

Laser Dentistry

The Diode Laser – The Diode Laser for Gingival Recontouring in Cosmetic Dentistry

Introduction:

Previously in these clinical technique articles in Dentistry Today, I have discussed the role of the diode laser for gingivectomies in conjunction with restorative dentistry (1) as well as with orthodontics.(2) The diode gingivectomy is the most common laser procedure in dentistry (3) and can make dealing with gingival hyperplasia simpler in many situations. When dealing with esthetic dentistry, a dentist's focus is often on the "white" part of the smile - namely the dentition. If we indeed add our focus to the "pink" portion of the patients smile, and look at symmetry of gingival zeniths when dealing with anterior smile dentistry, then the diode laser can often be a life saver for making cases just that much better. (4-8)



Principles of Smile Recontouring:

When using the Picasso Lite and World (7w) lasers for the treatment of gingival recontouring around anterior teeth, the clinician should first evaluate the amount of keratinized tissue that is present, and the esthetic demands of the case. In situations where minimal attached tissue is present, careful thought should be given to whether a diode laser is the best tool for the situation. Kravitz et al has suggested that a minimum of 1mm of attached tissue be present before using the diode laser to ablate tissue. (9).

Dr. David Sarver wrote a series of three excellent articles looking at the role of the diode laser in orthodontics in 2004 and 2005. (10-12) In part 1 he looked at the principles of shape and proportionality of anterior teeth. Focus for many general dentists has been on the tooth structure and reshaping incisal edges, but gingival recontouring of soft tissues can yield better length to width proportions on teeth. A focus on gingival shape and gingival contour is essential when altering soft tissue proportions of anterior teeth. Many of these principles are covered through cosmetic dentistry articles dealing with smile design. Generally, the gingival heights of the maxillary centrals should be symmetrical in shape, and correspond to the height of the canines, whereas the lateral incisors can be 1/2 -1mm more coronal. The zeniths of the soft tissue curvature should be slightly distal to the long axis of the teeth, (figure 1) and the width of the tooth should be 75-80% of the length of the tooth. Therefore, the diode laser can be used to help with 1) improving gingival shape and contour, (2) lengthening crowns, (3) idealizing tooth proportionality, and (4) resolving crown/height asymmetries.

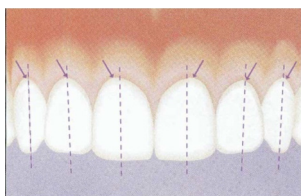


Figure 1 shows recommended zenith placement relative to long axis of maxillary anterior teeth. Courtesy of Dr. David Sarver (reference 11)

When considering smile principles and the artistic components such as contours and ideal proportions Rufenacht (13) and Chiche (14) have discussed in great detail these issues. Dolt and Robbins (15) have described a differential diagnosis process for how to examine, diagnose and treat esthetic dilemmas in gingival/tooth architecture. The focus when using any diode laser should be that this wavelength is well absorbed in hemoglobin, pigment and melanin but is not able to ablate bone, or other hard tissues in the oral cavity. Therefore, the clinician should always be cognizant of the anatomic relationships of the dentogingival complex as discussed by Kois in his classic study. (16) Kois found that maintaining biologic width was predictable when measured at 3mm directly on the facial and 3-5mm interproximally if measured from the free gingival margin to the osseous crest. The gingival margin, mirrors the osseous curvatures so our focus must be to retain this biologic width when using a diode laser for recontouring soft tissue as this wavelength can only interact with soft tissue and cannot be used to shape bone. Should reshaping of the tissue with the diode laser necessitate osseous bone reshaping in order to maintain biologic width, then hard tissue crown lengthening through full flap surgery or at times in a more minimalistic fashion with erbium lasers should be considered. Flax and others have shown nice results with the erbium lasers when osseous recontouring is needed in order to maintain this biologic width. (17-20).

Diode Laser Gingivectomy Protocol

When considering smile recontouring of gingival tissues as an individual treatment or in combination with indirect porcelain restorations, the clinician should consider several issues. Careful probing of the sulcus and bone sounding can provide accurate information as to the depth of the gingival sulcus complex, and the amount of free gingiva that is available to be excised. The author suggests that a minimum of 1.0 -1.5 mm of gingival sulcus be retained to avoid inflammation of the tissue and infringement of biologic width. If the recontouring infringes on the osseous crest then persistent erythema, bleeding and discomfort in the area will occur. If restorations are not planned with the smile recontouring, then the author suggests that some form of mechanical retention postoperatively be used to "hold" the tissue in the new position, otherwise relapse can occur. Essix retainers fabricated from an alginate impression taken immediately after recontouring can be sufficient for this "holding" of the tissues. They can be worn at night for 4-6 weeks to maintain the new tissue levels. On the other hand if restorations are completed in conjunction with the laser smile recontouring, then the restorative margins (crown or veneer) are sufficient to maintain the final position of the tissue. If the amount of tissue to be removed is minor (1mm or less), then the recontouring can be accomplished on the same day as the preparations and impressions are done. If the amount of gingiva to be removed is greater than 1.5 mm of soft tissue then the clinician may wish to place provisionals and allow for a couple of weeks of healing to occur prior to final impressions. This may provide for improved esthetic results in challenging cases.

The diode laser is used in contact for these procedures, and as such should be used with an initiated tip. Proper initiation of the tip uses articulating paper at 0.5 Continuous wave for 5-8 seconds painting both the tip and the sides of the disposable single use tip. The author prefers to use the Picasso Single Use disposable tips that are bendable and 400 microns in diameter. There are two lengths available (5 and 10mm) and the 10 millimeter ones are a little more flexible so care must be taken to not break them during the procedure. The genotype of the tissue is important to consider when determining settings that should be used. The thinner the tissue, the more likely recession can occur if the clinician uses higher settings. Therefore careful evaluation of the laser tissue interaction with magnification is essential to success. If the tip is dragging then

the energy setting should be raised, but if charring or carbonization is occurring then the settings should be lowered. Excessive carbonization of tissue can lead to iatrogenic sequelae including recession, and post operative pain. Minor areas of carbonization can occur even with ideal settings, but these localized areas of charring, can be eliminated by rubbing hydrogen peroxide over the area with a cotton pellet or a microbrush dipped in the 3% hydrogen peroxide solution and scrubbed gently on the area. The tip of the laser should be held at a 45 degree angle to the tissue, in an external bevel fashion, and gently moved horizontally back and forth in a brush like fashion. Since the laser is end cutting, dragging the tip rapidly across the tissue will not ablate the tissue, but either cause the tip to break, or result in bleeding and frustration. The tissue that needs to be removed should be estimated prior to starting with the laser, and every effort should be taken to remove the tissue in one horizontal cut if the amount of tissue is greater than one mm. If the amount of tissue to be removed is less, then gradual reduction of the tissue from the gingival crest apically can be done.

These gingival recontouring procedures can be completed at low settings of around 0.6 - 1.5 watts continuous wave (CW) with an initiated tip. The author uses lower settings (0.6-0.8 watt CW) when dealing with thinner tissue (less than 1mm horizontally from osseous crest). (See Table 1) Pulsed settings can also be used in these situations to reduce the risk of recession. Preparations are undertaken after the recontouring is completed and diode troughing can be used in tissue management for immediate taking of impressions if the total amount of tissue removed is minor (1.0 mm or less). Careful attention to provisional fabrication is essential as overextended or over contoured temporary restorations can cause tissue recession which becomes apparent at the delivery appointment.

Step	Table 1 - Smile Recontouring
1	Pick a 400 micron- 5mm or 10mm 90 degree tip.
2	Initiate the tip with articulating paper at 0.5w CW.
3	Use settings of 0.6-1.5 w CW with anesthetic, position tip at 45 degrees for gingivectomy.
4	Use pulsed settings (blue smiley face) of 1.2 -1.8 w for topical only gingivectomies.
5	Using short back and forth brush strokes for gingivectomy. Try to estimate amount of tissue to remove prior to beginning lasing keeping in mind need to preserve attached tissue and biologic width.
6	Use a wet cotton pellet or 3% hydrogen peroxide in an Ultradent syringe with a dental infusor tip to remove carbonized debris or tissue tags.
7	Preparations and impressions if tissue removed is minor (1.0mm or less)
8	No overextension or overcontouring of provisionals, carefully remove temporary cement from gingival sulcus.

Clinical Case 1- Single Central Recontouring

Male aged 40 years old wanted to improve anterior esthetics on extensively restored central incisor. The soft tissue on the upper right central was not harmonious and not symmetrical with the adjacent central incisor. Probing depths revealed a pocket of 4mm, so soft tissue crown lengthening was possible. The diode laser was used to remove tissue on the right central incisor, and for crown troughing as well. Final postoperative results show nice "white" and "pink" components to the smile with healthy pink tissue. Figures 2-8.



Fig. 2: Preoperative smile.



Fig. 3: Gingival disharmony on centrals.



Fig. 4: After Diode laser recontouring.



Fig. 5: Crown preparation completed.



Fig. 6: Healing at 2 weeks.



Fig. 7: Final appearance of crown placed.



Fig. 8: Before and after smile with single e.max crown placed..

The diode laser can be a great soft tissue handpiece for many areas of restorative dentistry and the ability to improve gingival harmony with selective soft tissue refinement can provide for optimal treatment results during esthetic treatment.

References

- van As G. Uncovering the tooth: the diode laser to uncover teeth, brackets and implants. Dent Today. 2012 Jan;31(1):168.
- van As G. The diode laser- the diode laser for gingivectomies in orthodontics. Dent Today. 2011 Oct;30(10):176.
- White JM, Swift EJ. Lasers for Use in Dentistry. Journal of Esthetic and Restorative Dentistry. Vol 17, Issue 1, page 60, January 2005
- Adams TC, Pang PK. Lasers in aesthetic dentistry. Dent Clin North Am. 2004 Oct; 48(4):533-60, vi.
- Meesks T. Creating beautiful smile symmetry: tissue considerations. Dent Today. 2009 Oct;28(10):98,100-1.
- Pang P. Lasers in cosmetic dentistry. Gen Dent. 2008 Nov-Dec;56(7):663-70.
- Magid KS, Strauss RA. Laser use for esthetic soft tissue modification. Dent Clin North Am. 2007 Apr;51(2):525-45.
- Lee EA. Laser-assisted gingival tissue procedures in esthetic dentistry. Pract Proced Aesthet Dent. 2006 Oct;18(9):suppl 2-6.
- Kravitz ND, Kusnoto B. Soft-tissue lasers in orthodontics: An overview. American Journal of Orthodontics and Dentofacial Orthopedics. Vol. 133, issue 4, Suppl., Apr. 2008, Pgs S110-S114.
- Sarver DM. Principles of cosmetic dentistry in orthodontics: part 1. Shape and proportionality of anterior teeth. Am J Orthod Dentofacial Orthop. 2004;126:749-53

- Sarver DM, Yanosky M. Principles of cosmetic dentistry in orthodontics: part 2. Soft tissue laser technology and cosmetic gingival contouring. Am J Orthod Dentofacial Orthop. 2005;127:85-90.
- Sarver DM, Yanosky M. Principles of cosmetic dentistry in orthodontics: part 3. Lasertreatments for tooth eruption and soft tissue problems. Am J Orthod Dentofacial Orthop. 2005;127:262-4.
- Rufenacht CR. Fundamentals of esthetics. Carol Stream (IL): Quintessence Publishing Co; 1990. p. 104-7. Chapter 4.
- Chiche G. Esthetics of anterior fixed prosthodontics. Carol Stream (IL): Quintessence Publishing Co; 1994
- Dolt A, Robbins J. Altered passive eruption: an etiology of short clinical crowns. Quintessence Int 1997;28(6):363.
- Kois J. Altering gingival levels: the restorative connection. Part I: biologic variables. J Esthet Dent 1994;6:3-9.
- Flax HD. Soft and hard tissue management using lasers in esthetic restoration. Dent Clin North Am. 2011 Apr;55(2):383-402.
- Low RA. Minimally invasive dentistry combined with laser gingival plastic surgery: maximize your aesthetic results. Dent Today. 2008 Aug;27(8):102, 104-5.
- Eshom DS. The Er,Cr:YSGG laser periodontal surgery. Pract Proced Aesthet Dent. 2008 Aug;20(7):433-5.
- Sarver DM. In the spotlight: three of the hottest topics in dentistry! Interview by Damon Adams. Dent Today. 2009 Sep;28(9):94, 96, 98-9.



By Dr. Glenn van As