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1 Protocol for a new concept of no-prep ultrathin 2 ceramic veneers

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Abstract

Objectives: Frequently no-prep veneers, although ideally considered the best option because of tooth structure maximum preservation, were essentially criticized for some potential limitations including esthetic outcomes and periodontal complications.

Clinical considerations: A new protocol to optimize no-prep veneers restorations is presented. A key point of the proposed technique is to identify optimal margins' positions: margin is positioned in the point of maximum convexity of teeth, avoiding the over contouring of traditional no-prep veneers.

Conclusion: The procedure can be appreciated for the precision at the margins and the resulting marginal stability. The case reports show that properly managed no-prep veneers can have biologically healthy and optically beautiful margins and emergence profiles.

Clinical Significance

High-quality no-prep veneers can be more challenging to realize than conventional veneers and the success seems to depend on a combination of good case selection, margins' position, sound adhesive principles, clinical, and laboratory experience.

KEYWORDS

ceramic, dental adhesion, no-prep veneer

26 1 | INTRODUCTION

27 Ceramic veneers are frequently presented as the major class of clinical con-
28 servative modalities in aesthetic dentistry.^{1,2} The so-called "no-prep"
29 approaches have been described for more than 10 years in literature³⁻⁸ and
30 ideologically reiterate the methodologies of 1980s, when veneers were
31 introduced as conservative, additive restorative procedures for which slight
32 or no preparations were required.^{9,10} Nevertheless, lack of clear-cut guide-
33 lines for technical procedures and for case selection has often led to confu-
34 sion and misunderstandings.¹¹ Frequently, no-prep veneers, although
35 ideally considered the best option because of tooth structure maximum
36 preservation, were essentially criticized for some potential limitations
37 including esthetic outcomes and periodontal complications as a conse-
38 quence of overcontoured teeth that could alter the emergence profiles.^{11,12}

39 Indeed, no-prep veneers could have biologically healthy and optically
40 beautiful margins and emergence profiles if properly selected and

41 managed. Some interesting papers focused on no-prep veneers case
42 selection process are available¹³⁻¹⁶; conversely clinical studies often do
43 not provide enough technical information on clinical and laboratory
44 perspectives.

45 In this article, a new protocol to optimize no-prep veneers restora-
46 tions (called CH NO-PREP VENEERS) is presented. A key point of the
47 proposed technique is to identify optimal margins' positions: margin is
48 positioned in the point of maximum convexity of teeth, avoiding the
49 over contouring of traditional no-prep veneers (Figure 1). Dental maxi-
50 mum convexity works as a natural shoulder margin for veneer. In this
51 way, veneer cannot change dental profile after cementation.

52 2 | CASE SELECTION

53 For patients who visually may be aspirants for no-prep veneers rehab-
54 itations, an additive-only wax-up should be prepared; after a silicone

55 matrix of this wax-up is produced, the final shape and position of teeth
 56 should be verified in the patient's mouth by filling the matrix with an
 57 acrylic resin and placing it over the existing dentition to create an

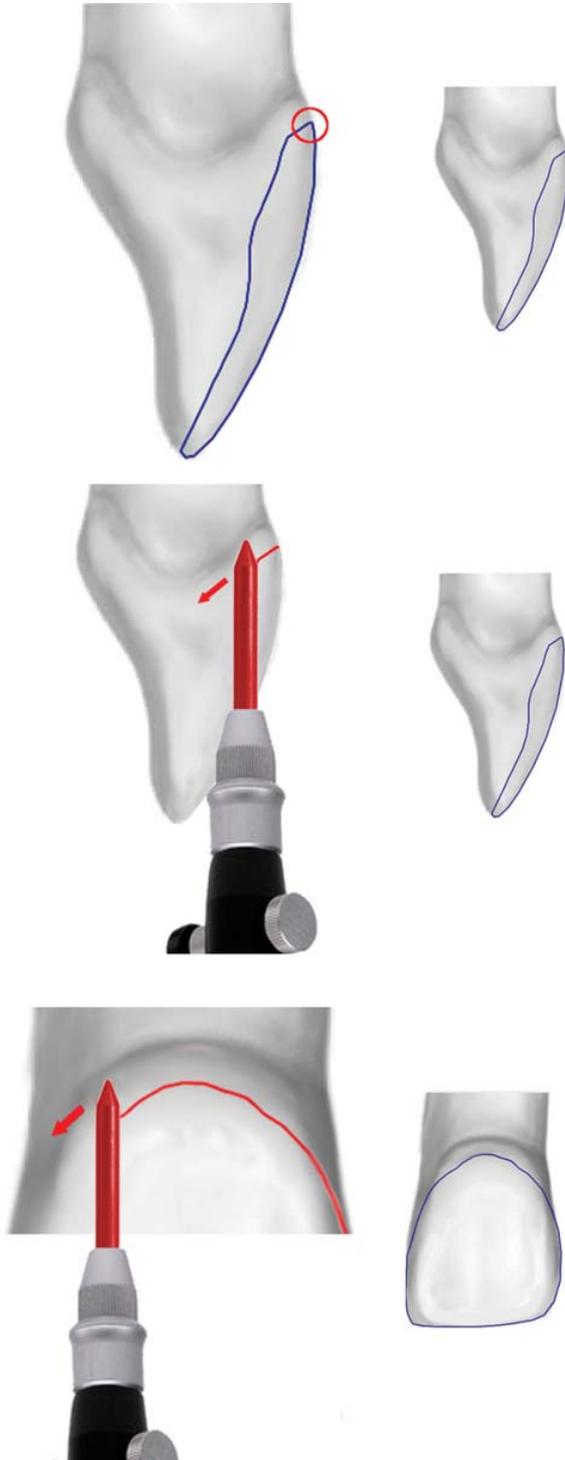


FIGURE 1 Illustration of margin positioning: red line corresponds to the maximum convexity of teeth; blue line corresponds to veneers restoration



FIGURE 2 No-Prep direct intraoral resin mockup

intraoral mock-up (Figure 2). Wax-up and mock-up are essential to approve the final forms, or eventually to program small adjustments for the final restoration. If an esthetically pleasant result can be accomplished by additive procedures only, the case is one step nearer to qualifying for very conservative veneers with no preparation. If the mock-up results are esthetically pleasing, then phonetic and functional evaluations should be undertaken.

3 | MARGINS INDIVIDUATION

After position, form, function, phonetics, and color evaluations, arches impression are taken with silicon material (Hydrorise; Zhermack SpA, Badia Polesine, Rovigo, Italy) and stone models (ResinRock IV; Whip Mix Europe GmbH, Dortmund, Germany) are prepared. Stone models should be used to determine which areas of the teeth are ideal to place the finishing margins of the restorations. The upper model is placed on a lab surveyor in order to mark the line of maximum convexity of each tooth to be restored with a veneer (Figure 3A,B). This line is the border line between buccal and cervical sides of frontal teeth; it is consistently irregular because this transition line is not regular in nature.

3.1 | Laboratory Fabrication

As stated by Magne et al.,¹⁷ no-prep veneers require superior skills in the laboratory: fabrication and handling of ultrathin veneers could be particularly challenging. The major effort is to obtain a natural shape without bulky margins and overhangs. With the proposed technique, this task is made less demanding for the technician, because finishing margins are exactly kept in the positions marked in the previous step on the stone model (Figure 3C). It is enough that technicians use these marked lines as margins and respect the natural emergency profile of tooth for veneer shape.

There are two conventional porcelain options for making veneers. An established technique that can yield lovely results is to stack feldspathic porcelain on either a platinum foil or refractory die. Advantages include the ability to vary the opacity and chroma levels in different parts of each individual restoration as needed. The main limitation to these restorations is the very fragile nature of thin feldspathic veneers, which can crack easily during fabrication and placement. Another technique is to fabricate pressed veneers using high-translucency lithium-disilicate ceramic material. This material can be pressed extremely thinly, with high flexural strength that can reduce the delicate handling

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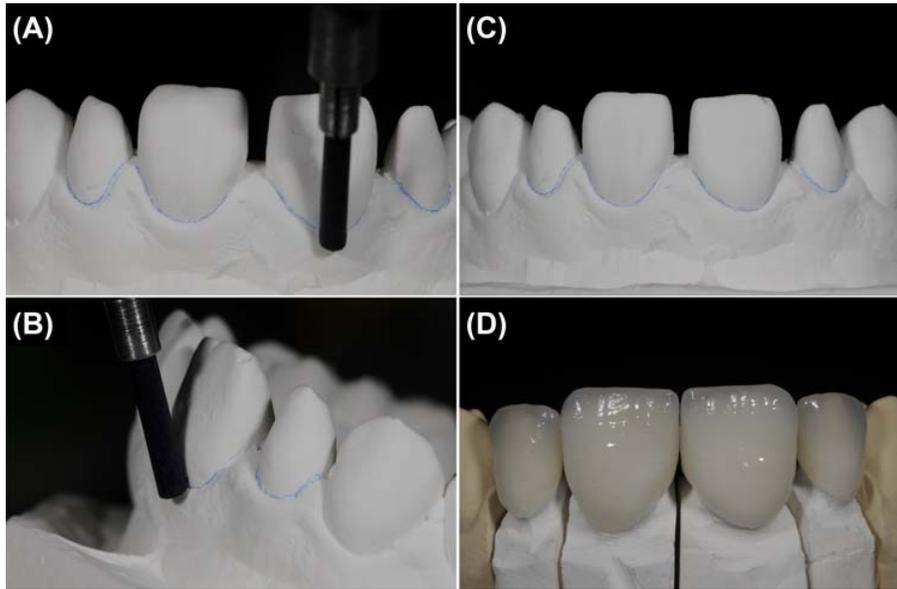


FIGURE 3 A,B, Model placed on lab surveyor to mark the blue line of maximum convexity of each tooth to be restored with a veneer; C, laboratory diagnostic phase. The blue line, that is the border line between buccal and cervical sides of frontal teeth, coincides to the finishing margins of the veneers; D, feldspathic porcelain veneers on die

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96 necessary with feldspathic material. In the presented cases, after mak-
 97 ing the impressions, a dental technician fabricated all veneers using
 98 feldspathic porcelain (IPS InLine; Ivoclar Vivadent AG, Schaan,

Liechtenstein) on refractory die (Nori-Vest; Kuraray Noritake Dental 99
 Inc., Hattersheim am Main, Germany) (Figure 3D). Feldspathic veneers 100
 are preferred to lithium-disilicate ceramic material for the possibility of 101
 stratification, which can make obtain a more natural aesthetics (Figures 102
 4-6). 103

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FIGURE 4 Intraoral anterior view of teeth before treatment. Diastemas and lateral conoids are evident and not pleasing to the patient

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3.2 | Clinical Phases

After choosing the case for no-prep veneers rehabilitations (Figure 7) 104
 and a dental technician fabricating the veneers using feldspathic 106

104



FIGURE 6 Esthetical and gingival tissue integration around the thin porcelain laminate veneers

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FIGURE 5 View of the thin porcelain laminate veneers ready for cementation

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FIGURE 7 Intraoral anterior view of teeth before treatment. Preoperative view revealing nonuniform shape/position/color of maxillary anterior teeth

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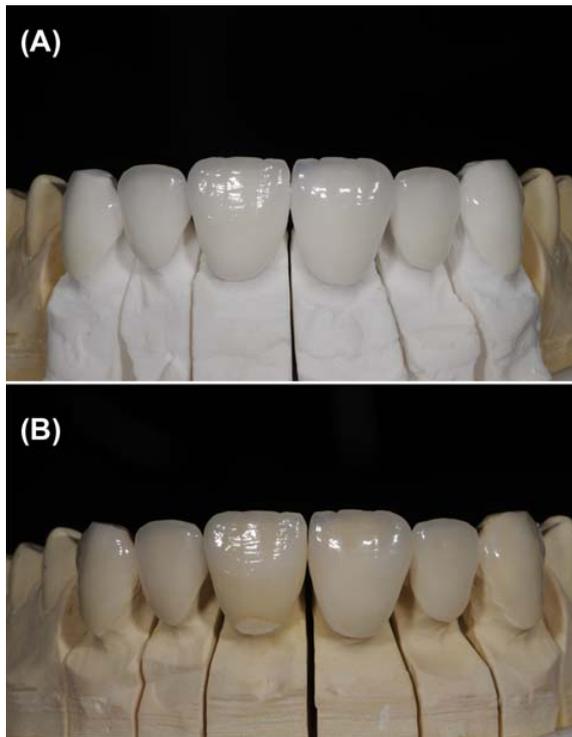


FIGURE 8 Feldspathic porcelain veneers on A, refractory and B, primary dies

Micerium, Avegno, Genova, Italy) is warmed up with the preheating device preset to 55°C,^{19,20} put on the cementation surface of veneers, and used as luting agent. Preheated composites are handled with preheated metal tools, so as to maintain the temperatures reached by the composites as long as possible.

Then, the veneers are placed on the corresponding teeth, paying attention to achieve full seating using finger pressure. Extreme care must be given during this stage because thin margins are at risk of chipping during handling and also because very often each veneer has a single insertion path for the natural undercuts of no-prep teeth.¹⁷

A thin explorer is used to remove excess luting material extruded from the veneers' margins. The pressure on veneer is stopped when no more excess of luting material extruded from the margins. Six to eight seconds of light-polymerizing at the incisal edge ensure stabilization of the veneer. Residual cement is removed under a stereomicroscope (SOM 32; Karl Kaps GmbH & Co.KG) magnification with explorer, scalpel, and interproximal floss for interproximal side.

Oral and vestibular surfaces were subsequently light-polymerized in two sessions of 40 seconds each (L.E. Demetron I; Sybron/Kerr). Then, veneer margins are checked again under a stereomicroscope and using a dental probe. Residual excess cement was further removed with a 15c scalpel (#371716, Bard-Parker; Becton-Dickinson, Dr. Franklin Lakes, NJ, USA). Diamond burs, polishing discs, or silicone polishers should not be used to finish the veneers; interproximal floss should be preferred to polishing strips for interproximal sides. After that, static and dynamic occlusions are checked. The patient should be recalled after 3–7 days for rechecking occlusion, proximal contact relationships, marginal integrity, and gingival margin health (Figures 11–14).

4 | DISCUSSION

When given the option, most patients choose the least amount of tooth structure removal.²¹ The patients are highly motivated to have no dental reduction while achieving as many of his treatment goals as possible. Although this is definitely not a reversible procedure, the likelihood of losing no tooth structure was still very attractive to the patient.¹⁵

No longer should be suggested to over-prepare teeth only for convenience or lack of understanding of alternative treatments. Minimally invasive dentistry should not be purely a simple responsibility, but a professional duty.^{11,22,23}

porcelain (Figures 8 and 9), each veneer must be individually tried on dental surfaces by clinician. In case of multiple restorations, they are tested on teeth surfaces alternately and then all together to evaluate the congruence of the proximal contacts. The dentist should assess in sequence: the absence of friction between preparations and restorations; the accuracy of interproximal contact points; marginal fits; shapes and color, to assess the level of esthetical integration.¹⁸

Ceramics are treated with hydrofluoric acid at 9.6% for 90 seconds, and then with an ultrasonic bath for 5 minutes in alcohol. After this, a silane agent is applied for 30 seconds to the surface. Teeth are treated for adhesion by application of 37% phosphoric acid on enamel for 15 seconds, rinsing with tap water for 15 seconds (Figure 10). The adhesive agent is brushed on the adhesive surface of veneers and teeth and, to avoid inaccuracies of fit, it is not light-polymerized before restoration placement. A microhybrid composite (Enamel Plus HRI;



FIGURE 9 View of the thin porcelain laminate veneers

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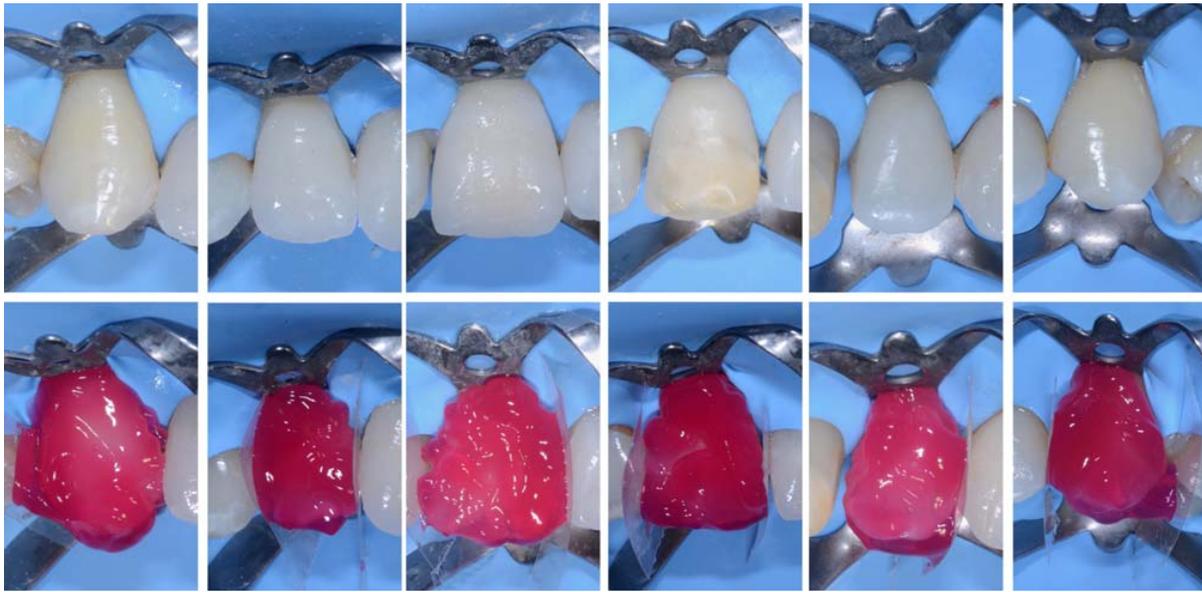


FIGURE 10 Adhesive-phases. Each veneer must be individually luted on dental surface

High-quality no-prep veneers are often more challenging to realize than conventional veneers. No-prep dentistry is not a simpler or quicker service, but rather a minimally invasive approach to smile design that has a premium value to many patients. There are several attractive motivations for no-prep veneers' rehabilitations. When tooth reduction is totally eluded, anesthetic is not needed. The fact that no tooth structure is removed means intermediate provisional restorations are not required. Although accurate impressions are just as critical with minimal preparation techniques, the invasiveness and difficulty of the impression technique are removed. With no preparation, there is a likelihood of retaining natural enamel, which increases bond strength and the long-term integrity of the margins.¹⁵

With ultrathin veneers, thickness of the luting cement can have a relevant influence on the stress distribution in the porcelain veneers. In a finite element analysis, Magne et al.²⁴ concluded that laminate veneers that were too thin with a poor internal fit, resulted in higher stresses at both the interface of the restoration and the surface. This could lead to postbonding cracks in thin laminate veneers. Delivery of thin porcelain shells on unprepared teeth is particularly challenging because it calls for the use of very thin composite resins to prevent bending forces during seating.¹⁴ When porcelain is prepared very thinly to minimize the preparation of sound tooth structure, a good internal fit has to be created.²⁵ Using a resin composite cement, total control on the seating of the restoration was created.

The satisfactory esthetical results for no-prep veneer restorations of this article were achieved using a preheated light-cured composite as luting agent.^{1,2,26,27} The necessary working time for positioning the indirect restorations and removing the excess cement was conveniently extended at the discretion of the clinician using a light-curing composite as luting agent, overcoming the relatively restricted working time allowed by dual-cure cements. Warming resin-based restorative materials prior to placement enhances composite adaptation to cavity walls

by decreasing the viscosity of unpolymerized resin composite paste.^{19,20} Some in vitro studies indicate a significant increase in conversion of commercially available resin composites with an increasing curing temperature, and an increase in both polymerization and conversion rates seen at maximum cure rate.^{28,29} As a result, more highly crosslinked polymer networking and improved mechanical and physical properties (higher fracture toughness and strength, less wear) may be anticipated.²⁹ The use of temperature to improve flowability avoids some of the possible problems associated with a flowable resin



FIGURE 11 Comparative (A) preoperative and (B) postoperative natural smile of the patient

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FIGURE 12 Lateral views of natural smile of the patient with luted veneers

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203 material, such as the ongoing release of unreacted monomer and less
204 favorable physical characteristics.³⁰

205 To avoid compromising restorations' marginal fit, no diamond burs,
206 polishing discs, or interproximal polishing strips were used to finish the
207 restorations. Residual cement was removed only with an explorer, scal-
208 pel, and floss, checking restorations' margins under a stereomicroscope
209 magnification.

210 Through the clinician's experience and knowledge, the appropriate
211 treatment plan can be selected based on the patient's clinical situation
212 and demands, to provide patients the best in function, longevity, and
213 esthetics. Lesage's philosophy of doing conservative dentistry is a
214 noble goal but it should be noted that conservative does not mean lim-
215 ited preparation but, rather, preparing the least amount of tooth struc-
216 ture needed to achieve the goals of the case.

217 In conclusion, in the author's opinion, the case presented in this
218 article demonstrates the use of no-prep veneers as the preferred mini-
219 mally invasive option, and one that took into account all the best inter-
220 ests of our patient. Please review the photographs closely. If you think
221 that you would have done preparations in this case, please reconsider
222 and know that there are many more situations for no-prep veneers
223 than one might think.⁸



FIGURE 13 Intraoral anterior view after treatment

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FIGURE 14 A detail of frontal anterior view after treatment

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The CH NO-PREP VENEERS procedure can be appreciated for the
precision at the margins and the resulting marginal stability, which
increases the durability and the predictability of prognosis.

DISCLOSURE STATEMENT

The authors do not have any financial interest in the companies or
products used in this article.

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