

Soft Tissue Lasers . Clinical Uses of Diode Lasers in Orthodontics. (Part 1)

Orthodontists have long been challenged by tissue problems that can occur during or after treatment. Until now, their only viable option for the more severe vases has been to refer them to the periodontist—to say nothing of the many other soft-tissue discrepancies that are not significant enough for the referral, but do not affect the final results, especially esthetic appearance.

The diode soft-tissue laser is a highly effective and predictable new device for simple recontouring of tissue, requiring only a topical anesthetic. In our opinion, the diode laser will soon gain wide acceptance in orthodontics because of its ease of use, reasonable cost, positive patient response, and impact on esthetic results.

How the Laser Works

Laser is an acronym for light amplification by stimulated emission of radiation. Laser light has four properties that make it difficult from ordinary light: it is monochromatic (composed of a single wavelength), columnated (the light waves run parallel to one another rather than being divergent), uniphasic (the light waves have synchronous peaks and valleys), and intense (able to change the nature of

targeted tissues). These properties make laser light extremely focused and powerful.

Lasers have come into widespread usage in general dentistry in the last decade. What makes the diode laser particularly applicable in orthodontics is that its wavelength is between 800 and 980 nanometers—appropriate for removing soft tissues, due to their pigmentation and hemoglobin content. Energy from the laser is converted in a photothermal reaction, making it possible to “paint away” targeted soft tissue in a controlled and focused manner without unwanted side effects on the surrounding teeth. Of course, there are lasers of higher wavelength and intensity that can target hard tissues.



Fig 1 : The Spectralase Dental Diode Laser.

A Diode laser suitable for orthodontics can cost \$8000-\$15,000. Although this might seem expensive, the laser's functionality and ease of use make it cost-effective. There are several diode lasers on the market; we use the Spectralase in our office.

Operative Procedure:

To prevent unnecessary thermal degeneration, the Academy of Laser Dentistry advises using the least amount of power that can effectively accomplish a desired procedure. A setting of 1 watt at a continuous pulse (as opposed to a gated or intermittent pulse) has proved effective for most soft-tissue procedures. A setting of 1.25 watts may be required with more fibrous tissues or lengthier procedures, but we have not found it necessary to exceed that amount.

A 400-micron optical fiber is recommended over a 300-micron fiber, which is slightly more friable and breakable. Before each patient use, 2-3 mm should be cut off the end of the fiber to avoid cross-contamination; care should be taken to cut cleanly, so that the laser light source is focused rather than dispersed. The optical fiber is then inserted into a plastic wand with a disposable tip for use in the mouth. The fiber is activated by pulsating the laser on a dark surface such as carbon paper (articulating paper). A sharpie can also be used to color the tip black.

The anesthetic of choice is a compound topical TAC 20% (Tetracaine 4%, Phenylephrine 2%, and Lidocaine 20%). The combination of the two local anesthetics has a profound effect, while Phenylephrine promotes local hemostasis to reduce systemic absorption and thus prolong the duration of action.

After the mucosal area is dried, the topical gel is applied to the target tissues with a Q-tip or cotton roll and left in place for three minutes before the laser procedure is initiated. Its peak effect will occur within six minutes and last a minimum of 20-30 minutes.

When recontouring numerous anterior teeth, particular attention should be paid to the overall smile line. Many patients have an asymmetrical tissue drape. The most attractive smiles show 100% of the anterior teeth, although 1-2 mm of gingival display is generally not displeasing. The zenith, or highest point of contour, of the tissue on the tooth should be slightly distal to the center of the long axis. Laying dental floss across the height of the tissue contours can be helpful in evaluating a gingival smile line.



Fig 2 : Set up tray includes TAC 20%, safety goggles, mirror, perio probe, 2 x 2 gauze, cotton rolls and articulating paper.



Fig 3: Plastic wand with disposable tip. Note that optical fiber runs through it.

A periodontal probe is used to measure the depth of the sulcus. A biologic width of at least 2-3 mm, as determined by bone sounding should normally be maintained, but as little as 0.5 mm of tissue will regenerate over time. Scribing a line with pinpricks of the periodontal probe will help the operator maintain the appropriate biological width and provide an exact indication of the amount of tissue to be reduced.

The vaporization and removal of target tissue is referred to as “ablatement”. Safety goggles are imperative for patients, surgical staff, and any observers to prevent inadvertent exposure to reflected energy or stray light. These goggles are not sunglasses, but wavelength-specific eyewear manufactured especially for laser light. The near-infrared laser light is not visible to the operator; the visible red-wavelength light is an aiming beam that indicates where the laser is being focused.

The diode laser is activated with a foot pedal. The operator gently moves the fiber-optic wand over the target tissue, using a light brush stroke to “paint away” the desired amount of tissue. The tip is held at a slight angle to provide a beveled, natural contour, instead of an abrupt ledge. Care should be taken to avoid excessive contact, which might cause unwanted collateral damage. An assistant should hold an aspirator at the ablatement site to remove charred tissue and associated odors.

After the laser procedure is completed, a cotton pellet soaked in hydrogen peroxide is used to debride the area of charred tissue, allowing the clinician to check the shape and bevel of the gingival cuff. Although most patients report almost no pain, an over-the-counter pain medication such as ibuprofen or acetaminophen is recommended.

The patient should be given an ultrasoft toothbrush to use while the surgical site is healing. Gentle brushing will promote healing, but the patient should be made aware that some light post-operative bleeding is not unusual for several days after the procedure. The diode laser is especially effective at killing bacteria at the surgical site, which also promotes effective and rapid healing.



Fig 4: The optical fiber is activated by pulsating the laser on a piece of articulating paper.



Fig 5: The “ ablatement “ of tissue using a diode laser.

References

1. Hilgers, J.J, and Tracey, S.G., Journal of Clinical Orthodontics, May 2004, pp 266-269
2. Sarver, D. M, Clinical Forum, PP 7-14



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| 1. | T F | A laser light has four properties: columnated, uniphasic, intense and monochromatic. |
| 2. | T F | A diode laser has a wavelength between 700-800 nm. |
| 3. | T F | The anesthetic of choice for laser procedures is topical TAC 20%. |
| 4. | T F | Sunglasses can be used as eyewear during a laser procedure. |
| 5. | T F | The vaporization and removal of target tissue is known as "ablatement". |