Dental World 2017 - The Effect of Different Techniques of Enamel Etching on the Shear Bond Strengths of Fissure Sealants- Ozgul Baygin- Karadeniz Technical University

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Abstract

The specimens were randomly assigned to 1 of 5 groups with 10 teeth each. The data were analyzed by means of one-way analysis of variance and Tukey's post-hoc tests (pGroup4 (5.99±1.36)> Group3 (5.27±1.56)>Group5 (2.02±0.86)>Group2 (1.65±0.69). No significant differences were observed between Groups2 and 5.

Keywords: Er,cr:ysgg laser; Cojet-prep; Fissurotomy-bur; Etching; Fissure sealant

Introduction:

The properties of an ideal sealing material include biocompatibility, retention, and resistance to abrasion and wear . The success rate of fissure sealants depends on factors, such as retention and resistance to shear bond strength (SBS) associated with the quality of the adhesion between the sealant material and the enamel . Prior to sealant application, it is important that the tooth surface and fissure areas are free of gross plaque and debris that might interfere with sealant penetration. The use of phosphoric acid is a well-accepted and standard method for roughening enamel surfaces. However, remaining debris and pellicle might not be removed by means of conventional prophylaxis and acid etching. Therefore, several preparations and cleaning techniques used on the tooth surface before sealant application have been suggested. A widening of the fissures with rotary instrumentation is yet another type of fissure conditioning that has been recommended prior to sealant application. This is known as the invasive pit-and-fissure technique used to clean the fissure entrance, permit inspection of incipient caries, and determine the degree of possible caries extension toward the dentinoenamel junction. Results of clinical studies have been encouraging for caries prevention, but they do not conclusively support the routine practice of fissure preparation before sealant application . There is limited and conflicting evidence that mechanical preparation with a bur results in higher retention rates in children.

Materials and Methods:

Fifty partially or totally impacted human mandibular third molar teeth, free of caries and without any other microscopic defects, were assigned for extraction and extracted after obtaining the informed consent form signed by the patients, as this was an in vitro study. The teeth were stored in distilled water at 40 C for a maximum of one month. After surface debridement with hand scaling instruments and cleansing with a slow-speed hand piece and a brush with a fluoride-free pumice, root sections 2 mm below the cementoenamel junction were taken. The crowns were bisected longitudinally in a mesiodistal direction and the buccal and lingual surfaces were selected for experimentation. Coronal sections were embedded in polyester resin and the surface of each specimen was polished using 200-grit and 600-grit silicon carbide paper in a mechanical grinder (EcoMet®, Buehler®, Lake Bluff, IL, USA). The overlying enamel was flattened to create an enamel surface area of 3 mm in diameter. The specimens were randomly assigned to 1 of 5 groups with 10 teeth each (Table 1). For the acid-etching procedure (Group 1), the enamel buccal/ lingual surfaces of the teeth were first air dried and then etched for 20 sec with a 35% orthophosphoric acid gel (Scotchbond™ etchant delivery system, 3M ESPE, St. Paul, USA) rinsed for 15 sec and air dried for 10 sec. 3 mm diameter etched enamel surface was obtained.
Following these procedures, cylindrical transparent gelatin tubes (Tygon Micro Bore PVC Tubing, Small Parts, Miami Lakes, FL, USA) (diameter of 3 mm and height of 2 mm) were placed on substrate surfaces. It was light-cured for 40 sec (Curing light XL 3000™, 3M Dental Products, St. Paul, USA), and the matrix was subsequently removed. After storing the specimens for 24 h in distilled water at 37o C, we tested them in shear mode by using a shear knife-edge blade in a universal testing machine (Instron Corporation, Canton, MA, USA) with a crosshead speed of 0.5mm/ second. We compared the mean bond strengths using a one-way analysis of variance and Tukey's post-hoc tests ($p<0.05$).

Results:

the mean SBS and standard deviations for all groups. The following SBS values (mean±SD values-MPa) were obtained: Group 1 (8.47±1.30) > Group 4 (5.99±1.36) > Group 3 (5.27±1.56) > Group 5 (2.02±0.86) > Group 2 (1.65±0.69). Group 4 had higher SBS values than Group 3, although no significant differences were found. In addition, no significant differences were observed between Groups 2 and 5.

Discussion:

It is recognized that studies examining the various alternative roughening methods to the acid-etch technique used for surface roughening necessary for the adhesion of fissure sealants to the enamel surface are limited. A SBS test provides insight into the adhesion of these materials and serves as a screening mechanism for predicting clinical performance .
Phosphoric acid is one of the best methods to bond resins to enamel.. Generally, 10- 37% orthophosphoric acid is applied to both the enamel and the dentin [3,20].In this study, we used a 35% orthophosphoric acid gel and found that acid .Acid etching results in chemical changes that can modify the organic matter and decalcify the organic component. As a result of this demineralization, enamel becomes more susceptible to caries attack, which is induced by plaque accumulation around the bonded fissure sealant. Hossain reported an increase in the calcium-to-phosphorus ratio achieved during laser irradiation that resulted in caries inhibition.

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