Guidelines for Predictably Preparing and Cementing All-Ceramic Restorations

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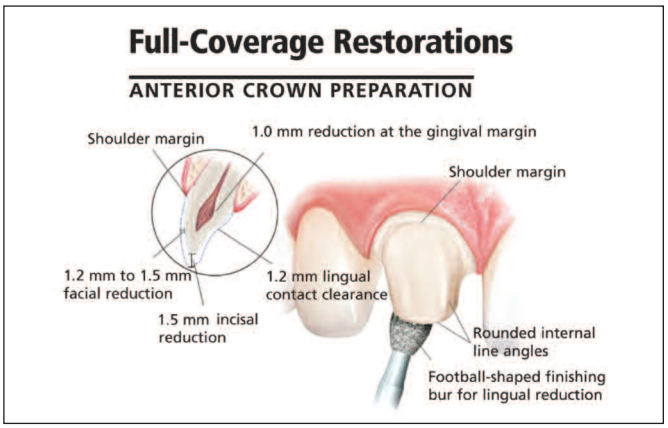
As the case is with all restorative procedures, proper techniques must be followed for a favourable outcome. It is critical to follow the appropriate preparation and cementation guidelines to ensure long-term clinical success. The introduction of the esthetic and durable lithium disilicate materials (IPS e.max Press and IPS e.max CAD) provided outstanding restorative options. IPS e.max lithium disilicate material can be used for fabricating both anterior and posterior restorations that can be delivered using adhesive, self-adhesive and conventional cementation techniques.

Generally, successful outcomes with all-ceramic restorations are only achieved if the preparation guidelines are closely followed taking into consideration minimum thickness requirements. This article describes key points for dentists to consider when preparing for and delivering all-ceramic restorations.

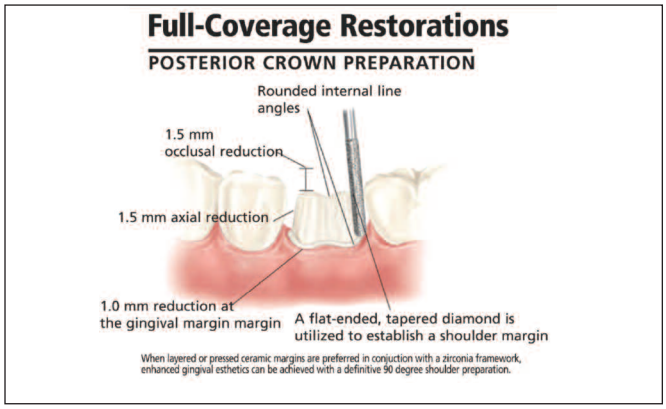
Preparation

According to the basic preparation guidelines for all-ceramic restorations, sharp line-angles or edges should be avoided. A shoulder preparation with rounded internal line angles (modified shoulder) is the finish line of choice. Deep chamfer preparations are also acceptable. The preparation should reflect at least the minimum thickness allowed for the material to be used.



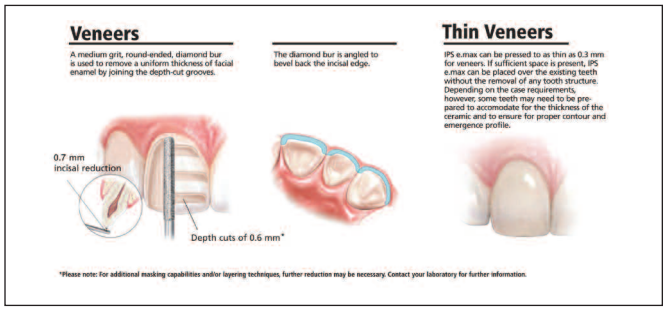
Anterior Crowns

When preparing for anterior full-coverage restorations, a 1.5 mm incisal reduction is first provided. Axial reduction follows maintaining the anatomic contours of the tooth. Generally, an axial reduction of 1.2 to 1.5 mm is adequate. Lingual reduction is best achieved using a football-shaped diamond bur providing a minimum occlusal clearance of 1.2 mm. Finally, the finish line is optimized to a 1 mm modified shoulder or a wide chamfer.



Posterior Crowns

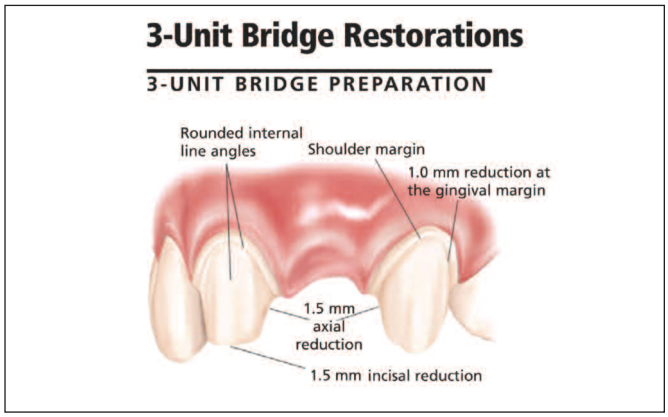
When preparing posterior full-coverage restorations, an occlusal and axial clearance of 1.5 mm should be provided. A 1 mm modified shoulder is finalized using a modified flat-end tapered diamond bur.



Veneers

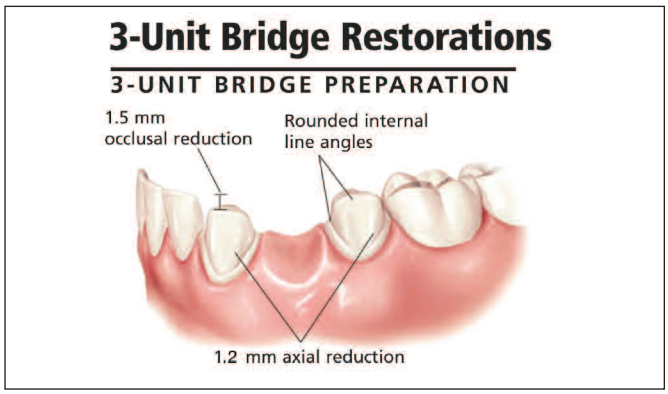
Ideally, veneer preparations should be kept in enamel. The incisal edge should be reduced by .7 mm with the incisal margin placed away from occlusal contacts. A depth cutter is best utilized to achieve a uniform reduction of the desired depth. The facial surface is prepared by joining depth cuts using a round end tapered diamond bur.

IPS e.max lithium disilicate can be pressed as thin as 0.3 mm facially and 0.4 mm incisally. Based on the clinical scenario, some clinicians may elect to place the veneer restoration without any tooth preparation (no-prep veneer). In other instances, the teeth may require preparation to accommodate the thickness of the ceramic and provide a proper emergence profile.



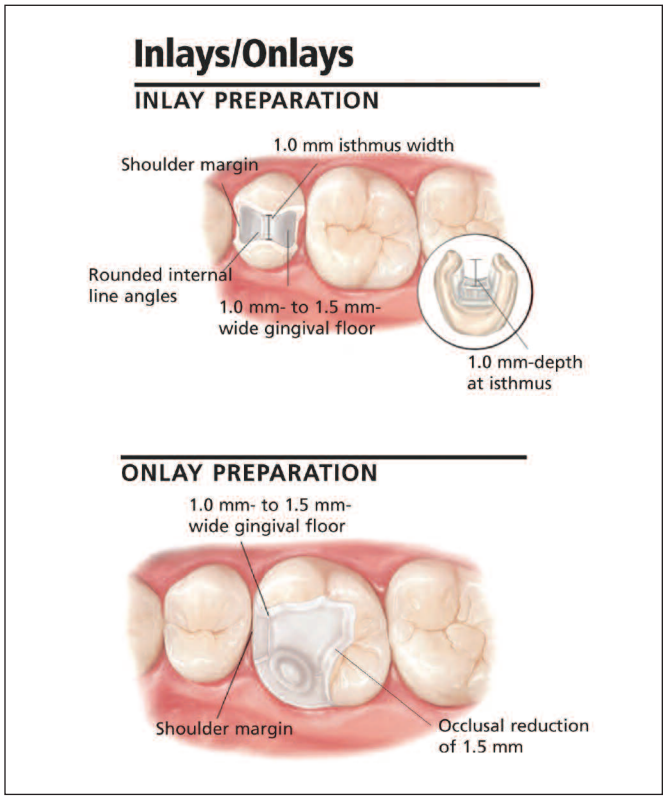
3-Unit FPDP (Fixed Partial Denture Prosthesis)
Differences in masticatory loads between the anterior and posterior regions dictate different design guidelines for all ceramic FPDPs. Regardless of the position of the restoration, it is paramount to provide the proper connector size recommended for the ceramic material used.

Anterior
When fabricating an anterior IPS e.max Press FPDP, pontic width must not exceed 11 mm. Simple guidelines for single crown preparation should be followed when preparing the abutments with special attention to the minimum thickness requirements for the material used. A proper path of insertion must be assured and sharp line-angles should be avoided throughout the preparation.



Posterior
IPS e.max Press 3-unit FPDP can extend as distal as the 2nd premolar with a pontic width not exceeding 9 mm. Simple guidelines for single crown preparation should be followed considering minimal thickness requirements for the material used. As the case is with anterior FPDPs, sharp line-angles and edges should be avoided throughout the preparation and a good path of insertion should be verified.

Inlays/Onlays
When preparing for inlays and onlays, the static and dynamic occlusal contacts must be taken in consideration. Preparation margins should be free of centric and eccentric occlusal contacts. The preparation should exhibit sufficient depth and isthmus width; a minimum of 1 mm. The isthmus and proximal boxes should exhibit slight divergence providing a



good path of insertion and eliminating the need for excessive adjustment. Needless to say, sharp edges should be avoided throughout the preparation.

Cementation

Multiple factors influence cement selection for all-ceramic restorations. These include: the restorative material, preparation design, isolation capability, and the esthetic outcome.

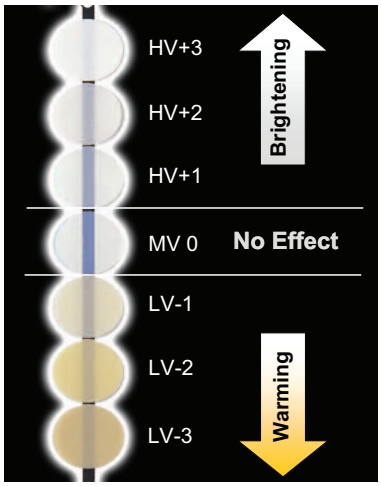
All-ceramic restorative materials can be classified into two major categories:

Glass-Ceramics
Ceramics with a high glassy content, such as feldspathic, fluorapatite and leucite-reinforced ceramics, provide the patient with life-like esthetics. These materials obtain additional support from the adhesive bond and must be adhesively cemented using a resin cement. The use of conventional and self-adhesive cements is contraindicated.

High-Strength Ceramics
These ceramics exhibit good mechanical properties and can withstand occlusal loads in the absence of an adhesive interphase. While conventional cementation is permissible for these ceramics, adhesive cementation offers multiple advantages and remains the material of choice for delivering these restorations. Examples of high strength ceramics include lithium disilicate materials (IPS e.max CAD, IPS e.max Press), alumina and zirconia-based ceramics.

The preparation design plays a major role in cement selection for high-strength ceramics. Preparations that lack adequate mechanical retention (short preparations < 4 mm, excessive taper > 8°) should be adhesively bonded using a

Value Shading System



This logical shade sequence is based on "brightness" in lieu of "colour".

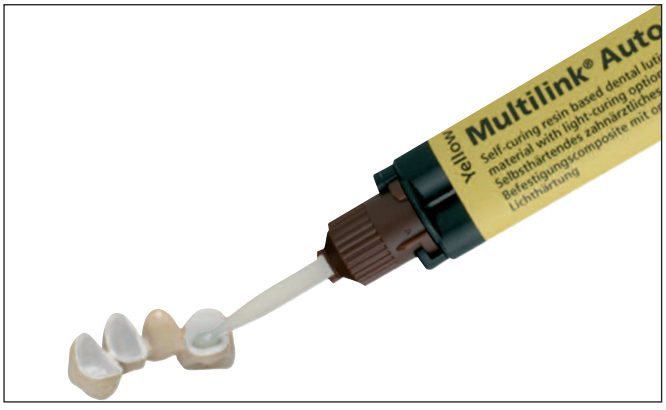
The 7 "value" shades provide the opportunity to "warm" or "brighten" the appearance of the final restoration.

- No effect (Medium Value)
- Gradual brightening (High Value +1, +2, +3)
- Gradual darkening (Low Value -1, -2, -3)

resin cement. If the preparation demonstrated adequate mechanical retention (long preparation > 4 mm, minimal taper < 8°), the restoration may be conventionally cemented. Needless to say, veneers and partial coverage restorations lack mechanical retention and can only be adhesively bonded.

Adhesive resin cements remain a superior option; however, they require meticulous isolation procedures. In the absence of a good isolation capability, conventional cements may be considered when using a high-strength ceramic.

Esthetic resin cements offer multiple shades that can minimally alter the final shade of the restoration if desired. Variolink Veneer offers a great value-shading system with matching try-in pastes. Variolink Veneer is purely light-cured and is free of amines offering long-term shade stability. Variolink II is a dual-cure aesthetic resin cement that offers numerous shades and viscosities and a high degree of radiopacity. Both Variolink Veneer and Variolink II utilize the etch and rinse technique and have proven long-term clinical success.



Multilink Automix is a universal resin cement that utilizes the self-etch technique. It is a self-cure with a light-cure option offering very high immediate and long-term bond strength values. Clinical trials have proven its long-term success and reduced postoperative sensitivity.

Self-adhesive resin cements were recently introduced to offer some advantages of resin cements with the convenience of conventional cements. Speedcem is a self adhesive cement that can be used with high strength ceramics to maximize clinical efficiency.

Conclusion

Selecting the most appropriate preparation and cementation techniques and properly performing them are crucial to the success of the clinical outcome. To enhance clinical success, this article has outlined the key principles related to all-ceramic preparation and cementation and recommended protocols for dentists to follow when integrating all-ceramic restorations into their patient treatment.

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