

Considerations for planning esthetic treatment with veneers involving no or minimal preparation

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Editor's note: This new feature, which will appear in JADA on an occasional basis, offers articles on selected clinical topics written by expert clinicians.

Porcelain veneers have become the ultimate option for esthetic smile rehabilitation. One of the important factors for patients and practitioners in the selection of porcelain veneers as a treatment modality is the conservation of tooth structure, a consideration that has improved long-term results and resulted in enhanced patients' acceptance of treatment. However, the main factors to consider when planning the amount of preparation required for a porcelain veneer depends on the goals of the patient, the midline position and cant, lip position and fullness, color, incisal edge position, desired tooth contours and occlusion; conversely, preparation does not depend on the specific brand of porcelain.

Recent marketing efforts by dental manufacturers and laboratories, directed both at dentists and consumers, have advocated "no-preparation" veneers as a tooth

ABSTRACT

Background. Recently, some manufacturers, dental laboratories and practitioners have been marketing their "no-preparation" porcelain veneer systems as ones that will achieve results the same as or better than those seen with traditional veneers accomplished with tooth reduction. This case report describes case selection and esthetic treatment planning considerations for veneers involving no or minimal preparation.

Case Description. A 30-year-old woman with erosion on the facial surfaces of her maxillary teeth sought treatment for esthetic improvement of her smile. The author evaluated the patient's goals, midline position and cant, lip position and fullness, color, incisal edge position, desired tooth contours and occlusion. Once the author determined the ideal final position of the teeth and compared it with their current position, he decided that the patient was a perfect candidate for no-preparation veneers.

Clinical Implications. To optimize the outcome, dentists should perform a complete esthetic examination before selecting and planning treatment for patients receiving porcelain veneers involving no or minimal preparation.

Key Words. Porcelain veneers; dental veneers; esthetic dentistry. *JADA 2007;138(3):331-7.*

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structure-conserving option that is esthetically equivalent to or better than veneers requiring preparation.¹⁻³ Although the type of porcelain—fired feldspathic versus pressed feldspathic—may influence the level of tooth reduction, this should not be the main consideration. The final desired position, color and shape of the restoration should be the main determinants of the level of reduction. Fired feldspathic porcelains (such as IPS d.Sign [Ivoclar Vivadent, Schaan, Lichtenstein], HeraCeram [Heraeus Kulzer, Armonk, N.Y.], Creation [Jensen Industries, North Haven, Conn.], Lumineers by Cerinate [Den-Mat, Santa Maria, Calif.], or Omega 900 [Vita Zahnfabrik, Bad Sackingen, Germany]) all can be created as thin as 0.3 millimeters. Pressed feldspathic porcelains (such as IPS Empress [Ivoclar Vivadent], Authentic [Microstar Dental, Lawrenceville, Ga.] and OPC [Jeneric Pentron Clinical Technologies, Wallingford, Conn.]) can be created as thin as 0.5 to 0.7 mm. However, an esthetic examination may show conditions such as severe discoloration, protruding teeth or crowding that will require additional reduction to achieve esthetic and functional excellence.⁴⁻⁶ Depending on the existing conditions 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.⁷⁻¹¹

The no-preparation technique offers the patient and practitioner the option of maintaining healthy tooth structure.^{12,13} There are many significant advantages to conservation of tooth structure, including lack of need for anesthesia, absence of postoperative sensitivity, bonding to enamel, minimal flexing stress, longer-lasting restorations, potential for reversal, and higher levels of acceptance of treatment among patients.

Before advising any patient regarding treatment options in any esthetic case, the dentist should complete a complete facial and dental analysis, which should include a periodontal examination, photographs, radiographs, mounted models and an interview with the patient. The esthetic analysis should include an evaluation of the patient's requests and expectations, and an assessment of the following oral features: dental midline, facial profile, lip thickness, tooth exposure at rest, incisal curvature, tissue positions, smile width, buccal corridor, phonetic evaluation, tooth shape and texture, incisal edge position, individual tooth proportions and contours,

occlusal relationship, cant of the occlusal plane, tooth axis and tooth arrangement.¹⁴⁻¹⁷ Only after the practitioner has completed the smile analysis and has determined the ideal final position and shape of the teeth to be restored can he or she determine the necessary amount of reduction or the most appropriate type of veneering porcelain. To achieve the desired result, the dentist should choose the type of porcelain and amount of tooth removal according to the patient's specific esthetic condition and goals.¹⁸⁻¹⁹ The design of veneer preparations also must be 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.

THE ESTHETIC EXAMINATION

The aspects of the esthetic examination that are important in deciding preparation level are the patient's expectations, midline position, lip fullness, incisal edge position, occlusion, the shapes of the teeth and the desired color change. Many other principles are involved in esthetic treatment planning; however, they are beyond the scope of this article and, therefore, are not discussed here.

Patients' expectations. The dentist should fully understand patients' esthetic objectives and concerns before undertaking any procedure.^{20,21} Practitioners always must respect their patients' wishes without imposing their own opinions, bearing in mind that esthetic judgment is subjective.²²⁻²⁴ Some patients place limitations on esthetic results—for example, by declining orthodontic treatment or tissue-recontouring procedures, or by not allowing reduction of a rotated tooth. Many patients are willing to accept a level of esthetic compromise in their final smile to accommodate their desire for no or minimal reduction of tooth structure. However, before starting the dental procedure, the clinician should confirm that the patient's esthetic expectations can be achieved by means of a preview technique, such as using a direct composite mock-up, a laboratory-fabricated wax-up or computer imaging.²⁵⁻²⁷

Midline position. Dental midline discrepancy often is diagnosed during examination. The facial and maxillary teeth in the midline are not aligned in about 30 percent of the population, and only about 25 percent of maxillary and mandibular midlines coincide.²⁸⁻³¹ Conflicting data exist on how significant midline position is to patients.^{22,32,33}

According to Johnston and colleagues,³² a midline that is off-center is identified easily. However, Kokich and colleagues²² found that most lay people failed to identify the midline as being off unless it was more than 4 mm off. To ensure patient satisfaction, the clinician must inform the patient of his or her midline position before treatment begins, even though correction with veneers may not be possible. Although midline appearance can be altered via restorations, the gingival tissue will not adjust to significant changes.³⁴⁻³⁶ The clinician can determine the position of the papilla primarily by the root positions of teeth and the underlying bone position. Attempting to accomplish significant midline shift with restorative material can lead to compromised interproximal tissue health.

Another concern related to midlines is an oblique midline.^{32,37} This type of midline deviation is noticeable and should be corrected.

To accomplish any alteration of midline, interproximal preparation is required. If no preparation is done, the laboratory technician will have to place the midline in the previous location and with the same degree of angulation.

Lip fullness. In addition to framing the smile and establishing the minimum areas in need of esthetic enhancement, the lips also provide guides for the facial-lingual position of the teeth.³⁸⁻⁴⁰ In 70 percent of people, two-thirds of their lip support comes from the gingival two-thirds of their teeth, and one-third of their lip support from the incisal one-third of the teeth.^{41,42} Consequently, the bodily position of the teeth plays an important role in lip support. The maxillary incisal profile should be contained within the inner border of the lower lip. This allows for adequate closure of the lips—that is, so that they come together without any interference from a facially positioned incisor.^{43,44} Repeated stimulation of the lips by improperly positioned teeth may cause the formation of labial tubercles.⁴⁵

Before altering the facial-lingual position of the teeth, the clinician should classify the lips as full, medium or thin.⁴⁶ In a patient with thin lips, changes in the arrangement of the teeth may alter lip support and position, possibly leading to the patient's having problems with facial esthetics, speech and/or lip closure; he or she also

may feel that the teeth are rubbing against his or her lips.^{41,47} If the patient's teeth are crooked or rotated and the clinician is considering placing veneers with no preparation, the clinician should note the most facial position of the teeth requiring restoration; this is because all the other surfaces of the teeth will need to be built out to the most facial point. The clinician also must optimize the thickness of the veneer material for the patient to have a uniform smile. Even when a minimally thick (0.3-mm) porcelain veneer is used, this can result in certain areas of the restoration's being quite bulky. Thick lips are less affected by the thickness of the restorations.^{41,47}

Incisal edge position. The incisal edge of the maxillary central incisors is the most important determinant in the creation of a smile.⁴⁸ Once it is set, it serves to establish the proper proportions of the teeth and the levels of the gingiva.⁴⁸ Altering the incisal edge position often is necessary to produce a more youthful and attractive appearance.^{49,50} As people age, they typically show less of their maxillary teeth, owing to natural wear to the tooth structure, parafunctional habits or loss of facial muscle tone.^{51,52} When lengthening anterior teeth, in addition to an esthetic evaluation, the clinician also must consider phonetics and occlusion.

To evaluate the length of central incisors in the rest position, the "M" sound can be used^{53,54}; having the patient say words such as "mom" achieves the rest position. At rest, the teeth and lips are separated, and the clinician can evaluate tooth display. In the rest position, the average amount of maxillary central tooth display at age 30 years is 3.45 mm; at 40 years, 1.6 mm; at 50 years, 0.95 mm; at 60 years, 0.5 mm; and at 70 years, 0.2 mm.^{51,53}

Other valuable phonetic tools are "F" and "V" sounds, as in words such as "firefighter." When the patient says "F" or "V," the incisal edge of the maxillary central incisors should touch the inside border of the lower lip lightly.^{41,55} If restorations are fabricated with an incisal edge position that no longer exists or with one that has moved forward from the ideal position, the patient may have phonetic problems and a feeling that he or she is biting the lower lip.⁴⁵ When the clinician places no-preparation veneers, the facial profile

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Figure 1. Preoperative view of full smile with erosion on maxillary anterior teeth.



Figure 2. Wax-up of proposed new smile.



Figure 3. Facial view of putty matrix made off wax-up.



Figure 4. Occlusal view of putty matrix to be used as preparation guide.

and incisal edge position always will be moved forward; hence, special consideration is required.

Occlusion. The restoration of the anterior segment should not compromise occlusal schemes or the functional health of the dentition. When altering teeth's position and shape, the clinician should take care not to violate the principles of occlusion, such as anterior guidance or pathways of motion.⁵⁶⁻⁵⁸

Tooth shape. When a patient desires changes to the size, shape or contours of teeth, the clinician must pay detailed attention to preparation design. Maxillary central incisors have an average width of 8.3 to 9.3 mm.⁵⁹⁻⁶¹ The length of the average unworn central incisor varies from 10.4 to 11.2 mm.⁵⁹⁻⁶¹ Length averages tend to vary greatly with age; however, width generally remains constant.⁶⁰ Young, natural-looking central incisors have a width-to-height ratio of 75 to 80 percent.^{61,62} Sex and race do play a role in this ratio; for example, men's central incisors tend to have a higher width-to-height ratio than do

women's.^{63,64} An important tooth-shape criterion for an esthetic smile is symmetry of the maxillary central incisors.^{62,65} Although exact symmetry of the central incisors is found only in 14 to 17 percent of people, width deviation between them of more than 0.3 mm is noticeable.^{62,65,66} For clinicians, ensuring symmetry in size and shape of the maxillary laterals and canines, as well as establishing the buccal corridor gradation, also are important when attempting to achieve a pleasing smile for the patient.^{17,67} Thus, the clinician should make the patient aware of the esthetic restrictions that can arise from misaligned or asymmetrical teeth. One of the limitations of no-preparation veneers is that the widths of the teeth being restored cannot be altered significantly.^{8,68,69}

Desired color change. The color of porcelain veneers does not always meet patients' expectations; this dissatisfaction can lead to a failed case.⁷⁰ The color discrepancy arises because the relative thinness of the restoration and the light



Figure 5. Gingivectomy completed with diode laser to correct tissue heights.

that passes through it can make the color of the underlying preparation show through.⁷¹ To overcome significant shade change requests, the dentist must increase the thickness of the restoration by deepening the preparation.^{72,73} This will allow room for the technician to block out the underlying tooth color and achieve the desired color change. Another objective during color change is preventing margins from becoming visible. It is important to consider the visibility from different angles to determine the margin finish line in the gingivoproximal area. To achieve significant color change, the clinician must perform interproximal preparation until the unprepared tooth surface is no longer visible.^{8,68}

Similarly, to avoid gingival margins' showing through with major color changes, the restorations must be placed slightly subgingivally.⁶⁹ Clinician must take special care when subgingival margins are indicated, to avoid tissue inflammation and gingival recession.⁷⁴ Preparation will be necessary when subgingival margins are placed to achieve a proper emergence profile.

CASE PRESENTATION

A 30-year-old woman sought treatment, her chief complaint being that her teeth appeared too small and did not show enough (Figure 1). On examination, I noted that she had erosion on the facial surfaces of her maxillary incisors. The patient did not recall any reason for this erosion. Her dental midline was in the correct position. The overall shapes and color of her teeth also were pleasing. However, her teeth did appear small and as if they might benefit from being built out. To determine if this was the appropriate treatment for her, I completed a wax-up of

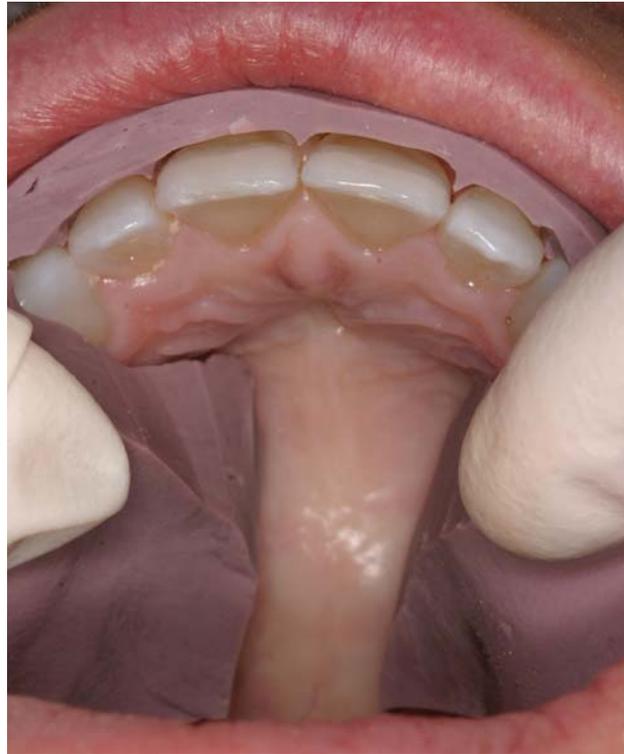


Figure 6. Putty matrix try-in showing ample clearance for restorations without tooth reduction.

the proposed new position of the teeth (Figure 2). I made a putty matrix of the facial body position of the proposed smile off the wax-up to use as a guide for new tooth position (Figures 3 and 4).

To prepare the patient for veneers, I adjusted the soft-tissue positions using a diode laser (Figure 5). Then I applied the putty matrix. The putty matrix showed that there was ample space on the facial aspect to build the teeth out (Figure 6). Furthermore, the putty matrix showed that there was no need to change the widths of the teeth, as the interproximal guides on the putty matrix lined up with the natural teeth. Therefore, in accordance with the esthetic principles applied in the case, I determined no preparation was necessary for this patient. I took a final impression using a vinyl polysiloxane material, as well as a stick-bite. I fabricated temporary restorations from a mold of the wax-up to serve as a trial run of the new positions (Figure 7).

I saw the patient one week later for feedback regarding the new positions of her teeth. I evaluated phonetics, occlusion and esthetics. With the patient's approval of the provisional restorations, I sent impressions and photos to the laboratory technician as a guide for the final restorations.



Figure 7. Provisional restoration placed to evaluate esthetics, phonetics and occlusion.



Figure 9. Retracted view of final restorations.

The technician fabricated porcelain veneers using a fired feldspathic porcelain (IPS d.Sign). Two weeks after cementation, I saw the patient for a follow-up appointment. The patient was pleased with the esthetic and functional results of her porcelain veneers (Figures 8 and 9).

CONCLUSIONS

The proper approach to achieving the best smile possible for any esthetic case initially involves a full smile analysis. Only when the practitioner determines the ideal final position of the teeth and compares it with the current position of the teeth can he or she determine the best preparation design, select the most appropriate porcelain system and properly inform the patient of his or her treatment options and their implications. Patients with small or lingually positioned teeth should be considered ideal candidates for techniques involving no or minimal preparation. However, many patients may be satisfied with limited improvement in their smile to preserve as much



Figure 8. Full smile of no-preparation porcelain veneers.

of the original tooth structure as possible. The clinician should inform the patient regarding the esthetic results and the dental health effects of each treatment modality. ■

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