THE ROLE OF LASER THERAPY IN IMPLANT DENTISTRY

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INTRODUCTION

As dental implants are becoming more common in dental practice, so the question may arise: what is the role of laser therapy in Implant Dentistry and can it be used to improve the treatment of the patient? In fact, lasers may be used at all stages, from preplacement of implants through to controlling and eliminating infection in the area of the final implant.

Light amplification by stimulated emission of radiation leads readily to the acronym: LASER. The light emitted by a laser is measured in wavelengths, which vary with the type of laser. In Dentistry, the lasers used and their wavelengths cover a wide range – visible light from 400 to 700 nm, Diodes 830-1,064 nm, Nd: YAG 1,064 nm, Erbium 2,790-2,940 nm, and CO2 9.3-10.6 micrometers. Each laser has a wavelength which has a specific thermal output and produces a specific tissue interaction that is always predictable. Dental lasers are classified by various methods according to the lasing medium, such as: gas laser and solid laser; according to tissue applicability: hard tissue and soft tissue lasers; according to the range of wavelength. The risk associated with laser application also influences the classifications. Erbium lasers are used for treatment of hard tissue, for example in the preparation of cavities, but they may also be applied in the treatment of soft tissues. [1] However, Diode lasers can be used only for the treatment of soft tissue and pain management.

DISCUSSION

All the lasers including CO2 may be beneficial for pre-treatment and post-treatment of the area where implants may be placed.

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ACRONYMS

nm: nanometers

DNS: Dental Neurosciences

Lasers can enhance conventional treatment by decreasing bleeding and reducing swelling, by promoting better healing and by delivering an antibacterial effect.[2]

Diode lasers are manufactured to produce different wavelengths, with 810, 940, 980, and 1064 nm being the most common. The energy from these lasers targets pigments such as haemoglobin and melanin in the soft tissue. The energy generally is delivered by a fibre in contact mode. By conditioning, or carbonizing, the fibre, the tip heats up to between 500° and 800° C. The laser effectively cuts by vaporizing the tissue, which occurs through physical contact of the heated tip of the laser, rather than from the optical properties of the laser light itself.

Absorption of the wavelength is the primary desired laser–tissue interaction; the better the absorption, the less the collateral thermal heat directed toward the implant. The 980-nm wavelength is absorbed into water at a slightly higher rate than the 810-nm wavelength, making the 980-nm diode laser potentially safer and therefore more useful around implants. The 980-nm diodes are safe to use near titanium surfaces even at higher power settings. Studies show that the 810-nm diode laser creates a high temperature rise at the implant surface. Romanos also reported that 810-nm diode lasers may damage the surface of the implant. [2]

Diode lasers are considered to be similar to neodymium doped yttrium-aluminum-garnet (Nd:YAG) lasers in dental applications. The advantage of a diode is that this produces less depth of penetration than with the Nd:YAG laser. This more limited effect allows the operator greater control of the laser and reduces the risk of lateral thermal damage.

Disadvantages include slowness in speed of cutting and a gated-pulse delivery mode that translates into potential heat build-up in tissue, which could in fact lead to lateral thermal damage.

The clinician should therefore be aware of the power density of the diode, especially when working close to the surface of implants.

The fibre delivery system of diode and Nd: YAG lasers allows debris to build up on the fibre tip. Consequently, frequent cleaning and cleaving of the tip are necessary. Second stage exposure of implants when the tissues are relatively thin, is an appropriate use for a diode laser. A full-thickness flap raised for the placement of implant fixtures, in more challenging for lasers.

By vaporizing water molecules within the hard tissues, erbium lasers create microexplosions in the hydroxyapatite that break down the hard tissue during the ablation process. This effect is achieved without charring or carbonization, and the heat generated is minimal. It is most effective in lightly vascularized tissue where bleeding will not be an issue. As the energy is absorbed into water, the erbium laser is safe to use around implants and can be applied in the treatment of peri-implantitis and mucositis . This laser will leave the bony surface bleeding (for healing), so curettage is not necessary, but it will not harm the surface of the implant. Erbium lasers have excellent bactericidal properties because when absorbed into intracellular water the energy ruptures the cell membranes of bacteria. It has been confirmed that lasers show high effectiveness in decontamination of zirconia implants.[3]

Using laser energy to make any incision has several benefits. First, a sterile cut is less likely to become infected. Lasers incise tissue without creating the cascade of events that leads to swelling and inflammation. Because lasers seal off lymphatics and blood vessels, a clinically measurable reduction in pain, swelling, and other postoperative complications has been documented for these incisions. Analgesics and antibiotics are needed less frequently, and often in lower doses and with fewer drug interactions. because patients experience a significantly less traumatic postoperative course. These benefits apply in both minor and more advanced surgical procedures.

CONCLUSION

Laser therapy could be used as an adjunct to conventional treatment for peri-implant diseases, provided the appropriate strength and wavelength are selected.[4]

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