



Medical Applications for Cold Laser

Dr. Nagham Thamer Ali

Ministry of science & technology

Nagam2105@gmail.com

Abstract

Low level laser therapy is a form of alternative medicine where laser beams or light-emitting diodes (LED) are used on different areas of the body. Unlike the behavior of high-energy lasers that cut and destroy tissues, a low-level laser is used to relieve pain or stimulate and enhance function. Cell.

In this study, a review of the concept of cold lasers and the different medical applications of the cold laser, their advantages and disadvantages, is studied, and the optimum conditions for work and the suitability of the cold laser for appropriate application are determined.

Keyword: Cold Laser, LLLT, Medical applications.

التطبيقات الطبية لليزر البارد

الخلاصة

ان العلاج بالليزر منخفض القدرة (low lower laser therapy) يعتبر شكل من اشكال الطب البديل حيث تستخدم اشعة الليزر او الثنائيات باعثة للضوء على مناطق الجسم المختلفة وعلى عكس سلوك الليزر ذو الطاقة العالية الذي يعمل على قطع وتدمير الأنسجة يستخدم ليزر منخفض المستوى في تخفيف الالام او تحفيز وتعزيز وظيفة الخلية.

في هذا البحث يتم دراسة مراجعة مفهوم الليزر البارد والتطبيقات الطبية المختلفة لليزر البارد، مميزاتها ومعوقاتها وتحديد الظروف المثلى للعمل وملائمة الليزر البارد للتطبيق المناسب.

الكلمات المفتاحية : الليزر البارد، LLLT، التطبيقات الطبية.

Introduction

After invention of laser in 1960, thousands of application was used its unique properties. Health of human is one most vital urgent need has been adopted by scientists for the past seventy years, as most research has directed towards applications that touch human life, including medical applications. Laser as term refer to (Light Amplification by Stimulated Emission of Radiation). lasers are classified according to the active medium, or consistent with the output energy into several classifications [1]. Laser are often classified consistent with the energy intensity it produces to:

- pure laser which is of high intensity resulting from the continuous emission of single wave radiation in terms of length, frequency and polarity.

- IPL- (Intense Pulse Light) leading to a high-intensity (higher than previous) electromagnetic impulses.

- LED- (Light Emitting Diode) - is produced by the continual emission of two-intensity low-wave electromagnetic radiation and therefore the resulting energy is that the average energy of the two wavelengths of radiation.

The first and second sorts of lasers are often utilized in surgery and cosmetology (eye and skin surgery, tumor removal, etc.) The third type is the type that's utilized in physiotherapy and is that the class that we have an interest in studying from laser and its treatment is named LLLT (LOW LEVEL LASER THERAPY) Or low-level laser processing is the focus of our research.

Cold laser therapy

Cold laser therapy is low-intensity laser therapy that stimulates healing while using low levels of light. The technique is named “cold” laser therapy because the low levels of sunshine aren't enough to heat your body's tissue [2]. the level of light is low in comparison to other sorts of laser therapy, like those wont to destroy tumors and

coagulate tissue. Surgical and aesthetic lasers heat the tissue being treated. faithful its name, cold laser therapy doesn't .

Cold laser therapy takes different names such as[3]:

- low-level laser therapy (LLLT)
- low-power laser therapy (LPLT)
- soft laser bio stimulation
- photo biomodulation

Cold laser therapy uses safe, visible or infrared of multiple wavelengths to focus on a wide spectrum of neurological and orthopedic conditions. The FDA - approved Class III laser utilized in this practice is safe for human exposure. By combining traditional cold laser therapy with quantum wave technology, this therapy enhances healing during a relaxed, noninvasive manner [4]. it's been shown to alleviate pain and vastly improve quality of life for people affected by variety of neurological, muscular, skeletal, lymphatic, vascular conditions.

Mechanism for cold laser work

Cold laser therapy is assumed to affect cellular physiology through the excitation of cells by light. While there's no universal theory about the underlying science, scientists have demonstrated that light can enhance communication between cells additionally to stimulating chromophores (light-sensitive enzymes) that play a task in several metabolic

processes, including the assembly of ATP, collagen and vitamin D [5]. it's through this stimulatory effect that low-level laser treatment can act as a strong analgesic by improving blood circulation, stimulating peripheral nerves and fighting inflammation in problem areas of the body. During this procedure, different wavelengths and outputs of low-level light are applied on to a targeted area. The body tissue then absorbs the light. The red and near-infrared light causes a reaction, and therefore the damaged cells respond with a physiological reaction that promotes regeneration. Superficial tissue is usually treated with wavelengths between (600 and 700) nanometers (nm), For deeper penetration, wavelengths between (780 and 950) nm are used[6]. Although you'll feel the laser device touching your skin, the procedure is painless and noninvasive. there'll be no sound and you'll feel no vibration or heat. Each treatment typically takes only a couple of minutes. as shown in figure (1).



Figure (1) Cold laser therapy for pain relief

Laser-tissue interaction

Laser-tissue interaction can result in a variety of effects, including photo thermal, photochemical and photo acoustic. When a laser beam strikes the surface of a tissue, the photons can be absorbed, reflected or scattered. Absorption converts radiant energy into heat, while scattering results in a loss of power density, and can be associated with thermal damage due to elevation in temperatures below the boiling point[7]. Figure (2).

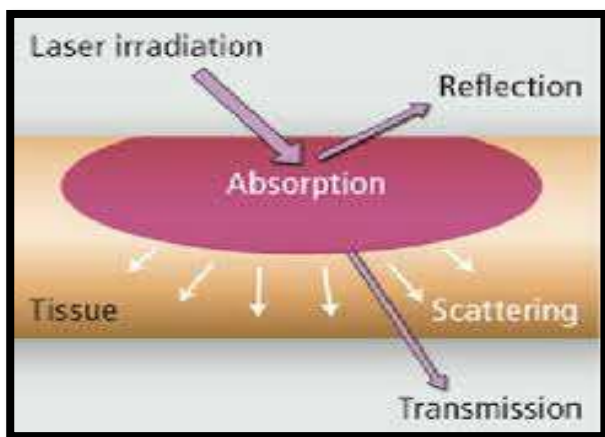


Figure (2) Laser-tissue interaction

Photo thermal effects refer to the absorption of light, with the conversion of energy to heat. this is often the most common application of laser energy in gynecology [8]. In contrast, surgical diathermy, also known as electro surgery, is that the production of heat caused by the passage of electrons through a material with resistance [9]. the particular effect observed in tissue depends upon the quantity of energy delivered, the wavelength of the laser, and therefore the coefficient of absorption of the tissue [10]. the quantity of energy delivered may be a factor of wattage, time and beam spot-size. Power density is described as Watts/cm², and is therefore

inversely proportional to the area of the spot-size. In each tissue, the coefficient of absorption is restricted to a given wavelength. Photons with wavelengths within the far-infrared range are highly absorbed by water, whereas wavelengths within the visible and near-visible regions of the spectrum are absorbed by chromophores, like hemoglobin and melanin [11] figure (3).

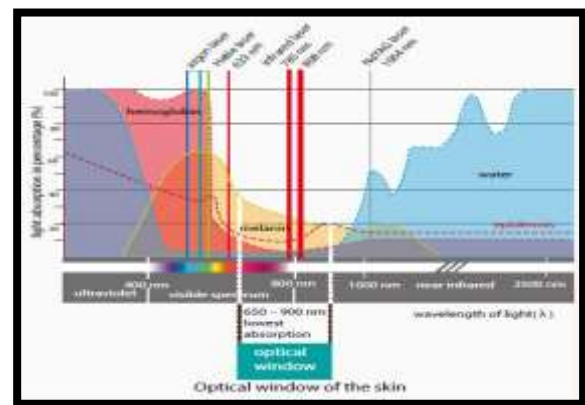


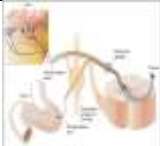
Figure (3) Wavelength used in cold laser therapy

Treated Areas for cold laser therapy

The laser is a powerful tool for physical therapists to enhance lymphatic's, restore and strengthen damaged nerve, muscle, and cartilage, thus providing patients with increased mobility and vigor. Doctors, dentists, physical therapists, and other medical professionals use cold laser therapy during a sort of ways. the most uses of cold laser therapy are tissue repair and relief from pain and inflammation (12). Low-level laser use has been promoted to treat many musculoskeletal diseases including carpal tunnel syndrome, fibromyalgia, osteoporosis, and rheumatoid arthritis. it's also been promoted within the treatment of TMJ

disorders, wound healing, smoking cessation and tuberculosis. While low-level laser therapy may help relieve some people's pain temporarily, there's no evidence to support the claims of this treatment's effect on long-term results or its preference for a few other techniques that use heat. As shown in table (1).

Table (1) Summery of some medical application for cold laser

No.	Year of Publication	The first publisher	Medical applications	Mechanisms of LLLT	results
13	2015	Howard B. Cotler	treatment of pain		(LLLIT and LED is beneficial for pain relief
14	2005	HAWKINS, D. AND	Wound Healing		effect of low level laser therapy (LLLIT) on cellular and molecular processes in the cell.
15	2015	Su Jung Kim	Dentistry		The effects of LLLIT with regard to orthodontic tooth movement are controversial
16	2014	Pinar Avci	Hair loss		(LLLIT) applied to the scalp as a treatment for hair loss and discusses possible mechanisms of actions

17	2018	Marieke Bamps	HNSCC cancer cells		LLLIT increases cell proliferation during a dose-dependent manner in HNSCC cells but not in normal epithelial tonsil cells.
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Conclusions

In this review, Cold laser therapy or low-intensity laser therapy had been utilized in recent years in several medical applications. It's had encouraging results, especially with pain, dentistry and cancer research. Low-level laser treatment is painless, safe and not destroy tissue.

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