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Glass ionomer cements in complex oral rehabilitations. A case report.

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INTRODUCTION

As of their introduction on the market in the middle of the 1970s, glass ionomer cements have established themselves as fixing and reconstruction material, soon becoming the reference materials for many procedures. The property to be chemically anchored to dental structures, the ability to be used also in a moist tooth surface and the prolonged release of fluoride are among the main points of strength that have created original success of these materials. However, the development of modern resins composite and the numerous clinical trials have highlighted the limits that in the time the reconstruction procedures with glass ionomer cements showed, especially the high wear trend and the frequent marginal fractures with possible formation of secondary decay. This was added the fact that the original translucency and aesthetic aspect of the first glass ionomer cements were rather poor.

It is assisted by a progressive decay of use of glass ionomer cements as materials of reconstruction, in favor of composite resins ever more highly developed, as well as in favor of never completely abandoned dental amalgams.

The advent of nanotechnology has allowed in recent times to structurally modify many dental materials, from impression materials to composites and, of course to glass ionomers, allowing in some cases to overcome the physical limits thought insurmountable.

One of most important news introduced recently on the market is the combination of a glass ionomer cement with some acrylic, light cured resins which applied superficially on the surface of restoration substantially increase the hardness of the material, the smoothness of the surface and the level of the marginal seal. Laboratory trials on different materials showed that, when compared with a traditional glass ionomer, a glass ionomer treaty with these resins presents a hardness comparable to that of a modern resin composite. (graph 1).

Finally, thanks to search, for glass ionomer cements not only have been exceeded the limits of hardness and resistance to stress, but it was possible to confer on them also an aspect of translucency and coloring in different areas of the oral cavity which allow them to be a good alternative, also aesthetics.

CLINICAL CASE

In September 2007 the patient F. B., female, 59 years old, reached the university dental clinic at Galeazzi Orthopaedic Institute of Milan (Italy), requesting a visit for a prosthetic rehabilitation. The patient declares in the anamnesis of not to be smoker, not to take drugs, not to be a carrier of chronic diseases and in general to have a good health status. At objective examination the patient showed absence of pathological lesions to mucosal structures, oral hygiene is assessed as satisfactory but there were marked dental abrasions (Figure 1 and 2), due to declared consume of lemons, repeatedly throughout the day.

The plan of care provided the complete upper jaw rehabilitation, both on natural elements and over implants, and prosthetic and conservative therapies in the lower jaw. Because of the presence of periodontal recessions, the patient declared increased sensitivity, mainly concentrated in the front lower area.

Following the prosthetic plan, oral hygiene, the removal of tooth staining and endodontic treatments were first performed.

Subsequently, endodontic glass fiber pivots were inserted and fixed with dual cement, and where the abrasions were more evident, all surfaces have been reconstructed with glass ionomer cement (Equia ®, GC ltd, Japan): the low retention offered by these compromised elements, in facts, drove the preference to the chemical adhesion of these cements (Figure 3).

The elements were prepared and a custom-made provisional was applied (Figure 4, 5). Then, the elements 33 and 34, heavily involved by destructing processes, were endodontically treated and rebuilt with a dental pivot. Also in this site a provisional was then placed (Figure 6).

Fillings of the elements 32-31-41-44-45-46 were subsequently performed.

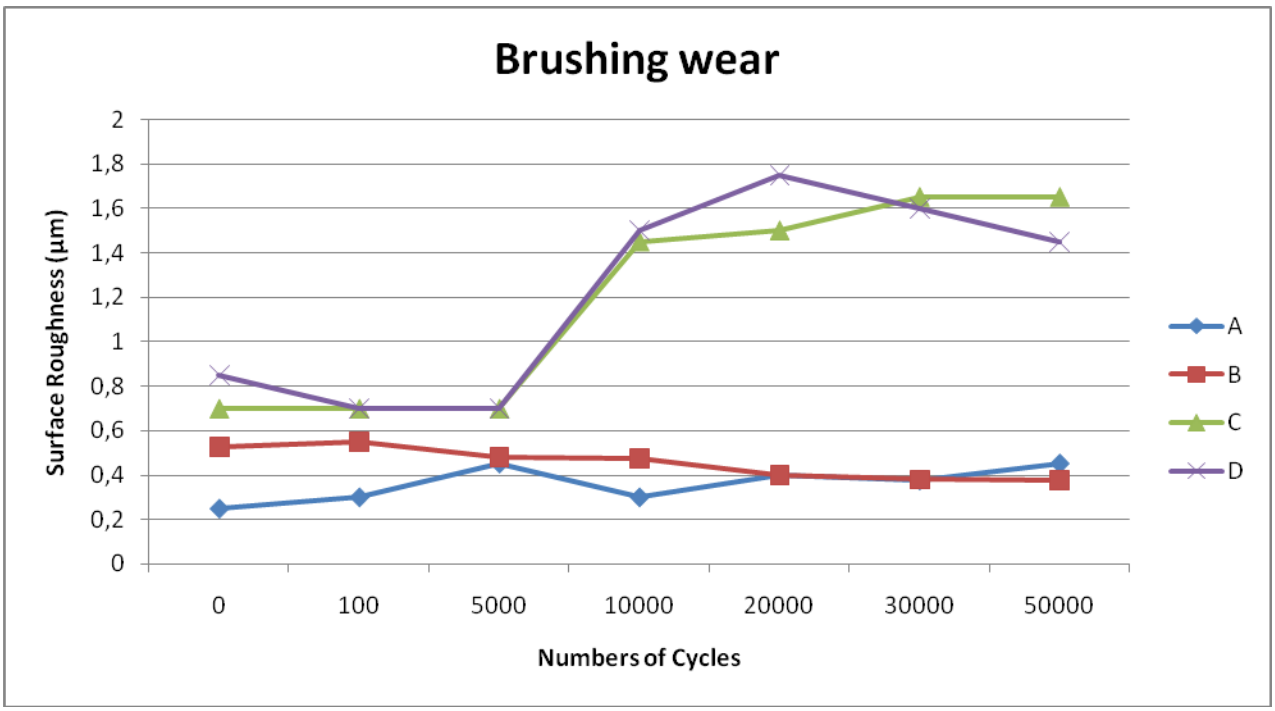
The greater reliability of this kind of glass ionomer materials, the presence of dental hypersensitivity and the yield aesthetic provided by the Equia® system, drove the choice of this kind of solution (figures 7 and 8). Due to the good yield of the material in wet environment, especially in contact with saliva and oral fluids, the positioning of the rubber dam wasn't necessary.

First of all the root surfaces of the elements involved have been polished with professional instruments (Figure 9) and conditioned with GC dentin conditioner (Figure 10 and 11). After 20 seconds the cavities were abundantly rinsed and dried with a slight jet air of the syringe, avoiding to dry completely, but leaving them slightly moist.

For the reconstruction color corresponding to 3, 5 in Vita Shade® scale has been selected. Equia® system is available in pre-mixed capsules, that avoid any possible error of mixing by the operator. Each capsule, for the reconstruction, has been shaken with light shots, then activated by pressing a special button on the capsule and finally placed in the professional mixer, where it was made turn for 10 seconds at a speed of about 4,000 rpm.
Through a special glass ionomers applicator, the cement has been extruded in a single stage on the involved dental areas (Figure 12 and 13) and then manually shaped (Figure 14). At last, the reconstruction was finely shaped and, once hardened, finished using rotating tools, according to the standard technique (Figure 15).
The estimated time to complete a restoration done with Equia® is averagely 3, 15 minutes, of which a minute and 15 seconds are necessary for processing and 2 minutes to harden the cement in the mouth. Equia® is decidedly advantageous when compared to traditional glass ionomers, whose working time requires about 5 minutes.
Once the restoration was completed, to optimize both aesthetic and mechanical characteristics, a layer of a nanofilled resin, called GC coat plus ®, has been applied, and then it has been polymerized for 20 seconds (Figure 16). The infiltration and dispersion of nanofilling particles contained in it shall ensure a lasting protection and restoration of the margins, increasing the resistance to wearing action.
The resin fills the porosity that inevitably remain on the surface, so allowing a uniform distribution of the mechanical load. In the absence of such protective layer, instead, the stress will distribute itself on a irregular surface, causing the training of numerous rhymes of fracture within the same.
Furthermore, the final treatment with GC Coat Plus® keeps smooth the surface of the restoration in the long term because it prevents disintegration and the dissolution of the layer more outside of the material. Also the yield aesthetics is optimized with the final implementation of GC Coat Plus®, which gives to fillings the same brightness of natural teeth (Figure 17).
6 months from their positioning, the patient is satisfied for the reconstructions and yield aesthetics, while the dental sensitivity, after an initial strong reduction, disappeared after about 2 months from treatment (Figure 18). This probably depends from the prolonged release of fluoride that glass ionomer cements are able to offer.

CONCLUSIONS

The reality of glass ionomer cements is profoundly changed in recent years. The new mechanical and aesthetic properties have significantly widened their possibilities of use. Furthermore, the heavy limits that have characterized them out in the 1980s have been exceeded. Although composite materials represent, to today, the material from reconstruction of reference, a glass ionomer system, especially if based on nanotechnology, may be an equivalent alternative or, in some conditions, even higher, even in complex and multidisciplinary therapeutic plans.



Graph 1. Wearing resistance of some reconstruction materials: nanofilled acrilic resin (A, blu), traditional composite resin (B, red), modified glass ionomer cement (C, green) and new generation glass ionomer cement (D, violet). Source: R&D Departement, GC ltd, Tokio, Japan.

Figure 1: initial case

Figure 2: particular of teeth # 32, 31, 41

Figure 3: after rubber dam removal, a layer of glass ionomer cement has been placed on the most compromised teeth, before cutting the pivots in order to avoid the contamination with silica dust.

Figure 4 : reconstruction with dental pivots and prosthetic preparation

Figure 5: custom-made upper provisional

Figure 6: custom made provisional on teeth # 33-34

Figure 7: V class lesions on elements # 32, 31, 41

Figure 8: V class lesions on elements # 44, 45, 46

Figure 9: professional clearing and stain removal

Figure 10: GC dentin conditioner (blu) and GC Coat plus (yellow)

Figure 11: application of GC dention conditioner on to-be-treated surfaces

Figure 12: Equia A 3,5 application

Figure 13: Equia A 3,5 application on 44, 45, 46

Figure 14: first remodeling

Figure 15: bur shaping

Figure 16: application of GC Fuji Coat on filling surface

Figure 17: final case

Figure 18: final case at 6 months. Stability of teeth fillings