

# fundamentals of adhesion

## FINISHING AND POLISHING TOOTH-COLORED ADHESIVE RESTORATIONS: PART I

Douglas A. Terry, DDS\*

Finishing and polishing methods correlate regardless of the material: gemstones, wood, enamel, composite resin, or porcelain. A pleasing aesthetic outcome for any material requires a regimented protocol to produce optimal results. In restorative dentistry, this finishing and polishing process is dependent upon the abilities of the operator, the restorative material (ie, composite resin, porcelain), and the finishing and polishing devices. This process can influence the longevity of both the direct and indirect restoration by affecting wear resistance and marginal integrity.<sup>1,2</sup> A proper finishing and polishing process, however, will not improve the results for inadequacies in adhesive preparation design, improper restorative material selection, and deficient or inconsistent adhesive protocol.

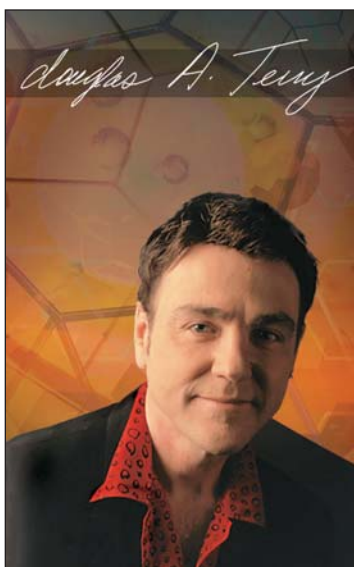
In general, finishing refers to the contouring, adjusting, shaping, and smoothing of the restoration to obtain desired anatomy, while polishing produces a smooth surface luster and highly light-reflective surface.<sup>3</sup> The technique for removal or trimming of composite resin or porcelain can be developed in three sequential steps: contouring, fine finishing, and polishing. Contouring involves the gross reduction of the composite or ceramic restoration to obtain the desired form and shape as determined by the parameters of function and aesthetic considerations.<sup>4</sup> Fine finishing comprises the delicate and precise finishing of the margins, removal of surface defects, scratches, and development of a smoother surface.<sup>5</sup> Polishing consists of reducing the roughness and scratches produced during the finishing procedure (Figures 1 through 3).<sup>3</sup>

The objective during the polishing procedure is to reduce the surface irregularities so that the distance between the scratches is less than the wavelength of visible light (ie, approximately  $0.5 \mu\text{m}$ ), which makes the surface as reflective as natural tooth enamel.<sup>6</sup> A surface appears smooth when its roughness is significantly less than  $1 \mu\text{m}$ .<sup>7</sup> These procedural steps should be performed

in sequence using abrasives in various types of devices. The principle is similar to metal polishing in which the sequence of abrasives progresses from the coarsest abrasive to the smoothest. The abrasiveness of one particle or material to another depends on its hardness.<sup>8</sup> Hardness has been defined as the resistance to permanent indentation or penetration.<sup>3</sup> In order for a finishing and polishing system to be effective, the cutting particles (ie, the abrasives) must be harder than the filler component of the restorative material.<sup>9</sup> Accordingly, the effectiveness of the finishing and polishing process depends upon the type of restorative material utilized.<sup>9</sup>

Various hand and rotary instruments and finishing and polishing devices utilizing assorted wet and dry techniques have been advocated by technicians and clinicians. A multitude of finishing and polishing devices (eg, carbide burs, finishing diamonds, abrasive discs, stones, and strips, resin points, and impregnated rubber or silicone discs, wheels, points, cups, polishing pastes) are available to the laboratory technician and restorative dentist<sup>3,5,10</sup> and fall within one of two categories—cutting instruments or abrasive finishing or polishing devices. While no statistically significant difference exists between finishing and polishing anterior and posterior restorative materials,<sup>11</sup> the consideration factors for finishing and polishing any restoration are dependent

on the instrument shape, surface shape and texture of tooth and restoration, surface of finishing and polishing instruments, and the sequence of the restorative treatment.<sup>11</sup> Successful finishing and polishing of any restoration is determined by the type of restorative material used and the shape of the finishing device and is defined by the surface morphology of the tooth and restoration. Since the geometry and shape of the natural teeth and these devices essentially remain the same, the only variable is the continual changes in the formulation of the restorative material.

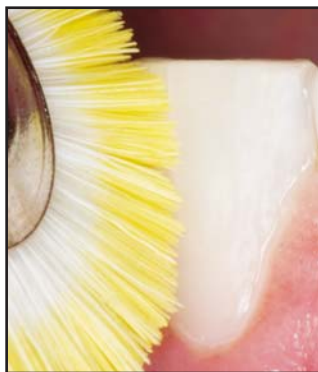




**Figure 1.** Contouring to obtain the desired form and shape is completed with a needle-shaped multifluted carbide cutting instrument.



**Figure 2.** Bonded abrasive silicone points can be utilized for fine finishing.



**Figure 3.** Loose abrasives and a goat hair wheel can be used to attain a high surface luster.

Restorative materials of the past (eg, amalgam, gold) required finishing and polishing procedures to refine anatomical morphology, contours, marginal integrity, and occlusion, while enhancing the surface smoothness of the restorations. The objectives of finishing and polishing techniques of tooth-colored adhesive restorations are the same today, except the development of adhesive materials has introduced a new element to the restorative equation: aesthetics.

An optimally finished aesthetic adhesive restoration should provide a smooth surface that will prevent plaque accumulation and resist stain.<sup>10</sup> It should also possess ideal contours and emergence profile for improved tissue compatibility.<sup>10</sup> Additional benefits of a proper finish are anatomical form for occlusal harmony, shade coordination to surrounding dentition, symmetrical surface texture to adjacent or opposing natural teeth, improved marginal adaptation and integrity, longevity, and aesthetics.<sup>10</sup> Aside from the actual finishing and polishing, the long-term restorative maintenance of the surface polish becomes the operator's final challenge. An understanding by the restorative team of the importance of utilizing proper finishing devices, polishing techniques, and protective surface glazes at the maintenance visit may provide the benefit of increased longevity of the restoration.

## Conclusion

While dental restorations from the "past to the present" have shared a common interest of function and longevity, the clinician must now also possess an understanding of aesthetics. With the improved formulations of composite and porcelain restorative materials, finishing instruments and techniques become a reflection of the knowledge and expertise of the clinician. Part II of this discussion will describe the finishing and polishing process for the single variable—tooth-colored restorative materials.

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**\*Assistant Professor, Department of Restorative Dentistry and Biomaterials, University of Texas Health Science Center Dental Branch, Houston, TX; Faculty Member, University of California Center for Esthetic Dentistry, Los Angeles, CA; private practice, Houston, TX.**