Smile enhancement with laser technology – predictable and esthetic

Dr Hugh Flax details the fundamental importance of the esthetic zone to a patient’s external appearance and inner emotions

With the esthetic zone being absolutely critical to a patient’s external appearance and inner emotions, orchestrating a bioesthetic result is mandatory. Too often, this is complicated when esthetic desires infringe on the health of the periodontal complex. This is often true when biologic width violations have occurred iatrogenically.

Many factors may contribute to these failures; the two main culprits being intracrevicular margin location and overcontoured restorations. Not only is plaque accumulation problematic, but the supracrestal fibres also become interrupted, causing the tissues to become further inflamed and esthetically unmanageable. Kois’ landmark study defined the total dentogingival complex (DGC) as clinically predictable at 3mm on the direct facial aspect, and at 3mm-5mm interproximally when measured from the free gingival margin to the osseous crest.

It is critical anteriorly that the gingival margin mimics the osseous scallop while maintaining the DGC.1 Further complicating these complex situations is the degree of inflammation in the soft tissue, affecting the clinical development of health and esthetic symmetry.

Dental lasers have evolved considerably as an adjunctive and alternative treatment to safely, conservatively, and reliably decrease bacterial levels and improve the hard and soft tissue contours. An ideal result

Often the patient is frustrated with his or her previous poor cosmetic results. However, to improve the periodontal framework in order to create an ideal result, they must be referred to yet another doctor. Even more challenging is the extended healing time created by reflective mucoperiosteal surgery. This not only affects the chronology of final restorative care, but also delays the patient’s ultimate satisfaction and happiness for a minimum of two to three months.

Fortunately, dental lasers have evolved considerably as an adjunctive and alternative treatment to safely, conservatively, and reliably decrease bacterial levels and improve the hard and soft tissue contours. Studies of Er: YSGG lasers by Rizoiu and others have shown that thermal coagulative results, as well as bony ablation characteristics are similar to a dental bur.2 From a patient-friendly standpoint, less need for suturing and shorter healing times improves case acceptance for doing ideal dentistry. In selected cases, such as the one presented in this article, minimally invasive laser procedures, with precise restorative planning and technique, can satisfy esthetic and functional parameters. Furthermore, patients can enjoy optimal results more comfortably and efficiently.

A conservative strategy was devised that would allow us to correct the problems and causes in a “multi-tasking” manner.

Case Presentation

A 58-year-old female patient presented for correction of what she termed her “tilted smile” (Fig 1). Given that she was starting a new sales career, she also wanted to make her teeth brighter and her smile much broader. The patient shared her frustration about previous dental consultations that had focused solely on orthodontic or surgical solutions without considering a more practical approach that would fit her busy life.

Her smile analysis estab...
lished a collapse of the buccal pits in the buccal corridor. Furthermore, the axial inclinations, irregular gingival margins, and incisal edges created a downward tilt to the patient’s right due to tooth positioning. Close-up imaging showed healthy gingival tissues as well as a weakened right central incisor from a large composite (Fig 2).

Findings
A full clinical examination with radiographs and mounted models revealed the following:
- Biomechanically, the majority of her teeth remained strong despite previous dental care.
- Periodontally, soft and hard tissues were healthy.
- Occlusally, load testing was normal (after muscle relaxation) and there was obvious CR-CO anterior- vertical slide due to a premature contact at tooth #50.
- Esthetically, the width-to-length ratio of the upper centrals was 1:2, far from the ideal range of 0.75:1.0. Tooth shade was a Vita A2.

Treatment Plan
Given the patient’s previous history and her desire for minimally invasive dental care, a conservative strategy was devised that would allow us to correct the problems and causes in a “multi-tasking” manner:
- Muscle and bite therapy with a Tanner appliance, followed by careful equilibration aided by the T-scan (Tekscan System; South Boston, MA).
- Three-dimensional wax-up on a Stratos articulator (Ivoclar Viadent; Amherst, NY) (Fig 5).
- Home bleaching of the lower teeth with Opal veneers and a crown (Fig 6).
- Esthetically, the width-to-length ratio of the upper centrals was 1:2, far from the ideal range of 0.75:1.0. Tooth shade was a Vita A2.

Treatment
At the initial closed periodontal lift, the ErCr-YSGG laser was used in three modes (gingival sculpting, osseous recontouring, and bio-stimulation). Prior to anesthesia, the desired framework was planned and outlined using a fine marker (Fig 4). Furthermore, a stick-bite was used, not only to establish an ideal incisal plane, but also to properly align the gingival margins (Fig 5).

With the settings at 2.0 Watts (W), 20 pulses per second, 20 per cent air, and 20 per cent water, a G-6 tip (600µ in diameter) was used to shape the labial gingival region. No tissue necrosis or significant bleeding occurred as a result of using the laser’s relatively lower settings.

At the facial margins, osseous sculpting required great precision in order to maintain a 5-mm DGC. A specially tapered T4 tip (400µ in diameter) was used at a 25 per cent higher wattage of 2.5W. Prior to usage, the tip was measured and marked to 5 mm in order to maintain controlled adjustments within the gingival sulcus during periodontal probe movement of the tip (Fig 7). The resection was smoothed with a 7/8 curette (Fig 8). Using low-level laser therapy at a setting of 0.25 W, a decrease in the release of inflammatory histamine and increased fibroblasts for junctional epithelial growth was achieved by “frosting” the outer epithelium and injection sites (Fig 9). The patient was placed on a vigorous home-care regimen (Oxygel, Oxy-fresh; Coeur d’Alene, ID) and closely monitored for a
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The UCL Eastman Dental Institute is pleased to announce the award of a two-year Fellowship by the Faculty of Dental Surgery of the Royal College of Surgeons of England to researcher Nilsha Shah, Lecturer in Orthodontics at the Institute.

The prestigious award will support Nilsha Shah’s ongoing research, begun during her postgraduate studies, into the creation of in vitro craniofacial skeletal muscle tissue for use in the development of novel therapies to treat cranio-facial deformities such as cleft lip and palate, with the ultimate aim of providing tissue for use in future cranio-facial reconstructive surgery.

Currently, there are a number of limitations to conventional therapies used to treat patients with craniofacial deformities, including donor site morbidity and the failure of transplanted tissue to establish and maintain normal tissue function.

It is anticipated that the Fellowship grant will allow Nilsha to find a suitable way of integrating biologically engineered cranio-facial muscle with tendons and bone attachments, which would provide a valuable contribution to the field.

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About the author

Dr. Flax has been an Accredited Member of the AACD since 1997. He was co-chair of the Conference Advisory Committee for the 2003 Annual Scientific Session and will be for the 2008 meeting in New Orleans. He is a member of the AACD Board of Directors, is on the editorial board of The Journal of Cosmetic Dentistry, and chairs the Disaster Relief Fund. Dr. Flax also is a member of the ADA, the AGD, the ALD, the L.D. Pankey Alumni Association, and the Pierre Fauchard Society. He is a Fellow of the IADFE. Dr. Flax practices full time in Atlanta, Georgia, focusing on functional and appearance-related conditions and advanced laser dentistry. He and his wife, Robyn, have two daughters.

References


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These changes not only improve the final esthetic outcome of the case but also provide the physiologic functional parameters required for successful dentistry.

The use of a hard/soft tissue laser is a wonderful adjunctive tool for cosmetic and restorative dentistry. The case discussed here demonstrates that this type of laser technology gives dentists the ability to make significant soft and hard tissue changes while being minimally invasive. These changes not only improve the final esthetic outcome of the case but also provide the physiologic functional parameters required for successful dentistry.

Figure 12: Ideal proportions and emergence profiles will create long-term healthy tissues and esthetics.

Figure 11: The great improvement in esthetics boosted the patient’s self-confidence and pride in her dental care.

Figure 10: Detailed information helps the laboratory to translate clinical results to the porcelain restorations.

Figure 9: A “laser bandage” is placed along the treated area to improve the healing time and decrease the patient’s discomfort. Note the immediate improvement of the geometric progression of gingival embrasures.

Figure 8: A curette helps clean and smooth the sulcus of any debris.

‘These changes not only improve the final esthetic outcome of the case but also provide the physiologic functional parameters required for successful dentistry’

Prepared for veneers and a crown with mild soft tissue reshaping, to fine-tune our previous treatment. After taking impressions and bite registrations, prototype provisional (Luxatemp Plus, Zenith DMD Englewood, NJ) were fabricated using the “shrink-wrap” technique. The patient was sent home with the same home-care regimen as mentioned previously, and instructed to “test-drive” her new smile for esthetics and function. She returned in a week to perfect the prototype’s occlusion, color, and morphology. Photographs and models were sent to the laboratory, providing a final blueprint for the porcelain restorations (Fig 10).