

Minimally Invasive Complete Mouth Reconstruction using Full-Contour Ceramic Veneers: A Clinical Report

Sheila Butler, DDS, MSc, PhD*; Ysidora Torrealba, DDS, MSD†

This case report illustrates a full-mouth rehabilitation for a patient that presented with severe non-carious tooth surface loss. The patient was restored following a minimally invasive tooth preparation, with 28 full-contour veneers. The patient was evaluated at baseline and at 2, 9, and 13 months following cementation to assess the integrity of the restorations, the proximal and occlusal contacts, pulp vitality, and tooth mobility. After 13 months, no postoperative sensitivity was reported. In addition, no secondary caries, loss of tooth vitality, or chipping or fractures of the veneers were detected. The clinical outcome of using a minimally invasive adhesive technique was an esthetic, mechanical, and biological success. [*P R Health Sci J* 2018;37:170-173]

Key words: Glass-ceramic, Minimally invasive veneers, Non-carious tooth surface loss

In recent years, the options for reconstructive dental treatment have increased because of the introduction of new materials and manufacturing technologies, in combination with advances in adhesive cementation. Non-carious tooth surface loss (NCTSL), which includes abrasion, attrition, and erosion etiologies, often in combination, is an increasingly common indication for dental treatment (1,2). NCTSL can lead to significant and progressive loss of tooth structure over time, even in patients without parafunctional habits (2).

The most common treatment option to rehabilitate these patients' teeth is to reorganize the occlusal scheme and restore tooth height using conventional full-coverage restorations (3,4). However, restoring with conventional crowns often necessitates a significant sacrifice of further tooth structure, with the dimensions of the tooth reduction dependent on material indications and the occlusal clearance available. This in turn may compromise pulpal vitality, leading to a need for endodontic treatment (5,6). It is understood that adhesive cementation confers a synergistic reinforcement of glass-ceramic materials that results in fewer clinical-fracture events (7) and increased flexural strength, as has been measured in in-vitro tests (8). This has led to improved clinical confidence in using contemporary glass-ceramic materials in a greater number of clinically challenging scenarios. Previous studies have reported that ultrathin veneer restorations perform well, clinically speaking, assuming that there is sufficient enamel remaining to enable reliable adhesive cementation (9,10).

This case study describes a conservative approach to managing moderate NCTSL of primarily an erosive etiology. The patient's teeth were restored in a minimally invasive manner, using full-contour lithium di-silicate veneers in combination with adhesive cementation.

Case Report

A 38-year-old man presented to the Kaye Edmonton Clinic at the University of Alberta, his chief complaint being the appearance of his smile, including the color and size of his teeth. He requested treatment to improve their function and appearance.

A clinical examination revealed a loss of vertical dimension of occlusion (VDO), unsightly anterior teeth, generalized erosion, and short clinical crown height (Figure 1). The patient reported no pain, but his teeth were sensitive to cold. Sensibility testing determined that all his teeth were vital. The patient reported that he smoked half a pack of cigarettes a day and that he ingested a significant number of distilled beverages and carbonated drinks, daily. The patient required a full-mouth reconstruction in combination with crown-lengthening surgery to re-establish ideal clinical crown dimensions.

A radiographic examination was performed following teeth cleaning and oral-hygiene instruction. No further pathology associated with the dental or periodontal structures was identified (Figure 1). Diagnostic casts were mounted on an articulator in centric relation and the VDO increased by 2mm. A full-mouth diagnostic wax-up was performed to define tooth shape and form. Restorative options were discussed with

*Assistant Professor, Division of Restorative Dentistry, School of Dentistry, Western University, London, Ontario, Canada; †Assistant Professor, Division of Restorative Dentistry, School of Dentistry, University of Alberta, Edmonton, Alberta, Canada

The author/s has/have no conflict/s of interest to disclose.

Address correspondence to: Dr. Sheila Butler, Schulich School of Medicine and Dentistry, Western University, 1151 Richmond St, London ON Canada. Email: sheila.butler@schulich.uwo.ca

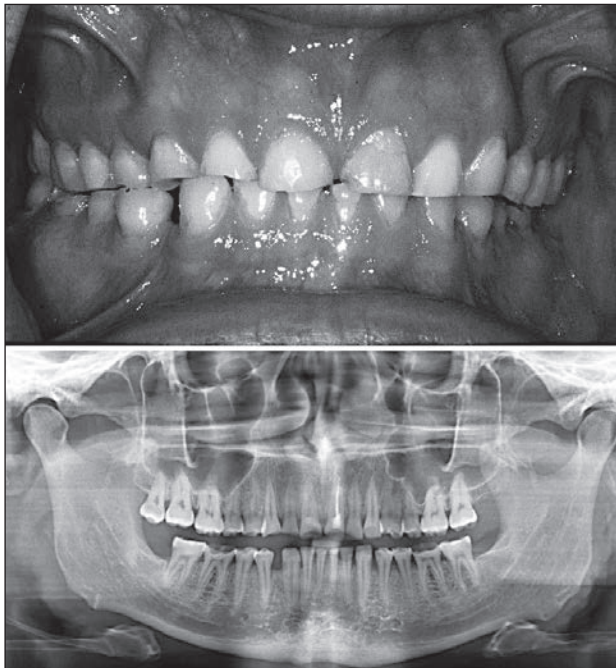


Figure 1. Facial view before treatment, and pretreatment panoramic radiograph.

the patient. Full mouth crown-lengthening surgery, elective endodontic therapy and posts for the lower molars, and 28 all-ceramic crowns were suggested. Full mouth crown-lengthening surgery, full-contour veneers, and composite build-ups for all the teeth were also discussed. The latter treatment option would preserve the pulp vitality and tooth structure leading to a significant amount of remaining enamel after tooth preparation. The latter option was chosen. Using the diagnostic wax up as a preparation guide enabled the tooth preparation to be performed as conservatively as possible, with some areas requiring minimal or no preparation at all.

First, full mouth crown-lengthening surgery was performed over the course of 2 appointments. After 9 months the patient returned for the restorative phase. The shade was selected and composite build-ups were performed on the maxillary molars and second pre-molars to establish the new VDO. The teeth were minimally prepared for full-contour veneers and refined with fine diamond burs (Figure 2). Final impressions were taken with polyvinyl siloxane (Imprint 4 regular; 3M ESPE). Provisional veneers were fabricated with Protemp Plus temporization material (3M ESPE) and cemented.

Full-contour veneers were fabricated using lithium di-silicate (IPS e.max, shade 1M2, Ivoclar Vivadent) by the heat-press technique. The restorations were etched with 9% hydrofluoric acid (Porcelain Etchant; BISCO) for 20 seconds and then washed and dried. Silane primer was then applied (Porcelain Primer; BISCO). The tooth surfaces were etched with 37% phosphoric acid, rinsed with water, and air dried. The adhesive (All Bond Universal; BISCO) was applied and light activated. The veneers were cemented with Duo-Link resin cement



Figure 2. Maxillary and mandibular teeth after full-ceramic contour veneer preparation.

(BISCO) and light activated for 40 seconds each for the facial, mesial, distal, and palatal surfaces of each tooth. The occlusal contacts were evaluated. The full-contour veneers are shown in figures 3 and 4, below.

The patient reported that he was satisfied with the restorative treatment provided following the initial cementation and subsequently at the 1-year follow-up appointment. The follow-up appointments were performed 1 week and 2, 9, and 13 months following the cementation. In this case, none of the treated teeth lost their vitality. No tooth mobility, postoperative sensitivity, or secondary caries were detected, and no failure of any of the restorations was observed. The patient reported no issues regarding food impaction and was able to maintain a high level of oral hygiene.

Discussion

The development of new glass-ceramic materials and our improving knowledge of how adhesive cementation can synergistically reinforce such restorations have enabled more conservative tooth preparations to be considered. It is well established that the loss of pulpal vitality is a common complication for teeth receiving conventional indirect extra-coral restorations, but this risk can be avoided by minimizing the volume of tooth structure removed (5,6). Different veneer

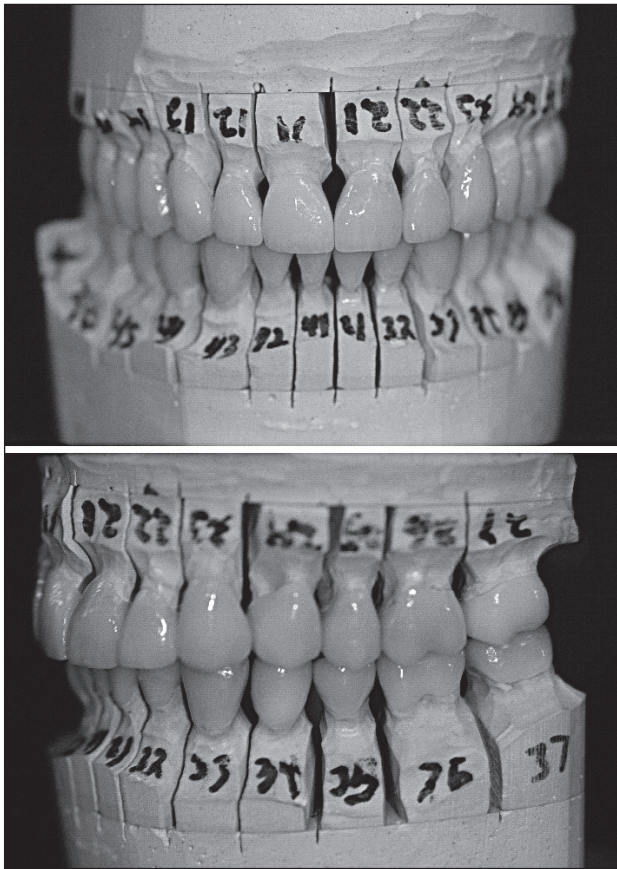


Figure 3. Full-ceramic contour veneers.

restoration approaches have been investigated to preserve pulp vitality and avoid major loss of the remaining tooth structure (10–15). Full contour ceramic veneers, also described as dentin-bonded-crowns (DBC), are a highly conservative option for patients with severely worn teeth requiring a VDO increase (16). In this case, the alternative restorative approach, using conventional crowns, would have required tooth reductions of up to 1.5mm on the facial surfaces. This would have necessitated, in some areas, elective endodontic therapy and the use of intra-radicular posts to retain a core, prior to crown placement. Due to the late interception, the patient had advanced NCTSL that required a full-mouth rehabilitation. However, it was determined that the primary etiology of his NCTSL was erosive and that there was no obvious parafunctional behavior. In addition, it was established that there was sufficient enamel remaining, particularly in the cervical region, to give confidence that reliable adhesive cementation was possible. Whilst there is a lack of long-term clinical evidence regarding the longevity of full-contour veneers (or DBCs) it is accepted that effective adhesive cementation is critical to their mechanical success (8,16).

This case demonstrates the value of implementing a rehabilitation protocol that reduces the patient's conspicuous tooth destruction, and does so with minimal invasion. The clinical outcome of this approach was an esthetic, mechanical,

and biological success, within the follow-up time-frame. Further studies are required to generate evidence to further support the clinical approach. However, this study does show that with careful case selection, considering loading patterns and adhesive cementation potential, successful outcomes are achievable.



Figure 4. Facial view after cementation of ceramic veneers.

Resumen

Este reporte de caso ilustra una rehabilitación oral completa de un paciente que presentó una pérdida severa de la superficie dental no relacionada con caries. Este paciente fue restaurado con 28 carillas de porcelana de contorno completa con una mínima preparación dental. El paciente fue evaluado al inicio y a los 2, 9 y 13 meses después de la cementación para determinar la integridad de las restauraciones, contactos proximales y oclusales, vitalidad de la pulpa y movilidad de los dientes. Después de 13 meses, no se reportó ningún tipo de sensibilidad postoperatoria o caries secundarias, ninguno de los dientes tratados perdió su vitalidad y no presentó ningún tipo de fracturas en la porcelana. El resultado clínico de la técnica adhesiva de mínima invasión fue un éxito estético, mecánico y biológico.

Acknowledgments

The authors are grateful to Paul Ladell from the University of Alberta Prosthetic Laboratory for fabricating the IPS e.max full veneers.

References

1. Bartlett DW, Blunt L, Smith BG. Measurement of tooth wear in patients with palatal erosion. *Br Dent J* 1997;182:179–184.
2. Van Roekel NB. Gastroesophageal reflux disease, tooth erosion, and prosthodontics rehabilitation: A case report. *J Prosthodont* 2003;12:255–259.
3. Edelhoff D, Sorensen JA. Tooth structure removal associated with various preparations designs for posterior teeth. *Int J Periodontics Restorative Dent* 2002;22:241–249.
4. Edelhoff D, Sorensen JA. Tooth structure removal associated with various preparations designs for anterior teeth. *J Prosthet Dent* 2002;87:503–509.
5. Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY. Clinical complications in fixed prosthodontics. *J Prosthet Dent* 2003;90:31–41.
6. Saunders WP, Saunders EM. Prevalence of periradicular periodontitis associated with crowned teeth in an adult Scottish subpopulation. *Br Dent J* 1998;185:37–140.

7. Malament KA, Socransky SS. Survival of Dicor glass-ceramic dental restorations over 14 years: Part I. Survival of Dicor complete coverage restorations and effect of internal surface acid etching, tooth position, gender, and age. *J Prosthet Dent* 1999;81:23–32.
 8. Fleming GJP, Cao X, Romanyk DL, Addison O. Favorable residual stress induction by resin-cementation on dental porcelain. *Dent Mater* 2017;33:1258–1265.
 9. Vailati F, Belser UC. Full mouth adhesive rehabilitation of a severely eroded dentition: The three-step technique. Part 3. *Eur J Esthet Dent* 2008;3:236–257.
 10. Guess PC, Selz CF, Voulgarakis A, Stampf S, Stappert CF. Prospective clinical study of press-ceramic overlap and full veneer restorations: 7-year results. *Int J Prosthodont* 2014;27:355–358.
 11. Furuse AY, Soares JV, Cunali RS, Gonzaga CC. Minimum intervention in restorative dentistry with V-shaped facial and palatal ceramic veneers: A clinical report. *J Prosthet Dent* 2016;115:527–530.
 12. Vailati F, Belser UC. Palatal and facial veneers to treat severe dental erosion: a case report following the three-step technique and the sandwich approach. *Eur J Esthet Dent* 2011;6:268–278.
 13. Vailati F, Gruetter L, Belser UC. Adhesively restored anterior maxillary dentitions affected by severe erosion: up to 6-year results of a prospective clinical study. *Eur J Esthet Dent* 2013;8:506–530.
 14. Gow AM, Hemmings KW. The treatment of localised anterior tooth wear with indirect Artglass restorations at an increased occlusal vertical dimension. Results after two years. *Eur J Prosthodont Restor Dent* 2002;10:101–105.
 15. Gerdolle D, Mortier E, Richard A, Vailati F. Full-mouth adhesive rehabilitation in a case of amelogenesis imperfecta: a 5-year follow-up case report. *Int J Esthet Dent* 2015;10:12–31.
 16. Burke FJT, Qualtrough AJE, Hale RW. Dentine bonded all-ceramic crowns: current status. *J Am Dent Assoc* 1998;129:455–460.
-