# EVALUATION OF THE MARGINAL MICROLEAKAGE IN FOSSAS AND GROOVES SEALING MADE WITH TWO GLASS IONOMER CEMENTS

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***Abstract:*** *The qualities of two glass ionomer cements used as sealants were evaluated by determining the existence of marginal microleakage and the degree of penetration. The teeth were stained with fuchsine, sectioned and then studied with a stereomicroscope.*

***Keywords:*** *sealants, glass ionomer cements, microleakage, stereomicroscope.*

***Rezumat:*** *Calităţile de sigilant a două cimenturi glass-ionomere au fost evaluate prin determinarea apariţiei şi profunzimii de penetrare a microinfiltratului marginal. Probele au fost colorate cu fuxină, secţionate şi examinate la stereomicroscop.*

***Cuvinte cheie:*** *sigilanţi, cimenturi glass-ionomere, microinfiltrat marginal, stereomicroscop.*

## INTRODUCTION

The sealing of groves and fossas is included by WHO in the four methods of preventing tooth decays, besides oral hygiene, general and local fluoridation and food hygiene. Sealing is a method for preventing groves and fossas decays on the occlusal surface of molars and premolars, on the vestibular and oral surfaces of molars or on the oral surfaces of the foramen caecum.

## PURPOSE OF STUDY

The purpose of the study is to test in vitro the efficacy of using two glass ionomer-type materials as sealing methods, as well as to assess the presence or the absence of the marginal microleakage on the interface between the dental enamel and the sealing material.

## MATERIAL AND METHOD

The study was made on a sample of 20 teeth, intact molars and premolars, recently erupted and extracted because of orthodontic reasons.

The teeth were divided equally in two groups, as following:

G1, Ketac Molar Easymix, GC;

G2, Fuji IX, 3M ESPE.

Experimental protocol

Before any sealing work, it is necessary to clean the occlusal surfaces of the teeth by professional brushing.

Applying the sealing materials.

Submitting the teeth to almost 50 thermocycles by their alternative insertion in hot and cold water.

Obturation of the teeth apices and the application of two layers of lacquer on the dental surfaces, except for the sealing material and 1 mm around it.

Inserting the teeth in the colouring solution.

Teeth sectioning.

Stereomicroscopic study of the sections.

a) Sealing technique with glass ionomer cements.

Cleaning the occlusal surfaces by professional brushing with sodium bicarbonate.

Clean and dry thoroughly the work area.

1. Conditioner applying (in the case of Ketac Molar Easymix, of the liquid), 10 seconds, then clean with plenty of water and dry the enamel area.
2. Material preparation: 1 spoon of powder to one drop of liquid. The powder is divided in two and then it is gathered in the liquid.
3. Apply the material in a larger quantity than recommended.
4. Apply the vaseline with your forefinger and press the cement firmly.

b). Thermocycles

Submit the teeth to almost 50 thermocycles accomplished by their alternative insertion in cold (5° C) and hot water (50° C).

c). Teeth isolation with a view to colouring.

In order not to compromise the result of the experiment by retrograde colouring or by the auxiliary grooves or fossas on the surface, the teeth were isolated by the application of two layers of lacquer, leaving uncovered only the sealing material around it, while the teeth apices were obturated with cement.

d). Teeth colouring.

Teeth colouring was accomplished by their insertion into fuchsine solution for 24 hours at 37° C.

e). Teeth sectioning

Teeth sectioning was accomplised in laboratory with the help of a diamond disk. The cutting direction was vestibulo-orally, resulting 4, 5 sections for each tooth, with a thickness of 2 mm.

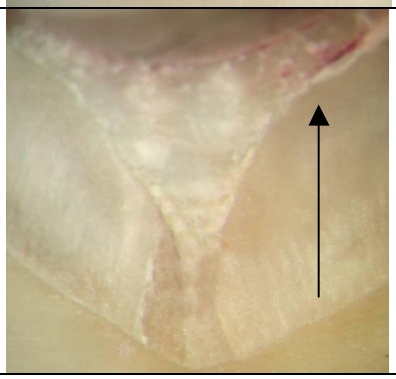
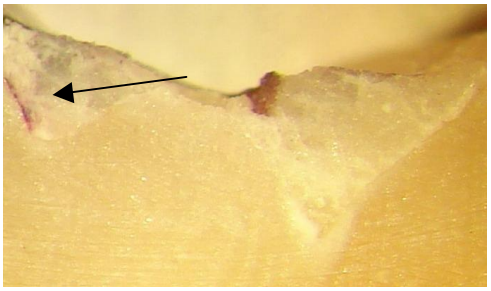
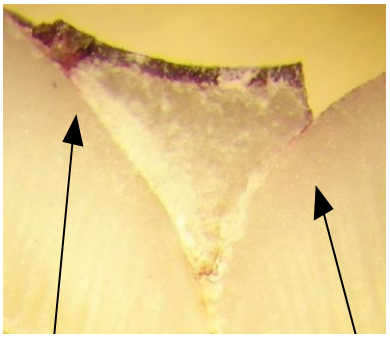
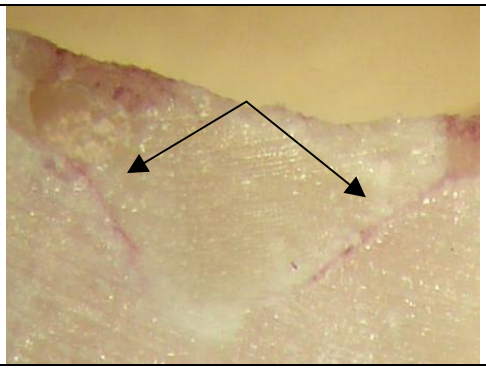
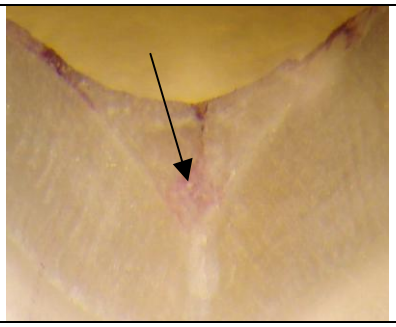
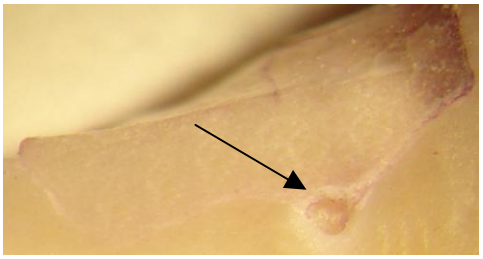
f). Stereomicroscopic examination of the sections.

Teeth sections were studied on both sides, 80 zoom with the help of a Zeiss-Technival stereomicroscope, within the Faculty of Engineering of Sibiu, with the support of Prof. Dr. Eng. Deac.In order to be able to analyse the presence of the marginal microleakage, respectively of the

level of colouring at the interface between the enamel and the sealing material, the following parametres were established:

- LEVEL 0 - lack of colour penetration
- LEVEL 1 - colour penetration on one of the fossa side.
- LEVEL 2 - colour penetration on both sides of the fossa.
- LEVEL 3 - presence of the colouring solution in the most declive area of the grooves and fossas.

**Table 1. Suggesting images for each group of the colorant agent penetration.**

| Level | Fuji IX | Ketac Molar |
|---|---|---|
| **0** |  |  |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |

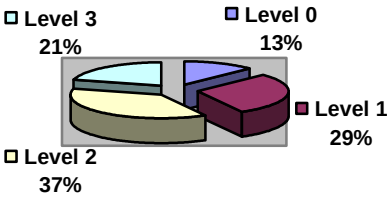
## RESULTS AND DISCUSSIONS

The results of the stereomicroscopic examinations are presented in table 2.

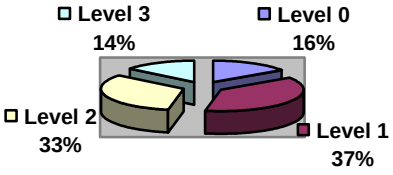
**Table 2. Stereomicroscopic examinations.**

| Level / Material | 0 | 1 | 2 | 3 | Total |
|---|---|---|---|---|---|
| Ketac Molar | 8 | 18 | 23 | 13 | 62 |
| Fuji IX | 10 | 24 | 21 | 9 | 64 |

**Ketac Molar**




**Fuji IX**




The above data were analysed statistically through the weighted average of each teeth group.

**„Mp=∑ ($C_i$×$G_i$)/ ∑$C_i$"**

Mp = weighted average

$C_i$ = quantity i, the number of pictures which received the same level at the stereomicroscopic examination.

$G_i$ = the level awarded for the images which made up the quantity i.

The weighted average consistied in the sum of the multiplications of each number of images ( Ci) with the awarded level (0, 1, 2, 3).

Everything is reported to the total number of images of the respective group (sum of the quantities).

| | |
|---|---|
| **Ketac Molar** | Mp= [(0×8)+(1×18)+(2×23)+(3×13)]/8+18+23+13=1.66 |
| **Fuji IX** | Mp=[(0×10)+(1×24)+(2×21)+(3×9)]/64=1.45 |

The results assessment shows that the differences between the score awarded for the two glass ionomer sealing materials are not significant. Yet, Fuji IX has an upper marginal closing in comparison with Ketac Molar.

The presence of the marginal microleakage made that in certain cases of glass ionomer sealing cements, during the sliding process, the material is detached from the dental surface, leaving behind an enamel intensively coloured in red.

The viscous composition of the glass ionomer cements makes difficult their insertion in grooves and fossas, proven by the air holes at the basis of the grooves.

Although, there were not any air holes, the adhesion to the slope walls, in their upper part, was sufficient for the colouring solution not to enter in depth.

The large and superficial V-shaped grooves allowed a better penetration of the sealing materials in comparison with the narrow and deep I-shape grooves,

## CONCLUSIONS

Both investigated materials present a satisfactory level of penetration in groves and fossas, but none was capable of preventing the penetration of the colouring solution at the interface with the dental enamel, in all cases.

The presence, respectively the absence of the marginal microleakage at the interface between the dental enamel and the sealing material depends on a series of factors, such as: mechanical and chemical proprieties, morphology of fossas, conditions of the oral cavity and the mastication forces.

The sealing materials of the grooves and fossas represent an efficacious method regarding the prophylaxis of the tooth decays, acting as a physical barrier and protecting the occlusal surfaces.

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