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Esthetic rehabilitation with laminated ceramic veneers reinforced by lithium disilicate

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Because of their predictable results and conservation of tooth structure, ceramic veneers are indicated for the esthetic treatment of anterior teeth with anomalous positions or appearance. The objective of this case report is to highlight the steps in dental rehabilitation using ceramic veneers reinforced by lithium disilicate. In this case the patient had diastemas between the mandibular incisors. After preliminary procedures, diagnostic models, waxing, and mock-up were completed, an impression was made with addition silicone, and the veneers were fabricated and cemented with light-cure cement. As a result, the esthetics and function expected by the patient were achieved. The use of ceramic veneers enabled a conservative and esthetically successful rehabilitation treatment. *(Quintessence Int 2014;45:129–133; doi: 10.3290/j.qi.a31009)*

Key words: conservative preparation, diastema closure, esthetic dentistry, laminated ceramic veneers, lithium disilicate

The concept of esthetics is a judgment about beauty and the sublime.[1] Among aberrations in smile esthetics is the presence of diastemas, occasioned by differences in tooth size.[2] Correct diagnosis and planning are essential because, depending on the size of the diastema, closure with composite resin or indirect ceramic restorations represents an excellent treatment alternative.[3,4]

Direct restoration with composite resin has advantages such as conservation of tooth tissue, low cost, reversibility, and a relatively simple technique.[5] However, for extensive tooth reconstruction, composites have a high failure rate,[6] averaging 2.9% annually. This can be due to secondary caries, loss of restoration, pigment impregnation, fracture, marginal defects,[7] or a high degree of color instability.[8]

Improvements in dental materials have made ceramic a desirable option for indirect esthetic restorative procedures,[9,10] especially in the form of veneers.[9,11] Ceramics have compressive strength, surface smoothness, abrasion resistance, gloss, and low plaque accumulation.[12,13] Attempts to improve these properties have resulted in the addition of oxide crystals,[14] enabling the production of ceramic veneers that are thinner, highly esthetic, and more resistant to wear.[15] Ceramic veneers foster greater preservation of tooth structure, maintain tooth vitality, and produce predictable results,[16,17] having failure rates of only 0% to 5% over 1 to 5 years.[18]

Owing to the need to improve diastema-compromised esthetics and the scientific evidence of the suc-

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Fig 1 Initial appearance of patient's smile.

Figs 2a to 2d Initial dental appearance. *(a)* Labial view. *(b)* Linguo-occlusal view. *(c)* Right view. *(d)* Left view.

Figs 3a to 3c Study model and diagnostic wax-up: step 1 of restoration planning. *(a)* Frontal view. *(b)* Buccal view. *(c)* Lingual view.

cessful use of lithium disilicate, this manuscript reports a case describing the treatment of diastema closure of mandibular incisors using lithium disilicate–reinforced ceramic veneers.

CASE REPORT

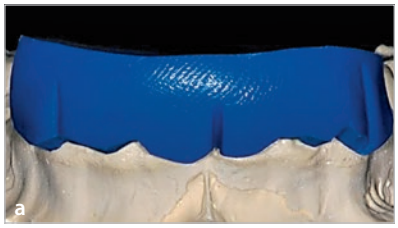
Treatment planning

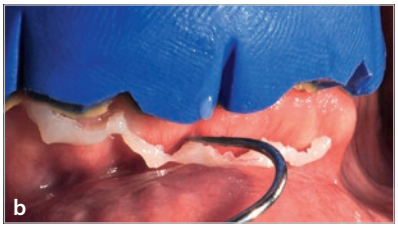
The patient, a 24-year-old man, presented to the School of Dentistry of the Federal University of Uberlandia, displeased with his smile. He had diastemas between all mandibular incisors, but had satisfactory occlusion and overjet (Figs 1 and 2). After clinical examination, radiographs, photographs, study casts, and diagnostic wax setup were performed (Fig 3). Periodontal conditions, presence of caries, occlusal interferences, smile esthetics, and facial symmetry were evaluated. Based on our evaluation, we decided on a conservative treatment approach using indirect lithium disilicate veneers.

The impression of the wax-up with addition silicone (Virtual, Ivoclar Vivadent) was done on the study model. The silicone matrix was trimmed to include the gingival papilla so that excess material could be removed without disturbing the matrix (Fig 4). For the mock-up the silicone matrix was filled with bis-acrylic resin (Systemp, Ivoclar Vivadent) and brought into position. Esthetics, symmetry, and occlusal high spots were analyzed (Fig 5).

Dental preparation and impression

A conservative preparation of the enamel was performed on all mandibular incisors using a diamond bur





Figs 4a and 4b Mock-up: step 2 of planning. *(a)* Waxing impression. *(b)* Excess bis-acrylic resin removal.

Fig 5 Analysis and adjustment of mock-up: step 3 of planning.

Fig 6 Minimally invasive preparation.

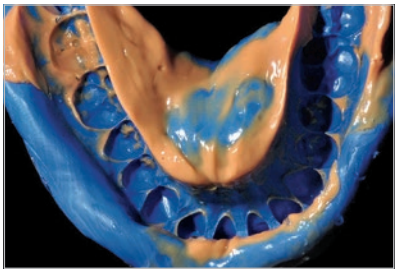


Fig 7 Definitive impression step with addition silicone.

Fig 8 Fabrication of veneers with lithium disilicate.

Figs 9a to 9c Surface treatment of veneers. *(a)* Hydrofluoric acid 9.5% etch followed by rinsing. *(b)* Phosphoric acid 37% followed by rinsing. *(c)* Silane application.

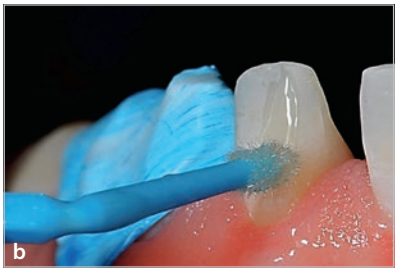
(#2135F, KG Sorensen). The mandibular left lateral incisor presented with a mild rotation, which required a more invasive preparation (Fig 6). At the same appointment, the impression was done, using addition silicone. Gingival displacement was obtained using retraction cord (#000 and #00, Ultradent).

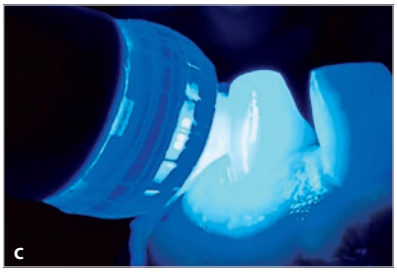
The retraction cords were removed and the impression was made with putty silicone. After 5 minutes, the high-flow silicone was applied first on the preparations and then on the impression tray. After another 5 minutes, the tray was removed and checked (Fig 7). The ceramic shade was designated as A1. The incisal characterization was made with blue phase and opaque line. The glass-ceramic lithium disilicate was used (IPS e.max Press, Ivoclar Vivadent) (Fig 8).

Proof and cementation

The proximal and cervical adaptation, periodontal relation, and asymmetries were checked. The low value -1 color was selected on the basis of the cement color scale (Variolink Veneer Try-In, Ivoclar Vivadent) and confirmed using test paste to simulate the cement color (Variolink Veneer Try-In). The internal surfaces of the veneers were etched with 9.5% hydrofluoric acid for 20 seconds (Condicionador de Porcelanas, Dentsply Brasil). The surfaces were washed with water, and 37% phosphoric acid was applied for 60 seconds (Total Etch, Ivoclar Vivadent). The veneers were silanized with a silane coupling agent (Monobond Plus, Ivoclar Vivadent) (Fig 9).

The enamel was conditioned with 37% phosphoric acid for 30 seconds (Total Etch), while the adjacent





Figs 10a to 10c Enamel treatment for adhesion. *(a)* Phosphoric acid 37% enamel etch. *(b)* Adhesive application. *(c)* Photo-activated for 20 seconds.

Fig 11 Fixation process and excess cement removal.

Fig 13 Final appearance of patient's smile.

Figs 12a to 12d Final dental appearance.

teeth were protected (Isotape, TDV Dental). The adhesive agent (ExciTE F DSC, Ivoclar Vivadent) was applied on the enamel and photo-cured for 20 seconds (Fig 10). We used 100% photo-cure resin cement (Variolink Veneer, Ivoclar Vivadent) to cement the veneers to provide the highest color fidelity. Excess cement was removed with a brush (KG Brush, KG Sorensen), and each surface was photo-activated for 60 seconds by a power LED 1200 mW/cm^2 (Radii Plus, SDI) (Fig 11). Occlusal contacts were marked, and protrusive and lateral movements were checked. The final appearance is shown in Figs 12 and 13.

DISCUSSION

Esthetics is adversely affected by diastemas; one cause is microdontia, which affects from 1.5% to 2% of the population.[19] The present case report justifies the choice of diastema closure, because the patient felt unable to speak in public due to phonetic impairment. Study models and wax-ups are essential to assess clinical conditions, restoration form, occlusal factors, and esthetic design.[20] The mock-up fabricated with bis-acrylic resin supports the dentist and patient to determine an esthetically acceptable shade, select the material, and shape the teeth.[21]

The ceramics have predictable, esthetic, and long-lasting results.[22] The procedure was intended to be minimally invasive, therefore lithium disilicate ceramic

veneers with thicknesses ranging from 0.3 to 0.5 mm were fabricated because they have relatively high wear resistance without compromising optical properties.[23]

Due to the color stability and translucence of the veneer, it is necessary to use the test paste prior to cementing to simulate the cement color. Because the thinness of the restorations does not permit masking color changes with chemically activated cement, the cementing protocol is critical to the longevity of treatment,[24-26] and the exclusive use of photo-cured cement is essential. The rehabilitation of smile esthetics with thin veneers is indicated to correct morphologic anomalies. However, due to the thinness, these veneers have limited application for color changes.[26]

CONCLUSION

The recovery of function and smile esthetics of a patient with mandibular diastemas with ceramic veneers allowed conservative preparations. Detailed planning, correct selection of dental materials, and quality communication with the prosthetic technician contributed to a harmonious smile and the evident satisfaction of both patient and professionals.

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REFERENCES

1. Frese C, Staehle HJ, Wolff D. The assessment of dentofacial esthetics in restorative dentistry: a review of the literature. J Am Dent Assoc 2012;143:461–466.
2. Wolff D, Kraus T, Schach C, et al. Recontouring teeth and closing diastemas with direct composite buildups: a clinical evaluation of survival and quality parameters. J Dent 2010;38:1001–1009.
3. de Araujo Júnior EM, Baratieri LN, Monteiro Júnior S, Vieira LC, de Andrada MA. Direct adhesive restoration of anterior teeth: Part 3. Procedural considerations. Pract Proced Aesthet Dent 2003;15:433–437.
4. Baratieri LN, Araujo EM Jr, Monteiro S Jr. Composite restorations in anterior teeth: fundamentals and possibilities. Chicago: Quintessence 2005;3–82.
5. Heymann HO, Hershey HG. Use of composite resin for restorative and orthodontic correction of anterior interdental spacing. J Prosthet Dent 1985;53:766–771.
6. Tuncer D, Yazici A, Ozgünaltay G, Dayangac B. Clinical evaluation of different adhesives used in the restoration of non-carious cervical lesions: 24-month results. Aust Dent J 2013;58:94–100.
7. Kopperud SE, Tveit AB, Gaarden T, Sandvik L, Espelid I. Longevity of posterior dental restorations and reasons for failure. Eur J Oral Sci 2012;120:539–548.
8. Garoushi S, Lassila L, Hatem M, et al. Influence of staining solutions and whitening procedures on discoloration of hybrid composite resins. Acta Odontol Scand 2013;71:144–150.
9. Walter RD, Raigrodski AJ. Critical appraisal: clinical considerations for restoring mandibular incisors with porcelain laminate veneers. J Esthet Restor Dent 2008;20:276–281.
10. Guess PC, Stappert CF, Strub JR. Preliminary clinical results of a prospective study of IPS e.max Press- and Cerec ProCAD- partial coverage crowns [In German]. Schweiz Monatsschr Zahnmed 2006;116:493–500.
11. Signore A, Kaitsas V, Tonoli A, Angiero F, Silvestrini-Biavati A, Benedicenti S. Sectional porcelain veneers for a maxillary midline diastema closure: a case report. Quintessence Int 2013;44:201–206.
12. Seghi RR, Sorensen JA. Relative flexural strength of six new ceramic materials. Int J Prosthodont 1995;8:239–246.
13. McLaren EA. All-ceramic alternatives to conventional metal-ceramic restorations. Compend Contin Educ Dent 1998;19:307–308.
14. McLean JW. A higher strength porcelain for crown and bridge work. Brit Dent J 1965;119:268–272.
15. Kelly JR, Nishimura I, Campbell SD. Ceramics in dentistry: historical roots and current perspectives. J Prosthet Dent 1996;75:18–32.
16. Edelhoff D, Sorensen JA. Tooth structure removal associated with various preparation designs for anterior teeth. J Prosthet Dent 2002;87:503–509.
17. Zhang F, Heydecke G, Razzoog ME. Double-layer porcelain veneers: effect of layering on resulting veneer color. J Prosthet Dent 2000;84:425–431.
18. Peumans M, Van Meerbeek B, Lambrechts P, Vanherle G. Porcelain veneers: a review of the literature. J Dent 2000;28:163–177.
19. Namdar F, Atasu M. Macrodontia in association with a contrasting character microdontia. J Clin Pediatr Dent 1999;23:271–274.
20. Rudd KD. Making diagnostic casts is not a waste of time. J Prosthet Dent 1968;20:98–100.
21. Morley J. The role of cosmetic dentistry in restoring a youthful appearance. J Am Dent Assoc 1999;130:1166–1172.
22. de Andrade OS, Ferreira LA, Hirata R, Rodrigues FP, D'Alpino PH, Di Hipolito V. Esthetic and functional rehabilitation of crowded mandibular anterior teeth using ceramic veneers: a case report. Quintessence Int 2012;43:661–670.
23. Conrad HJ, Seong WJ, Pesun IJ. Current ceramic materials and systems with clinical recommendations: a systematic review. J Prosthet Dent 2007;98:389–404.
24. Blatz MB, Sadan A, Kern M. Resin-ceramic bonding: a review of the literature. J Prosthet Dent 2003;89:268–274.
25. Turgut S, Bagis B. Colour stability of laminate veneers: an in vitro study. J Dent 2011;39(Suppl 3):57–64.
26. Dozic A, Tsagkari M, Khashayar G, Aboushelib M. Color management of porcelain veneers: influence of dentin and resin cement colors. Quintessence Int 2010;41:567–573.