

## Minimally invasive dentistry and its impact on esthetic restorative dentistry

Wynn H. Okuda, DMD, FICD, FICOI

One of the goals of dentistry is to develop new approaches in restorative dentistry that will reduce the amount of tooth removal during treatment. With advances in material science and restorative techniques, we are able to attain these ideals and recreate nature with minimal removal of tooth structure. The latest developments in minimally invasive dentistry (MID) and its impact on esthetic restorative dentistry will be discussed (Fig. 1 and 2).

### Current advances in minimal intervention esthetics

The most conservative of all esthetic restorative procedures is one that involves no tooth removal at all. Minor blemishes on smooth surfaces of facial enamel can be an esthetic problem depending on the severity. From decalcification and enamel

mottling to congenital defects, interference in the formation of enamel and/or demineralization of the enamel matrix can result in an unaesthetic appearance of the smile and dentition.<sup>1</sup>

Normal enamel has the appearance of a lustrous surface that reflects light from the surface and subsurface. Along with that, different aspects of tooth structure will reflect, refract, and absorb wavelengths of light at different degrees. However the reflection and scattering of light from the surface and the subsurface should be relatively the same.<sup>2,3</sup> When this is the case, the enamel and the dentition will have a natural appearance. The appearance of the teeth is altered when there is a disturbance in the enamel matrix.

There are now several choices for correction of decalcified enamel and unaesthetic white spots. Enamel microabrasion

and remineralization techniques using Recaldent CPP-ACP (such as MI Paste and MI Paste Plus, GC America, Inc.) has proven to be a minimally invasive approach to corrections.<sup>4-6</sup> The developments in micro-invasive technology allows for minimally invasive treatment of these lesions (Fig. 3 and 4). In addition, for treatment of enamel decalcification and incipient decay—up to the first third of dentin—infiltration therapy can be used to reinforce demineralized areas through the capillary action of resin (such as Icon, DMG America).<sup>7-9</sup> This modality of treatment assists in restoring decalcified enamel. The infiltration of resin impregnates the voids left by the decalcification and aids in restoring the optical nature of the treated area resulting in a natural esthetic result, without any tooth removal.

For carious lesions that go beyond the



Fig. 1. Patient presents with missing restorations in central and lateral incisors.



Fig. 2. Composite resin restorations can exhibit great chameleon effect, color blending, and improved esthetics.



Fig. 3. Dentition affected by moderate decalcification of anterior teeth.



Fig. 4. Natural recalcification of dentition achieved.



Fig. 5. A failing composite restoration along the central incisor (tooth No. 8).



Fig. 6. Internal anatomy sculpted to create a natural characterization.

incipient stage, minimally invasive treatments are available for correction as well. Using the latest in composite resin technology, minimally invasive correction of Class I, II, III, IV, and V lesions is now attainable. In addition, with the latest generation of nanohybrid composite resin, long-lasting composite resin veneer restorations that mimic the strength and beauty of natural dentition can be attained.<sup>10</sup>

One of the challenges of esthetic dentistry is the creation of predictable color harmony between the restorative material and natural tooth structure. In natural dentition, different aspects of tooth structure will reflect, refract and absorb wavelengths of light at different degrees (such as enamel rods, dentinal tubules, dentin-enamel junction, etc.) Therefore, for an esthetic material to be successful, it must reflect, refract, and absorb light similar to tooth structure.<sup>11,12</sup>

When the composite resin is able to match the optical properties of the surrounding teeth, a chameleon effect is achieved that renders the restoration “invisible.” The latest nanohybrid composite resins (such as Kalore, GC

America, Inc.; Renamel Universal, Cosmedent; and Esthelite Sigma, Tokuyama Dental America, Inc.) achieve great success because the physical properties mimic the properties exhibited by natural dentition.

### Minimally invasive dentistry application

#### Case study

A 26-year-old male patient presented with a failing composite resin restoration on the central incisor (tooth No. 8) (Fig. 5). It was proposed to have a composite resin veneer restoration placed, using an MID approach.

There are several factors necessary to attain a successful composite resin restoration. Proper understanding of composite resin shade selection, and preparation design and sequence of composite resin layering are important in attaining an accurate blending of the composite resin to the existing tooth. A correct finishing and polishing technique is equally essential in obtaining optimal esthetic results.<sup>13,14</sup>

Shade selection is always done prior to start of treatment. This allows for the

proper shade layering sequence. Several composite resin shades were directly placed on the tooth to determine colors that would best match the adjacent teeth.

Total removal of the failing restoration and decay was performed. For minimally invasive purposes, a caries detector (Caries Detector, Kuraray America, Inc.) was used only to remove the infected caries. Minimally invasive burs (Micro Prep Kit, Komet USA, LLC) were used, as they are important to minimize tooth removal. A slight chamfer margin was created along the free gingival margin, so that optimal blending could be attained.

Prior to bonding and to restoring the tooth, the enamel was etched with 37% phosphoric acid (Select HV Etch, Bisco, Inc.). A dentinal adhesive (All Bond SE, Bisco, Inc.) was placed, blown thin for 10 seconds with compressed air, and light cured for 20 seconds. Using one of the latest generation of nanohybrid composite resins (Kalore) a sequence of composite resin layering was done to create a natural depth of shade that mimics the adjacent central incisor. To eliminate the shine-through of light, an opacous dentin shade



Fig. 7. Finishing with aluminum oxide discs and finishing burs.



Fig. 8. Using the correct principles of color selection, prep design, color layering, characterization, finishing, and polishing, esthetic success can be achieved with composite resin veneer restorations.

(A-02, Kalore) was placed in areas where dentin was lost. Then, using a freehand sculpt technique, universal shade A-1 was carefully sculpted over the opacous dentin shade, with an emphasis of placing internal anatomy to simulate natural dentition (Fig. 6). After placement of subtle characterizations with tints and color modifiers (Kolor + Plus, Kerr Corporation), a neutral translucency (Kalore NT) was used as the final layer.<sup>15,16</sup>

After final light curing, esthetic contours were refined using aluminum oxide finishing discs (Sof-Lex, 3M ESPE) and composite finishing burs (Q-Finishers, Komet USA, LLC) (Fig. 7). Finally, a micro-diamond polishing paste (Diamond Polish, Ultradent Products, Inc.) brought out the surface luster of the nanohybrid composite resin veneer. By using proper technique and state-of-the-art dental materials, natural color, contour, and finish were achieved (Fig. 8).

## Conclusion

In the development of MID, it is important to explore progressive ideas in order to preserve the natural dentition. With advances in innovative materials, new and improved clinical techniques are developed to elevate patient care. These tooth-conserving methods could replace traditional treatment as a new standard in restorative care. Using a creative approach to dentistry helps us provide our patients with new levels of excellence.

## Author information

Dr. Okuda is an international speaker on the topic of cosmetic dentistry and the founder of the *Okuda Educational Institute for Innovative Dentistry* in Honolulu, Hawaii, where he also has a private practice.

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## Manufacturers

Bisco, Inc., Schaumburg, IL  
800.247.3368, [www.bisco.inc.com](http://www.bisco.inc.com)

Cosmesdent, Chicago, IL  
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DMG America, Englewood, NJ  
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GC America, Inc., Alsip, IL  
800.323.7063, [www.gcamerica.com](http://www.gcamerica.com)

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