A conservative aesthetic rehabilitation on pigmented anterior teeth: Three years follow-up

Camila Lima de Andrade, Enrico Angelo, Josué Junior Araújo Pierote, João Victor Frazão Câmara, Isabel Ferreira Barbosa, Luis Alexandre Maffei Sartini Paullilo

ABSTRACT

Introduction: Aesthetic dentistry values the alignment of teeth and harmonization of the smile, and several techniques can be applied to close diastemas. Here, we presented an aesthetic approach to restore the smile balance with porcelain veneers. Case Report: A 46-year-old female patient sought dental treatment complaining of dental clenching and smile appearance. Pigmented anterior teeth and fractured indirect restoration were observed. Tooth bleaching was performed with 35% hydrogen peroxide and the impression of the jaw was obtained to perform the diagnostic waxing and a surgical guide in silicone. The guide was inserted and the gingival margin recorded with a scalpel. A mucoperiosteal flap was performed and the gingival collar extracted. For osteotomy, the distance between the edge guide and the cervical bone was measured with surgical chisels and carbide/diamond drills. From the dental mold, silicone impressions for use in the mock-up and in the making of the temporary restoration were made. The cementation protocol for the facets was carried out with hydrofluoric acid for 30 seconds. Conclusion: The present protocol proved to be effective when correctly indicated and executed, rehabilitating the patient’s aesthetics and function.

Keywords: Dental, Dental porcelain, Esthetics, Esthetic rehabilitation

INTRODUCTION

Nowadays, the demand of esthetic procedures is increasing. On that cases, metal free restorations, such as porcelain laminate veneers and crowns, are good alternatives of treatment. Besides, to improve tooth color, porcelain laminate veneers are also used for esthetic treatments involving morphological modifications related to shape, size, and volume [1]. Through appropriate indication and execution of a correct technique, high quality rehabilitation can be obtained with longevity [2].

The porcelain materials commonly indicated for use as porcelain laminate veneers are sintered feldspathic porcelain, due to its translucency and potential for use in small thicknesses [3, 4]. The range of variety in tonality of this materials, from opaque to translucent, allows a reproduction of natural tooth appearance, consequently resulting in a satisfactory esthetic result [5].
The longevity of ceramic restorations is better than a resin composite direct restoration, as shown on previous studies [5], and they also have shown lower failure rates on follow-ups, demonstrating the good longevity of this type of restoration.

Therefore, considering all the benefits described above of this type of material, the aim of this case report is to present an aesthetic approach to reestablish the esthetics and balance of the smile with porcelain veneers as the restorative strategy [6].

**CASE REPORT**

A 46-year-old woman sought for treatment complaining of dental tightening and wishing to improve the appearance of her smile. Clinical evaluation revealed pigmented anterior teeth (12, 13, 21, and 23) and fractured indirect restoration (11) (Figure 1A–C).

Following the clinical and radiographic evaluations, it was discussed with the patient for the benefits and risks about the treatment. In order to reestablish the size, shape, and color of the teeth, it was decided to prepare the six-maxillary anterior and ten mandibular anterior teeth for feldspathic porcelain veneers.

Firstly, a professional dental bleaching was performed using hydrogen peroxide 35% (HP Whiteness, FGM Products, SantaCatarina, Brazil). Three applications (15 minutes each) in each three sessions were performed at one-week interval. The initial color 3.5 after the procedure approached A1.

After that, an impression of the maxilla was obtained to realize the diagnosis wax-up (Figure 1D), and then a surgical guide in silicone, with the edge tangent to the cervical region of wax-up, was confectioned. The guide was inserted in mouth and the new gingival margin was registered with a scalpel. Mucoperiosteal flap was reflected from the incision line onwards. Then a crevicular/sulcular incision was given and the gingival collar was extracted using curettes. For the osteotomy, measurement of the distance between the guide edge and the cervical bone was performed using manual instruments (surgical chisels) and carbide/diamond burs with adequate irrigation, for preventing bone necrosis; then, the flaps were sutured using nylon thread 5.0 for correct repositioning of the gingival margin (Figure 2A and B). From the dental cast, silicone (Zetaplus, Zhermack, Labordental, São Paulo, Brazil) (Figure 1D–H) impressions were obtained to use for the mock-up (Figure 3) and the confection of the temporary restorations (Figure 2C–E). This procedure allows a tridimensional previsualization of the final result and a guidance for teeth preparation, allowing a conservative wear [7]. The material selected for temporary restorations was bis-acrylic resin and cemented with flow resin (3M ESPE). After six months, the definitive prostheses were delivered (Figure 4A and B).

Tooth preparation for porcelain veneers must be uniform and, whenever possible, restricted entirely to the enamel, by means of calibrated spherical diamond burs at the cervical region and burs with a depth limiting device [8]. The remaining facial enamel was reduced to the level of these grooves using a tapered-cylinder, round-end diamond bur (KG Sorensen, São Paulo, Brazil). The incisal third was prepared, reducing only the buccal surface, maintaining enamel tissue in this region for adhesion of ceramic and resin. The silicone matrix, obtained from the wax, guides the amount of dental wear carried out during preparation, in order to maintain rounded angles. An extra fine, tapered-cylinder, round-end diamond burr (KG Sorensen), silicone rubber (Enhance, 3M ESPE), abrasive disks (Pop-On, 3M ESPE), and felt disks (Feltros Diamond, FGM Products) were used to polish the teeth’s surface. The final amount of wear was 0.8 mm at the medium third and 0.4 mm at the cervical third. At the end of preparation, it was showed that the final amount of wear was 0.8 mm, at the medium third, and at the cervical third 0.4 mm (Figure 5A).

Molding was performed with double viscosity polyvinyl siloxane material, using two retraction threads (Ultrapack, Ultradent Products, São Paulo, Brazil), which were removed after the material was introduced.

Teeth color was selected with a ceramic scale (VITA). Finally, temporary restorations, using a bis-acryl resin (Luxatem Plus, DMG, Hamburg, Germany), were made.

The upper and lower casts were sent to the dental technician for pouring, creation of dies, and fabrication of porcelain veneers—Lithium Dissilicate (Empress Esthetic, Ivoclar Vivadent, São Paulo, Brazil) (Figure 5B). After the confection, the veneers were carefully positioned to verify marginal adaptation, alignment, shape, and color, with very satisfactory results (Figure 5C).

After the veneers were checked, the conditioning of internal surfaces was performed through the application of 9.5% hydrofluoric acid for 30 seconds (CondacPorcelana, FGM Products) (Figure 5D). Then, they were washed under constant water, air-dried, and then a silane coupling agent (Prosil, FGM Products) was applied (Figure 5E and F). The luting of the veneers was performed for each tooth individually, following the same sequence. After isolation of the gingiva and the prepared teeth, conditioning with 37% phosphoric acid (Dentsply) for 30 seconds, rinsing, and careful drying were performed. Next, a double application of one-bottle bonding system (Single Bond Adapter 2, 3M ESPE) was performed, gently air-dried on the tooth surface and sequentially, light cured for 40 seconds (Figure 5G).

The luting agent used in this case was a lighting-cure resin cement (Variolink Multilink). It was applied in the internal surface of the veneer, and then positioned on the teeth (Figure 5H and I). Excess cement was removed using manual instruments, and then, they were light cured at the facial and lingual sides for 40 seconds in each face. Finally, final adjustments of the ceramic were
performed with diamond burs FF (KG Sorensen) on marked areas and finishing and polishing of the cement line were performed with flexible aluminum oxide disks to avoid additional wear. Cervical margins were verified, and cement excess was removed with strips of sandpaper. The final result (Figure 4A and B) and follow-up after three years can be seen on the facial (Figure 4C) and intraoral (Figure 4D and E) photographs of the patient.

**DISCUSSION**

Noninvasive treatments with high aesthetic quality, such as ceramic veneers, have been more demanding by patients. However, right selection of the material that will be used is a crucial factor for success of the treatment, with the same importance as the execution of a correct technique. To choose the correct material, some factors need to be considerate: the presence of discolored teeth resistant to vital bleaching procedures, disproportion of shape, size and volume, the need for morphologic modifications, presence of diastema, minor tooth alignment, enamel’s malformations, fluorosis, and teeth fractures. The placement of veneers is contraindicated when there is: a reduction on interocclusal distance; a deep vertical overlap, anteriorly without horizontal overlap;
patient with severe bruxism or with parafunctional/deleterious activity [1].

In this case report, the patient complained about the aesthetic of her smile, which presented extensive restorations in the central incisors, teeth color alterations, fractured and unsatisfactory restorations. A composite resin treatment may be indicated for a less invasive approach, due to its susceptibility to discoloration, wear, marginal fractures, which consequently would reduce the aesthetic result in long term. On the other hand, restorations with porcelain veneers, that were proposed, are more durable on anterior restorations, presenting superior esthetics results. Considering the advances on the production of ceramic and bonding materials [9], porcelain veneers were well indicated for this treatment.

Some studies have shown that the survival rates for veneer restorations were better for porcelain restorations than the other materials compared (94% for porcelain, 90% for indirect resin composite, and 74% for direct resin composite) [10, 11]. Furthermore, other studies have shown that the survival rate for bonded porcelain laminate veneer restorations is higher than 90% after 10 years [6, 11]. Other works compared with the clinical evidence for all-ceramic restorations and presented that the ceramics are particularly well suited for veneer restorations, which have failure rates (with loss of retention or fracture) of less than 5% at five years. Other authors found that the feldspathic porcelains showed similar long-term survival rates (observed 96% at five years, 93% at 10 years, and 91% at 12 years) [6].

Lithium disilicate has advantages such as aesthetics, providing a harmonic and natural aspect [4]. It has low mechanical properties and flexural strength ranges from 60 to 70 MPa [3]. This ceramic is appropriate for minimally invasive treatments (0.5 mm) with a high esthetic result demand. The ideal conditions for the bond between veneer and the substrate, are to the veneer, be bonded at least on 50% of the dental tissue remain [9, 12].

The mock-up technique was proceeded at the time of the teeth preparation and facilitating the patient visualization of the final restoration’s aspect [13–15]. The longevity, such as the treatment’s success depends on the adequate conditions of bonding between the veneers and the tooth complex [16–19]. The resin luting dual-cured cement has superior mechanical properties than resin flow composites, such as shear strength and hardness. However, the stability of the original color of the chemical or dual-cured cement may change over time, because of the oxidation of the tertiary amine content, which consequently may change the color of the restoration [15].

**CONCLUSION**

In this case, the use of lithium disilicate glass-ceramic was an excellent alternative in cases of previous teeth with shape change (cervical-incisal diameter was increased), mainly because veneers exhibit natural fluorescence and absorb, reflect, and transmit light exactly as a natural tooth. However, we highlight that, to achieve this result, a detailed planning with a good communication between patient, dentist, and the dental technician, as well as the correct selection of dental materials were essential.

**REFERENCES**

1. Radz GM. Minimum thickness anterior porcelain restorations. Dent Clin North Am 2011;55(2):353–70.
2. Federizzi L, Gomes ÉA, Báratro SSP, Baratto-Filho F, Bacchi A, Spazinzo A. Use of feldspathic porcelain Veneers to Improve smile harmony: A 3-year follow-up report. Braz Dent J 2016;27(6):767–74.
3. Donovan TE. Factors essential for successful all-ceramic restorations. J Am Dent Assoc 2008;139 Suppl 1:48–8.
4. McLaren EA, Whiteman YY. Ceramics: Rationale for material selection. Compend Contin Educ Dent 2010;31(9):666–8.
5. Magne P, Belser UC. Novel porcelain laminate preparation approach driven by a diagnostic mock-up. J Esthet Restor Dent 2004;16(1):7–16.
6. Peumans M, De Munck J, Fieuws S, Lambrechts P, Vanherle G, Meerbeek BV. A prospective ten-year clinical trial of porcelain veneers. J Adhes Dent 2004;6(1):65–76.
7. Reshad M, Cascione D, Magne P. Diagnostic mock-ups as an objective tool for predictable outcomes with porcelain laminate veneers in esthetically demanding patients: A clinical report. J Prosthod Dent 2008;99(5):333–9.
8. Rotoli BT, Lima DANL, Pini NP, Aguair FHB, Pereira GDS, Paullila LAMS. Porcelain veneers as an alternative for esthetic treatment: Clinical report. Oper Dent 2013;38(5):459–66.
9. Calvert G. Bonding to ceramics: Scientific evidences for clinical dentistry. Br Dent J 2010;209(2):99.
10. Meijering AC, Creugers NH, Mulder J, Roeters FJ. Treatment times for three different types of veneer restorations. J Dent 1995;23(1):21–6.
11. Fradeani M, Redemagni M, Corrado M. Porcelain laminate veneers: 6- to 12-year clinical evaluation—A retrospective study. Int J Periodontics Restorative Dent 2005;25(1):9–17.
12. Gresnigt M, Ozcan M, Kalk W. Esthetic rehabilitation of worn anterior teeth with thin porcelain laminate veneers. Eur J Esthet Dent 2011;6(3):298–313.
13. Prieto LT, Souza EJ Jr, Araújo CTP, Lima AF, Dias CT, Paullilla LAMS. Nanoleakage evaluation of resin luting systems to dental enamel and leucite-reinforced ceramic. Microsc Res Tech 2012;75(5):671–6.
14. Prieto LT, Souza EJ Jr, Araújo CTP, Lima AF, dos Santos Dias CT, Paullilla LAMS. Knop hardness and effectiveness of dual-cured luting systems and flowable resin to bond leucite-reinforced ceramic to enamel. J Prosthodont 2013;22(1):54–8.
15. Kilinc E, Antonson SA, Hardigan PC, Kesercioglu A. Resin cement color stability and its influence on the final shade of all-ceramics. J Dent 2011;39 Suppl 1:e30–6.
16. Malchiodi L, Zotti F, Moro T, De Santis D, Albanese M. Clinical and esthetical evaluation of 79 lithium disilicate multilayered anterior veneers with a medium follow-up of 3 years. Eur J Dent 2019;13(4):581–8.
17. Adolfi D, Tribst JPM, Adolfo M, Dal Piva AMO, Saavedra GSFA, Bottino MA. Lithium disilicate crown, zirconia hybrid abutment and platform switching to improve the esthetics in anterior region: A case report. Clin Cosmet Investig Dent 2020;12:31–40.
18. Moreira A, Freitas F, Marques D, Caramês J. Aesthetic rehabilitation of a patient with bruxism using ceramic veneers and overlays combined with four-point monolithic zirconia crowns for occlusal stabilization: A 4-year follow-up. Case Rep Dent 2019;2019:640563.
19. Samer MS, Faraz Q, Al-Dubai SAR, et al. Clinical outcomes and predictors of satisfaction in patients with improved lithium disilicate all-ceramic crowns. Med Princ Pract 2017;26(5):470–9.

**********

Author Contributions
Camila Lima de Andrade – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
Enrico Angelo – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
Josué Junior Araújo Pierote – Conception of the work, Design of the work, Acquisition of data, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
João Victor Frazão Câmara – Conception of the work, Design of the work, Analysis of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission
The corresponding author is the guarantor of submission.

Source of Support
None.

Consent Statement
Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest
Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.

Copyright
© 2020 Camila Lima de Andrade et al. This article is distributed under the terms of Creative Commons Attribution License which permits unrestricted use, distribution and reproduction in any medium provided the original author(s) and original publisher are properly credited. Please see the copyright policy on the journal website for more information.
Submit your manuscripts at
www.edoriumjournals.com