CASE REPORT

Replacement of ceramic laminates veneers after biologic, adhesive and aesthetic failure: case report

Mayara dos Santos **Noronha**[1], Daylana Pacheco **da-Silva**[1], Eduardo Fernandes **de-Castro**[1], Carlos Alberto **Carone**[2], Vanessa Cavalli **Gobbo**[1], Marcelo **Giannini**[1]

https://doi.org/10.14436/2447-911x.17.2.032-046.oar
Submitted: November 07, 2017
Revised and accepted: September 12, 2019

1. Faculdade de Odontologia de Piracicaba, Departamento de Odontologia Restauradora (Piracicaba/ SP, Brazil).

2. Laboratório Carone, Laboratório de Prótese Dentária (Limeira/SP, Brazil).

How to cite: Noronha MDS, da-Silva DP, de-Castro EF, Carone CA, Gobbo VC, Giannini M. Replacement of ceramic laminates veneers after biologic, adhesive and aesthetic failure: case report. J Clin Dent Res. 2020 May-Aug;17(2):32-46.

Contact address: Mayara dos Santos Noronha
Rua Dr. Álvaro Ribeiro, 15. Apto. 92 - Bairro Ponte Preta
Campinas/SP – CEP: 13.041-730
E-mail: mysnoronha@gmail.com - mysnoh@gmail.com

The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

Patients displayed in this article previously approved the use of their facial and intraoral photographs.

ABSTRACT

Ceramic laminated veneers (CLV) are ultraconservative indirect aesthetic restorations that requires minimal or no enamel preparation with minimum thickness (ranging from 0.2 to 0.5 mm). They are capable of reproducing the aspects of the natural teeth and their clinical longevity is greatly determined by the bond strength formed among the triad: tooth surface, luting cement and porcelain veneers. Therefore, this clinical case reports the replacements of unsatisfactory ceramic laminates after 7 years of clinical service. Initially, photograph documentation were taken and impressions were provided to perform the planning, diagnostic waxup and mock up. After patients consent, the old CLV were removed and teeth were prepared with minimal invasive technique, followed by impression with addition silicon. Lithium Dissilicate CLV were confectioned in laboratory and cemented. The proximal and cervical adaptation were previously checked, the relationship with periodontal tissues, asymmetries and the shade of the resin cement using the try-in resin cement. The surface of teeth and laminates veneers were treated before cementation, and fixed with a light-cure resin cement. The excess cement was removed with a disposable brush and each surface was light activated for 40 seconds using LED light-curing unit. Occlusal contacts, protrusive and lateral movements were checked. The success of rehabilitation treatment with ultraconservative ceramic laminates requires meticulous and multidisciplinary planning. The knowledge, observation and application of aesthetic, functional and biological criteria are essentials to achieve the longevity of rehabilitation.

Keywords:

Tooth Preparation. Dental Veneers. Ceramics. Rehabilitation.

INTRODUCTION

The development of minimally invasive techniques was only possible with the advent of new adhesive and restorative materials. They consist of conservative approaches that aim the preservation of the mineralized dental hard tissues by keeping the restoration margins mainly in enamel.[1-3] Enamel substrate is compound mostly by inorganic material and when compared to dentin, provides more reliable adhesion due to more homogeneous components distribution.[4] Since the restoration longevity is related to margin sealing of a restored cavity, enamel adhesion restorations are considered efficient and durable.[5]

Furthermore, these minimally invasive techniques allied with the growth of aesthetic treatments in anterior teeth, made possible emergence of ultrathin ceramic laminate veneers (CLVs).[6] CLVs are ultraconservative indirect aesthetic restorations that requires minimal or no enamel preparation with minimum thickness (ranging from 0.2 to 0.5 mm), capable of reproducing the aspects of the natural teeth.[7,8] In addition, CLVs have excellent optical properties that mimics enamel structure, adequate physical properties, durability and high success rates.[5] The clinical longevity is greatly determined by the bond strength formed among the triad: tooth surface, luting cement and porcelain veneers.[9]

Therefore, the restorative success relies in the adequate planning, which begins with the initial evaluation and anamnesis, extra and intraoral photography, well-made impressions, diagnostic waxing and digital planning. Moreover, the appropriate ceramic and a quality laboratory should be selected. However, there are several fundamental criteria that must be observed for an ideal aesthetic result, combining the smile with the individual characteristics. Among these criteria there are: health and gingival features, such as gingival zenith, interdental space, dental axis, characterization of relative dimensions and basic dental shape factors, surface texture, color, incisal configuration, smile line and smile symmetry.[1] If these criteria are not

observed, the success and longevity of the CLVs restorations will be compromised. Therefore, the present clinical case aims the to report a replacement of ceramic laminates due to biological, adhesive and aesthetic failures.

CASE REPORT

In the present case report, replacements of old ceramic laminates veneers after 7 years of clinical service were carried out. In the first session, clinical examination showed that the CLVs were with a series of failures as dental disharmony, unsatisfactory marginal adaptation, fractured ceramics and aesthetically unsatisfactory restorations (Fig 1,2,3).

Figure 1: Initial dental appearance- Vestibular View.

Figure 2: Initial dental appearance- Righ View.

Figure 3: Initial dental appearance- Left View.

The initial photographs and impressions were made to execute the digital planning and diagnostic waxup (Fig 4). After the first appointment and interview with the patient, the replacement of all laminate ceramics from canine to canine was suggested and approved by the patient. In the following session, the impression of the waxup on the study model was made with addition-curing, elastomeric precision impression material based on vinylpolysilone (Panasil Putty Soft, Kettenbach GmbH & Co, Eschenburg, Germany) and the mock-up with bis-acrylic resin was confectioned (Protemp 4, 3M ESPE, St Paul, Mn, USA) directly over the teeth (Fig 5). This procedure is performed in order to evaluate the result of the laboratory waxup and to provide predictability of how the future CLVs will be. Following the waxup impression, silicone mold was trimmed to include the gingival papilla so that excess material could be removed. For the mock-up, the silicone mold was filled with bis-acrylic resin and the mold was positioned over the teeth. Esthetics, symmetry, and thickness were analyzed. After the patient's waxup approval, the mock-up was removed and procedures of ceramics removal and dental preparation began.

Figure 4: Study model and diagnostic wax-up- step 1 of restoration planning.

Figure 5: Finished Mock up with Bis-Acrilic Resin

Tooth preparation was carried out based on the initial waxup (Fig 6). The old ceramic laminates were removed using diamond burs (#2135 and #2200, KG Sorensen, Cotia, SP, Brazil) and when resin cement was exposed, it was removed with abrasive discs (Sof-lex Pop On, 3M ESPE, St Paul, MN, USA). Dental preparations were finished and polished using fine and extra-fine grain sizes diamond bur (KG Sorensen, Cotia, SP, Brazil), which were minimal, practically returning the previous anatomy of the teeth, before cementation of the old CLVs (7 years ago) (Fig 7,8,9).

Figure 6: Tooth preparation based on initial waxup. Old restorative remove.

Figure 7: Final aspect of the minimally invasive preparation- Vestibular View.

Figure 8: Final aspect of the minimally invasive preparation- Right view

Figure 9: Final aspect of the minimally invasive preparation- Left View

The upper left central incisor was the only with greater wear at the incisal surface, due to the presence of composite resin restoration at this surface. At the same appointment, shades were selected using a color scale (Vita Classical, Vita Zahnfabrick, Bad Säckingen, Germany) and gingival retraction was obtained using retraction cord (#000, Ultrapack, Ultradent Products Inc, South Jordan, UT, USA) (Fig 10). Before impression, the retraction cords were removed (Fig 11) and the impression was performed with addition silicone (Panasil Putty Soft and Initial Contact Light, Kettenbach GmbH & Co, Eschenburg, Germany). After 5 minutes, the tray was removed, the negative impression checked (Fig 12) and a new mock-up was performed, serving as temporary restorations.

Figure 10: Inserting the gingival retractor cords (#000).

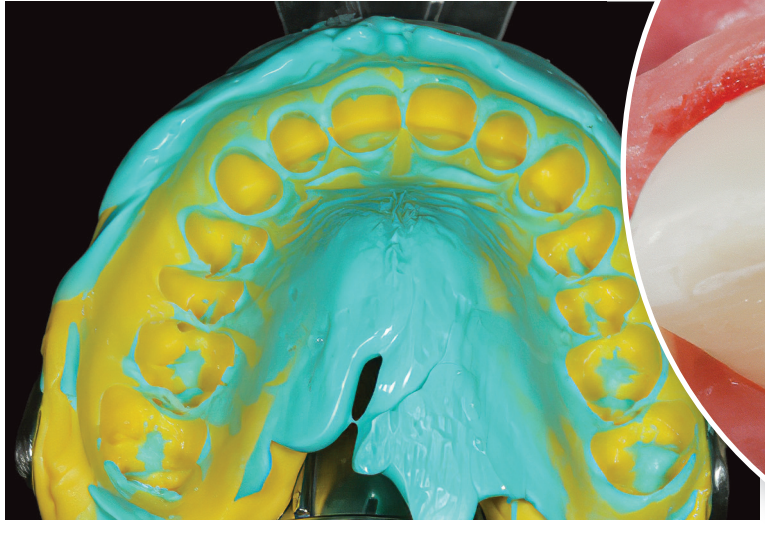

Figure 12: Final dental appearance.

Figure 11: Aspect of the sulcus after retraction cord removal.

The material was sent to the laboratory for the preparation of six laminate veneers. The ceramic shade was designated as B1 and A1. The incisal characterization was made with blue phase and opaque line. The glass ceramic based on lithium disilicate was the selected material for the CLVs (IPS e.max Press, Ivoclar Vivadent, Schaan, Liechtenstein) (Fig 13, 14,15).

Figure 13: Fabrication of veneers with Lithium Dissilicate.

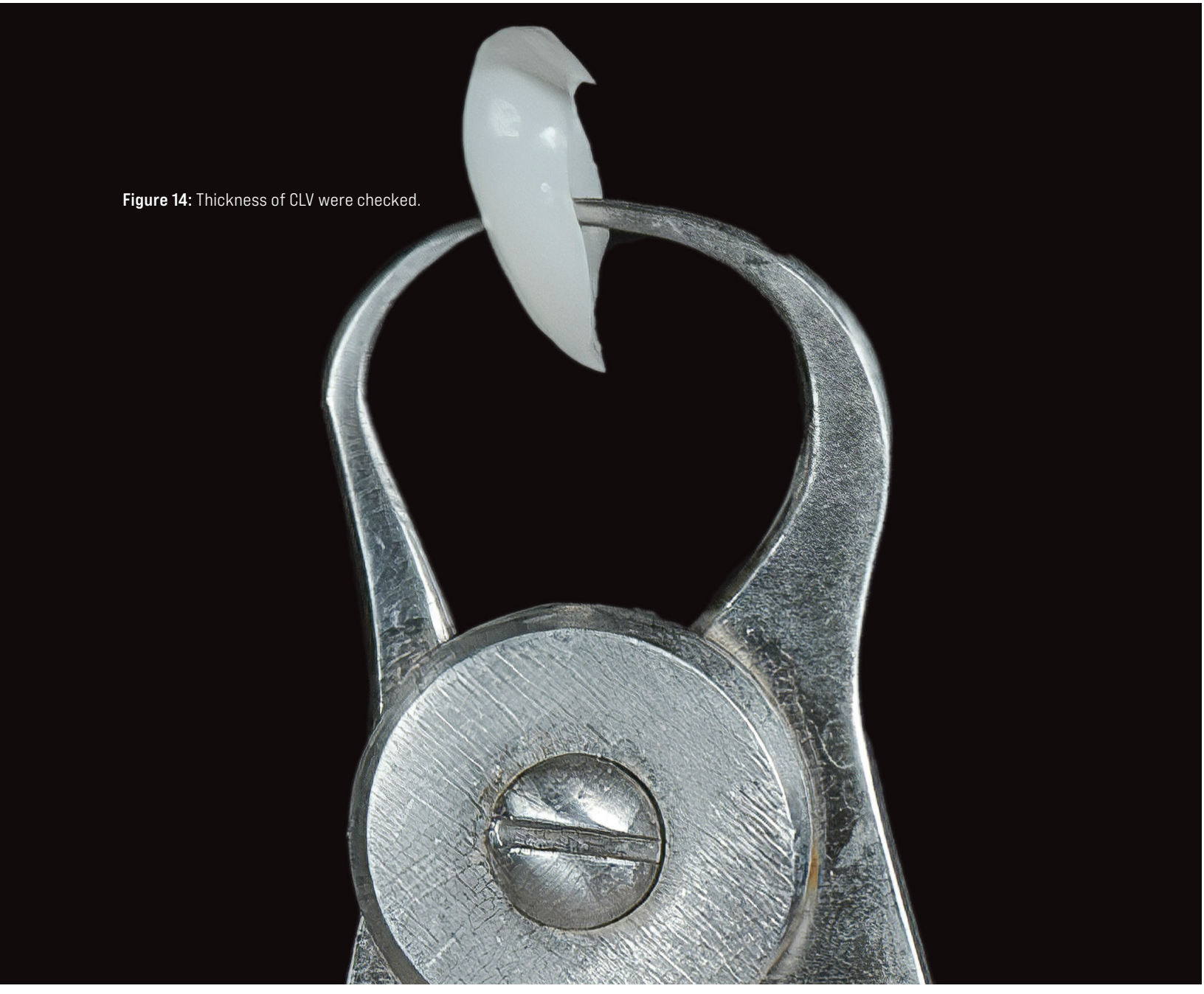

Figure 14: Thickness of CLV were checked.

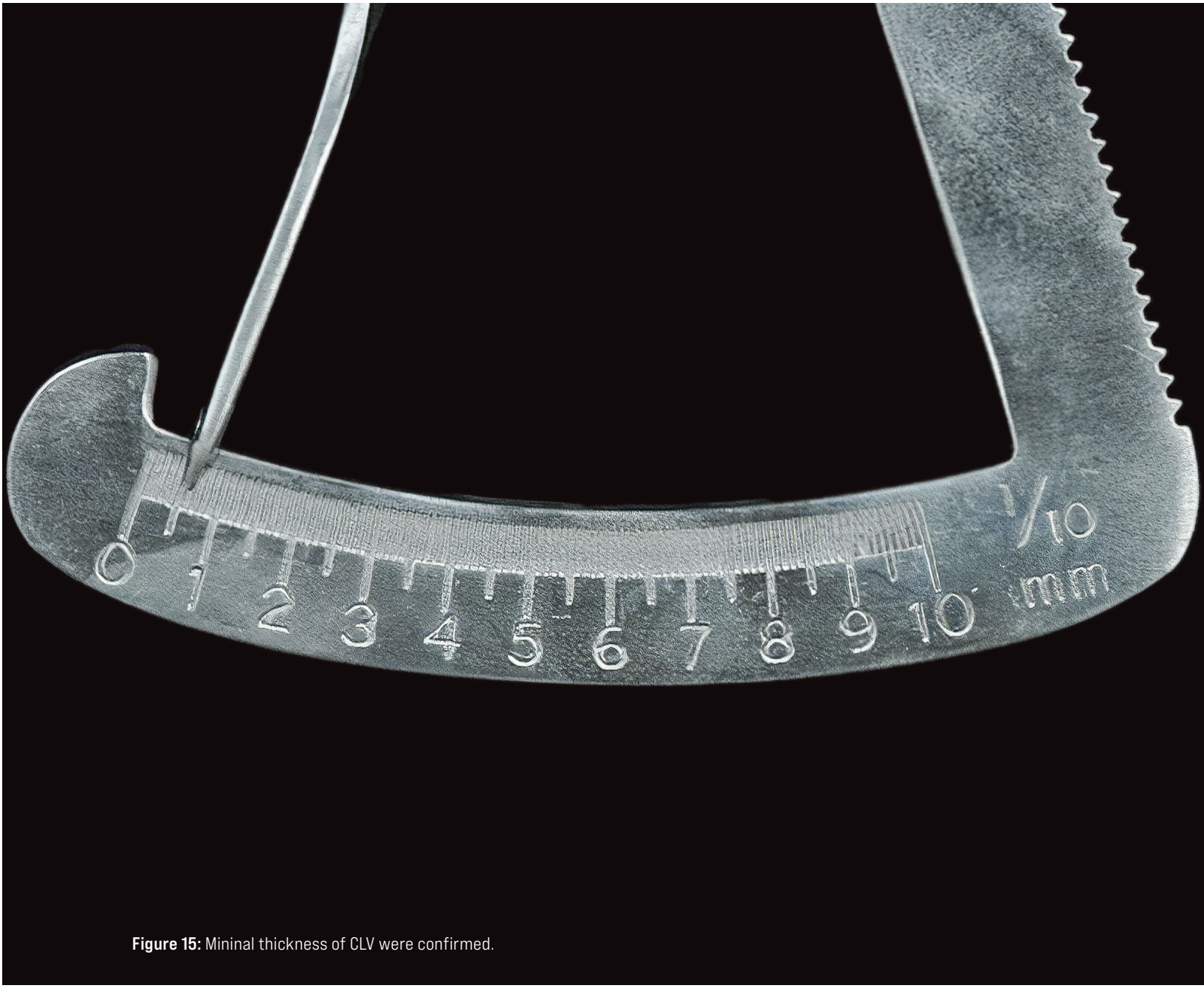

Figure 15: Mininal thickness of CLV were confirmed.

In the following session, it was checked proximal contacts, marginal and cervical adaptation, periodontal relationship, and symmetries. The resin cement shade was chose based on the shade scale of the cementing system and confirmed using try-in paste (NX3-Nexus, Try-In, Kerr Corp. Orange, CA, USA). The shade "White" was used for lateral incisors and canine, while the "Yellow" for the upper left central incisor. Clear shade was used for the upper right central incisor.

The internal surfaces of the laminates veneers were etched with 9.5% hydrofluoric acid (Dentsply, Petropolis, RJ, Brazil) for 20 seconds (Fig 16). The veneers were silanized with a silane-coupling agent (Silano Prime, Kerr Corp. Orange, CA, USA) (Fig 17). The adhesive agent (Single Bond Plus, 3M ESPE, St Paul, MN, USA) was applied on the laminates veneers (Fig 18) followed by the resin cement (Fig 19). The procedures of treatment of tooth surface were done (Fig 20) and enamel of prepared teeth was etched with 37% phosphoric acid for 30 seconds (Total Etch, Ivoclar Vivadent, Schaan, Liechtenstein), while the adjacent teeth were protected against the etching (Isotape, TDV Dental, Pomerode, SC, Brazil) (Fig 21). The adhesive agent (Single Bond Plus, 3M ESPE, St Paul, MN, USA) was applied on the enamel and light-cured for 20 seconds (Fig 22). The resin cement was applied to the laminates and them cemented one by one (Fig 23). Before light-activation, the excess of resin cement was removed with a disposable brush (KG Brush, KG Sorensen, Cotia, SP, Brazil) and total curing time was 40 seconds for each laminate, using a LED light (light irradiance of 1,200 mW/cm2, Valo, Ultradent Products Inc, South Jordan, UT, USA) (Fig 24). After cementation of all CLVs, occlusal contacts, protrusive and lateral movements were checked and the CLV procedures were finished (Fig 25).

Figure 16: Surface treatment of veneers- Hydrofluoridric acid and 9.5 etch for 20s followed by rinsing.

Figure 17: Surface treatment of veneers- Silane Application.

Figure 18: Surface treatment of veneers- Adhesive application.

Figure 19: Surface treatment of veneers- Cement Insertion.

Figure 20: Enamel treatment for adhesion.

Figure 21: Phosphoric acid 37% enamel etch.

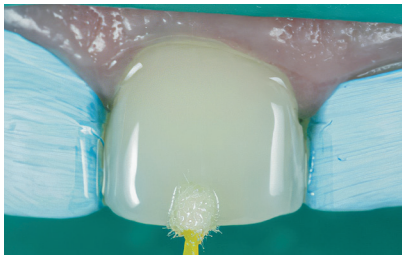

Figure 22: Adhesive application.

Figure 23: CLV were inserted and the excess of resin cement were removed.

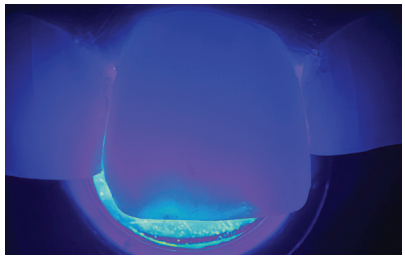

Figure 24: Photo-activated for 40 seconds.

Figure 25: Final dental appearance.

DISCUSSION

Ceramic laminates veneers have been the treatment choice for minimum invasive esthetic rehabilitation. In this clinical case report, the failure of CVLs after seven years of clinical service was shown. Although previous studies have indicated that the longevity of these restorations can reach around 13 to 16 years.[10-24]

Biological, adhesive and aesthetics failures were observed. The biological failure occurred at the cervical margin of the old CLVs, invading the biological space, which could compromise the patient's gingival health[18]. There was also the detachment of the CLV of upper right canine (adhesive failure) and fracture of the CLV of the upper right canine (mechanical and occlusal failure).

The thicknesses of the old CLV were in excess, and the cementation was performed with the improper positioning, not respecting the correct alignment of the arch. These situations could cause fractures and adhesive failures,[19-23] which according to previous studies, could be influenced by an inadequate thickness of the laminate, a poor tooth preparation, material flash at gingival margin or adhesive interface failure. In addition, errors in occlusal adjustments and parafunctional habits can interfere with the result.[9,25,26] Studies report that the principal failures involved CLVs are esthetic (31%), mechanical and adhesive (31%), loss of periodontal support (12,5%), loss of retention (12,5%), caries (6%) and dental fracture (6%).[20-24]

During the evaluation, the presence of interdental pigments and different light reflections on the surface of the laminates was observed, which could interfere with the perception of dental shape. In order to replace CLVs, the following strategies were observed and carefully executed:

1. Anamnesis, meticulous initial evaluation, quality photographs, moldings and mock-up making were essential in the treatment planning. The mock-up was used to assist in the evaluation of shape and harmony of future laminates[27,28] is a crucial procedure in the treatment

planning.[1] Dental preparation consisted of the removing old CLVs, keeping only the enamel structure and respecting the principles of minimally invasive dentistry,[29,30,31] since failures are more related to dentin exposition.[32] It is noteworthy that is important there is sufficient space for the ceramic material, thus allowing better resistance and optical properties.[27]

2. For final molding, addition silicon was used, a material with excellent reproducibility. In addition, a gingival retractor was used, which contributes to better molding and adaptation of CLVs on the gingival margins.
3. The choice of a reliable laboratory and a professional who knows how to work with the material must be well done, thus allowing quality in the manufacture of CLV.
4. A ceramic based on lithium disilicate was chosen, due to its excellent optical property, combined with mechanical properties. In addition, it is a material with good adhesion properties[12].
5. The light-curing resin cement are important and ideal for better bonding, aesthetics, color stability and longer working time[33].
6. After cementation, the occlusal adjustments were performed repeatedly. In the last appointment, all clinical aspects were reevaluated, and the final photography documentation were conducted.

The observation of the described principles allowed an excellent result, respecting smile harmony, marginal adaption, color stability and adequate aesthetics of the new CLVs (Fig 25).

CONCLUSIONS

The use of ceramic laminate veneers is an effective and safe alternative for aesthetic rehabilitation of anterior teeth. The presence of fractures or detachment of laminates can be minimized by an adequate clinical planning, dental preparation and cementation. The rehabilitation treatment with ceramic laminates requires prudence and multidisciplinary planning in order to restore teeth esthetically, functionally and biologically and to ensure longevity for the indirect restorations.

REFERENCES

1. Magne P, Belser U. Bonded porcelain restorations in anterior dentition: a biomimetic approach. Chicago: Quintessence; 2002.
2. Burke FJ, Lucarotti PS. Ten-year outcome of porcelain laminate veneers placed within the general dental services in England and Wales. J Dent. 2009 Jan;37(1):31-8.
3. Scopin de Andrade O, Kina S, Hirata R. Concepts for an ultra conservative approach to indirect anterior restorations. Quintessence Den Technol. 2011;34:103-19.
4. Asmussen E, Munksgaard EC. Bonding of restorative resins to dentine: status of dentine adhesives and impact on cavity design and filling techniques. Int Dent J. 1988;38(2):97-104.
5. Giannini M. Adesão: adesivos estado atual. In: Estética do sorriso: arte e ciência. São Paulo: Santos; 2003. Cap. 10, p. 103-10.
6. Beier US, Kapferer I, Dumfahrt H. Clinical long-term evaluation and failure characteristics of 1,335 all-ceramic restorations. Int J Prosthodont. 2012 Jan-Feb;25(1):70-8.
7. Scopin de Andrade O, Romanini JC, Hirata R. Ultimate ceramic veneers: A laboratory guided ultraconservative preparation con cept for maximum enamel preservation. Quintessence Dent Technol. 2012;34:29-43.
8. Vailati F, Bruguera A, Belser UC. Minimally invasive treatment of initial dental erosion using pressed lithium disilicate glass- ceramic restorations: A case report. Quintessence Dent Technol. 2012;35:65-78.
9. Peumans M, Van Meerbeek B, Lambrechts P, Vanherle G. Porcelain veneers: a review of the literature. J Dent. 2000 Mar;28(3):163-77.
10. Silva NR, Bonfante EA, Martins LM, Valverde GB, Thompson VP, Ferencz JL, Coelho PG. Reliability of reduced-thickness and thinly veneered lithium disilicate crowns. J Dent Res. 2012 Mar;91(3):305-10.
11. Duarte S Jr, Phark JH, Blatz M, Sadan A. Ceramic systems: An ultrastructural study. Quintessence Dent Technol. 2010;33:42-60.
12. Gurel G, Sesma N, Calamita MA, Coachman C, Morimoto S. Influence of enamel preservation on failure rates of porcelain laminate veneers. Int J Periodontics Restorative Dent. 2013 Jan-Feb;33(1):31-9.
13. Reeves WG. Restorative margin placement and periodontal health. J Prosthet Dent. 1991 Dec;66(6):733-6.
14. Friedman MJ. A 15-year review of porcelain veneer failure--a clinician's observations. Compend Contin Educ Dent. 1998 Jun;19(6):625-8, 630, 632 passim; quiz 638.
15. Fradeani M. Six-year follow-up with Empress veneers. Int J Periodontics Restorative Dent. 1998 Jun;18(3):216-25.
16. Dumfahrt H, Schäffer H. Porcelain laminate veneers. A retrospective evaluation after 1 to 10 years of service: Part II--Clinical results. Int J Prosthodont. 2000 Jan-Feb;13(1):9-18.
17. Aristidis GA, Dimitra B. Five-year clinical performance of porcelain laminate veneers. Quintessence Int. 2002 Mar;33(3):185-9.
18. Fradeani M, Redemagni M, Corrado M. Porcelain laminate veneers: 6- to 12-year clinical evaluation--a retrospective study. Int J Periodontics Restorative Dent. 2005 Feb;25(1):9-17.
19. Layton D, Walton T. An up to 16-year prospective study of 304 porcelain veneers. Int J Prosthodont. 2007 Jul-Aug;20(4):389-96.
20. Aristidis GA, Dimitra B. Five-year clinical performance of porcelain laminate veneers. Quintessence Int. 2002 Mar;33(3):185-9.
21. Nordbø H, Rygh-Thoresen N, Henaug T. Clinical performance of porcelain laminate veneers without incisal overlapping: 3-year results. J Dent. 1994 Dec;22(6):342-5.
22. Guess PC, Stappert CF. Midterm results of a 5-year prospective clinical investigation of extended ceramic veneers. Dent Mater. 2008 Jun;24(6):804-13.
23. Peumans M, De Munck J, Fieuws S, Lambrechts P, Vanherle G, Van Meerbeek B. A prospective ten-year clinical trial of porcelain veneers. J Adhes Dent. 2004 Spring;6(1):65-76.
24. Peumans M, Van Meerbeek B, Lambrechts P, Vuylsteke-Wauters M, Vanherle G. Five-year clinical performance of porcelain veneers. Quintessence Int. 1998 Apr;29(4):211-21.
25. Zarone F, Epifania E, Leone G, Sorrentino R, Ferrari M. Dynamometric assessment of the mechanical resistance of porcelain veneers related to tooth preparation: a comparison between two techniques. J Prosthet Dent. 2006 May;95(5):354-63.
26. Li Z, Yang Z, Zuo L, Meng Y. A three-dimensional finite element study on anterior laminate veneers with different incisal preparations. J Prosthet Dent. 2014 Aug;112(2):325-33.
27. Coachman C, Gurel G, Calamita M, Morimoto S, Paolucci B, Sesma N. The influence of tooth color on preparation design for laminate veneers from a minimally invasive perspective: case report. Int J Periodontics Restorative Dent. 2014 Jul-Aug;34(4):453-9.
28. ALGhazali N, Laukner J, Burnside G, Jarad FD, Smith PW, Preston AJ. An investigation into the effect of try-in pastes, uncured and cured resin cements on the overall color of ceramic veneer restorations: an in vitro study. J Dent. 2010;38 Suppl 2:e78-86.
29. Ge C, Green CC, Sederstrom D, McLaren EA, White SN. Effect of porcelain and enamel thickness on porcelain veneer failure loads in vitro. J Prosthet Dent. 2014 May;111(5):380-7.
30. Sadowsky SJ. An overview of treatment considerations for esthetic restorations: a review of the literature. J Prosthet Dent. 2006 Dec;96(6):433-42.
31. Omar H, Atta O, El-Mowafy O, Khan SA. Effect of CAD-CAM porcelain veneers thickness on their cemented color. J Dent. 2010;38 Suppl 2:e95-9.
32. Chen JH, Shi CX, Wang M, Zhao SJ, Wang H. Clinical evaluation of 546 tetracycline-stained teeth treated with porcelain laminate veneers. J Dent. 2005 Jan;33(1):3-8.
33. Turgut S, Bagis B. Colour stability of laminate veneers: an in vitro study. J Dent. Turgut S, Bagis B. Colour stability of laminate veneers: an in vitro study. J Dent. 2011 Dec;39 Suppl 3:e57-64.