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THE USE OF LITHIUM DISILICATE CERAMIC IN SMILE AESTHETICS REPAIR - CLINICAL CASE REPORT

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ABSTRACT

The search for aesthetics in order to have a harmonious smile has led patients to seek out a dental surgeon in order to optimize their smile with the use of ceramic laminates. The aim of this paper is to present a clinical case of aesthetic oral rehabilitation in the upper region, with dental contact lens-type ceramic laminates, presenting a clinical sequence and a restorative protocol with minimally invasive preparations. Patient, A. O. J. V., male, 28 years old, presented with the main complaint of dissatisfaction with the disharmony of his smile due to diastemas and differences in the size and positioning of his teeth. The following therapeutic options were proposed: ceramic fragment, composite resin veneers or ceramic veneers. Considering the aesthetic result, color stability and durability, the patient opted for contact lens-type ceramic laminates on 10 elements (15 to 25). The following clinical maneuvers were carried out: diagnostic wax-up, root coverage surgery using the semilunar flap technique, tooth preparation using wear guides, molding with addition silicon, testing and cementing the contact lenses, finishing and polishing the interfaces and occlusal adjustment. The contact lenses in the minimally invasive technique allowed for less wear on the tooth structure, adequate adhesion to the enamel and excellent esthetic and mechanical results. The aid of wear guides during tooth preparation was essential in this type of technique.

Palavras-chave: Dental porcelain. Ceramics. Dental Veneers.

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INTRODUCTION

The literature reports the search by dentists for materials that are capable of mimicking the tooth structure. In 1955, with Buonocore's experiments on acid etching, it was seen that it was possible to have restorative materials adhere to the tooth surface.1 This discovery boosted restorative dentistry in its various adhesive materials.

With the development of new adhesive materials, new techniques emerged. These techniques make it possible to obtain aesthetic treatments with minimal or no wear of the tooth structure, since the bonding of the restorative material to the tooth occurs through adhesion.2

These conservative or minimally invasive preparations are directly linked to the excellent physical and mechanical properties of the materials used.3-6

Among the new restorative materials is the ceramic system. Ceramics are biocompatible materials that have great resistance to wear, excellent color stability and excellent aesthetics. It is currently the main restorative material used in the manufacture of indirect restorations: inlay, onlay, full crowns, fragments, veneers and ceramic laminates.7,8

The disadvantages include: fragility in handling the piece, darkened teeth (making restoration difficult) for which the technique is not recommended in some cases, teeth with extreme crowding, after cementation their repair is minimal, does not change the color significantly, depends entirely on the professional's skill in all phases, provisional restorations must be well executed because they are cemented in an aesthetic region, teeth that require preparation or even possible wear of the antagonist,9 in addition to the high cost, the latter being the main factor for choosing other restorative materials.10,11

The ceramic laminates described by Charles Pincus in 1938 were initially a temporary means of providing better aesthetics to smiles in the film industry. However, in 1980, ceramic surface treatment protocols began and, together with enamel conditioning, it became possible to perform ceramic laminates as a definitive treatment.12,13

Of the various aesthetic treatments available, contact lens-type veneers stand out. They are designed as ceramic sheets that are cemented onto the tooth structure with little or no wear, and are strongly bonded to the tooth enamel.14

Ceramic veneers are indicated for teeth with changes in color or shape, such as conoid teeth, length correction, changes in surface texture, closing or reducing diastemas, aligning one or more teeth, repairing fractured teeth, endodontically treated teeth, enamel

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hypoplasia, fluorosis or amelogenesis imperfecta, or even teeth that have not responded well to dental whitening.15

To rehabilitate a patient with laminates and/or ceramic veneers, adequate planning is required, with a careful and thorough assessment of occlusal stability, disocclusion guides, presence of pathological signs of parafunction, angulation of the element and changes in color and shape.

It is necessary to know and understand the properties of the materials and their forms of use, monitor the clinical stages and have clear, precise and detailed communication with your prosthetist, offering excellent conditions to facilitate the laboratory phase of the rehabilitation process.16

It is worth mentioning the sensitivity of the cementation technique. It must be performed carefully and meticulously, respecting both the treatment of the tooth structure and the internal surface of the veneer, ensuring correct adhesion and consequent union between the parts, noting that no type of retention is performed during preparation. Following an adequate cementation protocol directly influences the duration of these pieces in the mouth.15

METHODOLOGY

Patient A. O. J. V., a 28-year-old male, sought dental care complaining of disharmony in his smile due to diastemas, differences in the size and positioning of the teeth.

During the first consultation, a medical history, clinical examination and initial photographic protocol were performed (Fig. 1). During the medical history, the patient presented good general health, was a non-smoker and had adequate hygiene. Figures 2, 4 and 5 show the dental exposure when smiling. During the detailed intraoral clinical examination, small premature contacts were observed on teeth 11 and 21, which had caused gingival resections in them, teeth with A2 coloration according to the Vita scale, irregular gingival zeniths, smaller laterals giving the appearance of a childish smile, irregular incisal edges and generalized diastemas between teeth 11 and 21 (Figs. 3, 6 and 7).

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Fig. 1 A, B, C and D. Frontal facial photos: sealed lips, lips at rest, smile and half-open smile. Source: The author's.

Fig. 2. Frontal photo of the patient's smile. Source: The author's.

Fig. 3. Photo of the upper and lower jaw in occlusion, with mouth retractor. Source: The author's.

Fig. 4. Right side photo observing diastema and size of tooth 12. Source: The author's.

Fig. 5. Left side photo. Source: The author's.

Fig. 6. Image used to analyze the initial smile and dental aesthetic patterns. Source: The author's.

Fig. 7. Photo of the occlusal record with carbon, highlighting the premature contacts in MIH. Source: The author's.

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The patient was presented with the following therapeutic options: ceramic fragment, composite resin veneers or ceramic veneers. Considering the aesthetic result, color stability and durability, the dentist and patient, together, decided to create contact lens-type ceramic laminates on 10 elements (15 to 25). Since the patient had already undergone dental whitening less than six months previously, this procedure was not indicated at this time.

RESULTS

Then, the preparation of the restorative plan began. For this, digital planning of the smile was carried out with the help of photos of the patient (Fig. 8). This technique allows the patient to have a detailed view and assists the professional during planning regarding the shape and size of the future lenses. Through this analysis, it can be seen that the patient had adequate incisal exposure, a smile with a childlike appearance, with small lateral teeth (Figs. 3, 4, 5 and 8) and the zenith of 11 and 21 above the desired, based on the literature (Fig. 6 and 8). After this analysis and interprofessional discussion in the area, having clarified the advantages and disadvantages, we opted to use the semilunar flap technique for root coverage in the gingival recessions of teeth 11 and 21. Prior to this surgical procedure, occlusal adjustment was performed on teeth 11 and 21 in MIH with the aid of carbon (Accu-Film II, Parkell, New York, NY, United States of America) and the FG 3168F pear-tip diamond bur from KG Sorensen (Cotia, SP, Brazil), molding with Hidrogum 5 alginate (São Paulo, SP, Brazil) for diagnostic waxing and restorative testing (Fig. 9).

To make the mock-up, a guide was initially made from the diagnostic waxing with addition silicone (Fig. 10) (3m company, Irvine, California, USA). The resulting matrix was filled with bisacrylic resin in shade A1 (Protemp 4, 3M ESPE, St. Paul, USA) and placed in the patient's mouth, remaining in position until complete polymerization (5 min). Once the bisacrylic resin had polymerized, the excess was removed with a scalpel blade no. 12, the unpolymerized surface layer was removed with gauze soaked in alcohol, and the treatment was finished and polished for proper evaluation (Fig. 11).

After careful analysis of the mock-up, the proposed treatment was approved by the patient (Fig. 12). After this approval, the surgical stage of root coverage of teeth 11 and 21 was performed using the semilunar technique.

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Two weeks after the surgical procedure (Fig. 13), the patient reported that he would be traveling for work for a long period of time; therefore, it would be necessary to advance the dental preparations and install the contact lenses, even before the complete healing of the gingival tissue. The patient was informed about the possible aesthetic damages involving the red aesthetics in the region of teeth 11 and 21. With this consent and option to advance the clinical execution, it was decided to make preparations with the supragingival end in elements 11 and 21, and at the gingival level in the others (15, 14, 13, 12, 22, 23, 24 and 25) to lessen damage to the marginal gingival tissue and reduce the possibility of alteration of the level of this gingiva.

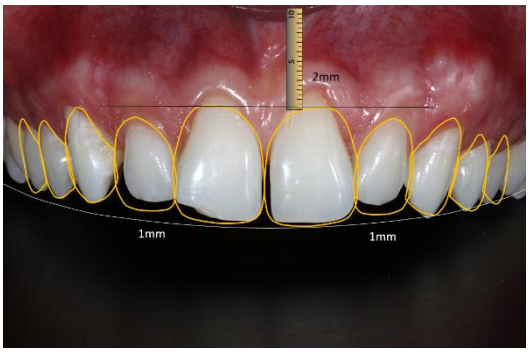

Fig. 8. Digital planning with proposed changes. Source: The author's.

Fig. 9. Palatal adjustments of premature contacts. Source: The author's.

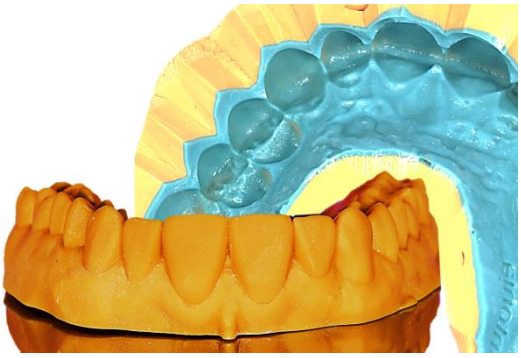

Fig. 10. Digital waxing and silicone guide. Source: The author's.

Fig. 11. Restorative test with bisacrylic resin. Source: The author's.

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Fig. 12. Incisal exposure with the lip at adequate rest. Source: The author's.

Fig. 13. Photo of the gingival appearance 2 weeks after root coverage surgery using the semilunar technique. Source: The author's.

During the same clinical session, tooth preparations (elements 15, 14, 13, 12, 11, 21, 22, 23, 24, and 25) were initiated under infiltration anesthesia, using condensation silicone guides (Hanau, Hesse, Germany) for reference regarding minimum and necessary wear (Figs. 14 and 15). Diamond burs 4138 and 4138F were used at high rotation under constant cooling (Fig. 16). After preparation with diamond burs, finishing was performed with a coarse-grained sof-lex disc (3m company, Irvine, CA, USA) for regularization and polishing of the preparations with a rubber tip (KG soresen, Cotia, SP, Brazil) (Figs. 17 and 18). The wear, guided by the silicone guides and millimeter probe, was made at around 0.2 to 0.6 mm (Figs. 19 and 20).

In the same session, the impression was made with a double wire (000 and 00) in the double-step technique with the addition silicone material (Express XT from 3M, Irvine, California, USA). This technique is well-established and cited in the literature (Figs. 21 and 22). After the impression, using the silicone guide, the mock-up was made with bisacrylic resin (Protemp 4 from 3M, Irvine, California, USA) as transitional provisionals (Fig. 24). The choice of future contact lenses followed the current color of the dental substrate, BL4 based on the Vita color scale. The molds, photos and smile planning (DSD) were sent to the laboratory for the production of injected lithium disilicate ceramic parts (IPS e.max Press, Ivoclar Vivadent) (Fig. 23).

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Fig. 14. Silicone guides for wear guidance. Source: The author's.

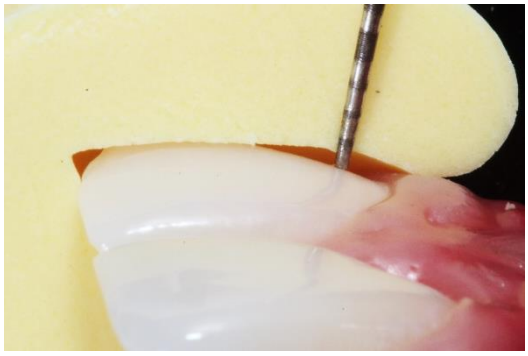

Fig. 15. Silicone guides for wear guidance. Source: The author's.

Fig. 16. Sorense 4138 KG diamond tip for initial tooth wear. Source: The author's.

Fig. 17. Refinement of preparation with Sof-lex disc. Source: The author's.

Fig. 18. Polishing the preparation with a medium-grain rubber cup. Source: The author's.

Fig. 19. Silicone guide in position to check wear. Source: The author's.

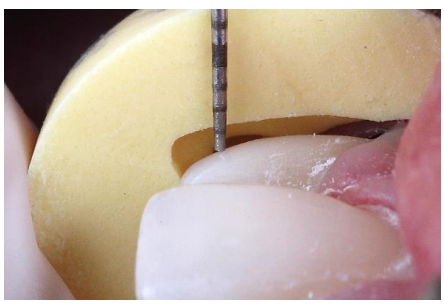

Fig. 20. Silicone guide in position to check wear. Source: The author's.

Fig. 21. Placement of the 000 retraction wire for molding with heavy material. Source: The author's.

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Fig. 21. Placement of the second retraction cord no. 0 for horizontal retraction of the gingival tissue. Source: The author's.

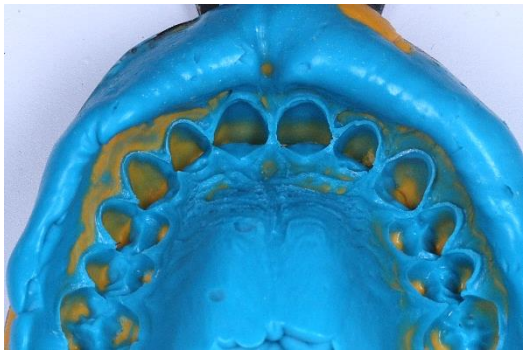

Fig. 22. Silicone mold using the double-step technique. Source: The author's.

Fig. 23. Plaster model of prepared teeth. Source: The author's.

Fig. 24. Temporary transition mock-up. Source: The author's.

Once the ceramic pieces were ready, the provisionals were removed and prophylaxis was performed with a Robinson brush and pumice stone to try the ceramic pieces (Figs. 25 and 26). The sheets were tried on separately to check individual adaptation, followed by a joint try-on and then a try-on with Try-in cement (Joinville, SC, Brazil) in shade A1.

After the try-ons and acceptance by the patient, preparation of the pieces and the dental substrate for definitive cementation began. Supported on a base of addition silicone, the internal surfaces of the pieces were etched with 10% hydrofluoric acid (Maringá, Paraná, Brazil) for 20 seconds, resulting in microporosities that improve cement retention in the piece. After washing and drying the acid abundantly for 60 seconds each, the silane bonding agent (Prosil, FGM, Joinville, SC, Brazil) was applied and left to rest for 60 seconds (Figs. 27, 28 and 29).

Each dental element was prepared with 37% phosphoric acid (Joinville, SC, Brazil) for 30 seconds (enamel), washed abundantly for 60 seconds and dried with air jets, followed by the application of the adhesive (3M Company, Irvine, California, USA) light-

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cured for 20 seconds (Figs. 31, 32, 33 and 34).Após a aplicação do adesivo na parte interna da peça cerâmica e secagem por 20 segundos, o cimento resinoso (3m company, Irvine, CA, EUA) da cor A1 foi aplicado uniformemente nas superfícies internas das peças com abundância, e levadas em posição sobre pressão digital para extravasamento do cimento (Fig. 30 e 35). Esses excessos foram removidos com pincel e fio dental nas interproximais e enfim polimerizadas por 60 segundos em cada face (Fig. 36).

Após a cimentação dos dez laminados cerâmicos, realizado ainda a remoção de excessos com lâmina de bisturi número 12, e com o auxílio de um papel carbono (Accu-Film II, Parkell, Nova York, NY), Estados Unidos da América) foi realizado o ajuste oclusal com broca de acabamento no formato de chama de vela. Após os ajustes as regiões desgastadas e as interfaces (dente/cimento/cerâmica) foram ajustadas e rigorosamente polidas com pontas de borracha utilizadas para polimento para resina composta.

Finalizada a instalação das lentes de contato, o paciente recebeu orientações a respeito da manutenção, higiene oral e cuidados necessários (Fig. 36, 37, 38, 39 e 40).

Fig. 25. Optical characteristics of ceramic pieces. Source: The author's.

Fig. 26. Test the pieces on the model to check fit. Source: The author's.

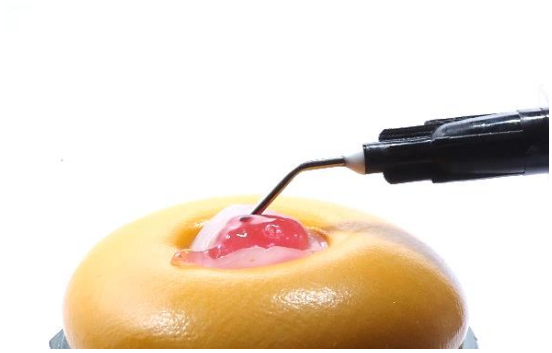

Fig. 27. Application of hydrofluoric acid to the inner face of the part for 20 seconds. Source: The author's.

Fig. 28. Thorough washing with air/water jet. Source: The author's.

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Fig. 29. Application of the silane bonding agent to the inner face of the piece, allowing it to evaporate for 60 seconds. Source: The author's.

Fig. 30. Application of the adhesive on the inside of the piece. Source: The author's.

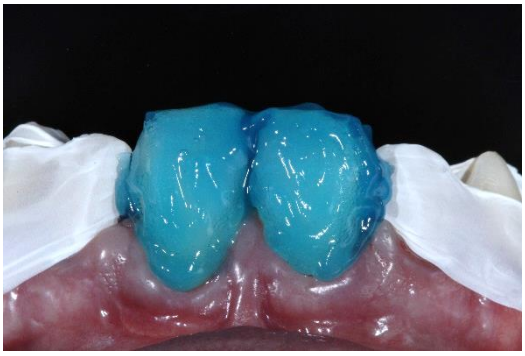

Fig. 31. Application of phosphoric acid for 30 seconds on the dental element. Source: The author's.

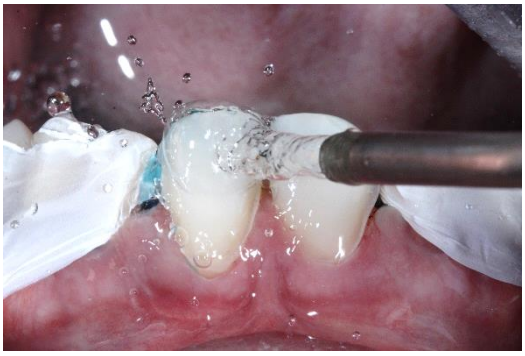

Fig. 32. Thorough washing with air/water jet. Source: The author's.

Fig. 33. Application of the adhesive to the dental element. Source: The author's.

Fig. 34. Photopolymerization of the adhesive for 20 seconds. Source: The author's.

Fig. 35. Placing resin cement on the piece. Source: The author's.

Fig. 36. Photopolymerization for 60 seconds on each side of the tooth. Source: The author's.

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Fig. 37. Final appearance after cementing the pieces. Source: The author's.

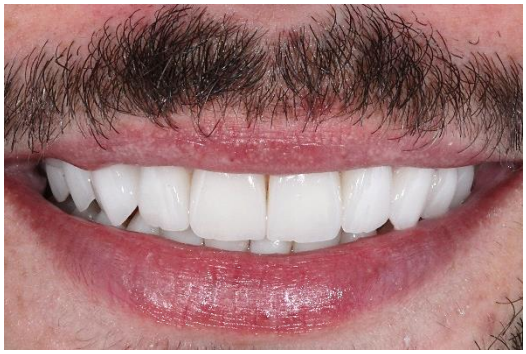

Fig. 38. Final appearance after cementing the pieces. Source: The author's.

Fig. 39. Initial appearance. Source: The author's.

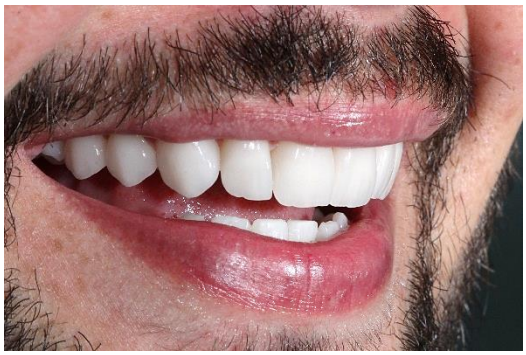

Fig. 40. Final appearance. Source: The author's.

DISCUSSION

According to Baratieri and collaborators; Souza VL; Bottino, M. A and Terry D, Geller W, ceramic laminates have been increasingly used in the dental field due to their biocompatibility, color stability, greater precision and mimicry of dental structures, excellent optical and mechanical properties, fracture resistance and hardness.16-19 Bottino MA explains that this abundant use is influenced by aesthetic standards and quality of life, and these standards can be achieved through ceramic laminates.20 Mclaren EA agrees that laminates have gained more space in the market not only due to their properties but also due to the aesthetic qualities that provide a natural look, contributing to a balance of the entire set.21

The reason for using the minimally invasive technique is described by Decurcio Rafael, who says that only a small amount of wear is necessary in order to obtain a better adaptation of the piece, creating a cervical end.15 For Mondelli, in conservative preparation the enamel should be preserved as much as possible, aiming at a satisfactory adhesive cementation, which is more effective and has greater longevity when the union is between ceramic and enamel than when it is between ceramic and dentin.22 In addition to the adhesive properties, the new ceramic systems have shown greater resistance and

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longevity when the structural properties are observed, allowing the production of thin ceramic laminates and minimally invasive preparations.23-25

Silicone guides during preparation are important because they allow checking whether the tooth wear was sufficient to receive the ceramics, thus aiming for minimal tooth wear.26Dercurcio R. says that at first the cements were applied only to fill the space between the tooth and the ceramic restoration and to make it remain fixed to the preparation, preventing movement during function.15 Mc Laren EA and Whiteman YY added that over time it was possible to develop a trajectory of evolution due to the improvement of the details related to the ceramic laminates, arriving at the current technique.27 However, in 1980, ceramic surface treatment protocols began, enabling an effective chemical relationship thanks to the cements resinous and adhesive systems, providing adhesion and retention to the tooth structure, in addition to a better marginal adjustment of the ceramic with the tooth.28,15

Öztürk and collaborators conducted a study on different polymerization cements, where they obtained the result that categorizes the dual cement with higher micromechanical properties in relation to the light-cured cement; even so, the light-cured cement is more indicated because it has greater color stability over time.29 Malheiros also adds that the working time of the light-cured cement is also better when compared to the dual cement, and that resin cement is used in ceramic laminates because it allows the translation of the tension generated on the ceramic to the support structure, presents excellent sealing, is practically insoluble, resulting in greater resistance of the ceramic.30 The resin cement to be used in cementation will vary according to the thickness of the laminate, and when it has high translucency, obtaining up to 2 mm in thickness, only the light-cured cement is indicated. This alternative has the advantage of being a more resistant material at the tooth/restoration interface, with no limited working time until the piece is seated and excess is removed, while the dual or chemical-only system has lower bond strength in the first hour after fixation.31,32 Ribeiro, S. D. states that the Dual is indicated in cases where the piece is more than 2 mm, where the light from the photopolymerizer would only be sufficient for the most superficial area, thus making the chemical reaction a necessity to continue and complement the polymerization.33 After the cementation is finished, a number 12 scalpel blade, serrated strips on the proximal faces and abrasive strips of different granulations are used to remove excess cement, preventing future infiltration and plaque accumulation. In the next session, the tooth/cement/ceramic

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interfaces are polished with special rubbers associated with extra-fine pumice stone.34 Zavanelli et al. describe the removal of marginal excess with a brush and the proximal with dental floss even before photopolymerization, and the adjustment of the laterality and protrusion guides and centric contacts is performed with the aid of carbon so that there is no occlusal interference, and finally, a new rigorous polishing of the adjusted areas and tooth/cement/ceramic interfaces is important to avoid future infiltrations, allowing for a longer duration of the restoration.35

Despite the numerous advantages, laminates have disadvantages, such as: sensitivity of the technique, difficult preparation and need for prior training, friability until the cementation of the piece, difficult repair, need for a specialized laboratory and higher cost.22,9,36-17

According to Coyne BM and Wilson NH, McLaren EA and Whiteman YY, after cementation, hygiene instructions should be reinforced, directly impacting the success of the treatment. In addition, they should also be instructed about their diet, since harder foods can cause fractures in the laminates.38,39

CONCLUSION

We can conclude from this work that contact lenses, because they present a minimally invasive technique, allow for less wear of the dental structure, adequate adhesion to enamel and excellent aesthetic and mechanical results. The assistance of wear guides during dental preparation plays a fundamental role in this type of technique.

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