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Diode lasers for periodontal treatment

The story so far

The concept of using dental lasers for the treatment of periodontal disease elicits very strong reactions from all sides of the spectrum. Everyone has an opinion. Everyone is certain that their own opinion is correct. But the only certainty is confusion, and the lack of clear direction in the concept of Laser Assisted Periodontal Therapy (LAPT).

Much of this uncertainty stems from not comparing "apples to apples," in terms of the type of lasers utilized and the way that studies are designed. Certain lasers are used specifically for soft tissue treatment. These include the CO2, Nd:YAG, and diode lasers. Others can be used for both soft and hard tissue applications. These are the Er:YAG and Er, Cr:YSGG lasers. They must be compared within their own category.

Many of these lasers have been shown to provide periodontal treatment benefits. In order to achieve an element of clarity and simplicity on this very complex topic, the following discussion exclusively addresses the use of the diode laser for periodontal treatment.

A specific instrument

The diode laser has become an important tool in the dental armamentarium due to its exceptional ease of use and affordability. It also has key advantages with regard to periodontal treatment. The diode laser is well absorbed by melanin, haemoglobin, and other chromophores that are present in periodontal disease (1). Hence the diode specifically targets unhealthy gingival tissues. The laser energy is transmitted through a thin fibre that can easily penetrate into deep periodontal pockets to deliver its therapeutic effects.

The 2002 American Academy of Periodontology statement regarding gingival curettage (2) proposes that "gingival curettage, by whatever method performed, should be considered as a procedure that has no additional benefit to SRP alone in the treatment of chronic periodontitis". Also stated is that all the methods devised for curettage " have the same goal, which is the complete removal of the epithelium" and " none of these alternative methods has a clinical or microbial advantage over the mechanical instrumentation with a curette".

This was the science in 2002. More recent studies have shown that instrumentation of the soft periodontal tissues with a diode laser leads to complete epithelial removal while instrumentation with conventional curettes leaves significant epithelial remnants (3).

An effective instrument

Bactericidal

Periodontal disease is a chronic inflammatory disease caused by a bacterial infection. Hence the bactericidal and detoxifying effect of laser treatment is advantageous in periodontal therapy (4). The diode laser's bactericidal effectiveness has been well-documented (5), (6), (7), (8).

Moreover, there is a significant suppression of A. Actinomycetemcomitans, an invasive bacterium that is associated with aggressive forms of periodontal disease that are not readily treated with conventional scaling and root planing (SRP) . A. Actinomycetemcomitans is not only present on the diseased root surface, but it also invades the adjacent soft tissues, making it difficult to remove by mechanical periodontal instrumentation alone (7), (9), (10). This necessitates the use of adjunctive antibiotic therapy (10). The diode laser provides a non-antibiotic solution. A. Actinomycetemcomitans has also been found in atherosclerotic plaques (11) and there has been evidence to suggest that subgingival A. Actinomycetemcomitans may be related to coronary heart disease (12). This makes it even more compelling to seek methods to control this aggressive pathogen.

Wound healing

Diode lasers are very effective for soft tissue applications including incision, hemostasis and coagulation (13). Many advantages of the laser vs. the scalpel blade have been discussed in the literature. These include a bloodless operating field, minimal swelling and scarring, and much less or no postsurgical pain (14), (15). When laser surgical procedures are carried out, the surface produced heals favourably as an open wound, without the need for sutures or surgical dressings (4). Studies have shown enhanced, faster and more comfortable

Figure 1

Figure 2

wound healing when the diode laser is used in conjunction with scaling and root planing (SRP) (7).

An adjunct to scaling and root planing (SRP)

There is very compelling evidence in the dental literature that the addition of diode laser treatment to SRP (the gold standard in non surgical periodontal treatment) will produce significantly improved results. After SRP, the diode laser is used on the soft tissue side of the periodontal pocket to remove the inflamed soft tissue and reduce the pathogens (16). Research has demonstrated better removal of the pocket epithelium compared with conventional techniques (3). Many studies have shown increased reduction of bacteria (especially specific periopathogens) when diode lasers are utilized after SRP (5), (17), (18). Significant improvement in decontamination and effective treatment of peri-implantitis also occurs with the addition of diode laser therapy (19).

Gingival health parameters are significantly improved with the addition of the diode laser to SRP. Studies have shown decreased gingival bleeding (17), (20), decreased inflammation and pocket depth (16), (17), as well as decreased tooth mobility and decreased clinical attachment loss (16). This improvement in gingival health remains more stable than with conventional SRP treatment alone and tends to last longer (21). Moreover, patient comfort is significantly enhanced during the post operative healing phase, with the addition of diode laser therapy. (7)

The research thus shows diode laser periodontal treatment to be an effective procedure. It is also a minimally invasive procedure. Patients are demanding less surgery and the diode laser provides the general dentist with an excellent means of keeping periodontal treatment in the general practice.

Figure 3

Figure 4

A safe instrument

Histological testing of roots where the diode laser was used after SRP demonstrated no detectable surface alteration to root or cementum. There were no signs of thermal side effects in any of the teeth treated (22). Many studies have specifically indicated no adverse tissue events, demonstrating the safety of the diode laser (5), (8), (17), (23).

The diode laser's very effective bactericidal action on periodontal pathogens makes the adjunctive use of antibiotics unnecessary (10). This eliminates the problem of bacterial resistance and systemic side effects engendered by antibiotic use (6). The laser is a safer, more effective treatment.

The protocol so far

The above cited research has demonstrated that the use of the diode laser after conventional scaling and root planing (SRP) is superior to SRP alone. Various protocols have been developed by clinicians to incorporate this treatment into the busy dental practice .

These protocols may be performed by the dentist and /or the hygienist as determined by the regulating organization in the geographic location of the dental practice.

Individual parameters vary depending on the clinician and the particular diode laser that is being used. However, most protocols do follow a simple formula. The hard side of the pocket (tooth and root surface) is first debrided with ultrasonic scalers and hand instrumentation (Fig. 1). This is followed by laser bacterial reduction and coagulation of the soft tissue (epithelial) side of the pocket (1). (Figures 2&3).

The laser fiber is measured to a distance of one mm short of the pocket depth. The fiber is used in light contact with a sweeping action that covers the entire epithelial lining, from the base of the pocket upward (24). The fiber

tip is cleaned often with a damp gauze to prevent the build up of debris.

Re-probing of treated sites should not be attempted for 3 months post operatively (Fig. 4), because healing starts at the base of the pocket and the new tissue remains fragile for this period of time (1).

The power settings and time parameters are determined by the particular laser used. The diode laser clinician must take training on the specific laser in the practice to be fully able to implement Laser Assisted Periodontal Therapy. With experience, the user will feel comfortable enough to adapt the protocol to his or her particular practice.

In the future, protocols will be modified and fine-tuned by various laser user groups after discussion of their experiences and results. These results will be incorporated into new procedures which will bring Laser Assisted Periodontal Therapy to a newer, more effective level.

The time has come

The time has come to embrace the routine use of lasers for the treatment of periodontal disease. The diode laser has been shown to be effective and safe for this purpose. If not now, when? Patients need treatment. Laser Assisted Periodontal Therapy is non – invasive. With the diode laser there is a reduced need for systemic or locally applied antimicrobials. This leads to fewer allergic reactions and antibiotic resistance.

There is significant proof that the addition of Laser Assisted Periodontal Therapy to conventional scaling and root planing improves outcomes. This is particularly compelling when considering the periodontal health/ systemic health link. It is time to open our minds to laser technology and apply the treatment that is in the best interest of our patients. **DA**

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