# Laser Dentistry

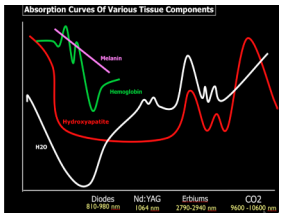
## Hemostatis and the Diode Laser — "A little dab will do ya!"

By Dr. Glenn van As

Introduction:

In this months Dentistry Today article I will take a look at the control of bleeding with the diode laser. Many procedures in general practice involve working directly or indirectly with soft tissue. Todays restorative materials are increasingly focussed on the premise of working in a dry field where moisture control is of maximum importance. With the emphasis of bonding in both direct and indirect restorations today, combined with the growing number of adult patients taking blood thinners ( be it "baby aspirin" to physician dispensed anticoagulant medications), careful attention to precise control of bleeding ( hemostasis) is essential to the long term success of our restorations.

Traditionally, clinicians have controlled incidental bleeding with a number of methods including pressure, injections of local anesthetic, hemostatic agents such as Ferric Sulphate, time or a combination of the above. The diode laser, unlike the monopolar electrosurgery units which have a coagulation and cutting mode, work in all modes of ablation to control bleeding. These wavelengths are very well absorbed in pigment, melanin and most importantly for hemostasis by the hemoglobin molecule. (Fig.1) Directly adjacent to the ablation zone when using a diode is a zone of coagulation and further laterally a small zone of thermal damage ( often seen as white tissue tags). (Fig.2). The ability to carefully control hemostasis with this minimal zone of thermal damage, while disinfecting the surgical site can be incredibly beneficial for the diode laser dentist.



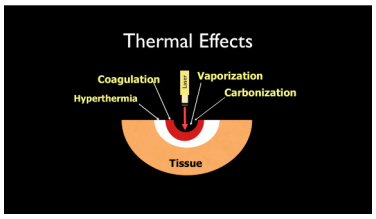
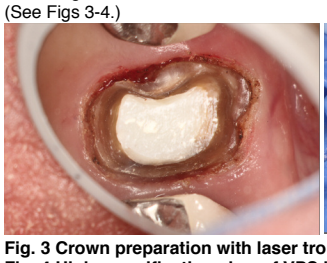




**Fig.1 Absorption of soft tissue diode lasers is best in pigment, melanin and hemoglobin.**
**Fig. 2 Central Zone of vaporization surrounded by zones of coagulation and hyperthermia. Minimal zones of carbonization (charring) should be the norm.**

Clinical Cases

One of the most common area that hemostasis is needed by most dental clinicians is during crown preparations. Many of our patients have inflamed interproximal tissue due to poorly contoured existing restorations, caries or poor oral hygiene. The traditional method of tissue management involves a two cord technique for tissue displacement, but unfortunately, it is not uncommon for bleeding to be an issue upon removal of the larger cord. Typically the bleeding when it does occur is controlled by hemostatic agents such as Ferric Sulphate which can discolor restorations, tissue and have an unpleasant taste associated with them. Diode laser technology utilizes an initiated tip which acts to ablate tissue (lateral distension ) and coagulate at the same time. The small "laser trough" allows impression material to accurately capture the marginal details with todays impression materials ( Polyvinyl Siloxane ) as well as with digital technologies such as CAD/CAM methodologies ( CEREC, E4D, Itero, etc.).
(See Figs 3-4.)



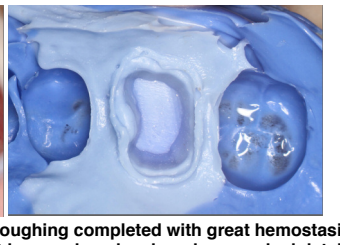


**Fig. 3 Crown preparation with laser troughing completed with great hemostasis.**
**Fig. 4 High magnification view of VPS impression showing nice marginal detail.**

Another commonality amongst dentists is the need to control tissue inflammation around our direct restorations. Composite resins utilized in a direct manner, often need to be placed equigingivally, or even subgingivally particularly in Class 2, 3 and 5 restorations. At times, the judicious use of the laser can be a "lifesaver" to completing the restoration without contamination. (Flg.5-6).

**Fig. 5 Diode retraction on Class V preparations completed.**
**Fig. 6 Final resin restorations completed in a bloodless field.**

Finally there are times when the laser can be used to control bleeding such as in the the following incidences:

- **Direct Pulp Caps** - in situations where an asymptomatic tooth has an accidental small microexposure of the pulp the diode laser can both be used to disinfect the site and provide hemostasis prior to completion of the restoration. (Fig. 7)

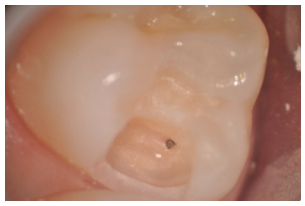


**Fig. 7 Diode pulp cap of small microexposure completed on asymptomatic upper first molar.**

- **Pulpotomies** - In children, there are situations where decay interproximally is large enough that it enters the pulp chamber. The standard formacresol pulpotomy can be revisited with the diode laser. The pulp chamber tissue is removed with a slow speed round bur until just the pulp "stumps" at the orifices to the roots are present. These small bleeding areas can be coagulated with a dabbing motion that touches the stumps and will quickly coagulate the remaining pulpal tissue stumps while disinfecting the site, reducing bacterial counts and lessening the need to use formacresol which has been shown to be toxic to bone.

- **Ablation of soft tissue around Dental Implants** - Diode lasers have been shown to be safe and effective for soft tissue management around dental implants. This can be of value when uncovering crestally placed fixtures at stage 2, and when completing the final restorative work around implant abutments. In addition should a crown become loose or completely debonded, it can be almost impossible to control the soft tissue hemostasis for final cementation.

- **Bonding of Emax crowns** - In situations where resin bonding of indirect restorations is needed, interproximal soft tissue can become inflamed during the time that the provisional restorations are in place. Diode reduction of the inflamed tissue or ablation of the inflamed soft tissue off the final margins can allow for final bonding of the restorations in a dry and non contaminated field.

- **Venous Lakes**- Venous lakes or hemangiomas are vascular lesions usually seen on the lips and buccal mucosa. These lesions can be photocoagulated with the diode laser effectively eliminating these lesions in 98.5% of cases in on treatment. The diode laser has become the treatment method of choice for eliminating these potentially hemorrhagic lesions.(Fig. 8)


**Fig. 8 Photocoagulation of venous lake with the diode laser shows complete healing after 2 weeks**

- **Surgical extractions**- bleeding after a dental extraction is more difficult to control due to the sheer volume of blood in the socket. The depth of penetration of a diode laser wavelength can be measured as 2-4 mm but the extraction socket is of course much deeper than this. Although the diode can coagulate the superficial blood in the socket, the bleeding from deeper will cause the coagulation to be more of a superficial nature which I term the "creme brulee effect". Eventually after several minutes the bleeding will slow down but one should be cautious with the amount of energy that is transferred into the area which if using high enough wattages could delay wound healing.

| Step | Procedure |
|---|---|
| 1 | Pick a suitable disposable tip for the Picasso Lite (2.5w) or Picasso 7w laser. |
| 2 | Initiate the sides and the tip of the laser with blue articulating ribbon at 0.5 w Continuous Wave for 5-8 seconds and until the tip glows incandescently when the laser is fired. This signals a properly initiated tip. |
| 3 | Bring the tip to the soft tissue and assure that ablation occurs when the laser is activated. (ablation, slight charring and a smoke plume from the tissue) |
| 4 | For small areas of bleeding- dab the area that is affected. Do not move the hand quickly or the quartz tip will increase bleeding. For moderate bleeding small circular movements in direct contact will work better. |
| 5 | Settings of 0.8 watts ( mild) to 2.0 watts ( moderate) Continuous wave in direct contact will work best. |
| 6 | **For venous lakes** first use an uninitiated tip to photocoagulate ( vascular lesion turns white) at 0.8-1.2w CW initially. Then initiate the tip ( see steps 2-3 ) and laser "puncture" the lesion to assure that the deeper vessels are clotted. |

The diode laser can be of tremendous assistance in regular daily dentistry as the "soft tissue handpiece" to control mild to moderate hemostasis issues. With an initiated tip, a light dabbing motion, the clinician can gain control of bleeding and thus complete tasks faster, easier and with less discomfort to the patient.