A simplified aesthetic concept: part two

Douglas Terry[1] and Karl Leinfelder[2]

Using a simplified placement technique

The method of restoring the prepared tooth has been the subject of considerable discussion. A myriad of restorative techniques have been developed to avoid the limitation of depth of cure, to reduce the effects of polymerisation shrinkage, improve marginal adaptation and seal (Dietschi et al, 1995; Lutz, Kull, 1980; Eick, Welch, 1986; Koenigsberg, Fuks, Grajower, 1989; Tjan, Berg, Lidner, 1992) to enhance aesthetic results (Tjan, Glancy, 1988; Kovarik, Ergle, 1993) and provide the clinician with maximum benefit for their application (Davidson, Feilzer, 1997).

Several of the incremental stratification techniques include horizontal, vertical oblique, centripetal, three-sited light-cure, and centripetal build-up. These various methods are recommended according to the type and dimension of the cavity preparation (Terry, 2004).

While it is commonly believed that segmentally filling the preparation generates the least pull on the buccal and lingual cusps, not all literature agrees. In a study conducted at the University of Minnesota, Versluis et al (1996) demonstrated that bulk fill produced the least strain on the opposing cusps.

Although these stratification techniques allow the clinician to provide beautiful results, the use of intricate multi-layering with numerous shades of composite may not be efficient, realistic, or practical for the modern dental practice.

In an effort to simplify, improve efficiency and provide optimal aesthetics, a new nano-composite formulation was designed and integrated to the following duo-shade modified placement technique for posterior and anterior composite restorations.

Posterior restorations

For posterior restorations (Figures 1-6) this technique uses one continuous increment (ie, tubular shaped) that is placed and adapted in an oblique layer against the cavity wall with a round tipped composite instrument (PKT-3A, Brasseler, USA). The increment is cured through the cusp and the original cavity floor becomes part of the cavity walls. This process reduces the ratio of cavity volume to an area of the cavity walls, which results in a substantial reduction in the

Figure 1: Preoperative occlusal view of defective amalgam restorations with recurrent decay on maxillary first and second premolars.

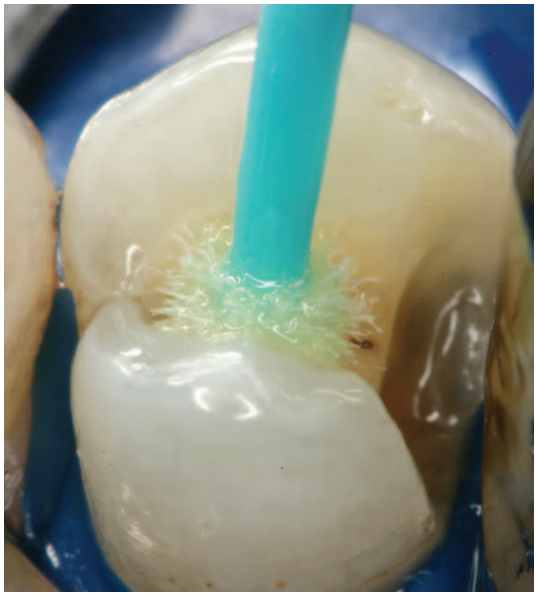


Figure 2a: After acid etching the enamel margins, a single component self-etch dentine adhesive was applied.

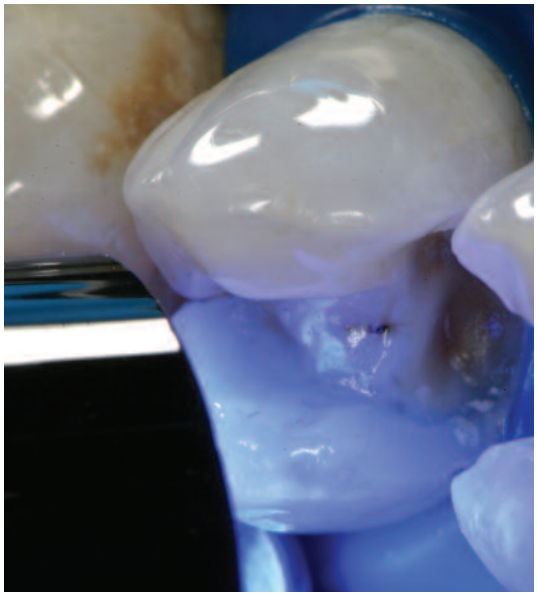
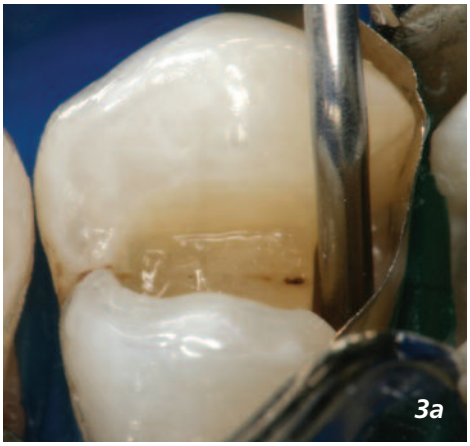
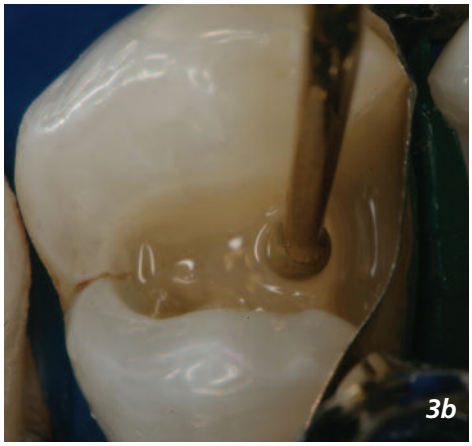


Figure 2b: The adhesive was then air-thinned and light-cured.





Figures 3a and 3b: A contoured sectional matrix band was placed. An A2 shaded flowable composite was applied as a cavity liner and uniformly distributed on the pulpal floor with a round tipped instrument.

marginal contraction gap (Hansen, 1986). A second elongated increment is adapted in the same oblique manner against the opposing cavity wall and light cured through the cusp.

For small- to medium-sized occlusal and a proximal cavity preparations, the internal dentine core requires two incremental placements. A final enamel layer is filled all the way to the occlusal margins. At this point, a round tipped instrument (such as the PKT-3A) is used to remove any residual composite material. Procedurally, the composite condenser is pressed against the occlusal surface. Using finger pressure, the instrument is used to trace the entire margin of the preparation. Such a technique not only eliminates all residual composite extended beyond the preparation but it also fills in any region that may have been somewhat underfilled.

Upon completion, the same burnishing instrument can be used to develop the central fissure, buccal and lingual developmental grooves and the incline planes. After light curing, the rubber dam is removed and an articulating paper is employed for the purpose of determining the existence of prematurities.

Anterior restorations

This same duo-shade placement technique can also be utilised in direct anterior composite restorations (Figures 7-

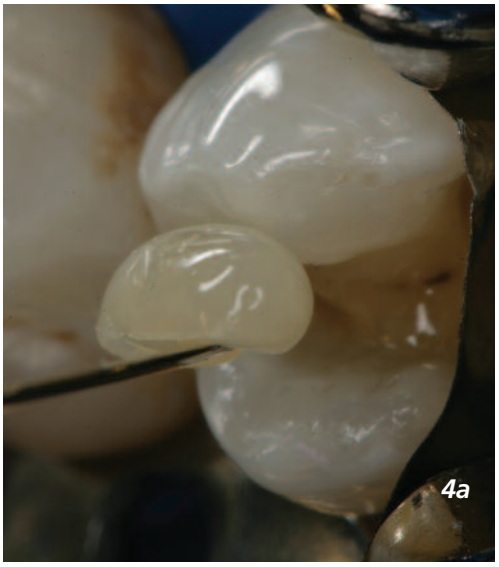


Figure 4a: An elongated 02 opaque dentine shaded hybrid composite increment is placed.

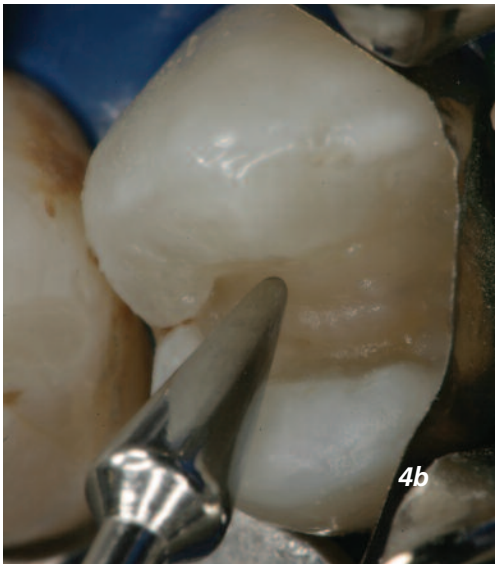


Figure 4b: It is adapted in an oblique layer with a round tipped composite instrument against the cavity wall and light-cured through the cusp using the ramp curing mode to minimise polymerisation stresses and enhance marginal adaptation.

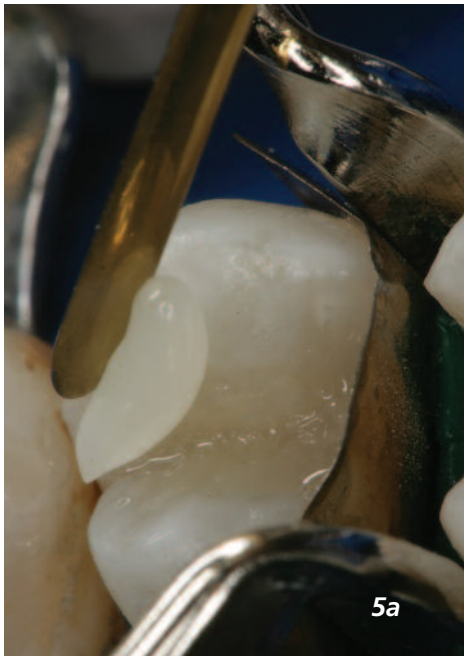


Figure 5a: A final increment of enamel-shaded hybrid composite was placed.

Figure 5b: The occlusal anatomy was developed with a PKT-3A.

12). The magnitude of the shrinkage stresses, however, generated from polymerisation shrinkage is less for most anterior composite restorations, since the ratio of bonded to unbonded surfaces is generally less for these restorations. Therefore, considerations for utilising stratification techniques to minimise the effects of shrinkage stress are minor.

We prefer to use a long bladed interproximal carver for placement and adaptation and a sable brush to smooth the surface. A curved instrument (TINL-R, Brasseler, USA) can be

Figure 6: The completed composite resin restorations using the duo shade technique reflect the harmonious integration of anatomical form and colour.

used to shape the lingual surfaces of anterior restorations.

For class III and IV composite resin restorations, an opacious dentine increment is placed as the internal core and a second enamel layer encapsulates this core. For the class V, this same placement procedure can be utilised with a translucent or opacious dentine core, depending upon the colour of the substrate. For deeper cervical restorations, placement of the dentine core in two sequential increments allows for an overall stress reduction by allowing more yielding of the free surface of the restoration to the underlying contracting bulk. Placing the occlusal dentine segment with a higher bond strength to enamel first and then the gingival segment may reduce the potential for microgap at the gingival margin.

Colour interpretation

Successful determination and transfer of colour to an aesthetic restoration depends on the clinician's understanding and interpretation of colour and its relationship to the anatomical morphology of the tooth. The anatomy of the tooth should guide the clinician in developing the correct interpretation of form and colour.

For optimal colour matching of proximal composite restorations, consideration should be given to the surrounding environment. Composite resin, enamel, and dentine cause considerable light scattering, which produces internal diffusion of incident light and allows the composite restoration to blend with the tooth appearance. This 'blending effect' or 'chameleon effect' occurs as diffused light enters from the surrounding tooth and, when emitted from the restoration, alters its colour by absorbing colour from the tooth. This colour alteration depends on the scattering and absorption coefficients, which can produce an undetectable colour match by blending with tooth colour (Hall, Kafaslias, 1991).

Conclusion

As we compare the old and the new in history, only time can provide the answers of knowledge, wisdom and truth.

Knowledge of a concept of the past and a desire to create are limited by the materials clinicians have available to them for restorative procedures. Advancements in composite resin technology continue to improve the practice of dentistry.

Continuing technological breakthroughs allow the clinician to not only comprehend the 'building blocks' of the ideal composite restoration, but also to implement and maximise the potential of new materials to attain more predictable and aesthetic results.

Since only the passage of time can provide the answer to the success of a material, future clinical trials will be required

Figure 7: Preoperative lingual view of a defective composite restoration with discolouration and recurrent decay on a mandibular lateral incisor.

Figure 8: The restorative shade recipe is determined by colour photographic comparison to the natural tooth structure.

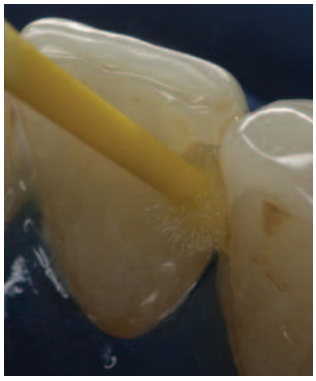


Figure 9: After the enamel cavosurface is acid etched, a single-component self-etch adhesive is applied, air-thinned and light-cured.

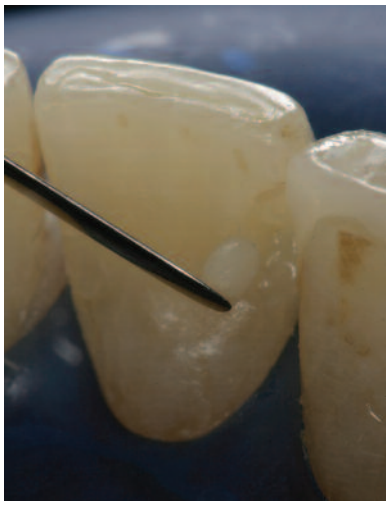


Figure 10: An increment of 03 shaded hybrid composite was applied as an opaque dentine core and light-cured for 40 seconds from the facial using the ramp curing mode to minimise polymerisation stresses and enhance marginal adaptation.

Figure 11a: A final translucent dark shaded enamel layer was applied.

Figure 11b: It was sculpted and smoothed with a sable brush and post-cured for 60 seconds.

to determine the long-term benefits of Voco's resin formulation.

The clinical examples provided in this article demonstrate the ability of this nanoparticle hybrid formulation to simulate the optical properties of the natural tooth.

References

1. Kovarik RE, Ergle JW. Fracture toughness of posterior composite resins fabricated by incremental layering. J Prosthet Dent. 1993; 69:557-560.

2. Rinn LA. Applied theory of color. In: The Polychromatic Layering Technique: A Practical Manual for Ceramics & Acrylic Resins. Chicago, IL: Quintessence Publishing;1990:21-30.

3. Larson TD. Techniques for achieving realistic color distribution in large composite resin restorations. J Am Dent Assoc. 1986;112:669-672.

4. Dietschi D. Free-hand composite resin restorations: a key to anterior aesthetics. Pract Periodontics Aesthet Dent.1995;7:15-25.

5. Donly KJ, Browning R. Class IV preparation design for microfilled and macrofilled composite resin. Pediatr Dent. 1992;14:34-36.

6. Winter R. Visualizing the natural dentition. J Esthet Dent. 1993;5:102-117.

7. Exner HV. Predictability of color matching and the possibilities for enhancement of ceramic laminate veneers. J Prosthet Dent. 1991;65: 619-622.

8. Terry DA, Geller W, Tric O, et al. Anatomical form defines color: function, form, and aesthetics. Pract Proced Aesthet Dent. 2002;14:59-67.

9. Fahl N Jr, Denehy GE, Jackson RD. Protocol for predictable restoration of anterior teeth with composite resins. Pract Periodontics Aesthet Dent. 1995;7:13-21.

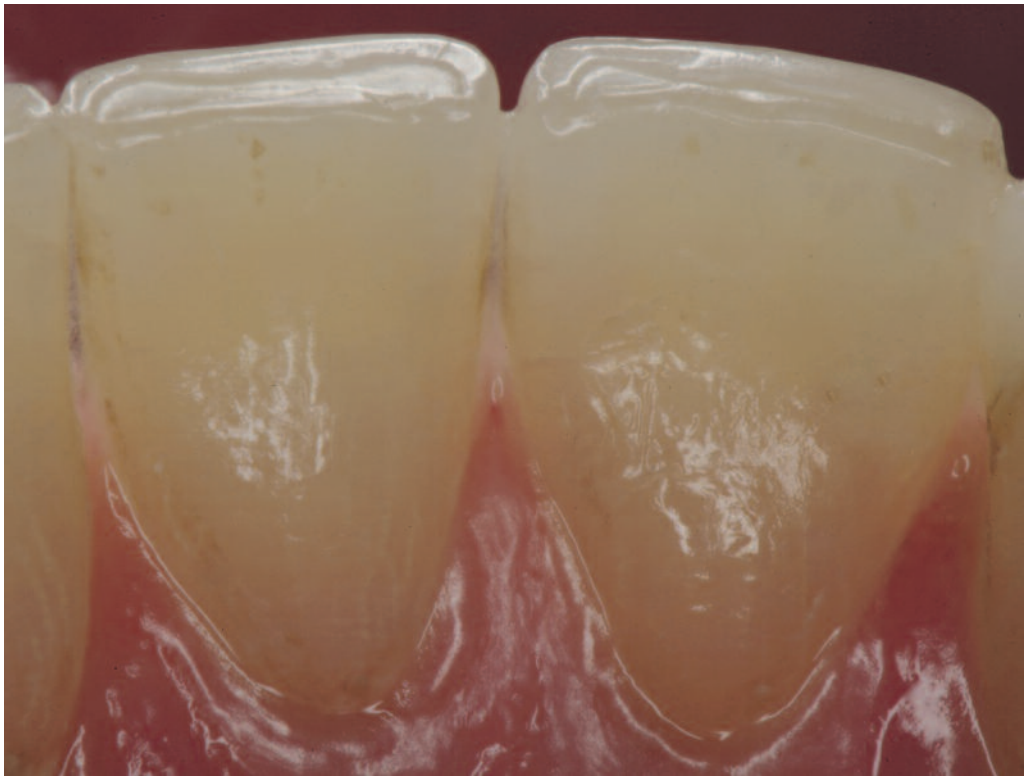


Figure 12: The postoperative result achieved with this simplified two-layer nano-composite system reveals the natural integration of composite resin with tooth structure.

10. Baratieri LN. Esthetic Principles [in Portuguese]. Sao Paulo, Brazil: Quintessence Publishing; 1998:48.

11. Dietschi D, De Siebenthal G, Neveu-Rosenstand L, et al. Influence of the restorative technique and new adhesives on the dentin marginal seal and adaptation of resin composite Class II restorations: an in vitro evaluation.

Quintessence Int. 1995;26:717-727.

12. Lutz F, Kull M. The development of posterior tooth composite system, in-vitro investigation. SSO Schweiz Monatsschr Zahnheilkd. 1980; 90:455-483.

13. Eick JD, Welch FH. Polymerization shrinkage of posterior composite resins and its possible influence on postoperative sensitivity. Quintessence Int.1986;17:103-111.

14. Koenigsberg S, Fuks A, Grajower R. The effect of three filling techniques on marginal leakage around Class II composite resin restorations in vitro. Quintessence Int. 1989;20:117-121.

15. Tjan AH, Bergh BH, Lidner C. Effect of various incremental techniques on the marginal adaptation of class II composite resin restorations. J Prosthet Dent. 1992;67:62-66.

16. Tjan AH, Glancy JF. Effects of four lubricants used during incremental insertion of two types of visible light-activated composites. J Prosthet Dent.

1988;60:189-194.

17. Kovarik RE, Ergle JW. Fracture toughness of posterior composite resins fabricated by incremental layering. J Prosthet Dent. 1993;69:557-560.

18. Davidson CL, Feilzer AJ. Polymerization shrinkage and polymerization shrinkage stress in polymer-based restoratives. J Dent. 1997;25:435-440.

19. Terry DA. Adhesive preparation designs. In: Terry DA. Natural Aesthetics With Composite Resin. Mahwah, NJ: Montage Media; 2004:21-37.

20. Versluis A, Douglas WH, Cross M, et al. Does an incremental filling technique reduce polymerization shrinkage stresses? J Dent Res. 1996; 75:871-878.

21. Hansen EK. Effect of cavity depth and application technique on marginal adaptation of resins in dental cavities. J Dent Res. 1986;65:1319-1321.

22. Dennison JB, Yaman P, Seir R, et al. Effect of variable light intensity on composite shrinkage. J Prosthet Dent. 2000;84:499-505.

23. Feilzer AJ, Dooren LH, de Gee AJ, et al. Influence of light intensity on polymerization shrinkage and integrity of restoration-cavity interface. Eur J Oral Sci. 1995;103:322-326.

24. Hall NR, Kafalias MC. Composite colour matching: the development and evaluation of a restorative colour matching system. Aust Prosthodont J. 1991;5:47-52.

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