Chairside

Maximizing Esthetic Transformations Using a Closed Flap ErCr:YSGG Modality

Charles Darwin said that "Beauty is the association of many complex associations." Undoubtedly this can be applied to the art and science of esthetic dentistry.

Harmony of function, biology, and appearance is paramount when creating long-term results for patients. Fortunately, the efforts of many pioneers like Pankey, Dawson, and Lee[1-3] have allowed contemporaries to achieve bioesthetic results more predictably.

Gingival symmetry and health are 2 challenging aspects of these multiple associations. Rufenacht[4] and Chiche[5] have detailed the artistic components (contours, proportions) of a memorable smile. Kois' classic study[6] defined the anatomic relationships of the dentogingival complex. Biologic width is predictable when measured at 3 mm facially and at 3 mm to 5 mm interproximally from the free gingival margin to the osseous crest. Ultimately the gingival margin must mimic the osseous curvatures to maintain a healthy gingival restorative interface.

In the world of minimally invasive care, dentistry has an amazing ally in laser technology. When used carefully, dental lasers are a safe, conservative, and reliable method of aseptically improving the health and contour of hard and soft periodontal tissues. Wang's 2002 study[7] showed that osseous crown lengthening with ErCr:YSGG laser could be completed without laying a flap, suturing, or damaging the bone. Out of contact the energy density is less and so there would be less cutting of the hard tissue. It's not what cuts best but how the laser cuts according to the physics of the laser. This is further supported in the literature by Rizoiu,[8] who found that the thermal coagulative results and ablation qualities were similar to those created by a dental bur. From a patient perspective, the decreased need for suturing and shorter healing times should increase case acceptance to complement the growing demand for esthetic dentistry. In addition, there is a huge advantage to giving the restorative dentist artistic control of the periodontal framework.[9]

The clinical study presented in this article demonstrates that, in selected cases, combining minimally invasive laser therapy with detailed restorative design and technique can satisfy the bioesthetic functional requirements.

Case Study

Diagnosis and Treatment Planning

A 16-year-old girl presented for correction of her short, chipped teeth (Figures 1 and 2).

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Figure 1—Chipped teeth and a gummy smile were a huge disappointment after this patient's previous orthodontic care.

Figure 2—Thick gingival genotype favors closed flap laser gum procedures.

Figure 3—Mounted study models are essential for diagnosing the source of tooth wear.

Figure 4—Width to length ratio of 1:2 predisposed an unesthetic smile.

Figure 5—Digital calipers allow precise measurements in perio-esthetic treatments.

Figure 6—A fine felt tip marker helps visualize the desired result.

She had completed orthodontic care during the past year and was disappointed by her unesthetic appearance. Furthermore, her previous dentists' unsuccessful attempts to repair the incisal breakdown were more complicated by increased headaches. The patient and her parents wanted to resolve these problems quickly, completely, and long-term because she was a full-time student and didn't want to deal with ongoing repair issues that could potentially occur with bonding.

A full clinical examination with radiographs, clinical photographs, and mounted models (Figure 3) revealed the following:

- Occlusally, load testing was normal (after muscle relaxation) and there was obvious centric relation-centric occlusion anterior-vertical slide because of a premature contact at tooth No. 30. Most or all of the dental attrition occurred in the upper arch.
- Periodontally, hard tissues were intact but most of the interdental papilla in the upper anterior sextant showed bleeding on probing and a depth of 4 mm. This was addressed with the patient by instructing her in a vigorous home care regimen of Closys flossing and brushing technique as well as through the disinfecting/fibroblast producing modality of the laser.
- Biomechanically, the teeth were not weakened by previous dental care.

Figure 7—Atraumatic gingival sculpting is precise with the Waterlase.

Figure 8—The closed flap osseous reduction must create a contour that mirrors the soft tissue and maintains a healthy biologic width.

Figure 9—Low level laser therapy greatly enhances the comfort and rate of post surgical healing.

Figure 10—Ten-day postsurgical healing is an improvement over standard osseous techniques.

Figure 11—Diagnostic wax-up helps blueprint the esthetic and occlusal parameters.

Figure 12—Luxatemp provisional veneers immediately after placement.

- Esthetically, the width to length ratio of upper centrals was 1:2, far from the ideal range of 0.75:1 (Figure 4). The adjacent teeth were even shorter. The gingival display was excessive, especially distal to the central incisors. The shade was a Vita A2.

Given the patient's previous history and her desire for minimally invasive dental care, a conservative treatment plan was devised that would allow for correction of the problems in a multitasking manner:

- occluso-muscular therapy with a maxillary centric relation orthoic followed by careful equilibration aided by the T-scan[a]
- diagnostic wax-up with a Stratos articulator[b]
- lower teeth whitened with Opalescence 15%[c]
- laser gum sculpting with the Waterlase YSGG[d] while the first 3 items were being accomplished (the combination of these 4 steps saved time and allowed us to carefully monitor progress on a weekly basis)
- final restoration with porcelain veneers

Clinical Technique

The desired lengths of the patient's teeth

[a]Tekscan, Inc, South Boston, MA 02127-1309; (800) 248-3669

[b]Ivoclar-Vivident, Amherst, NY 14228; (800) 533-6825
[c]Ultradent, South Jordan, UT 84095; (800) 552-5512
[d]Biolase Technology, Inc, San Clemente, CA 92673; (888) 424-6527

Figure 13—Veneer fit and contour should be evaluated before cementation.

Figure 14—NOLA appliance assists in dry field isolation during the bonding procedures.

Figure 15—A broader, whiter smile made a more memorable impression.

Figure 16—Symmetry and proportion as well as balanced canine guidance were greatly enhanced by the reconstruction.

Figure 17—Attention to detail created harmonious gingival contours and tooth anatomy.

were calculated using the ideal width to length proportion as a guide. These numbers were dialed into a digital caliper and the measurements marked on the gingiva at the desired gingival zenith positions (Figure 5). The positions also were based on matching an ideal smile plane, which can be ascertained by creating a "bite-stick" guide.[10] The curvatures were placed with a marker to create an outline for the new soft-tissue framework (Figure 6). It is recommended that this be done before anesthesia so the patient can get a more natural preview of the gingival heights and shapes.

After local anesthesia, the gingival margins were sculpted to the outline in a manner like festooning a denture (Figure 7). This was atraumatically done with the laser using at G-6 tapered tip at a setting of 2 watts, 30% air, and 30% water with a 20 pulse per second frequency. Sounding to bone was done with a periodontal probe after anesthesia. When the soft tissue was esthetically correct, the osseous reshaping was performed using the closed flap technique. A "sewing machine stitch" (ie, very precise up and down movements) using a 3 mm reference on a T-4 garnet tip works very well because of its narrow (400 mm) diameter. The settings on the laser were 2.5 watts, 30% air, and 30% water.

The osseous crest was smoothed with a 7/8 Gracey curet to minimize any need for remodeling during the healing phase (Figure 8).

The final part of the gum lift was the placement of a "laser bandage." Biomodulation, which is the effect lasers have on tissues to create positive biologic changes in diseased or treated tissues, has many well known benefits, including the decrease of histamine products that cause increased discomfort. This procedure is done at a defocused distance of 2 mm using a Z-6 tip at 0.25 watts, 11% air, and 0% water (Figure 9).

Home care instructions for the patient included taking a mild anti-inflammatory medication, rinsing with a saline mixture created with Dr. Hahn's Soothing Oral Solutions (www.DrHahns.com), and applying Oxyfresh Dental Gel[e] topically to promote healing and decrease volatile sulfur compounds.

During the healing phase, the patient was monitored weekly to optimize her bite guard therapy, equilibrate her occlusion, and measure her whitening results. Tissue response was excellent even at 10 days post-surgery (Figure 10). The blueprint for the new smile was completed during this time to allow for evaluation of the incisal edge position and gingival contour (Figure 11).

When used carefully, dental lasers are a safe, conservative, and reliable method of aseptically improving the health and contour of hard and soft periodontal tissues.

Veneer tooth preparation was performed with the LVS system[f] 4 weeks after surgery using a putty matrix as a guide to verify adequacy in tooth reduction. A polyvinyl siloxane impression was taken with Honigum[g] in a bloodless field. Centric bites and facebows were obtained as well as a stump shade of ST9[b]. Well contoured and sealed provisional veneers (Figure 12) were placed using Luxatemp Plus shade BL[g]. Home instructions were given and the patient was sent home to test drive her new smile. An impression of the approved temporaries was sent to the lab for final porcelain construction. Contours were duplicated using incisal labial matrices for quality control.

The veneers were visually inspected for fit and contour (Figure 13). After removal of the provisionals, the veneers were tried in for final approval. Placement of the veneers (Figure 14) was done with isolation using the NOLA retractors[h]. The retraction and suction for anterior teeth were easier to achieve than a rubber dam and very patient-friendly. Veneer cementation was performed with Variolink II Translucent[b]. Finishing occlusal detailing and polishing were followed by relining her protective maxillary centric relation orthotic.

Conclusion

The patient's confidence was greatly enhanced after surgery (Figure 15). Intraorally, the proportions and contours are close and are a significant improvement (Figures 16 and 17). The patient has a medium lip length, but this should not make much of a difference in the long term. The tissue at the mesial of tooth No. 7, as it appears in Figure 17, should be tighter. At the patient's first recall visit, 10 weeks after surgery, this situation was addressed. In addition, we continue to emphasize home care and proper nutrition. We expect to see an even better healing response as the tissue matures over the next few months.

The "bioesthetic symphony" requires the knowledge and application of skills that entail attention to detail and the use of the latest technology to improve the quality and patient friendliness of our makeovers. The use of the ErCr:YSGG laser in this case allowed for less invasive treatment and the creation of a positive experience.

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[e]Oxyfresh Worldwide, Inc, Couer d'Alene, ID 83815; (800) 333-7374
[f]Brasseler, USA, Savannah, GA 31419; (912) 925-8525
[g]Zenith/DMG Brand Division, Englewood, NJ 07631; (800) 662-6383
[h]Great Lakes Othodontics, Ltd, Tonawanda, NY 14150; (800) 828-7626