For the creation of natural porcelain-fused-to-metal restorations that will satisfy the highest aesthetic expectations, information must be accurately conveyed from the clinician to the dental technician. Although detailed tooth shade and shape are typically emphasized in each case, the unique elements and characteristics of a restoration’s surface texture and luster are often misinterpreted and improperly determined. Even worse, this information is often completely neglected by the restorative team during either initial communications or final stages of completion. Properly applied texture and luster provide the patient with an ideal perception of a restoration’s “realness” through both sight and feel. Indeed, this subtle detail can be used to confirm the entire oral personality of the patient. After all, an apple with the skin of an orange would not look quite so appealing, particularly among other shiny, smooth-skinned apples (Figure 1).

Matching Adjacent Teeth

Heavily textured and matte teeth are more commonly present in younger dentition, in contrast to the smooth and shiny teeth of older patients. Unfortunately, clinicians cannot always abide by these tendencies when determining the proper tooth/texture/luster relationship. While a patient’s age can certainly be a determining factor in this important relationship, tooth-to-tooth position and tooth-to-tissue position must be equally considered (Figure 2). In the following case, the maxillary lateral incisor remains heavily textured due to the pronounced anterior position of the central incisor and the resulting limited contact with the lip. Through misalignment, it remains protected from the wear and abrasion more visibly present on the central incisor. One can visualize and compare surface effects by rubbing articulating paper against the surface of both the stone model and the adjacent ceramic restoration (Figure 3). Important details such as groove position, direction, and depth can then be modified with various grinding and finishing instrumentation and polished accordingly.

It is extremely important to mimic the texture of adjacent teeth that are equally or uniformly positioned against gingival tissue. Both the quantity and quality of internally refracted light and surface-reflected light must be controlled and maintained to achieve maximum aesthetic results and ideal harmony. While it is possible for the technician to alter surface texture and luster by increasing the temperature of the ceramic firing equipment, desirable surface details and effects are often diminished, and the quintessence of the optical properties may be completely eliminated through excessive use of this technique. One of the distinct advantages of mechanical polishing...
of ceramic material is that it provides the operator with the ultimate control over the specific areas that should be polished, as well as the degree of texture and luster within these given regions. Information regarding color (i.e., value, hue, and chroma), as well as the texture and brilliance of the surrounding natural teeth (teeth #9, #10, and #11) and their relationship to tissue is clearly evident (Figure 4).

The Technician’s Responsibility

The initial responsibility of providing natural aesthetics for a restoration lies with the laboratory technician, who must have a complete understanding of tooth morphology, color, and the related effects of tooth position. Additionally, since every material requires its own unique guidelines to ensure optimum results, in-depth knowledge of the ceramic material is requisite to all application and finishing techniques. Generally speaking, even when the correct ceramic application protocols for shade and shape have been followed, a restoration cannot “become a tooth” without proper texture and luster. In fact, many inadequacies in both shade and shape can be overcome by the correct recreation of tooth surface. The photographs in this article provide an overview of these critical elements of surface detail.

Following the completion of the glazing process, a progressive, detailed polishing technique can be used to finalize the restoration (Figure 5). By achieving the desired surface texture, the operator can also increase the degree of brilliance on the more prominent line angles and heights of contour. These areas of the restoration typically have the most contact with the lips and/or cheeks during mastication. The fluorapatite-leucite ceramic restorations (IPS d.SIGN®, Ivoclar, Amherst, NY) are polished on the master model (Figure 6). The occlusal surfaces are also polished (Figure 7) according to the predetermined case requirements.

Intraorally, IPS d.SIGN restorations demonstrate the desired harmony (appropriate color, contour, position, and ideal texture and brilliance) with the natural teeth. For posterior restorations, although ideal contour is reproduced during the fabrication stage using brushing techniques, surface texture and luster can be highlighted with appropriate abrasives to achieve a natural appearance (Figure 8).

Chairside Responsibilities

Quite frequently, contact points and/or occlusion may require some degree of adjustment during the seating appointment. The clinician’s ability to properly re-establish ideal surface texture and luster through standard chairside finishing and polishing techniques may be limited by one or more factors.
Type of Ceramic Material Used During Laboratory Fabrication

Science dictates that the clinical properties of feldspathic ceramic materials are less favorable than the new generation fluorapatite-leucite glass-ceramic system, IPS d.SIGN. This new material offers more ideal abrasion and wear rates relative to tooth enamel, and it is easier to polish and/or repolish in the laboratory and chairside. It is important to note that every restorative material has its own unique requirements for glazing, polishing, and/or repolishing. The mandibular posterior teeth in Figure 9 were fabricated with conventional feldspathic ceramic. Though the result was acceptable, an obvious surface difference can be detected by the technician, clinician, and patient when compared to the new generation fluorapatite-leucite ceramic (IPS d.SIGN) demonstrated on the opposing maxillary dentition (Figure 9).

Degree of Necessary Adjustment

Heavy, more aggressive adjustment may indicate the need for more progressive and incremental repolishing steps with coarse then fine abrasives. It may additionally require specialized techniques, materials, or equipment, again, depending on the restorative material being used. All-ceramic inlays (IPS d.SIGN) (Figure 10) are placed on teeth #2 and #3. Since adhesively bonded restorations can be adjusted only following bonding, particular attention should be placed on the selection criteria for a restorative material that will support occasional aggressive intraoral polishing techniques. In this case, a detailed all-ceramic finishing system (Figures 11 and 12), with progressive and consecutive polishing steps specifically designed for this purpose, was used to restore the adjusted occlusal areas to the proper texture and luster and resulted in aesthetic and functional restorations (Figure 13).

Chairtime vs. Laboratory Time

As a matter of office economics, it may be prudent to reschedule the patient and request that the laboratory perform the necessary repolishing of the restorations, particularly if shade considerations or alterations become a concern.

Long-term Wear and Reliability

Incorporating and maintaining proper surface texture and luster can be critical for determining a restoration’s long-term wear and reliability. Over 30 years of detailed clinical evaluation offers clear evidence that improperly polished ceramic material, whether performed through laboratory technique or clinical procedure, can greatly increase the resulting abrasion and wear of opposing natural teeth. Underpolished ceramic will absorb higher levels of fluid and bacteria, potentially creating an unfavorable oral environment for the patient.
Furthermore, such increased absorption may compromise the longevity of the restoration due to the inherent weakening of the crystalline structure of the ceramic material.

The utilization of IPS d.SIGN glass-ceramic has demonstrated reduced wear and abrasion resistance in comparison to conventional feldspathic materials. This method provides clinicians with an immediate advantage in the restorative and rehabilitative process.

Conclusion

Since the macrogeography of the ceramic surface plays a significant role in influencing overall aesthetic results, it must be maintained throughout the restorative process. Consideration must be made for tooth position and relationship to adjacent and opposing teeth and tissue, as well as the age of the patient and apparent age of the dentition. After the initial natural glaze bake, both the laboratory technician and the clinician can implement a variety of different techniques to adjust the surface texture and luster of the ceramic. Knowledge and understanding of the natural tooth determinants and the related restorative material science are of equal importance to both the resulting polishing techniques and the related supporting materials. The utilization of the IPS d.SIGN ceramic offers an aesthetic enamel-like material with a small grain size (better agglomeration), easier polishability, and wear comparable to natural tooth structure. These are valuable advantages in meeting the demands for ideal aesthetics and prolonged clinical observation and success.

Acknowledgment

The author mentions his gratitude to Dr. Sahrbeck of Prosthodontics Associates and his partners for their case work, and offers a special thanks to Dr. Wilfred B. Vachon, Jr, of Brunswick, Maine, for his invaluable friendship and for the exceptional case presentation demonstrated in Figure 13.

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