

Conservative Ultrathin Veneer Restorations with Minimal Reduction: A 5-year Follow-up Report

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ABSTRACT

Aim and objective: This case report shows how a feldspathic veneer with diagnostic wax-ups, subsequent mock-up, and reduction guides can lead to good patient esthetics and reports a 5-year follow-up.

Background: Conservative tooth preparation is important for the long-term success of adhesive dentistry as it has been shown that bonding to enamel is more predictable in obtaining better long-term success than dentin. To preserve enamel for optimal bonding, diagnostic wax-ups and the subsequent mock-up are the first tools in a restorative dentist's arsenal to find and address differences between current and ideal tooth proportions and also help toward an overall conservative approach. Reduction guides are recommended in order to provide adequate tooth reduction and prevent over-reduction.

Case description: This case report shows a 5-year follow-up of feldspathic veneer restorations for a patient with excessive space among teeth, defective composite restorations on facial and incisal surfaces, and worn teeth. Veneers were delivered with conservative tooth preparation combining different tooth reduction guides.

Conclusion: This case report highlights the added benefits of tooth reduction guides and diagnostic wax-ups and the subsequent mock-up for long-term patient satisfaction.

Clinical significance: Conservative tooth preparation, reduction guides, and wax-ups may increase the life span of veneer restorations and demonstrate good esthetics at 5 years.

Keywords: Dental porcelain, Tooth preparation, Veneer.

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BACKGROUND

Conservative restorative dentistry technique relies on bonding and adhesive luting to achieve adhesion.¹⁻³ In general, enamel bonding is stronger and longer lasting than dentin bonding.⁴ It is also known that caries-free, intact enamel is an ideal substrate for etched porcelain laminate veneers.⁵ Ceramic veneers have shown to be a long-lasting treatment when compared to composite veneers, and provide improved long-term esthetics.^{6,7} Clinical challenges associated with porcelain veneers still exist and include luting composite resin polymerization shrinkage and chipping, for example.⁸⁻¹⁰ Despite this, ceramic veneer restorations are still popular but their success relies on preparation design,¹¹ adhesive bonding techniques and materials,^{12,13} and patient oral care practices.¹⁴ When it comes to preparation design, tooth reduction is necessary for ceramics to yield an optimal patient smile, but over-reduction can reduce bond durability and restoration longevity due to dentin exposure.¹⁵

Recent advances in dental materials have made ultrathin ceramic veneers (thickness of around 0.1–0.5 mm) able to bond to enamel with minimal to no tooth preparation.^{16,17} Many ceramics (such as lithium disilicate, lithium disilicate reinforced with zirconia, etc.) and others are currently available to clinicians.¹⁸⁻²¹ These ceramic materials have a relatively large concentration of a glass-based matrix that produces excellent esthetics and durable adhesion to resin cements when treated with appropriate adhesive treatments.²² In addition, conservative tooth reduction provides better mechanical properties—and so longer lasting restoration—when resin cements are bonded to underlying enamel.^{7,23-25} Good long-term survival rates and low failure rates have been reported for enamel-bonded ceramic veneers.^{26,27}

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Preparation of ceramic veneers can be a challenge for clinicians with little experience, which may cause the restoration to fail. To aid in this process, diagnostic wax-ups are fundamental²⁸ because they show differences between the existing and ideal tooth measurements.²⁹⁻³¹ The wax-up can also be used as a diagnostic mock-up for evaluation. In addition, the diagnostic wax-up



Figs 1A and B: (A) Initial smile; (B) Initial intraoral

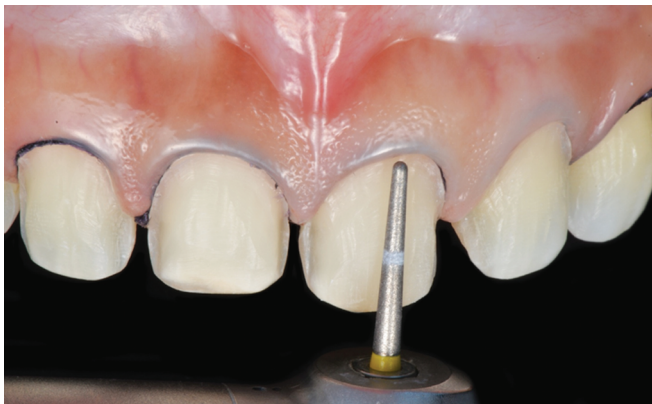


Fig. 2: Tooth preparations

functions can be used to make preparation reduction guides, again potentially useful for clinicians with less experience.³² Final tooth preparation can be made on the diagnostic mock-up in the oral cavity with a putty guide matrix. In short, mock-ups with provided initial groove depths help the clinician perform conservative veneer preparations because less enamel removal is needed.^{33,34}

This clinical report describes a method for ceramic veneers using a diagnostic mock-up, followed by controlled tooth preparation using different reduction guides for an overall conservative approach. A 5-year follow-up is also reported with retained results.

CASE DESCRIPTION

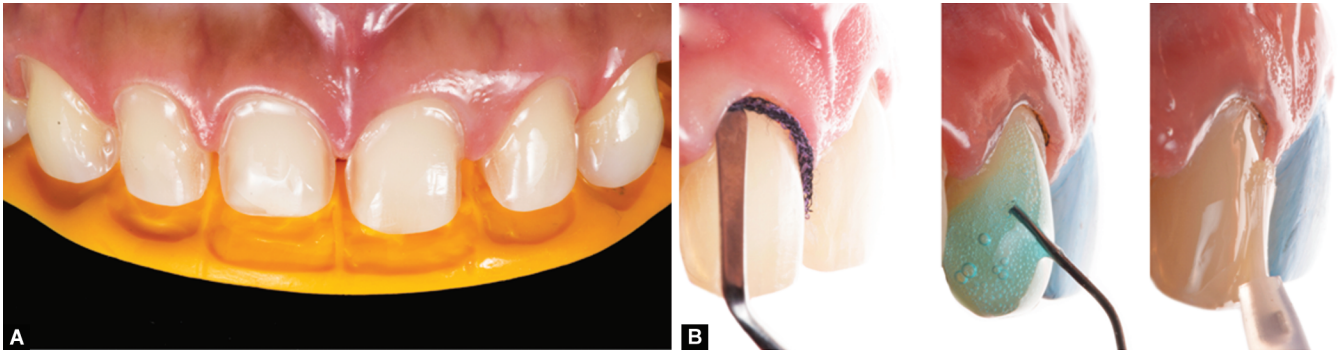
A 34-year-old patient (female) presented to the dentist with the chief complaint of "I do not like my smile" (Fig. 1). The patient presented at the Oral Rehabilitation Department at the Autonomous University of Queretaro School of Dentistry, Mexico. After initial assessment, the diagnosis was excessive space among teeth #6 to #7, #7 to #8, #8 to #9, #10 to #11, defective composite restorations on facial and incisal surfaces of #8 and #9, and worn teeth on #6, #8, #9, #10, and #11. A treatment plan consisting of a combination of orthodontics, restorative treatment, and tooth bleaching was discussed. Endodontic treatment was not needed. The patient declined the bleaching treatment and the orthodontic treatment. A diagnostic wax-up (GEO Classic Renfert) followed by fabrication of a mock-up guide (Bisacril Telio CS C&B Ivoclar Vivadent) was performed. The patient was satisfied. They agreed upon the course of action consisted of porcelain veneers on teeth #6, 7, 8, 9, 10, and 11.



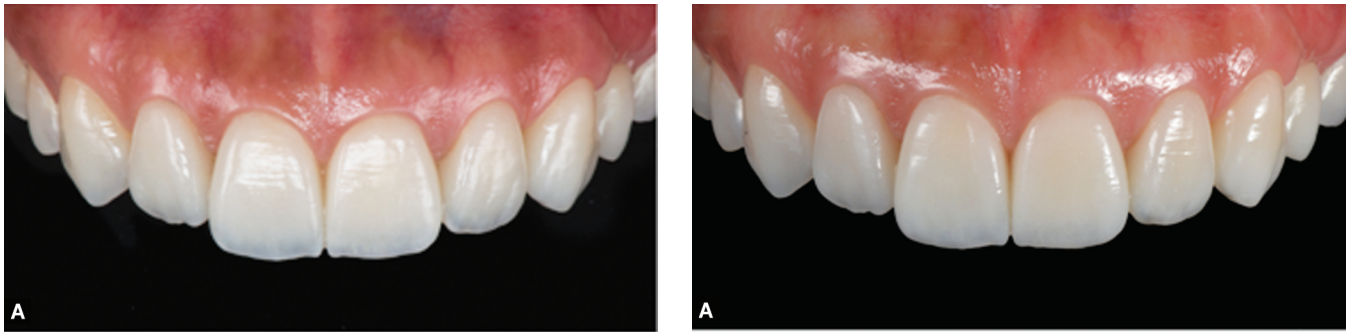
Fig. 3: Facial reduction guide

At the following clinical appointment, retraction cord #000 (Ultrapak, Ultradent) was placed and conservative tooth preparation was performed using reduction guides to evaluate incisal, facial, and two plane reduction (Figs 2 and 3). The final preparations were polished with polishing discs (Soft-lex TX Disc, 3M) (Fig. 4A). For optimal results, cords were first packed at #00 and then at #0 (Ultrapak, Ultradent Products Inc.). Type IV stone (Fujirock, GC America Inc.) was used after the final impression (polyvinylsiloxane material; Elite HD, Zhermack) to make cast and dies. Feldspathic porcelain (IPS e-max, Ivoclar Vivadent) was used to create ceramic veneers.

Try-in allowed contours and margins to be evaluated, and the patient requested to proceed with the final bonding procedures. The teeth were cleaned with a pumice paste and chlorhexidine gluconate (Consepsis Scrub, Ultradent Products) in order to clean debris while disinfecting the area prior bonding. The veneers were bonded in pairs using the sequence of placement of #8 and #9, then #7 and #10, and finally #6 and #11. Ceramic restorations were treated with hydrofluoric acid surface (Porcelain Etch, Ultradent Products Inc.) for 20 seconds and then rinsed and dried copiously before being placed in an ultrasonic cleaner for 5 minutes for further cleaning. Silane (Monobond-S, Ivoclar Vivadent) was then applied for 60 seconds with rinsing and drying again. Cord #00 was packed and the tooth substrate prepared for bonding with a traditional 32% phosphoric acid etching (Uni-Etch w/BAC, Bisco Dental; 30 seconds) and then rinsed and then fully dried (Fig. 4B). The primer was applied for 20 seconds (OptiBond FL, Kerr Dental), with excess removed by air, and then cured. The curing luting composite cement (Variolink Veneer Neutral Shade, Ivoclar Vivadent) was applied to ceramics #8 and #9, placed, and excess removed with a micro-brush and floss before light curing for 80 seconds total; 20 seconds on the mesial, incisal, facial, and the distal surface each. This process was repeated for teeth and veneers on #7, #10, #6, and



Figs 4A and B: (A) Final tooth preparations; (B) Bonding ceramic veneers



Figs 5A and B: (A) Final restorations; (B) Final smile

then #11. Glycerin gel (Deox, Ultradent Products Inc.) was applied on the ceramic surface to prevent an oxygen inhibited layer and surfaces were then again light cured (20 seconds each). Excess resin cement was removed with a #12 scalpel blade. Articulating paper (Articulating Paper Strips, Henry Schein) was used to check occlusion. The patient reported they were satisfied with the final esthetic results and reported no postoperative sensitivity (Fig. 5). The patient was still satisfied with the clinical results at the 5-year, periodic, follow-up (Fig. 6).



Figs 6A and B: (A) Five-year follow-up restoration; (B) Five-year follow-up smile

DISCUSSION

This clinical report of a 5-year follow-up of feldspathic ceramic veneers describes how diagnostic wax-ups, subsequent mock-up, and reduction guides can lead to good patient esthetics. A wax-up was first performed and then a mock-up was made. A putty matrix guide provided the patient with the ability to give feedbacks on the final restorations. Fabrication of reduction guides allow the clinician to measure individual preparation areas and control preparation so to be appropriate to the type of restoration desired and other clinical factors.²⁸ Despite the fact that experienced clinicians may not view preparation guides as necessary, the authors recommend them. Excessive reduction of the tooth is a common mistake when

guides are not used and may lead to dentin exposure and decreased bonding potential. Optimal tooth preparation can guarantee no disturbance of the periodontal health and structural integrity.³⁰ Conversely, under reduction will cause the dental laboratory to fabricate over-contoured restorations.

Conservative preparations can provide sufficient remaining tooth structure to prepare for a full coverage crown in the future in case of veneer failure. Here, feldspathic porcelain (IPS e-max, Ivoclar Vivadent) was used to enable an ultrathin approach but the cementing strategy must also be robust to support such an approach.³⁴ Since none of the current dental prosthesis can be guaranteed to last forever, it should be considered for both the clinician and the patient to have a very conservative and controlled tooth reduction.³⁵ Similar to other case reports with excellent results,²⁰ the cement strategy should also be considered for color stability and translucency. Digital restoration design, which has also shown predictable outcomes,³⁶ may also assist throughout patient treatment. Long-term success of the restoration requires following well-defined protocols for restorative material selection, conservative tooth preparation, and bonding ceramic protocols.

CONCLUSION

Preparation guides allow optimal amounts of tooth reduction for veneer preparations. Diagnostic wax-ups and the subsequent mock-up allow the clinician to modify length and width of the teeth without any modification. Mock-ups then show patients a realistic representation of the future restoration. Reduction guides are recommended in order to provide adequate tooth reduction. When combined, the use of conservative tooth preparation and these techniques can improve the longevity of the restorations and demonstrate good esthetics at 5 years.

CLINICAL SIGNIFICANCE

Conservative tooth preparation, reduction guides, and wax-ups may increase the lifespans of veneer restorations and demonstrate good esthetics at 5 years.

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