Color Science and Shade Matching in Direct Composite Restorations: Case Report

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A 22-year-old male presents with an incisal edge fracture on tooth No. 9. This tooth had been previously repaired with a restorative composite (Vitalescence, Ultradent, South Jordan, UT) 7 years and 8 months prior. He is in no pain and the fracture appears to have been isolated to a cohesive separation from a traumatic occlusal event. There are no other signs of separation or leakage from the previously placed Class IV.

Due to the conservative nature of the fracture it was decided to repair the fracture with a direct composite restoration. Herculite Ultra was selected (Kerr) due to its hybrid structure and chameleon optical effects. A monolayering technique for simplicity was used and still yielded optimal esthetics (Figure 1 and Figure 2).[1-3]

Preparation, Bonding, and Layering

A custom shade guide using Herculite Ultra was placed in the visual plane of the tooth to be restored under color-corrected 5,500 K fluorescent bulbs (Figure 3). Fluorescent and indirect incandescent lighting conditions were used to establish a metamerism curve to help in selection of the restorative color. Two composite colors were selected to determine the optimal color choice (Figure 4). A 3-mm by 2-mm test strip A3 and A2, were placed 4 mm apart directly onto the tooth surface. The strips were light-cured and it was determined A2 would be utilized. The fracture was beveled 1.5 mm with a medium diamond (Brasseler USA, Savannah, GA) making sure any unsupported or failed composite was removed (Figure 5). The preparation's bevel line was finished in a non-linear pattern to reduce the chance for a visible line to appear during the finishing process. To reduce the chance for marginal leakage, a total-etch technique was used for 20 seconds using 35% phosphoric acid gel (Figure 6). The acid was rinsed with distilled water under pressure for 5 seconds and the excess water was evacuated under suction. The surface was dried under suction to reduce contamination for 15 seconds. All labial tissues were retracted to reduce the chance for moisture contamination. OptiBond FL (Kerr) was scrubbed into the preparation for 7 seconds making sure to reduce any ambient light to reduce premature polymerization. High-velocity vacuum was used to evacuate the excess bonding agent to an optimal film thickness for 5 seconds. The bonding agent was cured under LED curing polymerization for 20 seconds. The first layer of composite 1.5-mm in thickness is placed and cured for 20 seconds. It was determined that a second layer was necessary to overfill all voids and provide for excess composite to ensure that no oxygen-inhibited resin and unpolymerized composite would be present after shaping and polishing. The second layer was cured for 20 seconds. This step of overfilling and reducing is critical for long-term color stability. It is possible to use an oxygen-inhibiting material such as KY jelly (Johnson and Johnson, Langhorne, PA), DeOx (Ultradent) or another appropriate water-based glycerine lubricant but this filled to ideal technique allows little room for error during the color-matching and finishing process.

Finishing and Polishing

The removal of the oxygen-inhibited (unpolymerized) layer was achieved with a fine flame-shaped diamond NTI135014 (Axis Dental Corp, Coppell, TX) or 135F (Brasseler USA). This bur is used to define line angles and give initial surface texture to reveal the hue and translucency of the restoration. It is used to remove the bulk excess of composite and feather into existing tooth structure or restorative material. It was followed by the medium-coarse OptiDisc (Kerr) for finer shaping and to close the composite grain in preparation for the polishing phase (Figure 7). A Gloss plus HiLuster Plus polisher (Kerr) was used to finish followed by an Occlubrush (Kerr) or Jiffy brush (Ultradent). The Occlubrush is an intermediate stage polisher that is not used to shape but provides a luster that scatters light and provides a natural

(1.) Class IV fracture of tooth No. 9. **(2.)** Apical view of tooth No. 9 fracture. **(3.)** Custom composite shade guide used to select appropriate shade of composite.

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optical property found in natural teeth (Figure 8). This was followed up with a PoGo polisher to optimize surface light reflection. The PoGo also highly polishes the restoration and allows light to penetrate deeper into the restoration by reducing the surface scattering and reflecting of light, yielding a beautifully finished restoration that blends into the surrounding tooth structure. Occlusion was checked, adjusted, and polished (Figure 9 and Figure 10). Excursive and protrusive movements were also replicated to reduce the traumatic occlusal events that can load cycle a composite to premature failure and overcome the cohesive or adhesive properties of the restoration.[4]

References

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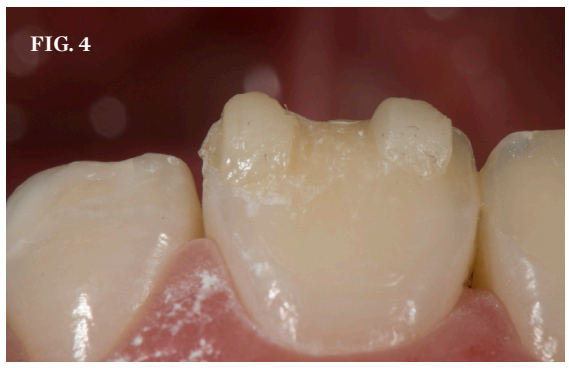
FIG. 4


FIG. 5


FIG. 6

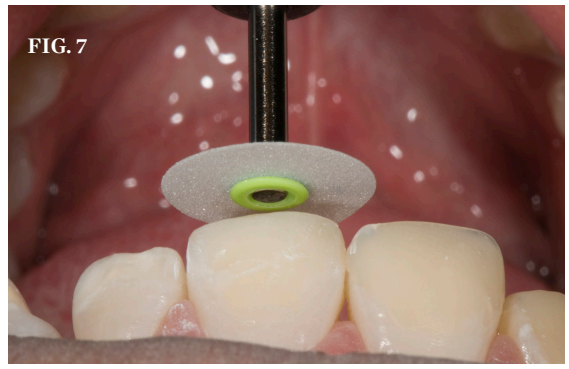
FIG. 7


FIG. 8


FIG. 9


FIG. 10

(4.) A2 and A3 composite test strips are placed to help determine the final composite shade to use. **(5.)** The tooth surface is prepared and beveled. **(6.)** Tooth is etched. **(7.)** A disk is used to shape and define the incisal edge and line angles. **(8.)** Polishing. **(9.)** Apical view of finished restoration. **(10.)** Completed restoration.