
EVALUATION OF CLINICAL PERFORMANCE OF RESIN-MODIFIED GLASS IONOMER RESTORATIONS IN PERMANENT POSTERIOR TEETH

Vivian de Agostino Biella¹
Aparício Fiuza de Carvalho Dekon²

¹Specialized in Restorative
Dentistic. Hospital for Re-
habilitation of Craniofacial
anomalies(HRAC-USP),
Bauru-SP

²Graduation student in
Dentistic. School of Den-
tistry of Bauru-USP; Mem-
ber of the Dentistry Sector
of the HRAC-USP; Assis-
tant Professor of the Disci-
pline of Oral and maxillo-
facial surgery and trauma-
tology, University of the
Sacred Heart, Bauru-SP

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ABSTRACT

The aim of this study was to clinically evaluate 159 resin-modified glass ionomer restorations (Vitremer-3M) accomplished in the permanent posterior teeth of 81 patients attending the Restorative Dentistry Sector of the HRAC/USP. The restorations were divided in groups, according to the period of time they had been placed in mouth (6-12 months, 12-18 months and 18-36 months) and were evaluated according to the following items: present restorations, absent restorations (either lost or replaced by other material), caries recurrence, material wear, fractured restoration, fractured tooth, discoloration, marginal integrity and presence of occlusal contacts over the restoration. The results demonstrated more than 91% of present and clinically acceptable restorations, which was regarded as a successful outcome, since according to the evaluated items just a few cases of fractured material and caries recurrence led to restoration replacement. It was concluded that the glass ionomer cement Vitremer-3M presents good clinical performance in cases of incipient lesions in premolars and molars, in areas submitted to low occlusal loads, and especially in high-risk patients. The technical principles for such restorations should be strictly followed both for tooth preparation and material application.

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INTRODUCTION

Amongst the top concern of dentists now a days is the preservation of teeth against caries. However, if present it should be treated and restored and it is important that the material offer maximum preservation of the healthy remaining tooth structure, longevity of the performed procedure and an adequate condition of oral hygiene.

Presently, among dental material used in dentistics, the glass ionomer cements (GIC) may be considered as the most versatile since they are indicated both for preventive procedures such as the sealing of small scar and fissures and for traditional curative procedures such as class I, II and V restorations as bases and lining element of cavities and also as cementation agents in endodontic, orthodontic and prothetic treatments (NAVARO; PASCOTTO, 1998). Reasons to improve this material include its highly favorable characteristics such as the coefficient of thermal expansion similar to that of the dental structure providing a good marginal sealing and decreasing microinfiltration (PIN et al., 1998), a proved potential of adhesion by physical and chemical means to the different substrates (enamel, dentin and cement), allowing, in this regard, a considerable economy of healthy dental tissue and biological compatibility (NAVARRO et al., 1988). Due to the dynamic character of the material, which is able to release and to recharge fluoride ions from many sources, it has been used in dentistry clinic as a supporting material in the treatment of patients with a high risk to caries (MCLEAN; GRASSER, 1985; BARATIERI et al., 1986b; SILVA; SIMÕES, 1995; SEGURA et al., 1997; NAVARRO; PASCOTTO, 1998; PIN et al., 1998). Some authors have indicated the GIC in incipient class I cavities in permanent teeth claiming that, in case of later need for changing the restoration for another material, the adjacent enamel, as well as the distant one, are more resistant to acid attack and, therefore, it will be difficult to relapse a secondary carie in the margins of the prepared cavity (BARATIERI et al., 1986b; BUSATO et al., 1987, SALLES, 1997).

However, ionomeric cements, still in stage of development, are fragile materials with low resistance to traction, wear and shear stresses, being contra indicated in areas prone to great occlusal charges. Besides that, the excessive translucency restrain the use in dental surfaces where esthetics is relevant (MATIS et al., 1988; BARATIERI et al., 1986a).

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Thus, Garcia-Godoy (1986) proposed the indication of GIC to the restoration of posterior teeth presenting incipient cavities and in areas of low biting stress. This technique would remove only decayed tissue without a defined preventive extension and without the need of additional removal. The advantages are the preservation of healthy tissue, reduction of microinfiltration and fluoride release.

The introduction of resin modified GIC aiming to increase the resistance of the material, induced the production of a series of comparative studies to the conventional GIC (SALLES, 1997; PIN et al., 1998; VERCELINO; BASTOS, 1998; LOUGUERCIO et al., 2000; SILVA et al., 2000). However, most investigations restricted themselves to *in vitro* studies, cervical lesions or very short periods of observation. Therefore, it is important some longitudinal studies of the clinical performance of restoration with resin modified glass ionomer cement.

The present study aimed to evaluate different clinic aspects of restoration with a resin ionomer cement (Vitemer-3M) in permanent posterior teeth performed in patients of the Dentistry Clinic of Hospital de Reabilitação de Anomalias Craniofaciais da Universidade de São Paulo (HRAC-USP) in three different periods according to the moment of insertion of the material.

MATERIAL AND METHODS

In this study, it was evaluated 159 restoration performed in posterior teeth with incipient caries using a resin modified glass ionomer (Vitremmer-3M) in 81 young patients registered and attended at the adults dentistry sector of the HRAC-USP.

The restorations were divided in groups according to the time elapsed form the insertion of the material in the oral cavity (6 to 12 months, 12 to 18 months and 18 to 36 months) and evaluated following the criteria of: restoration present, restoration absent (missed or changed for another material), relapse of carie, material wearing, fracture in the restoration, tooth fracture, color modification, marginal integrity and presence of occlusal contacts on the restored material.

All restorations were made by students of the course of specialization on dentistic restoration of the HRAC-USP following the recommendation of manufacturers and preceptors.

Clinical exam included visual inspection and probing after dental prophylaxis with Robson brush imbibed in pomme stone and

water. Data were recorded in a clinical record (FIGURE 1) and the analysis of data allowed the assessment of the clinical behavior of the ionomeric restorations as regards time. FIGURES 2 and 3 shows the examined restoration and the determination of the occlusal contacts by means of carbon paper.

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FICHA DE AVALIAÇÃO CLÍNICA

Nome do (a) paciente: _____

Número do prontuário: _____

Data do tratamento: _____

Cimento de ionômero de vidro utilizado: _____

Dentes e faces envolvidas: _____

AVALIAÇÃO CLÍNICA:

- Restauração: ausente presente
- Recorrência de cárie: ausente presente
- Desgaste oclusal: ausente presente
- Fraturas na restauração: ausente presente
- Fraturas na estrutura dentária: ausente presente
- Alteração de cor: ausente presente
- Integridade marginal: boa deficiente

CONTATOS OCLUSAIS:

OBS: _____

FIGURE 1 – Clinical Record used to register data while evaluating the restorations.

All procedures were authorized by patients or parents through signature of a consent form according to the rule of the Code for Ethics in Research as instituted by the HRAC-USP.

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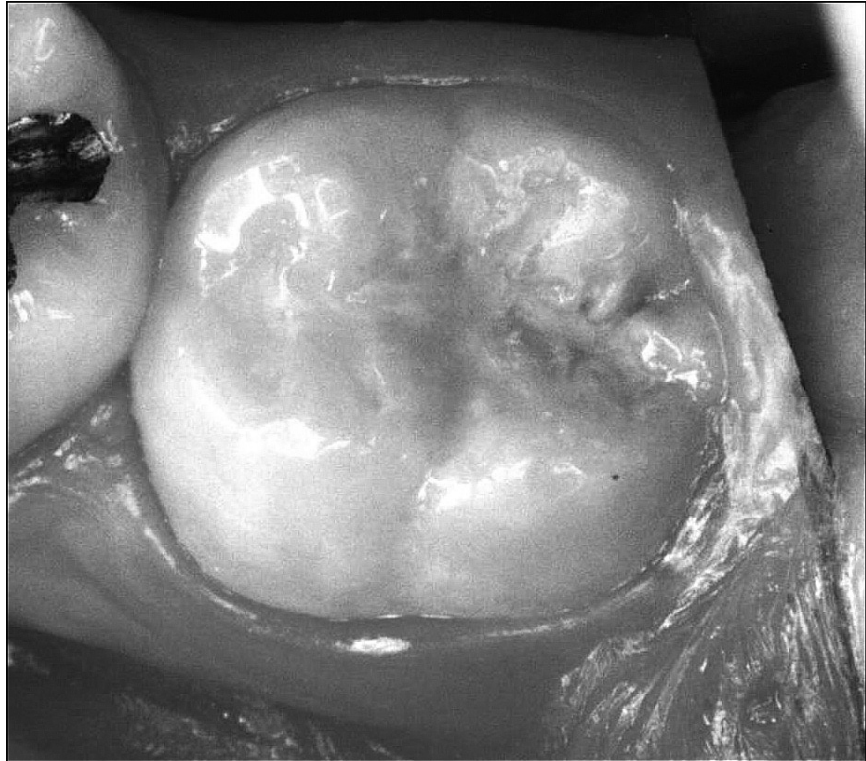


FIGURE 2 – Clinical picture of an examined tooth considered as clinically adequate.

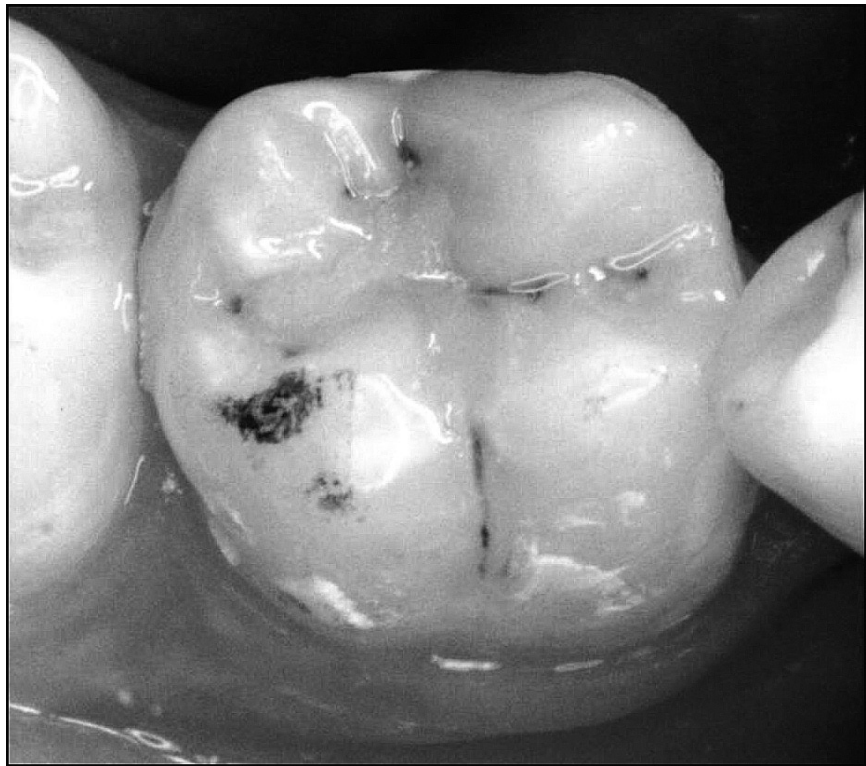


FIGURE 3 – Clinical picture of a tooth with caries relapse leading to substitution of the restorative material. Note the demarcation of the occlusal contacts.

RESULTS

Data obtained from the clinical evaluation of restorations can be seen in TABLES 1 and 2. The first table depicts the number of restoration according to time period as well as the number of lost and replaced restoration (Absent) in the same period. The second table shows the clinical performance on various aspects of the present restorations according to time period.

TABLE 1 - Number (n) and percentage (%) of present and absent restoration according o the time period in the oral cavity.

Restoration	6 to 12 months n (%)	12 to 18 months n (%)	18 to 36 months n (%)
Present	47 (100%)	28 (96.55%)	70 (84.33%)
Absent	0 (0%)	1 (3.44%)	13 (15.66%)
Total	47 (100%)	29 (100%)	83 (100%)

TABLE 2 – Clinical performace of found inometirc restoration according to the period into the oral cavity.

EVENT	6 to 12 months n (%)	12 to 18 months n (%)	18 to 36 months n (%)
Relapse of caries	4 (8.51%)	0 (%)	4 (5.71%)
Material wearing	5 (10.63%)	8 (28.57%)	20 (28.57%)
Fracture of restoration	1 (2.12%)	0 (0%)	4 (5.71%)
Tooth fracture	0 (0%)	0 (0%)	0 (0%)
Color modification	41 (87.23%)	23 (82.14%)	58 (82.85%)
Deficiency of marginal integrity	5 (10.63%)	0 (0%)	15 (21.42%)
Occlusal contact in the restoration	0 (%)	0 (0%)	6 (8.57%)

DISCUSSION

There is an increased use of GIC in the last years and, according to the literature, in preventive restoration it has been used with success due to the fact that the material shows important properties

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of adhesivity, promotes preservation of the dental structure once it is not necessary the use of classic preparation with additional mechanic retentions, besides allowing fully sealed margins and, in addition, to release fluoride to the neighboring structures (SILVA; SIMÕES, 1995).

Preventive restorations with GIC may be used in cases of incipient caries or fissures in areas of low biting stress. This sort of material shows excellent adhesion to the dental structure (enamel and dentin) and a cariostatic effect due to the release of fluoride (GARCIA-GODOY, 1986).

Silva and Simões (1995) indicate its use of conventional ionomeric cements for restoration of cavities of class I and II of deciduous teeth and these authors stress the valuable preventive power of such materials. The present photoactivated resin ionomeric cements, showing better resistance to fracture and wear, have the indication of their use expanded to incipient cavities in permanent teeth (VERCELINO; BASTOS, 1998). However, the literature is scarce in longitudinal studies evaluating such restorations on the clinical point of view. Taking the advantage of the relative frequent return of treated cases in the HRAC-USP the present study was conducted. Observation of the present evaluation are similar to those reported by the mentioned authors once the percentage of clinical acceptance of restorations with GIC were positive in the different studied time periods. Out of 159 restoration only three teeth showed absence of restoration and 11 showed other restoration than the original (amalgam or composite resin), which substitution was made by a professional in the hometown of the patient. It was not possible to determine the exact reason for the substitution but most of them occurred in the group of old restorations. However, more than 91% of restoration intact in the follow up can be considered as a success taking into consideration that patients presented cleft lip and palate with deficient oral hygienization due to the low esteem, coming from regions with low dentistry assistance, using orthodontic devices and removable rehabilitative prothetic pieces that make difficult dental hygienization.

Croll (1993) proceed to clinical evaluation comparing conventional resin modified GIC in conservative class I cavities in permanent teeth and observed that resin modified GIC should not be used to substitute cuspides or areas of biting stress. They should be used in conservative cavities with cuspides adequately supported by healthy tissue. Despite the fact that the restorations performed in the HRACF-USP with ionomeric material had been indicated only in cases of incipient caries, in pre-molars and molars, in the period be-

yond 12 months it was observed wearing in 30%. Signs of wear were more marked in cases of occlusal contacts directly over the structure of the material or in the interface tooth-restoration. In spite of that, the restorations were considered as clinically acceptable.

Teeth involved in this study showed no severe compromise of their structure in the moment of treatment and maintained this condition afterwards. This is a reason for no detection of tooth fracture in the series. On the other hand, it was observed an interdependency of restoration fracture and relapse of caries being this the top reason for restoration change. The presence of fracture allowed the adhesion of plaques and stimulated the caries relapse. This occurred in 9 cases out of 145 ionomeric restoration evaluated.

In what regards the ability for marginal sealing, this can be very effective according to Pin et al. (1998). Indeed, it was not observed marginal deadaptation in the restoration in the period from 6 to 12 months and the majority of marginal deficiencies in the other groups were due to excess left during the application of the material inducing microfractures, although no caries were observed in the interface. Such deficiencies were easily corrected by a new finishing and polishing.

These aspects speaks in favor of glass ionomer cement as an excellent restorative material for posterior teeth with incipient lesions, mainly in those patients in high risk for caries, and the technique should be strictly followed for preparing the cavity and in the application of the material, avoiding as far as possible occlusal contacts directly on the restorative material or the interface tooth-restoration in order to increase its longevity.

Concern with esthetical properties of restorative materials is a reality in the dentistry clinics. In this regard it is important to evaluate modification in the color in GIC. Among the factors that determined the durability of an esthetic restorative material is its capability to maintain the original color while acting in the oral cavity. The present available dental composite material has great esthetic capability but this material tends to modify the initial color due to pigmentation of ingested food colorants (LIPORONI et al., 1995).

Results of the present study indicate that GIC Vitremer-3M is prone to severe color modification the more it remains in the oral cavity. However, this occurrence, in the studied period, did not lead to the need of replacement of the restorative material in the HRACF-USP but could be a reason for changes made in the hometown of some patients.

According to the results and taking into consideration the adhesivity, compatibility with the pulp, fluoride release and greater re-

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sistance to wear the resin modified GIC is a material that can act properly as a restorative material for incipient lesions.

CONCLUSIONS

According to the literature and the analysis of the results it is possible to conclude that:

1. Facing the satisfactory results resin modified GIC are indicated as restorative material in incipient class I cavities in permanent teeth in areas of low occlusal stress.
2. They show sufficient adhesivity, promoting a good marginal sealing and thus reducing onset of secondary caries.
3. Wear of resin modified GIN restoration is minimal. However, it is important to avoid direct occlusal contacts on them in the moment of insertion of the material.
4. GIC, mainly those resin modified, shows color modification that alter the esthetic pattern along the time.
5. GIC represents an advance in dentistry but did not yet reached their full development, which indicate the need for further clinical and laboratorial studies.

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