

Enhancing Smiles With Metal-Free Restorations: A Combination Approach



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With greater public awareness about smile enhancements, dentists are often challenged with greater demands from patients. Not only has this increased demand for esthetic restorative treatment challenged dentists, but also the laboratory technicians and dental manufacturers to develop techniques and materials to satisfy discerning patients. Using modern materials and following principles of smile design, the restorative team can succeed in restoring a smile to proper form, function, and health. The case presented demonstrates the significance of smile design and material selection in the esthetic zone.

Case Presentation

A woman presented to the practice dissatisfied with the overall appearance of her smile (Figure 1). She commented that she felt that her teeth and existing restorations were unattractive because of size, shape, and color (Figure 2); she desired better uniformity of her entire smile.

Initial diagnostic evaluation consisted of a series of digital images with study casts, a centric relation bite record, and a facebow transfer. The patient had some amalgam restorations present on her maxillary posterior teeth and multiple restorations present on her mandibular posterior teeth. She mentioned that she had undergone maxillo-facial surgery and orthodontics 10 years before to align her jaw and straighten her teeth; however, she was still displeased with the appearance of her smile (Figure 3).

Overall vitality and translucency appeared to be compromised with some of her teeth. After reviewing her full-mouth radiographs, she was referred to the endodontist for tooth No. 6 and teeth Nos. 10 through 13 as a result of necrosis. The endodontist was able to treat Nos. 6, 10, 11, and 12 with root canal therapy; however, tooth No. 13 was nonrestorable as a result of internal resorption. The patient was instructed to see an oral surgeon immediately for extraction of tooth No. 13.

A smile guide book was used to complete the smile analysis necessary

for predesigning the case. The size and shape of the patient's maxillary anterior teeth were too short, flat, and square. The patient preferred a softer more feminine look to complete her smile. To achieve this, the shape selected would be rounder, and the embrasures between the teeth would be larger. Lip line edge vs the incisal edge of the teeth suggested that the patient could tolerate lengthening of the incisal edges.¹ Because the patient's complaint was extreme dissatisfaction with the appearance of her smile and the previously placed restorations, she decided to restore both her maxillary and mandibular dentition.

Planning

To develop a treatment plan and determine if the vertical dimension could be increased, a diagnostic wax-up was fabricated (Figure 4). Based on information gathered from the initial consult, it was determined that the maxillary centrals could be lengthened by 1.2 mm to improve esthetics. The canines also would be lengthened to restore canine guidance in lateral excursions. With regard to her lower anterior teeth, the goal was to correct the length-to-width ratio and create a more rounded tooth shape.

As a result of the information gathered from the diagnostic wax-up, it was determined that esthetics



Figure 1—Preoperative smile view.



Figure 2—Preoperative retracted view, closed bite.



Figure 3—Preoperative retracted view, opened bite.



Figure 4—Diagnostic wax-up.



Figure 5—Sil-Tech impressions, preparation guides, and stone models used for fabricating the temporaries.

and function could be enhanced by restoring the entire dentition. The final treatment plan would consist of porcelain veneers (Ceramco 3, Dentsply Ceramco, teeth Nos. 3 through 11 and Nos. 22 through 27), all-porcelain Lava crowns (teeth Nos. 18 through 21 and Nos. 28 through 31); and a Lava bridge (teeth Nos. 12 through 14). The Lava all-ceramic system (3M ESPE) uses a computer-aided design/computer-aided manufacturing (CAD/CAM) procedure for the fabrication of all-ceramic crowns and bridges for anterior and posterior applications. The ceramic framework consists of zirconia supplemented by overlay porcelain (Lava Ceram, 3M ESPE). The zirconia can be colored in 7 different shades. The frameworks are fabricated using CAD/CAM techniques for presintered zirconia blanks. The milled framework, whose size has been

increased to compensate for the shrinkage during sintering, is sintered in a special high-temperature furnace resulting in a high-strength restoration with excellent fit.²

Preparation

When informed consent was obtained from the patient, treatment was initiated. After anesthetic was administered, all teeth requiring build up were properly cleared of old alloy and any decay using a Midwest MultiPrep Carbide Bur (Dentsply Professional). A seventh generation bonding agent (All-in-One, Kerr Corporation) was applied following the manufacturer's protocol and was cured. Using flowable composite followed by a packable composite (Premise, Kerr Corporation), the build-ups were accomplished on teeth Nos. 18 through 21, 29, 30,

and 31. Access openings created by the endodontist for root canal treatment were also filled with composite. The teeth were prepared sequentially starting from the anterior maxillary and mandibular segments to the posterior right and posterior left segments, so that a bite would be captured at each portion.

Because of the severe staining in some of the patient's natural teeth, it was essential to place the margins slightly subgingival.^{3,4} Using Expasyl, (Kerr Corporation) hemorrhaging was controlled and slight gingival retraction was achieved. Because the patient had a sensitive gag reflex, a quick-setting impression material was selected (Aquasil Ultra, Dentsply Caulk) to take the full-arch impressions. Because she had severe darkening in the endodontically treated teeth (Nos. 6, 10, 11, and 12), a stump shade was selected using the Chromascop shade guide (Ivoclar Vivadent) for each tooth to assist the laboratory technician in creating natural-looking restorations.^{5,6}

Provisionalization

A provisional restoration that would aid in determining the best size, shape, color, and position was made



Figure 6—Maxillary restorations.



Figure 7—Mandibular restorations.



Figure 8—Prepared teeth with retention grooves.



Figure 9—Postoperative retracted view, closed bite.



Figure 10—Postoperative retracted view, open bite.



Figure 11—Postoperative smile view.

from a Sil-Tech impression (Ivoclar Vivadent) of the diagnostic wax-up (Figure 5). Using Protemp 3 Garant temporary material (3M ESPE), this mold was quickly filled and placed on the patient's prepared dentition. Final trimming of the margins was accomplished with Midwest diamond burs (Dentsply Professional). The provisional restorations were seated with TempBond Clear (Kerr Corporation) and glazed with a liquid polish (Lasting Touch, Dentsply Caulk). Within minutes, the temporary was fabricated and the patient was released with her new smile.

The next day, the patient returned for evaluation of esthetics, phonetics, and bite. The patient already exhibited excitement and confidence with her provisional restorations. Information was recorded and the patient was advised to rinse with Oris chlorhexidine gluconate

rinse (Dentsply Professional) to keep her gingival tissues healthy.

Laboratory Considerations

Color photographs and diagnostic data were obtained and forwarded to the laboratory for the fabrication of the final restorations. During the laboratory phase, the full-arch vinyl polysiloxane impression material (Aquadil Ultra) was used to create a master model on which the restorations would be based. After the dental laboratory sectioned the dies on the model, the milling center digitalized the model using the Lava Scan ST optical scanner (3M ESPE) for any Lava restorations. Lava Scan ST consists of a noncontact optical scan system, a PC with a monitor, and the Lava CAD Windows-based software, which displays the model as a 3-dimensional object. The restorations were virtually designed using a special software program and

the data was sent to Lava Form (3M ESPE). The restorations were then milled from a presintered zirconia blank that was colored to a frame dyeing liquid shade of FS1, which corresponded to a B1 Vita shade. They were then sintered to final density in the furnace. The milling center returned the finished framework to the laboratory, which then veneered the framework with Lava Ceram and gave it the final artistic finish (Figures 6 and 7).

Cementation

Before try-in of the definitive restorations to verify fit and shade, the provisional restorations were removed sequentially starting from the maxillary anterior region. Any remaining cement was cleaned off the prepared teeth and bleeding from the gingival tissues was controlled with Expasyl paste. Horizontal grooves were placed in the facial surface of the maxillary anterior preparations to aid in retention and create a greater

masking effect of the discolored teeth (Figure 8).⁷

After the patient was shown the retracted view for acceptance, the cementation process was initiated. The porcelain veneer restorations were treated with phosphoric acid (37%) for 20 seconds, rinsed, and silanated with a porcelain primer (Silane Primer, Kerr Corporation). The prepared dentition was cleaned with chlorhexidine 2% (Consepsis, Ultradent Products Inc) for 15 seconds and rinsed to remove any contamination during the temporary phase. The preparations were treated with All-in-One according to the manufacturers' protocol. The adhesive was cured for 10 seconds per tooth with an L.E. Demetron II curing light (Kerr Corporation).

Nexus 3 resin cement (Kerr Corporation) was applied to the inner surface of the restorations. The restorations were then placed on the preparations, and while the restorations were held firmly in place, a rubber tip applicator was used to remove all excess luting cement from the margins. A thin layer of glycerin was then applied to the margins to prevent the formation of an oxygen-inhibiting layer.⁸ The restorations were tacked at the gingival margin.

While the restorations were still firmly held in place, the restored dentition was flossed and any excess luting cement was carefully removed. When most of the excess cement was removed, the restored dentition was light-cured from both facial and lingual sides. Any residual cement was removed with a No. 15 scalpel or finished with a fine diamond and polishing points. The posterior Lava crown and bridge restorations were seated with RelyX Luting Plus cement (3M ESPE).

When the resin-modified glass

ionomer cement was set, the occlusion was verified and adjusted. The overall health and structure of the soft tissue and restorations was very good (Figures 9 and 10). The patient was extremely satisfied with the definitive results (Figure 11).

Conclusion

If the challenges of cases such as this are carefully diagnosed and analyzed, and a treatment plan is designed, they can be addressed successfully, even with the esthetic demands of today's society. The key to the process is understanding what the patient demands and knowing the most appropriate, durable, and predictable restorative materials to facilitate the case. All patients deserve to feel understood and to get what they want. By following certain guidelines in smile analysis, material selection, and laboratory instruction, the dental provider can exceed any esthetic challenge. ©

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Product References

Product: Ceramco 3
Company: Dentsply Ceramco
Location: Burlington, New Jersey
Phone: 800.487.0100
Web site: www.ceramco.com

Products: Lava crowns, Lava bridge, Protemp 3 Garant, Lava Scan ST, Lava Form, Lava Ceram, RelyX Luting Plus
Company: 3M ESPE
Location: St. Paul, Minnesota
Phone: 800.634.2249
Web site: www.3mespe.com

Products: Midwest MultiPrep Carbide Bur, Midwest diamond burs, Oris
Company: Dentsply Professional
Location: York, Pennsylvania
Phone: 800.989.8825
Web site: www.prevent.dentsply.com

Product: Aquasil Ultra, Lasting Touch
Company: Dentsply Caulk
Location: Milford, Delaware
Phone: 800.532.2855
Web site: www.caulk.com

Products: All-in-One, Premise, Expasyl, TempBond Clear, Silane Primer, L.E. Demetron II, Nexus 3
Company: Kerr Corporation
Location: Orange, California
Phone: 800.537.7123
Web site: www.kerrdental.com

Products: Chromascop shade guide, Sil-Tech
Company: Ivoclar Vivadent
Location: Amherst, New York
Phone: 800.533.6825
Web site: www.ivoclarvivadent.us

Product: Consepsis
Company: Ultradent Products Inc
Location: South Jordan, Utah
Phone: 888.230.1420
Web site: www.ultradent.com

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