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Lasers In Peri Implantitis-A Review

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ABSTRACT

INTRODUCTION: LASER is an acronym for light amplification by stimulated emission of radiation,a device which emits light coherently into a small, intense, and nearly non-divergent beam with sufficient energy to cut hard and soft tissues. The effect of a laser depends on the energy emitted and absorption by the target tissue. This energy represents a monochromatic light which is collimated into a focused beam interacting with the targeted tissue by being scattered, reflected, absorbed, or transmitted.

Dental implants have become an indispensable established therapy in dentistry in order to replace missing teeth in different clinical situations Microbial colonization has been implicated to be the main causative factor in the pathogenesis of implant failures [1]. The presence of bacteria on implant surfaces leads to an inflammation of the peri-implant mucosa, which when left untreated, the inflammation spreads apically and results in bone resorption, which has been named peri-implantitis [2]. A recent review concluded that laser therapy provided identical outcomes as other surface detoxification methods about probing depth (PD) reduction, clinical attachment level (CAL) gain, and radiographic bone fill.

LASER THERAPY:

By means of a bactericidal action, CO2, Diode, Er:YAG- (erbium-doped: yttrium-aluminum-garnet) and Er,Cr:YSGG- (erbium, chromium-doped: yttrium-scandium-gallium-garnet) lasers are used in the treatment of peri-implant diseases with increased frequency. Minimal absorption and reverberations is ensured with the purpose to protect soft tissue and implant. Er:YAG and Er,Cr :YAG laser with wavelength of 3 microns can reduce biofilms to 90 percentage but which is in contrast to most mechanical therapies any biological compatibilities and cell stimulatory properties can't be re-induced [3]. Treatment with a CO2 308 nm excimer laser, however, led mainly and efficiently to satisfactory results in an anaerobic bacteria spectrum [4]. In comparison to mechanical (plastic curettes), treatments with an Er:YAG laser has shown significantly better results in terms of bleeding at peri-implantitis. However, both methods showed no significant differences in changes of pocket depths, clinical attachment level, plaque index and gingival recessions, although in both groups these parameters were improved [5].

Erbium YAG Laser is anticipated to to be useful in dental applications, because of its wavelength emitting at 2.94 μm is highly absorbed in water [6]. Previously, it was found that the Er:YAG laser could remove subgingival calculus from extracted human teeth at a low energy level under water irrigation with less temperature rise and cementum loss [7].when a bacterial cell containing much water is exposed to the Er:YAG laser, the light is mainly absorbed by water in the cell and water

evaporation causes cell destruction resulting in the cell death. The irradiated bacteria produced smaller colonies comparing to that of non-irradiated bacteria. Study done by Dworkin suggested, these findings might indicate that the surviving bacteria after exposure to laser irradiation have undergone sublethal damage [8]. It is also indicated that the Er:YAG laser had a bactericidal effect at a low energy and was capable of killing both black-pigmented and non-black-pigmented bacteria at the same energy [9]. Histopathological examination of tissue biopsies revealed a mixed chronic inflammatory cell infiltrate (macrophages, lymphocytes, and plasma cells) which seemed to be encapsulated by deposition of irregular bundles of fibrous connective tissue showing increased proliferation of vascular structures [10]. Examination of effectiveness of Er:YAG lasers comparing it to an air polishing system in a randomized clinical trial with 42 patients over 6 months was also done. [11]. Except for the difference in reducing effects on specific bacteria strains after a month (Er:YAG: Fusobacterium nucleatum; air polishing system: Pseudomonas aeruginosa, Staphylococcus aureus and Peptostreptococcusanaerobius) there were no long term-reducing effects shown after 6 months. In a recent study Mailoa et al. showed that laser therapy resulted in similar reductions of probing depths when compared to other decontamination methods [12].

Photodynamic Therapy:

Photodynamic therapy generates reactive oxygen species with help of a high-energy single-frequency light (e.g. diode lasers) in combination with photosensitizers (e.g. toluidine blue). Wave length range of 580 to 1400 nm and toluidine blue concentrations between 10 and 50 ug/ml, PDT generates bactericidal effect against both aerobic and anaerobic bacteria (such as Aggregatibacteractinomycetemcomitans, Porphyromonasgingivalis, Prevotella intermedia, Streptococcus mutans, Enterococcus faecalis) [13]. The only prospective randomized clinical trial by Basseti et al. covered 12 months follow-up. After manually debriding by titanium curettes and glycine air powder treatment half of the patients received adjunctive photodynamic therapy and the other half received minocycline microspheres into implant pockets. After 12 months, the number of periopathogens and level of IL-1β decreased significantly in both groups without significant differences. In a study by Deppe et al. regarding to the effectiveness of phototherapy on a moderate and severe peri-implantitis, both bleeding index and CAL were significantly reduced suggesting that severe cases still resulted in bone resorption [14].

CONCLUSION:

When laser treatment is used as an adjunct to mechanical treatment, recent evidences suggests similar or slightly better clinical outcomes compared with laser treatment alone. Current evidence fails to demonstrate a long-term beneficial (> 48 months) effect of laser treatment used as an adjunctive therapy to non-surgical periodontal treatment. Most studies show a reduction in bleeding on probing; however, short-term data demonstrate inconsistency regarding pocket depth reduction, CAL gains, and bone fill. Antimicrobial photodynamic therapy is laser treatment used in conjunction with a photosensitizer proven to reduce periodontal pathogenic bacteria. Current evidence supports that PDT may provide improvements in PD and clinical attachment level compared with conventional therapy for patients with periodontitis or peri-implantitis.

Future Studies:

1. Laser treatments should be compared to other methods of treatment for peri-implant mucositis and periimplantitis.
2. Further research is needed to determine the effect of laser energy and wavelength on implant surfaces and whether those effects are be positive or negative.
3. Evaluate the histologic patterns of healing (re-osseointegration, healing, scar formation) after laser treatment of implant surfaces.
4. High sample clinical trials comparing laser-assisted therapy to conventional periodontal or peri-implant therapies.

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