Enhancing Smile Using Porcelain Laminates after Gingival Recontouring: A Clinical Case Report

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ABSTRACT

Ceramics have been used in dentistry and medicine for many years. Currently ceramic restorative materials possess colour stability, mechanical strength, clinical longevity, excellent esthetic appearance, optimal bond strength to tooth substrate, and are compatible with the periodontal tissues. Their properties make these materials suitable for a wide range of clinical applications. The porcelain veneers are considered an excellent esthetic restorative option for darkened teeth and provide a conservative method of improving appearance or contour with high degree of patient acceptance. The present case report illustrates the results that can be achieved using porcelain laminate veneers to restore anterior dentition with a highly darkened tooth and misaligned teeth, presenting diagnostic casts, conservative preparations, provisional restorations, impressions, and adhesive cementation.

RÉSUMÉ

Les céramiques ont été utilisées en dentisterie et en médecine depuis plusieurs années. Les matériaux pour les restaurations en céramique possèdent la stabilité de la couleur, une force mécanique, une longévité clinique, une excellente apparence esthétique, une résistance d'adhésion au support de la dent, et sont compatible avec les tissus périodontiques. Leurs propriétés rendent ces matériaux utiles pour une vaste gamme d'applications cliniques. Les restaurations en porcelaine sont considérées comme une excellente option pour des dents décolorées et fournissent une méthode conservatrice d'améliorer l'apparence ou le contour des dents. Le présent rapport de cas illustre les résultats que l'on peut obtenir à l'utilisation de facettes en porcelaine pour restaurer une dent très décolorée et mal alignée, présentant un modèle d'étude, des préparations conservatrices, des restaurations provisoires, des empreintes et le cimentage.

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Porcelain veneers have become the standard of care for esthetic smile rehabilitation. Important factors in the selection of porcelain veneers as a choice of treatment are the properties such as colour stability, mechanical strength, longevity, excellent esthetic appearance, optimal bond strength to tooth substrate, and compatibility with the periodontal tissues.[1] Further, it allows the conservation of tooth structure.

Porcelain veneers have traditionally been made from aluminous or reinforced feldspathic porcelains.[2] Fired feldspathic porcelains (such as IPS d.Sign [Ivoclar Vivadent, Schaan, Lichtenstein], Lumineers by Cerinate [Den-Mat, Santa Maria, CA.], or Omega 900 [Vita Zahnfabrik, Bad Sackingen, Germany]) can be created as thin as 0.3 mm. Pressed feldspathic porcelains (such as IPS Empress [Ivoclar Vivadent], and OPC [Jeneric Pentron Clinical Technologies, Wallingford, CT]) can be created as thin as 0.5 to 0.7 mm. Depending on the existing conditions such as severe discolouration, protruding teeth, or crowding and the desired result, clinicians have advocated a range of preparation techniques for porcelain veneers: no preparation, enamel-only preparation, varied levels of dentin preparation and interproximal extensions.[3–7]

Conventional feldspathic ceramics can be chosen as well when the tooth is not exposed to functional occlusal loading and presents severe colour alteration, which could be effectively masked by the laminate veneer. The use of a feldspathic porcelain and refractory die technique allow different layers of porcelain to be added to achieve lifelike shade and translucency. In addition, the predominant vitreous phase (46–66%) in this type of ceramic determines its excellent esthetic characteristics.[7]

In planning for achieving the desired result, the dentist should analyze the specific condition of each patient using a diagnostic wax-up taking in consideration the amount of reduction needed in order to choose the type of porcelain. The design of veneer preparations is case specific if it is to satisfy the final esthetic goals; the design cannot be generalized as a single protocol to use in every situation.[8–10]

The dentist should understand the patient's esthetic objectives and concerns before undertaking any procedure, and the patients should understand the limitations of the treatment, especially when limiting options, for example, declining orthodontic treatment or tissue-recontouring procedures, or by not allowing reduction of a rotated tooth. The consensus on the treatment plan can be achieved by means of a mock-up technique with direct composite resin which will facilitate the visual communication and understanding of the possible final result.

Clinical Case

A 45-year-old female came to Schulich School of Medicine and Dentistry's adult clinic at the University of Western Ontario, and requested esthetic dental treatment because her maxillary anterior teeth were misaligned and central incisor discoloured. A full examination, including examination of soft tissue, periodontal and dental examination, radiographs and photographs of the anterior teeth (Figure 1), was performed.

During clinical evaluation it was observed that she presented a class I skeletal profile with 50% overbite, 2 mm over-jet, and that teeth 13, 21, and 23 were discoloured. Tooth 12 was proclined and presented with a caries lesion at the labial surface. The patient had no parafunctional habits such as clenching or bruxism. The periodontal tissue was thick and pink but irregularly scalloped in the maxillary anterior area; depth of probing varied from 2 mm from the distal of tooth #13 to 1 mm at the distal of tooth #23. There was discrepancy in the height of clinical crowns between right and left maxillary anterior segments.

Figure 1. Frontal view.

The information gathered, combined with a complete diagnostic wax-up of the proposed restorations, allowed a thorough diagnosis and comprehensive treatment plan to be presented and was discussed with the patient. A porcelain laminate veneer preceded by gingivoplasty was the treatment of choice to correct position, length, and colour mismatch of the anterior dentition. Gingivoplasty was selected instead of regular crown lengthening based on the existence of the sufficient thickness of the attached gingiva and the restoration margins were prepared at the gingival crest. No further surgical intervention was deemed critical.

Electro surgery was performed (Ellman Automatic Dento-Surg 90 FFP, Ellman International INC, Hewlett, NY, USA) on

Figure 2. Pre-operatory view with red marks around the gingival margin determining the amount of tissue reduction.

Figure 3. Gingivectomy completed with electrocautery to correct tissue heights.

Figure 4. Gingival aspect after the 60-day healing period.

Figure 5. Frontal view showing tooth preparation for porcelain veneers.

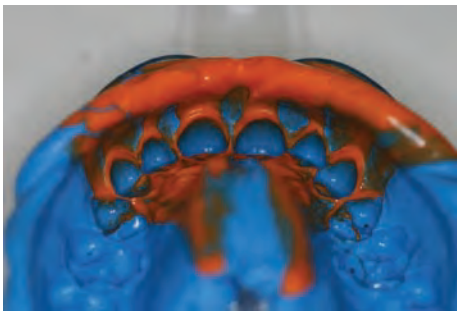

Figure 6. Final impression with PVS material. Note proper tissue retraction.

Figure 7. Provisional restorations reproduced form the diagnostic wax-up.

teeth 13, 12, and 11 to mimic the gingival heights with teeth 21, 22, and 23 (Figures 2 and 3). The patient was reassessed after a 60-day healing period presenting an esthetic "gum line" (Figure 4).

After discussing the treatment plan again with the patient, the informed consent was obtained to perform the tooth reduction for six porcelain veneers. The teeth were reduced approximately 0.5 mm of the labial surface using fine diamond burs with the aid of a putty matrix obtained from the diagnostic wax-up and with a finishing chamfer margin just below the gingival margin (Figure 5). The incisal edge of each tooth was reduced 1.5 mm in order to have an incisal overlap, which would allow proper seating of the veneers. Tooth 21 was reduced 0.7 mm in order to increase the thickness of the porcelain to block the discoloration.

Before the final impression, a knitted gingival retraction cord (# 00 Ultrapack, Ultradent Dental Products, South Jordan, UT) impregnated with hemostatic solution (Hemodent, Premier Dental Products Co, Plymouth Meeting, PA) was packed inside the gingival sulcus and left in place for six minutes in order to ensure that a secular space was kept for the impression material. The final impression of the prepared teeth was made with polyvinylsiloxane impression material (Take 1 heavy and light body, Kerr, Orange, CA) on a stock tray. After the cord was removed, a low viscosity material (light body) was injected onto the prepared tooth and a high viscosity material (heavy body) was injected onto the tray, which was immediately carried to the patient's mouth (Figure 6). An impression of the opposing arch and the occlusal registration was taken and the casts were mounted on a semi-adjustable articulator with replication of the incisal guidance obtained with the diagnostic wax-up.

After the final impression was taken, the surfaces of the prepared tooth were isolated with a glycerin gel and a temporary restoration was fabricated with a flowable composite resin (Revolution Formula 2, shade A2, Kerr, Orange, CA) to protect dental tissues and re-establish tooth shape. Only a very small spot in the center of the preparation was etched and had adhesive (Scotchbond Multipurpose, 3M ESPE, St Paul, MN) applied to it for the composite resin to adhere. This procedure ensured easy removal of the provisional restoration at the next visit without damaging the margins of the provisional veneer. The patient was satisfied with the change in appearance (Figure 7).

As close communication with the dental laboratory technician is essential, impressions and photographs were sent to the laboratory along with the information regarding shade selection (1M2 [VITAPAN 3D Master, VITA Zahnfabrik, Spitalgasse, Bad Säckingen Germany]). The veneer was fabricated with a feldspathic porcelain material (EX-3, Noritake Co., Tokyo, Japan) based on a refractory dye system, following the manufacturer's recommendations.

When the laminates returned from the lab, a careful check was completed of the proximal contacts, shade match, contour, and marginal adaptation. Each ceramic veneer was etched for two minutes with 10% hydrofluoric acid (Vita Ceramic Etch, VITA Zahnfabrik, Spitalgasse, Bad Säckingen Germany), washed with water and dried. A silane agent (Monobond S, Ivoclar Vivadent AG, Schaan, Liechtenstein) was applied to the internal surface of the veneer, and dried for one minute.

Figure 8. Final results, frontal view.

Figure 9. Forty-eight hours post insertion check-up. Lateral view showing the proper teeth alignment and an esthetic smile restored.

The teeth surfaces were etched for 20 seconds with 37% phosphoric acid and rinsed for 20 seconds. Excess water was removed with absorbent paper and an adhesive system was applied to the prepared surface (Excite DSC, Ivoclar Vivadent AG). Finally, the luting cement, A2 shade (Variolink Venner, Ivoclar Vivadent AG) was placed on the internal veneer surface before being placed onto the teeth preparation and the ceramic restoration was pressed lightly with the fingers. Excess interproximal cement was removed with a microbrush and dental floss. The veneer was then covered with a glycerin gel, and the resin cement light-cured on both surfaces for 120

seconds. After the margins were finished and polished, occlusion was checked and no adjustments were needed (Figure 8). The patient was booked for a recall 48 hours later in order to reassess occlusion and patient satisfaction (Figure 9).

Conclusions

Porcelain veneers provide an outstanding esthetic result when clinicians select the proper treatment sequences, techniques and materials. Care needs to be taken during tooth preparation and particularly during the luting phase to ensure maximal esthetic results are obtained for the patient.

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Disclosure

No conflicts declared.

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