ejpmr, 2023, 10(8), 72-79

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Case Study

ISSN 2394-3211

EJPMR

AESTHETIC AND CONSERVATIVE RESTORATIONS WITH BIOACTIVE RESIN MATERIAL: CASE REPORTS

Laís Froehlich[1], Poliana Maria de Faveri Cardoso[1], Rafael da Silva Vanolli[1], Maria Ritha Veiga Colognese[1*], Julio Katuhide Ueda[2] and Veridiana Camilotti[2]

[1]Department of Restorative Dentistry, School of Dentistry, UNIOESTE – State University of West Parana, Cascavel, PR, Brazil.

[2]DDS, MSc, PhD, Department of Restorative Dentistry, School of Dentistry, UNIOESTE - State University of West Parana, Cascavel, PR, Brazil.

***Corresponding Author: Maria Ritha Veiga Colognese**

Department of Restorative Dentistry, School of Dentistry, UNIOESTE – State University of West Parana, Cascavel, PR, Brazil.

Article Received on 21/06/2023 **Article Revised on 11/07/2023** **Article Accepted on 01/08/2023**

SUMMARY

Caries recurrence is still the major responsible for the replacement of direct restorations. The use of an ion exchange material as an oral medium could decrease this incidence. Bioactive restorative materials can release and recharge important ions: fluoride, borate, aluminum, strontium, silicate, and sodium, besides being anti-adherent to biofilm and easy to manipulate, representing a special class of composites that offer protection against caries and functional and aesthetic results. Thus, the present work aims to report two clinical cases performed with bioactive composite resins. In the first case, contributing to minimally invasive dentistry, it was possible to perform a strictly conservative preparation and restore it using the FL-Bond ll adhesive and Beautiful Flow composite resin, from SHOFU. In the second case, an unsatisfactory amalgam restoration was replaced using Beutifil Flow and Beautifil Bulk composite resins from the same manufacturer. It was concluded that this bioactive material offers healing properties through the release of fluoride and other ions, favors the clinical performance of restorations, and can be considered a good restorative option for carious and non-carious lesions.

KEYWORDS: Giomer; bioactive restorative material; fluoride; composite resin.

INTRODUCTION

Dental caries is a multifactorial chronic disease characterized by the metabolic activity of the bacterial biofilm present on the dental surface.[1,2,3] It can occur in an incipient form, as a small demineralization in the enamel, up to extensive dentin destruction with pulp involvement.[4] The high incidence of carious processes on the occlusal surface of posterior teeth is associated with fossulae and fissures present on this surface, which make cleaning difficult and favor biofilm accumulation.[3]

The restorative treatment is used, in most cases, to restore the function, shape, and aesthetics of the tooth, besides protecting the dentinopulpal complex, helping to control the biofilm on the restored surface.[4] Among the variety of restorative materials, composite resins are frequently used, mainly because they have excellent esthetic and functional properties, besides allowing easy preparation of the tooth. of the tooth structure.[5] On the other hand, they present a great disadvantage regarding polymerization contraction, which contributes to postoperative sensitivity, marginal fractures, marginal staining and secondary caries, even more common in regions of difficult hygiene.[6] Alternatively, we have the glass ionomer cement (GIC), a restorative material that has the great advantage of fluoride release, however, it presents low mechanical resistance.[5]

In order to combine the good properties of composite resin with the anticariogenic action of GIC, giomers, also called bioactive resins, were introduced in the dental market, which have S-PRG particles (Surface Pre Reacted Glass) containing fluorine, strontium, boron, sodium, aluminum and silicate capable of promoting the ionic exchange of the material with the oral environment.[7] In general, these ions help in the resistance to acids, greater resistance to microleakage, have an antibacterial effect and favorremineralization. In addition, strontium, fluoride and boron ions contribute to inhibiting the growth of oral bacteria.[8] Thus, these materials become an option for the treatment of caries in regions of difficult access to hygiene.[5]

Thus, this study aims to demonstrate, through two clinical cases, the use of bioactive composite resin in cases of primary caries and replacement of unsatisfactory restoration, pointing out its high versatility.

CASE REPORTS

Clinical case 1

A 15-year-old female patient, melanodermic, attended the dental clinic of the Universidade Estadual do Oeste do Paraná presenting a small cariouslesion in the scar region of the occlusal surface of tooth element 37 (Figure 1).

According to the treatment plan, prophylaxis was performed with pome stone and water, followed by absolute isolation of the operative field with the aidof the W8A staple (DFL, Rio de Janeiro, RJ., Brazil). The removal of the lesion was performed with a carbide bur #2 (KAVO, São Paulo, SP, Brazil) at low rotation (Figure 2).

Cavity cleaning was performed with 2% chlorhexidine (RIOQUÍMICA, São José do Rio Preto, São Paulo, Brazil) with the aid of a microbrush for 20 seconds and subsequent washing, selective enamel acid etching using 37% phosphoric acid (MAQUIRA, Maringá, Paraná, Brazil) for 30 seconds (Figure 3), followed by abundant washing and drying.

Then, with the aid of a microbrush, the FL-Bond II (SHOFU, Kyoto, Japan)self-etching adhesive system was applied in two steps, first the primer (Figure 4), then the adhesive (Figure 5), and light-cured (SHUSTER, Santa Maria, Rio Grande do Sul, Brazil) for 20 seconds.

The Beautifil Flow composite resin (SHOFU, Kyoto, Japan) was then inserted and light-cured for 20 seconds (Figure 6). Once the restoration was completed (Figure 7), an evaluation of the occlusal contacts was performed, which proved satisfactory (Figure 8).

Clinical case 2

A 60-year-old female patient, Caucasian, attended the dental clinic of the Universidade Estadual do Oeste do Paraná for clinical evaluation, where it was found the need for replacement of a metal restoration on element 36 (Figure 9).

After anesthesia and prophylaxis, absolute isolation of the operative field (Figure 10) was performed with a rubber sheet, cyanocrylate (HENKEL, Jacareí, São Paulo, Brazil), and staple #26 (DFL, Rio de Janeiro, Rio deJaneiro, Brazil).

Then, the amalgam was removed using a diamond tip no. 1014 (KAVO, São Paulo, São Paulo, Brazil) under high rotation cooling (Figure 11) and, after cleaning the cavity with 2% chlorhexidine, the enamel was selectively etched with 37% phosphoric acid for 30 seconds (Figure 12), followed by abundant washing and drying.

Afterwards, the FL-Bond II (SHOFU, Kyoto, Japan) self-etch adhesive was applied in two steps, first the primer (Figure 13), then the adhesive (Figure 14) and light-cured for 20 seconds.

The filling of the cavity began with the insertion of Beautifil Flow composite resin, which, due to its high degree of fluidity, was injected into the cavity as a lining material (Figure 15).

To finish, Beautifil Bulk Composite Resin (SHOFU, Kyoto, Japan) was inserted, which allowed us to work with increments of up to 4mm and to performthe dental anatomy in a simplified manner (Figure 16). Figure 17 shows the finalaspect of the restoration.

CASE 1

Figure 1: Initial clinical appearance.

Figure 2: Cavity preparation.

Figure 3: Selective acid etching of the enamel.

Figure 4: Primer application.

Figure 5: Application of the bonding agent.

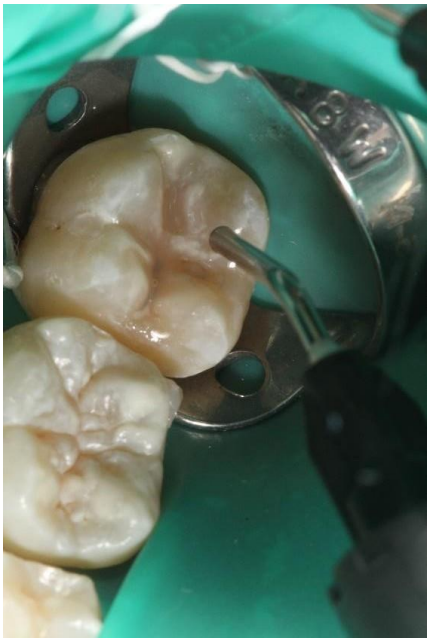

Figure 6: Insertion of the Beutifil Flow composite resin.

Figure 7: Final clinical appearance.

Figure 8: Evaluation of occlusal contacts.

CASE 2

Figure 9: Initial clinical appearance.

Figure 10: Absolute isolation of the operative field.

Figure 11: Cavity preparation.

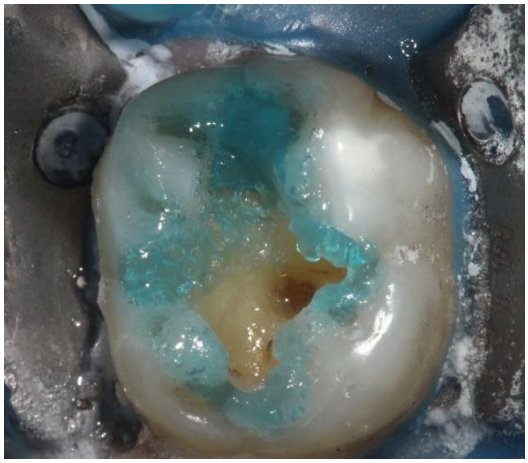

Figure 12: Selective acid etching of the enamel.

Figure 13: Primer application.

Figure 14: Application of the bonding agent.

Figure 15: Insertion of the Beutifil Flow composite resin.

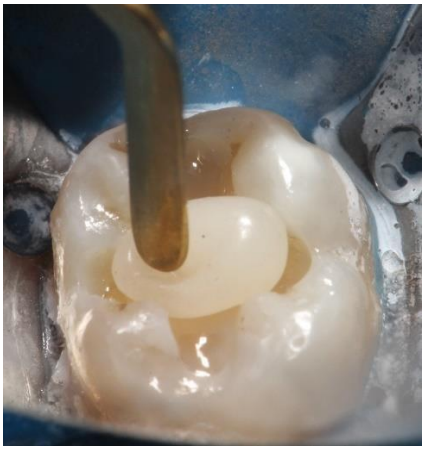

Figure 16: Insertion of the Beutifil Bulk composite resin.

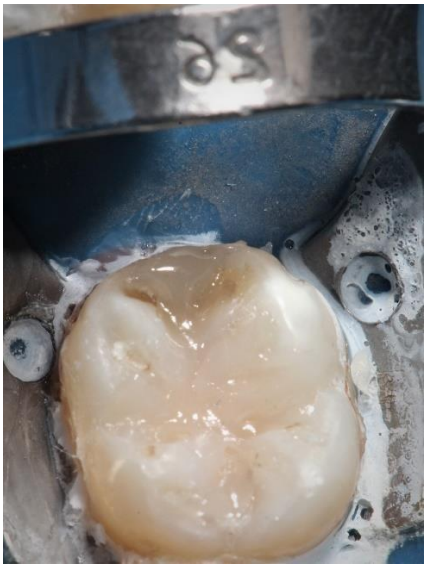

Figure 17: Final clinical aspect.

DISCUSSION

A very common procedure in dentistry is the replacement of defective restorations, caused mainly by the development of secondary caries lesions. However, every time a tooth is restored further loss of tooth structure occurs and the element is included in a repetitive restorative cycle, known as the tooth death spiral.[9]

Secondary lesions occur predominantly at the gingival margins of class II restorations, either due to the smaller amount of enamel available for adhesion[10] or to the difficulty in reestablishing the contact point and proximal contour, increasing biofilm retention.[11] Since the giomers act reducing microbial adhesion to the tooth surface and preventing secondary caries lesions, this material is an excellent alternative to avoid the number of

restoration changes.

The ionic exchange between tooth and oral environment is essential to promote the remineralization process. The calcium and phosphate ions present in the oral environment or in the restorative material provide the formation of hydroxyapatite crystals on the tooth surface.[8] The affected dentin portion remineralizes after the use of restorative materials with bioactive effect due to the release of ions.[12] Thus, S-PRG particles inhibit demineralization and increase remineralization of demineralized dentin surfaces.[13,14] Based on this, giomers were the material of choice for case 1, enabling selective removal of carious dentin.

An adequate polymerization is crucial to obtain the best physical, biological and mechanical properties of composites, being directly related to the resistance to fracture, wear, flexion and traction, as well as the color stability of the material, influencing its clinical longevity.[15] It is essential that light intensity and photopolymerization time are adequate, aiming at the lowest possible amount of residual monomers, because unreacted monomers impact the structural stability and biocompatibility of the dental material.

Giomers have been introduced into the class of smart materials due to their ability to release and recharge fluoride.[16] For the ion recharge it is important that the dental surgeon prescribes the use of fluorides that include prophylactic pastes, solutions for mouth rinses, pit and fissure sealants, dentifrices and fluoride rinses.[17] In this way, the material is converted into a fluoride reservoir, which continues to be released constantly.[18]

CONCLUSION

Bioactive materials with S-PRG technology have excellent physical, biological, mechanical, and esthetic properties, guaranteed by the release and recharge of fluoride, strontium, boron, sodium, aluminum, and silicate ions, which act to prevent secondary caries lesions and, consequently, increase the longevity of restorations, freeing the tooth from a repetitive restorative cycle.

BIBLIOGRAPHIC REFERENCES

1. Silva, EL., Januário, MVS., Vasconcelos RG., Vasconcelos MG. 2021, Dental caries: clinical and radiographic considerations for its diagnosis. Salusvita, Bauru, 40(2): 70-88.
2. Pozos-Guillén, A., Molina, G., Soviero, V., Arthur, RA., Chavarria- Bolaños, D., Acevedo, AM., 2021, Management of dental caries lesions in Latin American and Caribbean countries. Braz. Oral Res., 35: e055.
3. Batista, TRM., Vasconcelos, MG., Vasconcelos, RG. 2020, Pathophysiology of dental caries: understanding the carious process. Salusvita, Bauru, 39(1): 169-187.
4. Frencken, JE. 2017, Atraumatic restorative treatment and minimal intervention dentistry. British Dental Journal, 223(3).
5. Rusnac, ME., Gasparik, C., Irimie, AJ., Grecu, AGG., Mesaros, AS., Dudea, D. 2019. Giomers in dentistry - at the boundary between dental composites and glass-ionomers. Medicine and Pharmacy Reports, 92(2): 123- 128.
6. Nobre, DFL, Gomes, C. 2020. Bulk fill compositive resin - an advancement in restoring dentistry, 2(1): 24-33.
7. Amaechi, BT., Kasundra, H., Joshi, D., Abdollahi, A., Azees, PAA., Okoye, LO. 2018. Effectiveness of S-PRG Filler-Containing Toothpaste in Inhibiting Demineralization of Human Tooth Surface. The Open Dentistry Journal, 12(1): 811-819.
8. Kaga, M., Kakuda, S., Ida, Y., Toshima, H., Hashimoto, M., Endo, K., Sano, H. 2014. Inhibition of enamel demineralization by buffering effect of S-PRG filler-containing dental sealant. European Journal of Oral Sciences, 122(1): 78-83.
9. Cena, JA., Barbosa, YS., Jing, JZ., Rojas, G., Bilafan, R., Zanon, AEG., Figueiredo, ARC., Carvalho, TCR., Bizinoto-Silva, M., Damé-Teixeira, N. 2016. Maintenance, repair or replacement of restorations: a necessary reflection. Oral Sci., 8(1): 28-32.
10. Ribeiro, MDF, Pazinatto, FB. 2016. Clinical criteria for decisions between the replacement and repair of restoration in composite resin restorations-literature review. Rev. bras. odontol., Rio de Janeiro, 73(3): 223-30.
11. Karimi, Z., Kessa, S., Chala, S., Abdallaoui, F. 2015. Evaluation of the quality of proximal restorations with plastic materials: radiographic study. Odontostomatol Trop., 38(151): 5-12.
12. Akimoto, N., Ohmori, K., Hanabusa, M., Momoi, Y. 2011. An eighteen- month clinical evaluation of posterior restorations with fluoride releasing adhesive and composite systems. Dental Materials Journal, 30(3): 411-418.
13. Iijima, M., Ishikawa, R., Kawaguchi, K., Ito, S., Saito, T., Mizoguchi, I. 2019. Effects of pastes containing ion-releasing particles on dentin remineralization. Dental Materials Journal, 38(2): 271-277.
14. Saku, S. Kotake, H., Scougall-Vilchis, RJ., Ohashi, S., Hotta, M., Horiuchi, S., Hamada, H., Asaoka, K., Tanaka, E., Yamamoto, K. 2010. Antibacterial activity of composite resin with glass-ionomer filler particles. Dental Materials Journal, 39(2): 193-198.
15. Lima, ALX., Souza, PH., Amorim, DMG., Caldas, SGFR., Galvão, MR. 2016. Evaluation of the degree of conversion of composite resins photoactivated in different curing times and power densities. RFO, PassoFundo, 21(2): 219-223.
16. Burtea, CL., Prejmerean, C., Prodan, D., Baldea, I., Vlassa, M., Filip, M., Moldovan, ML., Antoniac, A., Prejmerean, V., Ambrosie, I. 2019. New Pre-reacted Glass Containing Dental Composites (giomers) with Improved Fluoride Release and Biocompatibility.

Materials (Basel), 12(23): 4021.
17. Bansal, R., Bansal, T. 2017. A Comparative Evaluation of the Amount of Fluoride Release and Re-Release after Recharging from Aesthetic Restorative Materials: An in vitro Study. J Clin Diagn Res, 9(8).
18. Jingarwar, M. M., Pathak, A., Bajwa, NW., Sidhu, HS. 2014. Quantitative assessment of fluoride release and recharge ability of different restorative materials in different media: An in vitro study. Journal of Clinical and Diagnostic Research, 8(12): ZC31-ZC34.