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INTRAORAL APPLICATION OF LOW LEVEL LASER THERAPY - A REVIEW

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Abstract

Low level laser therapy (LLLT) is a relatively new technique in the dental field. It is now used by many clinicians in dentistry. Among its most popular applications are the stimulation of the healing process and pain relief. This paper will discuss and review the most recent intraoral applications, its dosage, its applicability in dentistry, and the hazards connected with it are all discussed in this article so that it can be used to provide greater dental care. Low-level laser treatment (LLLT) elicits biological responses in the body by using light energy in the form of adenosine triphosphate (ATP). Pain relief, wound healing, muscle relaxation, immune system regulation, and neuron regeneration are all aided by increased cellular energy and changes in cell membrane permeability. The clinical consequences of LLLT are investigated in this article, as well as how it can be used in the dentistry area.

Keywords: low level laser therapy, Intra oral application, Dental field.

History and Introduction

LASER stands for Light Amplification and Stimulated Emission Radiation, and it was invented in 1967. Coherent light is produced by a device that creates light that is in phase (has the same frequency). Hard tissue lasers and soft tissue lasers are distinguished not by the type of tissue exposed, but by the type of laser-tissue interaction. The interaction of a laser with tissue is affected by wavelength, tissue type, power (incident energy), and time. Such lasers are referred regarded as 'hard' when their action is ablative (basically photothermic), direct, and primary. ' Alternatively, such lasers are referred to as 'soft' when their tissue effects are indirect and occur through secondary (essential biostimulatory) intermediary action. Low-level lasers, low-level laser therapy (LLLT), low-power laser therapy (LPLT), cold laser, biostimulation laser, bioregulation laser, photobiomodulation, photomedicine, medical laser, therapeutic laser, healing laser, nonthermal laser, low-intensity laser, low-reactive laser are

all terms that can be used to describe this group of lasers. Laser phototherapy is the most recent nomenclature, and it is widely acknowledged.[1,4]

Endre Master in Hungary and Fredrich Plog in Canada were among the first to use low-intensity laser radiation for therapy in the late 1960s. It stimulates tissue healing and lowers edoema, inflammation, and discomfort, in addition to the basic benefit of being nonsurgical.[1]

Mechanism of Action

Low-level laser treatment (LLLT) stimulates the generation of cellular energy in the form of adenosine triphosphate, or ATP, at the cellular level. The energy needed to enable a cell function and repair itself is provided by ATP, which can be thought of as the cell's gasoline.

Biostimulation and photodynamic treatment are the two main areas of action for LLLT.[1, 6]

1. Biostimulation

Smaller energies are used over a larger region in LLLT. The tissue effects are primarily photochemical and photobiological, as evidenced by an increase in cellular activity that is selective.[11]

2. Photodynamic Therapy (PDT)

It is based on a photochemical reaction that is cytotoxic. This reaction requires molecular oxygen, intravenously given dihematoporphyrin ether (DHE), and laser light. This results in the production of singlet oxygen, a highly reactive free radical that causes tissue necrosis. Many malignancies can be treated nonsurgically using PDT, or surgical excision can be performed with improved success due to tumour shrinking.[7]

Low Level Laser Therapy Technology

The laser device, the delivery system, and the controller are the three main components of an LLLT system. Semiconductor diode lasers are used in all commercially available LLLT systems. These are often Gallium-aluminum-arsenide (GaAlAs) devices that emit in the near infrared spectrum (wavelength: 700-940 nm) or indium-gallium-arsenide-phosphorus (InGaAsP) devices that emit in the visible spectrum range's red region (wavelength: 600-680 nm). When measured at the level of the diode laser itself, power outputs are typically 10 to 50 mW, albeit the ultimate usable output (from the handpiece) would be less due to delivery system losses. As a result, employing an external power metre to calibrate the laser system is a crucial quality assurance measure.[1]

Dosage

Despite the fact that laser therapy has a large therapeutic window, it is critical to use a safe dose. The provided energy is multiplied by the product of power and time (mW seconds) to compute the dose (energy density).

The following are some therapeutic dosages that have been suggested:

2 to 3 J/cm^2 on gingival tissues two or three times a week; 4 to 6 J/cm^2 on muscles two or three times a week; 6 to 10 J/cm^2 once or twice a week on the temporomandibular joint (TMJ); and 2 to 4 J/cm^2 directly on the tooth or indirectly above the apex or osseous structure.[1]

Low-Level Laser Therapy has a number of advantages and Benefits in Dentistry

When LLLT operations are conducted on soft tissues, laser energy is used to anastomose tissues, eliminating the need for suturing (stitching up the incision with a suture) through a process known as tissue welding.

- Injured soft and hard tissues recover more quickly.
- Reduces bleeding and blood loss.
- Reduces or eliminates the necessity for

anaesthesia in some cases (However, this depends on the clinical procedure).

- Decontamination of root canal systems and deep periodontal pockets to remove bacteria.
- Aids in the regeneration of PDL.
- Pain is reduced.
- Hard tissue repair is easier and more comfortable for patients.

Clinical Effects of LLLT

LLLT has been used successfully in dentistry for more than four decades, but only in the last ten years has the extent of the favourable therapeutic effects been proven in double blind placebo controlled research. Low-level laser therapy can be utilised as a treatment adjunct to other dental treatments as well as a surgical laser procedure for a variety of conditions and uses, some of which are listed below. The Arndt Schultz principle, which states that mild stimuli stimulate physiological processes whereas strong stimuli abolish physiological activity, best describes this.[6]

1. Post-extraction.[2,4,8,10]

- Reduction of post-operative discomfort.

- A decrease in the requirement for analgesics.

- Improved circulation for speedier recovery.

- Edema after surgery was reduced.

- Improved epithelial healing reduces the likelihood of a dry socket.

2. Dry socket.[2]

- Reduce the acute and severe pain of exposed socket nerves.

- Subsequent appointments - fibroblast stimulation for the formation of an epithelial layer in the socket.

3. Infection of the teeth.[2,9]

- Edema reduction (swelling).

- Stimulates the immune system and attracts neutrophils to the infection site, resulting in quicker healing.

4. Lesion of the soft tissues (herpes lesions, apthous ulcers and denture sores).[2,6]

- Pain relief.

- If discovered early enough, the lesion can be prevented.

- Healing time is reduced.

- Recurrence was reduced.

5. Restorative and cementing crowns.[7,11]

- It provides analgesia for minor tooth preparations and crown cementations, decreasing the need for local anaesthesia in certain situations.

- Post-op sensitivity is reduced.

- Anaesthesia is absorbed and eliminated more quickly.

- In deep restorative settings, the production of secondary dentin.

6. Gagging and nausea[5]

- When applied to the P6 acupuncture point, nausea and gagging are reduced.

7. Endodontics (following root canals, pulpotomies, endodontic surgery).[7,12]

- Pain and inflammation after surgery are reduced.

- Less need for post-operative analgesics.

8. Hypersensitivity of the dentine.[3,5,6]

- It reduces the conduction of c-fibres, which transport pulpal pain.

- Endorphin stimulation.

- Inflammation is reduced.

- Soft tissue healing stimulation

9. Orthodontics,[3, 5, 6]

- It reduces the intensity of pain.

- Stimulates osteoblasts, which increases tooth movement speed.

10. Implants .[5,6,12]

- Pain relief following surgery.

- Implant integration is faster.

OTHER POTENTIAL USES

Laser therapy has several applications outside of the dental chair. Ground breaking research on wound healing, stroke, heart disease, neurological diseases, and cancer is yielding remarkable results that could have a huge impact on medicine in the future.

Chiropractors, massage therapists, and tissue injury specialists all use laser therapy as an adjuvant to their present treatment regimens or as a primary treatment technique to relieve the strain of their physically demanding jobs. Many athletes and their coaches are interested in clinical research on muscle healing and exhaustion, and substantial study is being conducted to improve the performance of elite athletes.[1]

Contraindications and Safety Measures

Low level laser therapy, also known as therapeutic lasers, has been found to have no negative side effects or harm to patients undergoing surgery. These lasers are usually categorised as Class III or Class IV (Based on potential to cause damage). When using high-output invisible lasers, the risk of eye injury must be considered. A diode laser's light is generally divergent; however, when the light is collimated, the risk of eye injury increases significantly.. The patient and the dental professional must wear wavelength-specific protective goggles. Under magnification aids such as a microscope or surgical loupes, the laser beam should not be visible. In the operatory, non-flammable products must be used.[5]

Although there are no contraindications to using LLLT, patients with malignancies and coagulation disorders should be treated with the utmost caution.[5]

Conclusion

There are few choices for pain alleviation, inflammation and edema reduction, and wound healing stimulation for healthcare providers that do not include medicines with several negative side effects. Low-level laser therapy is an appealing alternative to medications because it is non-invasive and non-toxic. Many dentists aren't aware of how they can use their surgical laser instruments, which are common in most dental offices, to take advantage of the remarkable effects of low-level laser therapy.

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