Full-Mouth Reconstruction With Increased Vertical Dimension

Case Report

Dr. Larry Rowland, DDS

Everything is continually changing and evolving in cosmetic dentistry. Materials and techniques seem to change every few months. And that's not all. Cosmetic imaging, digital photography, and interpretation are keeping pace, further improving quality of care and communication between patients, dentists, and laboratories. We are even marketing our services through the Internet with websites and search engines.

The following case surely illustrates the influence of these changes and advances. A young woman made an appointment for a consultation. Like me, she worked in downtown Dallas, Texas. However, she did not find me from word-of-mouth, brochures, media, or the yellow page. She found me on the Internet. What's most interesting here is that I first got a website in February 1999; however, I didn't start seeing Internet referrals until I signed on with DentalDocShop in September 1999 (Figure 1). Now, almost every week I see at least one quality patient looking for elective dentistry who found me on the Internet. After selecting my practice and exploring my website (www.DallasDentalSpa.com), these patients know as much more about me before we ever even meet.

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This young lady did need some cosmetic work, so we imaged her using our in-office digital imaging system. Cosmetic imaging has always been an important tool in helping patients accept treatment for cosmetic cases, and has proven even more effective because I've switched to an in-office system. By using Digital Dentist professional image editing software combined with the Lorin Library of tooth design (www.digitdent.com), you can produce realistic simulations of dental treatment quickly and easily. The Lorin Library Studio Selection Workbook consists of aesthetic combinations of the three major shapes of the anterior teeth in

Figure 1. DentalDocShop search engine.

Figure 2. Pre-op frontal view showing collapsed occlusal vertical dimension with incisal edges of teeth almost touching.

Figure 3. Cosmetic image.

Figure 4. Pre-op retracted frontal showing of anterior and posterior occlusal relationships.

Figure 5. Pre-op showing maintenance of previously restored posterior teeth causing loss of right canine guidance.

Figure 6. Pre-op palatal view of maxillary arch showing inclined anterior teeth and contacts on posterior teeth.

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Figure 7. Pre-op frontal view showing crowding of maxillary teeth.

Figure 8. Close-up of anterior.

Figure 9. Tooth count on maxillary arches.

Figure 10. Preparation guide used to ensure adequate clearances.

Figure 11. Maxillary and mandibular anterior temporaries in place.

Figure 12. Provisional splint (quick up-cement) into in-office artist in temporaries.

form 10 different smile types for the doctor and the patient to view and select. Each of these smiles also has profile views, so the patient can verify that they like the chosen smile from the side. It can even be personalized with the individual doctor or lab name. The Lorin Library contains individual mini-images of different shapes of teeth that can be "dragged" and placed into the patient's digital photo to simulate porcelain veneers or crowns. After selecting the desired smile type, the imager can design the smile on the patient's digital image tooth-by-tooth. By using this imaging system, I maintain complete control over the smile makeover, and patients can receive a copy of their simulated smile during their appointment. They can immediately see what cosmetic dentistry and I can do for their appearance.[1]

After taking a full-face digital photograph, this patient was so excited with her before and after smile preview that she shared the pictures with her mother. Her mother then also checked me out on the Web and made an appointment for a consult. At that appointment, we were able to show the patient's mother her own smile makeover using digital imaging (Figures 2 and 3). She immediately scheduled another consultation.

This bright, energetic woman suffered from a multitude of complex dental problems. She had fluorosis discoloration courtesy of growing up in West Texas. Her posterior teeth had been restored in segments through the years, ultimately resulting in a collapsed vertical bite, loss of canine guidance, and the maxillary anterior teeth being splayed out facially (Figures 4 and 5). As a result of her condition, her lower front teeth could now bite into her lower posterior (Figures 6 and 7). Because her chief concern was dental aesthetics, we discussed all porcelain restorations for her front top and bottom teeth. However, this would be a cosmetic and functional compromise. It was my responsibility to discuss the possibility of opening her vertical dimension.[2] We took impressions, a face-bow record, and a bite registration.

Paul Westbrook of Westbrook and Associates has an excellent group of anterior occlusion and function, and how it relates to posterior occlusion. On the first set of models, Westbrook and Associates mined up only the anterior (Figure 8), and on the second set her bite was opened up by waxing up all of the teeth and restoring the Curves of Spee and Wilson. On our third meeting we discussed the various treatment plans. After showing her the mounted wax-up models, she immediately grasped the significance of the lost vertical dimension on her appearance, and made up her mind.[3] I recorded an open bite centric relation for diagnostic purposes, and concluded that she had lost 3 to 4 mm of vertical dimension of occlusion (VDO). Westbrook and Associates produced a maxillary anterior guided orthosis (MAGO) for her to verify her stable centric relation and to establish if she could tolerate the new VDO. After 4 weeks of wearing the MAGO in total comfort, I was confident that she was stable.[4]

The wax-ups were sent to Westbrook and Associates for the fabrication of hard/soft matrices for making provisionals at the new VDO. Treatment would be in two phases. First, we would prepare, temporize, and finish the anterior segment at the increased vertical. Then we would prep, temporize, and finish the posteriors.

At the next appointment, with the aid of triangular and headphones, teeth Nos. 5 through 13 and Nos. 21 through 28 were prepared for all-porcelain restorations. Because of the bell shape of the crowded incisors, incisal wear, and old restorations, the preps were more aggressive than traditional veneer preparations. However, it was much more conservative than crown preparations. The teeth were prepped using diamond burs from The Shofu Contemporary Cutting Kit. A small round diamond bur (0872-1) was used to outline the circumferential margins of teeth Nos. 21 through 28, and all of the old resin fillings were removed (Figure 9). The depth cutter created grooves to speed up the gross reduction. Round-end tapered diamonds (0856C-1 coarse and 0856C-1 superfine) were used to prepare the facial and proximal aspects of the preparations, and a small flame-shaped diamond (0852F-1) was used to reduce the incisal-lingual line angles. Shofu surgeon does recorded one sharp angles.

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The tooth reduction procedure was guided by the transparent preparation guide made from the image (aspired was up. Adequate clearance was ensured by placing the preparation guide over the prepared teeth and refaring as needed (Figure 10). Formerly, the amount of tooth reduction and preparation design were guided by the demands of the temporaries rather than the final restorations. Therefore, preparations sometimes necessitated needlessly removing healthy tooth structure. Now, with less aggressive preparation tech-niques and modern materials, teeth are prepared as neither veneers nor crowns, but as something in between.[5] After the preparations were complete, polyether impressions were taken using Impregum Soft (3M ESPE).

Aesthetically desirable temporaries are just as crucial as accurate and natural final restorations. When patients leave your dental office after tooth preparation, they should leave looking their best, even if "they are just temporaries." If patients look and feel great in the interim period with temporaries placed, you further ensure the success of the final restoration. I have found that attractive temporaries are crucial to the successful outcome of a case and are extremely important in building referrals.[6]

Hard/soft matrices made from the wax-up by Westbrook and Associates permit dentists to easily fabricate temporaries that match the cosmetic image agreed upon by the doctor and patient. The soft and hard construction and adaptation of the templates produce provisionals that have accurate tooth contours, healthy margins, and proper occlusion. The double-layered matrix was seated on the prepared teeth to verify fit. Hermetol and Cide Desoxidizer (Advantage Dental Products) was applied to the preparations and gently air dried. CRV Temp, a dual-cure bis-acrylic temporary crown and bridge material (Den-Mat, Caryo) was syringed into the clear double matrix and placed on the teeth. The cure was initiated with the Sapphire Powerlight (Den-Mat). When the polymerization was complete, the outer hard matrix was first carefully removed. The inner soft matrix was then removed to reveal a polished resin surface. Excess resin was removed, occlusion was adjusted, and the provisional was polished.

After the maxillary temporaries were finished and polished on the teeth, the patient was instructed to try out the function and aesthetics of the temporaries (Figure 11). The patient is usually scheduled for a complimentary cleaning with the hygienist, at which the temporaries may be altered to meet patient approval. We then take impressions and forward them to the laboratory. The next step is for the laboratory to copy the wax-up when fabricating the final restorations.

Various authorities kept the upper splinted temporary in place. The lower teeth were shortened and had a more parallel draw. These temporaries were finished and polished on the lathe. Then they were seated with dual-cure resin cement with no etch and no primer. When the temporaries were finished, we took an impression of the lower teeth. This was poured in spoil stone. A clear stint was vacuum formed on the lower model and trimmed halfway down the teeth. The posterior was air abraded and primed, and CRV Temp (Den-Mat) was applied. The patient was instructed to gently bite down. Because we increased the vertical in the anterior, the posterior interocclusal space was filled in by adding bis-acrylic to the clear splint. This was trimmed and polished to remove any interferences or excursions. This splint would protect the anterior temporaries (Figure 12).

Figure 13. Maxillary anterior temporaries seated with Ultra Bond cement.

Figure 14. Anterior restorations seated with anterior right canine prep.

Figure 15. Maxillary seated with Captek crowns and bridge.

Figure 16. Final view of left side.

Figure 17. Final palatal view of maxillary arch.

Figure 18. Final frontal view of maxillary arch.

Figure 19. Left canine guidance restored.

Figure 20. Final full face with opened vertical dimension.

RESTORATION AND FABRICATION

At the laboratory, the pre-op models were mounted using a face-bow transfer on a Kois Prestar articulator (Kois America). The prepared models were mounted with the open bite record captured with the modified MAGO appliance and bite registration material. Because of the complexity of this case, it was important to accurately mount the models to ensure proper occlusion and aesthetics. The laboratory-fabricated wax-up of the 16 maxillary and mandibular anterior was returned with the case. A putty matrix was made on these models to capture the incisal edge and incisal third of the facial. The wax was taken off the dies, and platinum foil was adapted on all dies. Shofu Vintage Halo porcelain was stacked, with A1 + Bright Value Dentin Shade at the gingival half blending to a B1 + Bright Value Dentin at the incisal half. Shofu Vintage Halo porcelain was selected because of its reduced potential for abrading the opposing dentition, and the wear characteristics of Shofu Vintage Halo porcelain closely imitate those of natural enamel. Shofu Vintage Halo porcelain is opalescent (absorbs yellow/red and reflects blue/green), has a low kaolin content, small crystal size, and can be easily polished chairside.

In the lab, Westbrook and Associates does an excellent job in matching the diagnostic wax-ups and the patient's imaged photos from the Lorin Library. The combination of tooth shapes (L1, No. 12) utilized for this case were square-round centrals and laterals with round cuspids.

Cuspid rise and anterior protrusive guidance were carefully maintained, any lateral interferences were eliminated, and the lateral protrusive was adjusted. Long-term success of these cases depends on sound occlusion and function.[7] After the veneers were baked and the function, contour, and surface texture were refined, they were glazed, etched, and internally silanated.

After 2 weeks, the resin temporaries were sectioned and removed with a spoon excavator. Ultra Bond Quick Light (Den-Mat) was chosen, and the teeth were prepared for bonding. Any residual resin was removed with fine diamonds and air abrasion (AirDent/Air Technique). Expt-ryl (Kerr) was expressed in the gingival sulcus to control bleeding. After 2 minutes, it was rinsed off. The abutments were etched with 35% phosphoric acid for 15 seconds and then thoroughly rinsed and dried. Hermetol and Cide Desoxidizer with Chlorhexidine (Advantage Dental Products) was applied and blot dried. Tenure A and B (Den-Mat) adhesive was generously applied to the teeth until they had a glossy appearance.

The resin was auto-mixed in the attached cartridge and syringed on the teeth to prevent air bubbles before the porcelain was filled with more luting agent and seated on the abutments (Figure 13). I seat the centrals first, then the laterals, and so on. Seating to centric lateral guide helps ensure the proper alignment. The contacts were floated and excess resin was removed with a sable brush. Ultra Bond is thixotropic, which allows for low viscosity during seating and high viscosity to prevent sliding or relocating before curing. A micro brush dipped in Tenure (Den-Mat) was used to remove excess cement and seal the margins.

The restorations were cured using a Virtuoso Sapphire Xenon Power Arc curing light (Den-Mat). When polymerization was complete,

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the gingival marginal flash was removed with a Hard Parkin blade No. 12. The Shofu Contemporary Polishing Kit, which includes six shapes of fine and superfine NTI Diamonds, was used to smooth the lingual incisal margins and interproximals.

A CitiSize (Den-Mat) was used to open the contacts, which were then verified with floss. The margins were finished and polished with Ceramiste (Shofu) cups and points, and the lingual margins were restitched and reinforced with Visorfloss (Den-Mat). Because we increased the patient's vertical dimension in the anterior, her posterior occlusion was now open (Figure 14). A new impression was taken and another splint fabricated.[7]

In 2 weeks, the posterior segments were prepared. In the upper right quadrant, the three-unit bridge was sectioned and removed. The Ribbet Bipolar electrosurgery unit was used to expose the margins on the distal abutment and create a gingival sulcus. No retraction cord was used or needed. The abutments were refined for a new Captek three-unit bridge. In the lower left quadrant, the mesiary filling was removed from tooth No. 31 and it was conservatively prepared for a porcelain onlay. Teeth No. 30 was re-prepared for a Captek crown, and teeth No. 29 was conservatively prepared for a porcelain crown.

In the upper left, the crown was removed from tooth No. 14 and refined for a Captek crown. The amalgam was removed from teeth No. 15 and it was conservatively prepared for a porcelain onlay. In the lower left, the old crowns were removed, and teeth Nos. 18 to 20 were prepared for Captek crowns. Captek was chosen because of both its bacteriostatic properties and aesthetics. Bite registration and impressions were taken and the teeth were temporized. Because the temporaries were made according to the increased vertical wax-up, no interim splint was necessary.

The Shofu ShadeEye-NCC chromometer, a highly accurate electronic shade-taking device, allowed communication with the lab to help ensure that the fabricated posterior Captek and porcelain restorations matched the already seated anterior all-porcelain restorations. The ShadeEye-NCC is designed to interact with the operator to identify the most precise, aesthetic shade match possible and communicate this information to the laboratory for duplication. The shade of the anterior restorations was recorded using the ShadeEye-NCC in the "porcelain mode." The way we perceive tooth color can be influenced by the color of the surrounding tissue. For this reason, the appropriate shade tabs were placed in the corresponding gingiva and positioned next to the tooth measured. I then took a digital picture and printed it out on Kodak quality paper to forward with the laboratory prescription for accurate duplication of shade and desired characteristics.

At the sealing appointment, the posterior temporaries were removed and the final restorations (Figure 15) were bonded in place with Tenure and Affinity (Den-Mat).

The end result was a full-mouth reconstruction with increased vertical dimension, beautiful aesthetics, and greatly improved function and comfort (Figures 16 through 20). Another great case that started from a new phone on the Internet. Next, we'll be tracking her daughter, the original patient who found us. ■

References

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Dr. Rowland has practiced in the Dallas Arts District since 1992. A fellow in the American Academy of Cosmetic Dentistry, Dr. Rowland lectures nationally on building a practice using cosmetic dental strategies, marketing materials, and technique. For a preview and information about "The Latest and Greatest in Cosmetic Dentistry Today: A Full Mouth Makeover Two Appointments," (an instructional video/DVD and manual), log on to www.dentalmastery.com or call (214) 969-0115.

Also follow Dr. Rowland along with Dr. David Ryals in the celebration of The Lorin Library.