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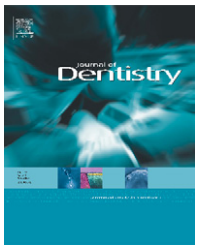

SEM and microleakage evaluation of the marginal integrity of two types of class V restorations with or without the use of a light-curable coating material and of polishing

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ABSTRACT

Objectives: To evaluate the marginal integrity of class V restorations through an SEM observation and a microleakage test.

Methods: Teeth with class V cavities were restored with either a flowable composite ($n = 20$) or a glass ionomer cement (GIC) ($n = 20$). Ten restorations in each group were immediately polished. A coating agent was applied on five polished and five non-polished restorations of each group. No coating was used on the remaining specimens. Epoxy resin replicas of the restorations were observed under a SEM and the percentage of marginal gaps was calculated. After immersion in a 2% methylene blue solution, three sections were obtained from each specimen and observed under a stereomicroscope. Occlusal and gingival microleakage were evaluated with a four-steps scoring system. The percentages of marginal gaps and the microleakage scores were analyzed with the Kruskal–Wallis ANOVA and the Mann–Whitney test with Bonferroni's correction. Occlusal and gingival microleakage were compared with the Wilcoxon test.

Results: No gaps were detected after coating. The restorative materials did not differ in interfacial gaps. Immediate polishing increased the gaps of uncoated restorations ($p < 0.05$). The microleakage decreased with coating, except for occlusal wall of polished flowable composite restorations. After coating, the occlusal microleakage was higher than the gingival ($p < 0.05$), except for non-polished flowable composite restorations. After polishing and coating, the flowable composite showed higher occlusal microleakage than the GIC. The polishing increased the occlusal microleakage of coated flowable composite restorations.

Conclusions: The coating procedure is advisable for restoring marginal integrity and reducing gingival microleakage in class V restorations.

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1. Introduction

Since their introduction to the dental practice by Wilson and Kent in 1972, glass ionomer cements (GICs) have shown a good performance in restoration procedures.[1]

These materials have a coefficient of thermal expansion similar to that of dentine, setting contraction less than composite resin and acceptable biocompatibility with the pulp and periodontal tissue.[2,3] Due to their favourable handling properties, these materials have been applied not only in restorative dentistry,[2,3] but they are also well accepted in pediatric dentistry.[4–8]

The capability to release fluoride,[9] providing a potential cariostatic and antimicrobial action,[10] makes GICs more appropriate for restorations replacing carious lesions[11,12] rather than for restoring traumatic lesions. In particular, GICs have been proposed for atraumatic restorative treatments[13–18] and as dental sealants.[19,20]

GICs are suitable for class III and V restorations, whereas for class I or II restorations GICs are advisable only when the occlusal stress is reduced.[3] As a matter of fact, in presence of high occlusal stress the use of conventional restorative materials, such as composites, is preferable to GICs.

However, GICs have been also suggested as base filling materials[21–23] or core build-up materials.[24] They have also been widely used for the cementation of prosthetic restorations[25,26] and orthodontic bands.[27]

A key feature of GICs is certainly the ability to chemically bond to enamel and dentin without the need of phosphoric acid etching and adhesive application.[3,28] However, the loss of marginal integrity has been reported as one of the main reasons for failure of GICs restorations.[29]

Recently a new concept of restorative system was proposed. This system, which attempts to provide aesthetic alternative restorations, combines a GIC (Fuji IX; GC Corp., Tokyo, Japan) and a post-coating material (G Coat Plus; GC Corp.).

The aim of this study was to evaluate through an SEM observation and a microleakage test the quality of the marginal seal of class V restorations performed by using either a flowable composite or a GIC, with or without the application of a light-curable coating material, and with or without an immediate polishing of the restorations before applying the coating agent. Thus, the null hypothesis tested was that the marginal gaps extension and the microleakage of class V restorations are not influenced by the restorative material, by the immediate polishing of the restoration or by the additional application of a post-coating material.

2. Materials and methods

Forty sound human premolars extracted for periodontal reasons were collected for the study. The teeth were hand-scaled and kept in saline solution (0.9% sodium chloride in water) at 37 °C for no longer than one month before being used in the experiment.

Standardized box-shaped class V cavities were prepared on the buccal aspect of each tooth with a round diamond bur (Komet S 6801.314.014; Komet, Lemgo, Germany) mounted on a high-speed handpiece, under copious water spray. The cavities measured 3 mm occluso-gingivally and 3 mm mesio-distally, with a depth of 1.5 mm and were located at the CEJ level, with the occlusal margin in enamel and the gingival margin in cementum–dentin (Fig. 1). The dimensions of the prepared cavities were checked with a Boley gauge. A ±0.3 mm tolerance in the measurements was considered acceptable for including the specimen in the trial.

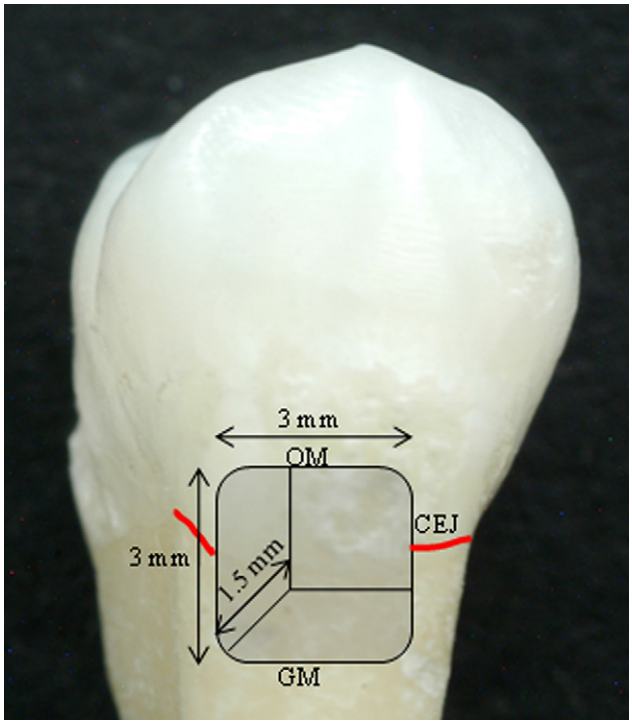

Fig. 1 – Schematic representation of a box-shaped class V cavity on the buccal aspect of an extracted premolar at the enamel–cementum junction (CEJ) level. The occluso-gingival and the mesio-distal dimensions measured 3 mm, whereas the depth of the cavity was 1.5 mm. The occlusal margin (OM) was located in enamel and the gingival margin (GM) was located in cementum–dentin.

The teeth were then divided into two main experimental groups ($n = 20$):

Group 1: An all-in-one adhesive (G Bond; GC Corp.) was applied on the cavity walls and light-cured (VIP; Bisco, Schaumburg, IL, USA) after having set the curing unit at an output of 600 mW/cm^2. A radiometer (Optilux Radiometer, Kerr, Danbury, CT, USA) was used prior to light-curing procedures in order to verify that the light intensity output was at least 600 mW/cm^2. During curing procedures the tip of the light-curing unit was maintained perpendicular to the pulpal wall of the cavity at a distance of approximately 6.5 mm from the latter. The teeth were then restored with a flowable composite resin (Gradia Direct Flo; GC Corp.);

Group 2: After cavity conditioning for 10 s (Cavity Conditioner; GC Corp.) the teeth were restored with a GIC (Fuji IX; GC Corp.).