

Rediscovering the Artistic Beauty of Dentistry With Porcelain Veneers



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Dentistry is experiencing an aesthetic revolution. This revolution began late in the last century and continues to accelerate today. In 2004 Bacon's MediaSource reported that the average monthly circulation of print articles about cosmetic dentistry peaked at 40 million. This did not include broadcast media.¹ One aspect fueling this is the huge group of aging baby boomers who spend an increasing percentage of their disposable income on products, services, and procedures designed to ward off the aging process.

According to the *Wall Street Journal*, the US boomer population is currently about 77 million.² Being the demographic "pig in a python" bulge of affluent buyers of all sorts of things, boomers have been a favorite target for marketers. As the boomers have matured, marketers have evolved product offerings and messages to appeal to the time of life occupied

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by this lucrative market. Chief among these—and this is so obvious that no real market research is needed to tell marketers of the demand among boomers—are products for restoring youthful appearance, vitality, self-assurance, and health. The most prolific of these personal improvements is teeth whitening, which is noninvasive, promoted professionally and over-the-counter, and appeals to both men and women.

The American Academy of Cosmetic Dentistry recently commissioned the Levin Group to conduct a survey entitled "The State of Cosmetic Dentistry." The survey found that approximately 70% of those seeking elective dental makeovers are between the ages of 31 and 50.³ Throughout history, humanity has been preoccupied with beauty. While the definition of what beauty is varies over time and culture, attraction to the handsome face and figure is universal, with the face being the

most recognizable characteristic of the entire body. So it stands to reason that most media images we see each day focus on the beauty of the face, and this may be the reason that the current boom in plastic surgery concentrates on procedures to improve facial appearance.⁴

One of the hallmarks of beauty in today's American society is a bright, white smile. Many of us form a biased opinion of a person at first glance. Accordingly, the smile, particularly the anterior aesthetic zone, is what patients consider first when it comes to elective dental therapies. The drive for facial beauty has resulted in both disciplines—cosmetic dentistry and cosmetic surgery—becoming parallel parts of the aesthetic process. Delivering the best possible aesthetic outcome is often served by a team approach, as seen in all the popular makeover shows.

Given the above scenario, it is unrealistic for us as dental professionals to expect that patients will simply present themselves and ask for smile makeovers. We must create a brand identity for our cosmetic services. We must showcase our work via the Internet, brochures, before-and-after photo albums, digital imaging, etc. This helps educate current and potential patients as to what is possible with modern aesthetic dental procedures.

Patients who visit our offices each day expect dentistry to mimic nature. The barrage of images our patients see daily in various media have not only exposed them to aesthetic possibilities, but also have raised their expectations as to what they can achieve. Patients expect our work to enhance not only their smiles, but also their lives. These heightened expectations require that we continuously gain education. Only by keeping up with the evolving technologies and materials can we provide the level of dentistry our patients anticipate and deserve.

The following case study demonstrates what can be achieved with modern aesthetic materials and techniques.

CASE STUDY

The patient, a 49-year-old female, wanted to enhance the beauty of her smile with aesthetic dentistry. She was in excellent health and was referred to me by her personal trainer, who was also a patient of record. The patient was first seen for a comprehensive dental examination that included her medical history, digital radiographs, periodontal assess-



Figure 1. Full-face, head to chin 1:10 magnification.



Figure 2. Frontal 1:2 magnification.

ment, TMJ evaluation with Doppler auscultation, 12 AACD digital images,⁵ face-bow transfer, diagnostic study models mounted on a semiadjustable articulator, CR bite registration, stick-bite record, shade analysis, and a simulated digital makeover. This initial comprehensive examination is an essential baseline and guide through the course of treatment.

The patient expressed that she had previously consulted an orthodontist, but she declined to proceed with the recommended orthodontic treatment plan because it would not be completed for her upcoming 50th birthday. The patient was also under the care of a periodontist, who cleared her for treatment. As with all comprehensive cases in my practice, I told her that I must study results of her comprehensive work-up prior to treatment in order to propose a proper, individualized treatment plan. I also consult with my dental laboratory for recommendations for the best aesthetic material for long-term outcomes in each case. This requires the lab to fabricate

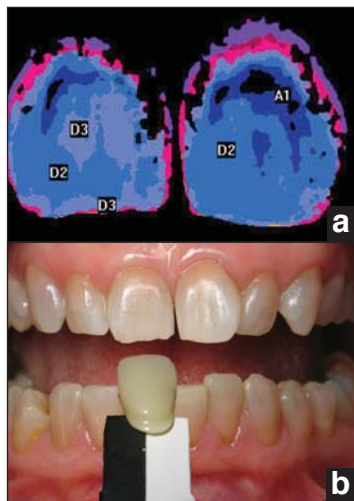
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Figure 3. Diagnostic wax-up.



Figures 4a and 4b. Note multiple enamel shades between incisal, mid, and cervical levels using the ClearMatch Software.



Figure 5. Occlusal view of preparations.



Figure 6a. Frontal view on model.



Figure 6b. Frontal view intraoral.

diagnostic wax-ups of the proposed treatment. Figure 1 shows the patient's full smile at initial presentation to my office.

Her aesthetic zone revealed excessive wear, a

bluish-grey discoloration from systemic tetracycline she received as a child, and malaligned anterior teeth (Figure 2). Teeth Nos. 7 and 10 were lingual as compared to the other anterior teeth; tooth No. 10 actually appeared to be missing when one viewed her from a lateral profile. She had negative buccal corridor space, which took away from the depth of her overall smile. The full facial image seen in Figure 1 shows the lack of confidence the patient had in expressing a full smile.

The malposition of the incisal edges was such that it caused the formation of labial tubercles on the inner wall of her lower lip, as seen in Figure 2. Tubercles result from repeated contacts with these edges, which stimulate excessive tissue formation. The incisal plane did not coincide with the interpupillary line.

The initial Rotofix face-bow transfer was performed, and casts were mounted on an Artex articulator (Jensen Industries). The face-bow relates the maxillary cast to the same axis on the articulator that is present in the skull, while the ear-bow aids in locating the condylar axis. The stick-bite record helps verify any shift in the face-bow that could result from lateral auditory meatus discrepancies. If these discrepancies occur when taking the face-bow, the intercondylar axis could result in significant change in the functional and aesthetic planes of occlusion.⁶ The stick-bite also allows the ceramist to have a visual of the incisal edge position as it relates to the interpupillary line.

The incisal edges of the anterior teeth should be parallel to the interpupillary line and perpendicular to the facial midline. The patient's chin must be parallel to the horizon; use of a miniature level gauge for correct alignment helps avoid a skewed incisal plane, which can result from skeletal issues and could result in a canted smile that would be unaesthetic. If the patient's head is incorrectly postured, it may result in the ceramist positioning the incisal edges incorrectly. Digital images of the stick-bite allow the ceramist to view the

position of the interpupillary/incisal edge position.

Once these were obtained, stone models were properly poured and trimmed for mounting on the articulator. The 12 preoperative digital images were burned onto a CD-ROM and sent to the lab along with preoperative shade analysis. The CD-ROM lets the lab view the images on its computer screens. This provides better viewing clarity compared with hardcopy prints that can skew color, resulting in the delivered veneers having unrealistic shades.

The patient was shown several tooth reference guides to provide the dentist and the lab her expectations. In our practice we try to shy away from tooth guides that show full facial images, as most patients choose the most beautiful face rather than the most beautiful smile. We also analyze the patient's facial form: is it square, ovoid, tapering, or square tapering? This helps in consulting with the patient to arrive at a sound choice among different tooth forms that will be in harmony with her face. Recently, a new software called the Interactive Smile Style Guide (iSSG; Digident.com), co-developed by Drs. Lorin Berland and David L. Traub, has allowed both the dentist and patient to digitally evaluate different tooth shapes and lengths of the anterior teeth interactively on a computer monitor rather than thumbing through a catalog.

We also provide our lab a computerized simulation of the before-and-after full face and smile. We perform this in our office using Dicom Imaging software (Kodak), or one can outsource digitized images to companies such as SmilePix or Smile-Vision. Studies have found that the computerized simulation can be the most influential determining factor in having the patient understand and accept treatment.⁷ We provided our ceramist with all of the above details so the patient's expectations could be relayed back to us via the diagnostic wax-up (Figure 3).

Diagnostics provided to the laboratory for fabrication of the wax-up included the following:

- face-bow mounted diag-

nostic stone models

- CR bite/stick-bite record
- preoperative images of teeth 1:1 and 1:2 at different angles (retracted and unretracted)

- preoperative images of teeth 1:1 and 1:2 with shade guide (retracted and unretracted)

- full image of face for evaluation of facial form

- image with patient's smile in repose, head to chin

- image of patient with full smile, head to chin

- smile design handbook name and shape chosen by patient

- detailed notes expressing a harmonious, proportionate smile that fits the face

- computerized cosmetic simulation.

The laboratory returned to us the mounted diagnostic wax-up with stents that would help us with the preparation of the case.

To help visualize the amount of reduction necessary, a buccal and incisal edge reduction guide was returned for each arch to be treated. These were formed using Sil-Tech putty (Ivoclar Vivadent), an extra hard condensation silicone that resists handling deformation. A full-arch putty stent was fabricated from this same diagnostic wax-up and relined with polyvinyl siloxane impression material so that in-office temporaries could be easily fabricated. Often I will place Luxatemp (Zenith/DMG) temporary material into the stent and immediately seat it onto the unprepared teeth. The material will lock onto the teeth, allowing me to visualize how the patient appears, where definitive changes are necessary, how the incisal edges relate to the lower lip line, if the midline is correctly placed, and if there are any canting issues. This also provides the patient with a "mock-up preview" of the proposed treatment. Luxatemp is a syringable bis-acrylic temporary material. Alternatively, I could use the free-hand application of flowable composite without a bonding agent to attain a similar result, though this takes more time than using Luxatemp.

Treatment commenced once the patient understood



Figure 7a. Right lateral view on model.



Figure 7b. Right lateral view intraoral.



Figure 8a. Left lateral view on model.



Figure 8b. Left lateral view intraoral.



Figure 9. Occlusal view.



Figure 10. Final seating, occlusal view.

and accepted the proposed treatment plan. Since the patient had intrinsic tetracycline discoloration and apparent multiple shades, pre-bleaching the teeth using a 1-hour, in-office procedure was followed by a 1-week, tray-based, take-home regime. As can be seen in Figures 4a and 4b, I used the ClearMatch Shade Analysis and Lab Communication system (Clarity Dental Corporation) to help

in the analysis and determination of the original shades of the anterior teeth. My bleach of choice was Gentle-White from Innovative Medical & Dental Solutions (gentlewhite.com). Gentle-White has a proprietary chemistry called Extracted Aqueous Barrier that stops sensitivity virtually at its source. Any sensitivity at this stage could affect patient compliance with the rest of my treatment sequence.

This initial bleaching allowed me to brighten the smile a bit and allow for a more uniform, even color for my ceramist, so that I would not have to use colored resin cements to modify the shade of the porcelain veneers. From my experience, color is best controlled in the lab. Although many excellent porcelain systems are on the market, my choice for this case was IPS Empress (Ivoclar Vivadent). Empress is a leucite-reinforced pressable glass ceramic with a long, successful track record. It provides excellent fit, translucency, and vitality.⁸ Studies have also demonstrated strengths between 160 to 180 MPa.⁹

The lab supplied me with a preparation guide and a clear matrix. This allowed me to visualize if I had removed enough tooth structure for fabrication of the porcelain restorations. Because of the severe anterior buccal flare and severe discoloration, I knew that I would have to reduce more tooth structure than I normally would. If her teeth were in perfect alignment, then LUMINEERS (DenMat) with their shade modification kit would have been a choice.

Figure 5 shows the occlusal view of the completed preparations with retraction cords in place prior to impressing. Although the patient only wanted to address the anterior 6 teeth (Nos. 6 to 11), I told her that the aesthetic result would be compromised. When I provided the wax-ups and simulation, I included the 2 bicuspids on either side to show the patient how aesthetically enhanced her smile would be. She still insisted on only 6 teeth being treated. When I fabricated the temporaries

via the indirect method (rather than the shrink-to-fit technique) she realized how aesthetically appealing her overall smile now appeared.

The choice of which method to use for temporization is purely a matter of professional preference. I find it easier to indirectly fabricate the temporaries; I have more control in opening up the proximal areas for better hygiene compliance and to remove, adjust, and discuss changes with the patient while placing and replacing the temporary each time. Seating the temporaries began with spot-etching. Each individual tooth was spot-etched with 35% phosphoric acid to allow for a bit more retention, then the teeth were coated with a desensitizing agent (AcquaSeal [AcquaMed Technologies]). AcquaSeal contains HEMA, which helps seal open dentinal tubules, and contains fluoride and benzalkonium chloride, which acts as an antimicrobial agent. Once this material was air-dried, a flowable composite (Revolution Formula 2 [Kerr]) was lightly flowed within the intaglio surface of the temporary. Since bis-acrylic materials are partly composite and partly resin, the flowable composite binds to the temporary itself and strengthens it. Only where the teeth have been slightly etched does the temporary/flowable combination actually adhere. When the patient returns for final seating of the definitive restorations, the temporaries and cured flowable material are removed with little if any flowable material adhered to the teeth.

The occlusion was adjusted, proximal areas were cleared of any composite flash, aesthetic contours were evaluated, and the temporaries were polished and glazed with a surface sealant (Dura-Finish [Parkell]). The patient was now given time to evaluate the form and function of her new smile. The temporaries provided a way for her to communicate to me her likes and/or dislikes. The patient and I could also preview the dimensions of her new smile within the full facial frame and evaluate the golden proportion theorem,

which we had previously relayed to the ceramist. Speech patterns, incisal exposure, and anterior guidance are noted and the patient can express any desired changes.

Once the temporaries were approved, which may require a few days to a few weeks of wear, alginate impressions were taken and sent to the laboratory with digital images of the stump shades and temporaries in place. Detailed lab notes such as color mapping, surface texture, morphology, characterizations, opacity, translucency, and final, desired shade of porcelain were all communicated to the ceramist.

The final, pre-etched restorations were returned from the lab and evaluated with try-in pastes. Digital images of the final restorations on the model prior to placement are shown in Figures 6a and 6b through 8a and 8b, and clearly reveal a beautiful incisal translucency and natural surface texture in the completed restorations.

The occlusal view of the restorations shows how the arch was instantly corrected, both on the model (Figure 9) and immediately on seating, following sound adhesive protocols (Figure 10).

Unretracted side views show the beauty of the restorations and the correction of the previous labial flare (Figures 11 and 12). Figures 13 and 14 show the unretracted lateral views of the veneers within the patient's new and enhanced smile.

The incisal edges follow the lower lip line, while the gingival line follows the upper lip line. Note the retracted view of the completed case 2 weeks post insertion, with excellent gingival tissue response (Figure 15). The visible widths of the centrals, laterals, and canines are in a golden proportion when viewed from the midline.

Figure 16 shows the completed, full facial expression of the balanced, harmonious smile.

CONCLUSION

By using advanced cosmetic procedures, cutting-edge technologies, and mathematical proportions of harmony and balance, one can rediscover the artistic beauty of den-

tistry using porcelain veneers. Along with proper communication and preparation, the expectations of the patient are not only met, but can even be exceeded. Revitalizing a person's smile not only enhances the patient's outer appearance but also improves self-esteem and confidence, bringing out the inner beauty that may have been previously concealed. ♦

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Figure 11. Right side view.



Figure 12. Left side view.



Figure 13. Right lateral view.



Figure 14. Left lateral view.



Figure 15. Full, completed case, retracted view.



Figure 16. Completed case, full facial view.