect of a flowable composite pit-and-fissure sealant compared to a fluoride containing conventional resin-based sealant in a young population over a 2-year period. The null hypothesis was that there would be no difference between the flowable composite used as a fissure sealant and resin-based fissure sealant in retention rates and caries-prevention effect in a young population over a 2-year period.

2. Materials and methods

2.1. Protocol

The subjects were recruited from patients of Istanbul University, Faculty of Dentistry, Department of Operative Dentistry clinics, who were regularly attending for routine dental care. Thirty-four young patients with a mean age of 20 years (range, 16–22 years), exhibiting at least 2 non-cavitated pit-and-fissure caries on first and second molars, were selected to participate in this randomized, single-blinded, controlled, single-centre split-mouth design trial. The study conformed to good clinical practice (GCP) guidelines, and the research protocol was approved by the Ethical Committee at Istanbul University Faculty of Medicine (project no: 2011/383-451). All patients received detailed information (verbal and written) on the principles of treatment, potential discomforts, risks of the procedures, and the study purpose, and signed appropriate informed consent forms. Moreover, the patients were instructed on possible causative factors of pit-and-fissure caries, and the multifactorial origin of the caries process.

2.2. Selection of patients

All patients requesting a routine dental treatment at the Department of Operative Dentistry, Faculty of Dentistry, Istanbul University, who were 16–22 years old (18 male and 16 female patients), in good general health, with at least 2 non-cavitated upper/lower first and/or second molar teeth in each quadrant of maxilla or mandible were candidates for inclusion in the study. The patients were not admitted to the study if any of the following criteria were present: (1) known allergy to any of the resins used, (2) clinically detectable caries, (3) previously placed sealants or restorations, (4) bruxism or malocclusion, or (5) residence outside of the city of Istanbul, insufficient address for follow-up, or unwillingness to return for follow-up.

2.3. Treatment regimen

One specially trained and experienced researcher performed the operative procedures. The fissures of the first and/or second molars were cleaned with a slurry of pumice, applied with a bristle brush in a slow-speed hand piece, to remove salivary pellicles and any remaining plaque. After prophylaxis, teeth were washed with a water spray for 60 s to remove pumice residues. Careful visual inspection was then carried out under good illumination on the clean, dry tooth surfaces with the use of a mirror and a blunt explorer. Occlusal caries