

SIMPLE GUIDELINES FOR AESTHETIC SUCCESS WITH COMPOSITE RESIN—PART II: POSTERIOR RESTORATIONS

Wolfgang M. Boer, DDS*



Aesthetics are as valuable in the posterior region as they are in the anterior. While the former is sometimes overlooked due to the limited visibility of posterior teeth, it is important that the clinician follow guidelines to ensure a high-quality restoration in this region. Restoring posterior teeth with direct resin can be accomplished through conservative and aesthetic treatment; however, it can also be challenging and time consuming to achieve exceptional aesthetics. Highlighting the importance of occlusal anatomy to the success of a direct resin restoration, this presentation outlines requisites to achieve this result.

Learning Objectives:

This article discusses guidelines for the aesthetic buildup of posterior restorations with direct resin techniques. Upon reading this article, the reader should:

- Realize how the aesthetics of posterior restorations can be enhanced through the application of intensive composite shades.
- Understand the importance of occlusal design when building the restoration.

Key Words: posterior, resin, composite, aesthetics, occlusion

*Private practice, Euskirchen, Germany.

Wolfgang M. Boer, Kölner Str. 73, D-53879 Euskirchen, Germany
Tel: +49 2251-78 10 20 • E-mail: Wolfgang.Boer@t-online.de

While Part I of this article discussed various guidelines for restoring anterior teeth in the dental office, this second part of the article will address the utilization of direct resin techniques to build up aesthetic posterior restorations. While shade selection plays a role in the restoration of the posterior dentition, accurate shaping of the occlusal surface is arguably of greater importance. Occlusal morphology in the posterior region presents a particular challenge in restorative procedures. A fundamental principle from a very different field can be applied: the rule of “form follows function,” which was postulated by the Bauhaus School for Industrial Design in the 1920s.¹ The exact reproduction of the natural morphology in the posterior region is more important for the aesthetic success of the restoration than shade matching is in the anterior region.

In the past, the occlusal design of the restoration was dependent upon the artistic skills of the dental technician or clinician. Interesting approaches, however, have been developed that deduce the ideal form from the natural example, rather than follow a rigid gnathological concept. Nature has created functionally perfect occlusal surfaces during the course of evolution, therefore, one should not try to reinvent the tooth when completing a restoration.

The Biomechanical Waxup Concept

Polz evaluated more than 3,000 caries-free teeth during the 1980s and developed the biomechanical waxup concept from his findings.² The accuracy of his observations has been further analyzed through the work of Mehl et al.^{3,4} The objective of Mehl et al was to conduct three-dimensional measurements of natural teeth using a laser scanner, for the purpose of interpolating an archetypal morphology using mathematical principles. Approximately 200 scans of each type of posterior tooth (ie, more than 3,000 teeth in total) were obtained. These ideal occlusal surfaces provided the basic data for calculating the occlusal design of



Figure 1. Case 1. Preoperative view of the worn amalgam filling in tooth #3(16), which is in need of replacement. Mesial-proximal caries are evident radiographically.



Figure 2. The amalgam filling is removed, and a thin enamel lamella is left to prevent damage to the adjacent tooth by rotary instruments.



Figure 3. The remaining enamel lamella is removed from the posterior tooth with the SonicPrep tip (KaVo, Lake Zurich, IL), and an enamel bevel is created.



Figure 4. A thin layer of a flowable composite is applied and polymerized, the proximal walls are contoured, and a white intensive shade is placed on the dentin core.



Figure 5. After the rough removal of excess, the occlusion is verified for the first time. There are no premature contacts on the filling.



Figure 6. Occlusal adjustments were unnecessary for this direct resin restoration. The natural cusp angle was reproduced in the restoration.

CAD/CAM ceramic restorations. If the ideal occlusal surfaces, according to Mehl, are compared with the tooth molds of Polz's biomechanical waxup concept, it can be noted that they are almost identical. These models, therefore, offer an adequate basis for contouring the occlusal surfaces of composite restorations.

It must be understood, however, that composite restorations cannot be used to treat gnathological problems, as they are not sufficiently wear resistant. They can only be used to create interference-free occlusal surfaces to minimize "trigger" functions. To manage functional problems, composite resin can be used for at least six months as a provisional restoration that permits evaluation of new guidance patterns. Nevertheless, in cases with significant bruxism, the established guidance can be lost after six weeks by this excessive wear. Ideal for rehabilitation in such instances is a pressed ceramic restoration fabricated by the dental technician in a lost-wax technique, as it is nearer to natural enamel hardness and wear.⁵

Occlusal Morphology and Shade Selection

While rebuilding the natural anatomy of the occlusal morphology requires a certain degree of skill, the author has found that it also considerably reduces the time required to remove premature contacts during finishing of the restoration. The preconception that occlusal contouring is useless—since it is eliminated during the subsequent occlusal adjustments—is often heard in this context. This bias can be attributed to the fact that clinicians often create fissures that are not sufficiently deep: premature contacts are only present if the inclinations of the cusp slopes are not steep enough. If the natural inclination of the cusp is maintained in the reconstruction, the finishing procedure can be reduced to simple polishing of the restoration (Figures 1 through 3).

The aesthetics of posterior restorations in particular can be enhanced through the application of intensive composite shades. Posterior teeth that are "white" are simply not found in natural dentition. Rather, the central fissures



Figure 7. Case 2. Preoperative view of patient presenting with unaesthetic amalgam fillings.



Figure 8. Postoperative view of direct resin restorations that exhibit a more aesthetic appearance.



Figure 9. Case 3. Preoperative view of a patient presenting with three different filling materials used in previously restored teeth.



Figure 10. View after the teeth have been restored with Four Seasons (Ivoclar Vivadent, Amherst, NY). The occlusal morphology has been reconstructed in accordance with the biomechanical waxup principle.

begin to show varying degrees of discoloration shortly after tooth eruption. Natural posterior teeth also often exhibit chalky white spots along the proximal marginal ridges and the ridges of the occlusal relief. These opaque discolorations are most likely attributable to the fact that these areas are particularly exposed to forces generated from mastication. In the author's experience, the resulting effect is similar to that of decalcified areas; as a result of attrition, the enamel loses its translucency owing to the irregularities in the apatite crystal structure. These areas are easy to simulate through the application of small amounts of white shade to the completed dentin core of the

composite restoration. The white shade is applied in small strokes to the area where the ridges of the occlusal relief will be located and then polymerized.⁶ To eliminate the need for an additional polymerization cycle, the intensive shade can be carefully applied to the uncured dentin material and then polymerized together with the dentin core. Once coated with enamel material, the new characterizations simulate the chalky discolorations of natural teeth (Figures 4 through 6).

Discolored fissures can be simulated with similar ease. The enamel material should be applied to each cusp, contoured, and polymerized individually to reduce

the shrinkage stress. If applied individually, the increments offer a large unbounded surface area and, therefore, a favorable C-factor to compensate for shrinkage.⁷ After an individual cusp has been completed, a small deposit of a dark-brown shade is applied to the area of the fissure. This material is left uncured while the next cusp is being contoured. In the process, the soft shade is moved towards the completed cusp. This results in a color deposit that is located in a fold of the enamel material. This method produces simulated fissure discolorations that closely resemble the form and appearance of natural discolorations (Figures 7 and 8). Furthermore, these characterizations do not disappear in subsequent occlusal adjustments or polishing, since the depot can only be reduced in height and cannot be completely removed (Figures 9 and 10).

Conclusion

Composite resins have a solid place in aesthetic dentistry, and enable the clinician to create a highly aesthetic restoration using direct techniques. In addition, the dental professional can rely on the chameleon effect to further enhance the aesthetic result of the procedure. The composite restoration homogeneously blends into the natural dentition, as its aesthetic properties are not marred by an untoward interface of cementation that blocks the passage of light between the natural tooth structure and restoration. Therefore, restoring posterior teeth using a direct resin technique can lead to an aesthetically successful outcome.

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CONTINUING EDUCATION (CE) EXERCISE No. X



To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.

The 10 multiple-choice questions for this Continuing Education (CE) exercise are based on the article "Simple guidelines for aesthetic success with composite resin—Part II: Posterior restorations," by Wolfgang M. Boer, DDS. This article is on Pages 000-000.

1. In the construction of a posterior restoration, which of the following features is of greatest importance?

- a. Shade selection based on dentin shade matching.
- b. Shade selection based on enamel shade matching.
- c. Both enamel and dentin shade are equally important.
- d. Building occlusal morphology is more important than shade matching.

2. Which best describes natural posterior teeth?

- a. Having bright white central fissures.
- b. An overall chalky, white appearance, with spots of high translucency.
- c. Varying degrees of discoloration, often with spots of decalcification.
- d. An overall, consistently white appearance.

3. Discolored fissures can be created on the restoration by which of the following steps?

- a. Applying, contouring, and polymerizing enamel material on each cusp individually to reduce shrinkage stress.
- b. Maintaining minimal surface area.
- c. Applying and immediately curing deposits of a dark brown shade to the area of the fissure.
- d. All of the above.

4. Which of the following observations were supported by the research of Mehl et al?

- a. The morphology of an ideal, archetypal tooth cannot be obtained via laser scanning.
- b. If scanned occlusal surfaces are compared with tooth molds obtained from the biomechanical waxup technique, they are almost identical.
- c. The three-dimensional scanning technique provides a far more accurate model of occlusal morphology than the waxup technique.
- d. None of the above.

5. What step(s) can ensure that the finishing procedure will require little more than final polishing?

- a. Creating deep fissures during restoration construction.
- b. Maintaining the natural inclination of the cusp.
- c. Both A and B.
- d. Neither of the above.

6. Bright white, opaque discolorations can be created on the restoration by which of the following steps?

- a. Applying the white shade in small amounts to the completed dentin core of the composite restoration.
- b. Applying the white shade in small strokes where the ridges of the occlusal relief will be located and polymerized.
- c. Applying the white shade to the uncured dentin material and then polymerizing it together with the dentin core.
- d. All of the above.

7. Under what conditions should a pressed ceramic restoration be considered instead of a composite restoration?

- a. When the patient does NOT exhibit any functional difficulties (such as bruxism).
- b. When the patient DOES exhibit severe functional difficulties.
- c. There is no reason one should be used over another.
- d. None of the above.

8. Which of the following is an appropriate "philosophy" regarding posterior restoration construction?

- a. Posterior restorations are an ideal opportunity to the "fix" imperfect occlusal surfaces of natural teeth.
- b. Rebuilding occlusion requires very little skill or artistry.
- c. The best posterior restorations arise when strict gnathological rules are obeyed.
- d. Clinicians and technicians should use the design set forth by natural occlusion to deduce ideal morphology.

9. Rebuilding the natural anatomy of the occlusal morphology:

- a. Increases the time required to remove premature contacts.
- b. Considerably reduces the time required to remove premature contacts during finishing.
- c. Is relatively simple and requires little additional skill.
- d. B and C only.

10. Simulating fissure discoloration via individual cusp treatment results in characterizations that do not disappear in subsequent adjustments or polishing. The colored deposit can only be reduced in width.

- a. Both sentences are true.
- b. The first sentence is true, the second sentence is false.
- c. The first sentence is false, the second sentence is true.
- d. Neither sentence is true.