NEXT GENERATION

Minimally Invasive Porcelain Laminate Veneer Preparation Design

ROBERT R. WINTER, DDS
**FACTORS Influencing Preparation Design**

This eBook focuses on tooth reduction required on the facial aspect and incisal edge for indirect restorations, using the least invasive preparation design necessary to address the esthetic goals of the patient and clinician.

Before you begin, it’s imperative to have a clear vision of the desired treatment outcome and an understanding of the complexities of the case. The next step is to determine the type and amount of tooth reduction required:

1. What tooth problems (morphology, arrangement, and structure) exist?
2. What are the esthetic (shade, brightness) concerns?
3. What functional issues (restricted envelope of function, parafunction, and bruxism) should be resolved?
4. Is there a combination of the above?

Recently there has been a resurgence of the “no-prep” concept. For certain clinical scenarios, an additive technique is the most appropriate (e.g., when changes in tooth morphology are desired without changes in shade or brightness).

The preparation guidelines featured are depth-limiting bur concepts I developed in 1990, which were then introduced to the market in 2009. The concepts are based on average enamel thickness, preservation of enamel, the ceramic thickness required to facilitate the desired shade change, and a translucent outcome.

**Fig 1 and Fig 2. Another important factor in preparation design is the restorative material.** Because glass ceramic is layered over the higher strength ceramic base, bilayer (two-material) ceramic restorations require more space than monolithic (one-material) restorations.
Preparation with Clear Intent

The first requirement to establish the final esthetic and functional outcome is to determine the definitive incisal edge position and the amount of translucency desired in the incisal third. This will dictate the amount of tooth reduction on the incisal edge. In some cases no reduction is needed because an additive technique will be required.

The depth of facial tooth reduction is determined by the esthetic changes expected in the outcome. It is important to understand the challenges associated with balancing translucency versus creating enough opacity to establish a natural appearance.

If the underlying tooth is discolored and requires masking, more tooth reduction is necessary. This provides the space to use an opacified material to mask the underlying tooth and make the shade change, and to build in a translucent layer of ceramic to mimic the appearance of natural teeth.

When possible, if significant shade changes are desired and a naturally translucent outcome is expected, an additive restorative technique must be employed to create space for the restorative material and maximize the preservation of enamel.

Fig 3. A minimal facial tooth reduction would be required to increase the tooth length and improve the tooth proportions.

Fig 4. The discolored tooth would require a more extensive facial reduction if the tooth is veneered.
Next Generation Minimally Invasive Porcelain Laminate Veneer Preparation Design

In preparation philosophy and design, I developed a series of tapered three-banded facial depth limiting burs. The goal was to create a preparation process that allows for predictable outcomes based on the changes in shade and value desired in the final restoration while preserving enamel and tooth structure. These burs are referenced as minimal, conventional, and extensive, based on the reduction required.

Without making controlled depth cuts, there is no reference to how much tooth structure has been removed. Because of the tapering thickness of enamel from the gingiva to the incisal third, the burs are tapered to allow more reduction in the incisal third, creating room to build in greater translucency for a final restoration that more closely mimics nature.

**Fig 5.** Preserving and bonding to enamel gives the highest bond strengths and the most predictable long-term glass ceramic veneer outcome. If the tooth is over-prepared, you do not have enough enamel for bonding and the survival rate of the restoration decreases. Gurel et al observed a 99% veneer survival rate if there is 100% enamel on the facial aspect of the tooth, but the survival rate drops to 94% when there is enamel only at the margins.
Incisal Reduction

Bur selection is determined by material choice, fabrication technique, the amount of translucency desired in the incisal third of the veneer, and whether the tooth is going to be shortened, lengthened, or will maintain its original position.

- If it is going to be shortened, the first step is to reduce the tooth to the optimal final edge position and then make the depth cuts from that level.
- If the tooth is going to be lengthened, there are two options. One is to establish the desired edge position by doing a direct mockup based on the diagnostic wax up and then making the depth cuts through the mockup. The second option is to estimate the additional length you want in the final restoration and then determine the space needed based on the restorative material and fabrication technique.
- If the length is to be maintained, depth cuts are made based on the current position.

The incisal depth limiting burs used in the illustrations have cutting lengths of 1.5, 2.0, and 2.5 mm. The bur has a depth-limiting collar, so over-preparation is not possible if used correctly. It is important to use the burs to the maximum depth of the collar on the incisal edge.

Fig 6. A direct bisacryl mock-up completed. The tooth morphology and functional considerations were established in the diagnostic wax-up. Fig 7. Try-in of a silicone index made from the preoperative tooth position. Fig 8. Try-in of a silicone index made from the diagnostic wax-up. This demonstrates the additive restorative process that was planned.

Fig 9. Incisal Depth Cut - WDL 2.0.
The choice of depth cut and bur selection depends on:

- The masking required to make the shade/value change and incorporate the translucency expected in the outcome
- The material selected (feldspathic vs high strength ceramic)
- The restoration fabrication technique (monolithic vs bilayered)

The critical balance of preserving enamel and creating the necessary restorative space can be challenging. The recommendations for facial tooth reduction from the gingival to the incisal third of the preparation needed to make esthetic changes are:

0-1 shade change: .3/.5/.7 mm (Minimal Veneer)

1-2 shade changes: .5/.7/.9 mm (Conventional Veneer)

2-3 shade changes: .8/1.0/1.2 mm (Extensive Veneer)

All recommendations are minimally invasive to accomplish treatment goals. If an additive restorative technique is used, even the extensive veneer reduction can maintain the majority of the labial aspect of the tooth and the margin in enamel.
In general, the longer or deeper the depth cut, the more space you create to increase the thickness of the ceramic. This additional space creates a greater potential to mask discoloration and increase the translucency of the restoration. Furthermore, the preparation space required is dependent on whether the restoration is monolithic or bilayered.

**Fig 14.** 2 Plane Reduction: 1st - Incisal Two Thirds. 2nd - Gingival Third.  
**Fig 15.** 2 Plane Facial Preparation with WS8M 0.6.  
**Fig 16.** Preparation Refinement with WS8F 0.6.  
**Fig 17.** Preparations with gingival retraction cord in the sulcus. (Tooth preparation extended interproximal to place the finish line palatal to the desired contact area to change the tooth morphology and close the interdental spaces.)
Closing Thoughts

When shade/value or length changes are necessary and a natural tooth appearance is desired, a systematic approach to facial and incisal reduction is required to ensure there is enough space for the material to mask any underlying tooth discoloration and to build in translucency.

If you are adding length or facial volume, you can preserve tooth structure by making a mock-up based on the diagnostic wax-up, and performing depth cuts directly there. Controlling the amount of facial and incisal reduction will determine the predictability of the esthetic outcome and the survival rate of the restoration.

You may want to consult your laboratory technicians before beginning preparation as they may have a preference regarding the amount of tooth reduction based on the material preference and fabrication technique.

**ESTIMATED SURVIVAL RATE OF GLASS-CERAMIC VENEERS**

- 92.4 to 95.4% after 5 years
- up to 93.5% at 10 years
- up to 82.93% at 20 years

---

Fig 18. Preoperative view.

Fig 19. Postoperative view.
Robert R. Winter, DDS

Dr. Winter maintains a Prosthodontic practice, is a master dental technician, and has taught more than 700 didactic, clinical, and technical courses worldwide. He is a principle instructor at Spear Education in Scottsdale, Arizona, and a consultant for DLH. He is Past President of the American Academy of Esthetic Dentistry and a member of the American Academy of Restorative Dentistry.

Dr. Winter is a member of the graduate prosthodontics faculty at the University of Washington and the University of Southern California and is on faculty at Midwestern University College of Dental Medicine.

Disclosure: Dr. Winter has developed the series of burs for Brasseler USA but is not compensated on the sale of the burs.
REFERENCES

