

# Clinical Evaluation of the Glass Ionomer Cement as restorative material in Non-Carious Cervical Lesions: A Case Report

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## ABSTRACT

Non-carious cervical lesions are characterized by a loss of a healthy tooth structure unrelated to a carious process; the Glass Ionomer Cement is a widely used material in preventive and restorative dentistry because it has unique characteristics, such as adhesion to dental structure and a linear coefficient of thermal expansion similar to the tooth, making it the most appropriate material for this type of situation. A male patient attended the Dental Complex of Quixadá Catholic University Center, reporting the presence of a cavity in the teeth. After an anamnesis and detailed clinical examination, non-carious cervical lesions of the abfraction type were diagnosed on teeth 34 and 35. Lesions were restored with resin-modified glass ionomer cement. The integrity of the restoration was evaluated at three different times for a period of 6 months. The treatment of these cervical lesions is difficult because of the absence of a retentive cavity, the chemical adhesion of the material is the main retention factor in this type of restorations. The most commonly used adhesive materials to restore these lesions are Ionomeric Cement and Resin Compounds. The marginal and structural integrity of the restorations with Resin-modified glass ionomer cements performed on non-carious Abfraction cervical lesions were evaluated. After a 6-month clinical follow-up, the restorative material remained intact, presenting only a few signs of surface degradation, which can be attributed to wear caused by brushing.

**KEYWORDS:** Glass Ionomer Cements. Tooth Wear. Operative Dentistry

## INTRODUCTION

Non-carious cervical lesions (NCCL) refer to the loss of mineralized tissue at the cementum-enamel junction caused by some factor that is not related to the presence of carious tissue.<sup>1</sup> This loss causes an exposure of the dentinal tubules due to fracture or wear of the enamel and cementum, which can generate hypersensitivity, as well as aesthetic disharmony and functional problems.<sup>2</sup> The NCCL can be classified as abfraction and abrasion.<sup>3</sup>

The treatment of these lesions is challenging due to its morphology and complex etiology. The restorative material used in these cases should contain biomechanical properties favoring the treatment in order to strengthen the dental remnant, preventing a possible plaque retentive factor, as well as being able to resist degradation caused by acidic substances and functional habits.<sup>4</sup> Another property that the restorative material must have in order to resolve this case is to have the ability to adhere to the tooth since many of the lesions occur in dentin, which is a

substrate with unfavorable adhesion characteristics due to its complex morphology.<sup>5</sup>

Glass Ionomer Cement (GIC) is widely used as a definitive and provisional restorative material in current dentistry. The popularity of this material is due to its properties that provide good adhesion to the tooth, besides having anti-cariogenic action due to the fluoride release and compatibility with the dental structure.<sup>6</sup> These characteristics give the material a clinical versatility, being used routinely in preventive dentistry, cementing orthodontic appliances, lining material in deep restorations, as a fundamental material in Atraumatic Restorative Treatment (ART), among others. Its functions go beyond the procedures performed by dentistry,<sup>7</sup> and it is also used in medicine for otological treatments.<sup>7</sup>

The GIC consists of a glass powder and an alkenoic acid, the powder of the material is constituted by the union of three main components, being: silicate, aluminum oxide,

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and calcium fluoride. Alkanoic acid, corresponding to GIC liquid, is mainly composed of water and polyacrylic acid.<sup>8</sup>

In order to improve the physical and chemical properties of GIC, some resinous monomers were added to its conventional composition, resulting in Resin Modified Glass Ionomer Cement (RMGIC).<sup>9</sup> This addition caused the material to gain a longer working time, an improvement in its handling compared to conventional ionomeric cement, and an increase in wear resistance and physical properties. Considering the need for a material that is compatible with the morphology found in non-carious lesions, the RMGIC is an ideal material for the treatment of these complex cases.<sup>10</sup>

The aim of this study was to report a case of non-carious cervical lesion of the abfraction type, restored with resin-modified glass ionomer cement and to conduct a descriptive evaluation of the behavior of this material at three different moments during 06 months.

## CASE REPORT

The patient F.C.L.S, male, 32 years old, participated in the Dental Complex of Quixadá Catholic University Center, with the main complaint "the presence of cavities in the teeth." An anamnesis and a detailed clinical examination were carried out with the purpose of mapping the initial oral condition of the patient. During the clinical examination, loss of tooth structure was observed in the cervical region of teeth 34 and 35, these lesions were wedge-shaped and angled edges (Fig. 1). The characteristics of the lesions associated with the data collected during the anamnesis led to the diagnosis of non-carious cervical lesion of the abfraction type. The treatment plan chosen was to perform the restorations of these lesions using the RMGIC as definitive restorative material.



Figure 1: Initial aspect of non-carious cervical lesion on teeth 34 and 35

Prior to the restorative procedure, prophylaxis was performed in the lesion area with the help of a prophylactic paste (Herdos® Vigodent) and a Robinson brush. Due to the location of the lesions, absolute insulation cannot be made. Therefore a relative insulation

was performed by placing cotton rolls and using an Expandex® (Indusbello) oral retractor wire. To assist in exposing the margin of the restoration, a gingival retraction wire # 000 (Ultrapak® Ultradent) was inserted around each tooth, aiming at the gingival spacing around the lesions.

With the controlled local humidity, the restorative protocol was started; using a Microbrush, the product primer the application was made for 30 seconds, followed by a photoactivation for 20 seconds. The restorative material was manipulated respecting the powder and liquid proportions recommended by the manufacturer and inserted into the cavity in single increment with the aid of a Centrix type syringe (Nova DFL®), thus avoiding the formation of air bubbles. After the accommodation of the glass ionomer in the cavity the material was photopolymerized for 40 seconds.

The initial finishing was performed with the aid of a N° 12 scalpel blade, respecting the anatomical characteristics of the tooth, after the gross removal of the excesses, the final finishing was done using fine-grained diamond drills and polishing rubbers. Finishing was accomplished by applying the surface varnish (Finishing Gloss) obtaining the following result (Fig. 2).



Figure 2: End appearance of the restoration

### Results of Clinical Evaluations:

**Clinical Assessment After Two-Months:** In the clinical evaluation after 2 months (Fig. 3), the loss of gloss obtained by applying the surface varnish was observed. There was also a small degradation in the coronal margin of the restorations in both teeth, with the tooth 35 showing a slight peeling of the restorative material in the mesio-cervical portion. In general, both restorations were intact, without loss of volume in the vestibular region and without any degradation in the cervical margin of the cavity.

**Clinical Evaluation After Four-Months:** In the evaluation of 4 months (Fig. 4), a stabilization of the marginal degradation was observed, with the restoration limits maintained and without the presence of slits at the interface. The vestibular degradation of the tooth 35 remained stable without being perceived clinically an



Figure 3 - Two-months restoration appearance



Figure 4 - Four months restoration appearance



Figure 5 - Aspect of six-months restorations

increase of the wear. The restorative material presented no clinically visible loss, being stable and with a surface wear compatible with abrasion caused by brushing.

**Clinical Evaluation After Six-Months:** At the 6-month clinical evaluation (Fig. 5), it was possible to observe that both restorations maintained their integrity, showing no clinical signs that showed a loss of volume on the vestibular face. The tooth 34 differed from what was observed in the previous evaluations and showed a localized scaling located at the center of its cervical portion, compatible with that seen on tooth 35 in previous evaluations. When evaluating the marginal integrity, it

was possible to observe a slight degradation in the inferior and superior margins of the cavity, but it was not observed the presence of cracks in the interfaces of the restoration so that the sealing of the cavity remained intact.

In the evaluation of tooth 35, maintenance of the characteristics described in previous evaluations (2 and 4 months) was observed. Punctual degradation, located in the mesio-cervical portion of the restoration, remained stable. Also restoring tooth 34, the margins showed degradation characteristics, but no cracks or other signs characteristic of marginal seal loss were observed. From the point of view of structural analysis, it also maintained its integrity, with no superficial loss of its structure.

## DISCUSSION

NCCLs present a high prevalence among patients, their presence may generate problems such as hypersensitivity, besides the functional and aesthetic impairment of the affected dental elements. Faced with an assessment of the prevalence of NCCLs in 1,002 people, totalizing a sample of 18,555 teeth. The results indicated that 1 in 6 teeth presented some cervical lesion, with lower premolars being the most affected (34%).<sup>11</sup>

The etiology of the NCCLs still generates discussions in the literature, in an evaluative sample of 100 individuals, found that in 77% of the cases diagnosed with any cervical lesion, they were not related to the specific etiological factors for each type of lesion.<sup>12</sup> An analysis of 2,341 teeth showed that patients who presented occlusal alterations and who frequently ingested soft drinks presented an association of this eating habit with the presence of cervical lesions; it is clear that NCCLs require special clinical attention regarding their diagnosis, prevention, and treatment.<sup>13</sup>

The treatment of these cervical lesions is difficult due to the absence of a retentive cavity, the chemical adhesion of the material is the main retention factor in this type of restorations. The adhesive materials most used to restore these lesions are Ionomeric Cements and Resin Composites.<sup>14</sup>

Comparing the use of two restorative materials in 30 patients who had at least two cervical lesions, 35 restorations of each material were performed. After a 2-year follow-up, the results showed that the retention rate of the restorations performed with the RMGIC (Vitremer®-3M ESPE) was 100%, against 78.8% of the Composite Resin (Excite / Tetric Ceram®- Ivoclar Vivadent ). This result was similar to the data obtained in our analysis, even taking into account a shorter evaluation time, RMGIC presented 100% retention the dental structure in the 6-month period.<sup>15</sup>

The Glass Ionomer Cement stands out as a restorative material due to its numerous physical and mechanical properties, of which we can mention an excellent adhesion to the dental structure, which contributes to a good marginal seal, guaranteeing a greater longevity to

the restoration. However, despite its good properties, GIC is disadvantageous when in contact with solutions with low pHs, such as citric acid, making it more susceptible to clinical failures.<sup>16</sup>

In a study, evaluating different restorative materials by subjecting them to contact with several foods (water, ethanol, cola, citric acid and lactic acid) for a period of 6 months. At the end of the evaluation period, it was concluded that it is not a significant increase in the surface roughness of the GIC independent of the storage media. In this research, there are no internal observations for the practice of food, besides making clinical observations of superficial degradation that can be attributed to the intake of foods in which they are acids.<sup>17</sup> During the 06 months of evaluation, the restorative material (Vitremer®) showed good retention and resistance to masticatory efforts. This can be attributed to its mechanical properties and good adhesion to dental structure, and the modulus of elasticity of ionomeric materials similar to the modulus of elasticity of enamel and dentin, thus ensuring a behavior closer to that presented by natural structures.<sup>18</sup>

Although the literature states that GICs have a direct adhesion to dental structure, without the need for pretreatment, the manufacturer of Vitremer® suggests that the application of a Primer be performed prior to the restorative procedure, this procedure has the function of modifying the smear layer and properly wet the surface of the tooth.<sup>19</sup>

The materials evaluated were Vitremer Primer, 20% polyacrylic acid, and 32% phosphoric acid, evaluating different materials for pretreatment of dental surfaces in restorations using RMGIC (Vitremer®). In this study, it was concluded that pretreatment with Vitremer Primer presented the best results, showing a smaller microleakage in the restorations performed with this material.<sup>20</sup>

Evaluating the microleakage of different restorative materials in the Class V cavities, among them the RMGIC. Sixty human maxillary and mandibular premolars were prepared, restored and submitted to thermocycling. Subsequently, the teeth were immersed in 0.5% of rhodamine B dye for 48 hours. The teeth were sectioned and evaluated microscopically. The results showed that the RMGIC presented a significantly lower infiltration and a better adaptation of the restorations<sup>21</sup>.

Restorative materials are subjected to thermal, mechanical and chemical processes in the oral cavity, which often leads to loss of structure on the surface of the restoration.<sup>22</sup> In this study, a punctual degradation was observed in the vestibular region of the restored teeth, which may be justified by the abrasion caused during brushing. This degradation has been demonstrated in previous studies, thus comparing the roughness of different materials subjected to pH cycling and toothbrush abrasion. The results showed that Vitremer showed roughness after brushing and irregularities in surface morphology after pH cycles.<sup>23</sup>

In the present study, the restorative protocol followed the guidelines of the manufacturing, of restorations presented intact cervical margins without clinical signs of infiltration, a fundamental aspect to avoid secondary cavities, discoloration, and failure of restoration.<sup>24</sup>

## CONCLUSION

The marginal and structural integrity of Resin Modified Glass Ionomer Cement restorations performed on Non-Carious Cervical Lesions of Abfraction type were evaluated. After a 6-month clinical follow-up, the restorative material remained intact, presenting only some signs of surface degradation, which can be attributed to the wear caused by brushing. Resin-Modified Glass Ionomer Cement was shown to be effective as a restorative material for this type of lesion, combining the physical, mechanical and aesthetic properties necessary for the solution of this case. However, a more in-depth evaluation and a longer duration should be performed in order to resolve the doubts pending, and may thus sediment the indication of this material as the one of choice for the treatment of Non-Carious Cervical Lesions.

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