



Low Level Laser Therapy and its application in Dentistry

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ABSTRACT

Laser is a sort of electromagnetic irradiation source. Low level laser therapy do not have thermal effect due to which it produces photoreactions in the tissues and cells through light stimulation and called as Photobiostimulation. Differentiating feature between high level and low level laser therapy is activation of photochemical reactions without heat production. Low level laser therapy is used in various dental treatments.

Keywords: Low level laser, Photobiostimulation, photochemical reactions.

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INTRODUCTION

Light is an electromagnetic energy type that exists as both a wave and a particle. Ordinary light and laser light differ greatly from one another.

The visible spectrum's numerous colors—violet, blue, green, yellow, orange, and red—combine to form ordinary light. Laser light (a particular colour), which has the monochromacity quality; this colour may be visible or invisible in dental applications. Three qualities define laser light: efficiency, coherence, and collimation. Collimation is the process of giving a beam of lights certain spatial boundaries so that it will always be the same size and shape when it leaves the laser chamber. Radiation with this characteristic is produced by dental x-ray equipment [1].

Coherency refers to the uniformity of the light waves generated by the device. They all have identical wave forms and are in phase with one another, It translates to equal peaks and dips everywhere.

Efficiency is a quality of laser light that makes it useful in medicine. The amount of heat needed to accurately incise a gingival papillais delivered using a 2 watt Nd:YAG laser [2].

The three measurements that make up a laser's photon wave are as follows.

Velocity is first (the speed of light), and the height of the wave's oscillation as a whole is its amplitude, which comes in second along a vertical axis from the peak to the base. This is a measure of the wave's intensity: the more work that can be done, the bigger the wave's amplitude. The wavelength is the third element, that which separation either two matching places on a wave measured along its horizontal axis. The laser light's delivery to the surgical site and its interaction with tissue are both influenced by this measurement of physical size. The length of a wave is calibrated in meters, however dentistry's preferred wavelengths are measured in smaller units called microns or nanometers [3-4].

Using power to classify lasers [5]

A-Powerful, heated, or hard lasers

By generating heat and accelerating the movement of energy in tissues, these lasers produce their therapeutic effects. Necrosis, carbonization, evaporation, coagulation, and protein denaturation are some of these impacts.

These lasers typically have a power greater than 0/5W. The use of these lasers in surgery is possible.

B-Lasers with Moderate Powers:

Without producing a lot of heat, these lasers exhibit therapeutic effects. In tissues, their light has a stimulating effect. These lasers have 250 to 500mW of power.

C-Low Level or Cold Lasers:

These lasers don't heat up the tissues in any way.

They cause a light stimulation, which leads to light and gradually occurring tissue reactions known as photobiostimulation.

These lasers typically have a power of less than 250mW.

Based on wavelength, classifying lasers

Based on their wavelengths, lasers are divided into four categories: UV wavelengths of 300–400 nm, visible light wavelengths of 400–700 nm, near infrared (NIR) wavelengths of 700–1200 nm, and far infrared (FIR) wavelengths of 1200 nm.

Depending on the material used for their sources, classify lasers

lasers that use gas, like CO₂, Ne, and He Lasers made of liquids like dye lasers, solids like ruby lasers, and semiconductors like GaInP, GaAs, and GaAs.

Low Level Laser Therapy Mechanism

Low Level Laser therapy acts upon biostimulation and photodynamic therapy: Biostimulation - Low Level Laser Therapy spreads out tiny energy across larger areas. The majority of the tissue impacts are photochemical and photobiological, and a specific rise in cellular activity can be observed. Biostimulation reduces the microcirculation deficit and expedites the healing of worn-out cells for therapy-resistant skin and mucosal ulcers, arterial, venous, microcirculatory, and lymphatic circulation deficits, metabolic and neurogenetic insufficiencies, and resistant infections. A cytotoxic photochemical reaction serves as the foundation of photodynamic therapy [2, 5]. Dihematoporphyrin ether (DHE), which can be delivered intravenously, laser light, and molecular oxygen are all necessary for this process. This results in the production of singlet oxygen, a highly reactive free radical that causes tissue necrosis. Many cancers can be treated non-surgically using photodynamic therapy because the tumour shrinks, enabling excision.

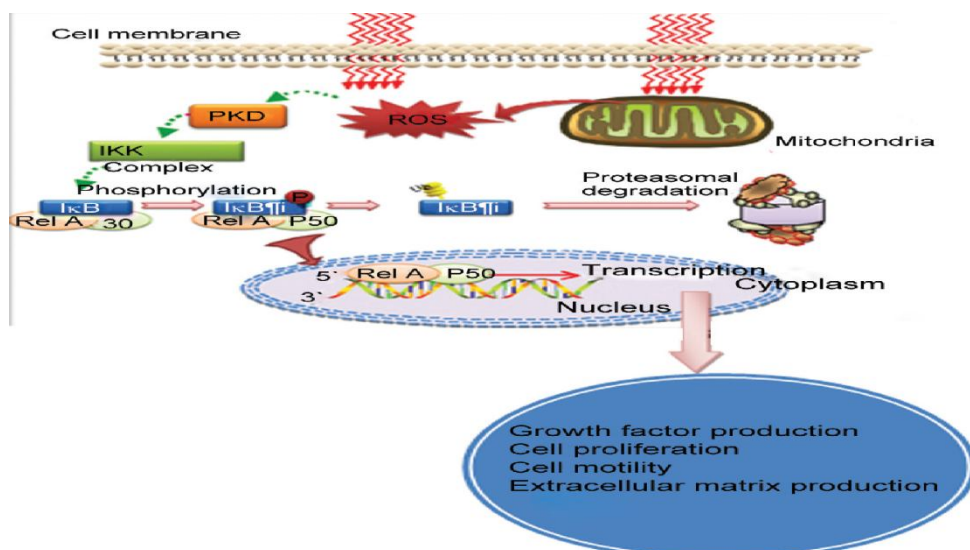


Figure 1 Depicts biostimulation and photodynamic therapy.

Application of low level laser therapy

Alveolar osteitis :The treatment of alveolar osteitis is providing relief from pain. By preventing the synthesis of prostaglandin-2 and cyclooxygenase-2, two prominent mediators of inflammation, it also aids in the reduction of inflammation. Due to the effect on wound healing Keratinocytes are more mobile, early epithelization is encouraged, fibroblast proliferation and matrix synthesis are accelerated, and neovascularization is boosted. Dentin hypersensitivity- Inhibits the nociceptive signals arising from peripheral nerves which leads to dentin hypersensitivity [3].

Dental infections - Bacteria are killed by lasers through a process known as fatal laser photosensitization (LLP). A low power laser device's laser beam activates a dye called toluidine blue O, which then has a fatal effect on the targeted cells, including bacteria.

Oral Mucositis - It is used to prevent mucositis and healing erupted sores.

Temporomandibular Joint Disorders - Therapy significantly reduced discomfort, enhanced lateral mobility and mouth opening, and reduced the quantity of triggers sites in TMD with myogenic and arthrogenicaetiology.

Removable prosthetic reconstruction - Used to remove tori and exostoses, to correct enlarged tuberosity, to correct flabby ridges.

Implant Placement- It decrease pain during implant placement helps the implant integrate into the bone more quickly and improves the quality of the bone surrounding the implant.

CONCLUSION

Though there are many options available for treating various dental diseases with medications but low level laser therapy is an advancement in the field of dentistry which helps in early wound healing, painless and blood less procedures. Another technique for reducing pain is low-level laser therapy and improvement in mouth opening and has lesser side effects documented which make it as a treatment of choice in future in treating aphthous ulcer, mucositis, alveolar osteitis, dentin hypersensitivity, Temporomandibular joint disorders.

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