

Applications of LLLT in Dentistry and TMJ Disorders

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ABSTRACT

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Opinion

LASER is an acronym of light amplification by stimulated emission of radiation. A beam of light passes through a specific medium stimulating the atoms within the medium and the light is following a specific direction, the direction of the medium with the wavelength of the original beam. Laser irradiation constitutes an innovative method of minimally-invasive dental treatment in the whole field of dentistry. In 1960 it was first appeared in the field of dentistry [1]. It has many advantages such as ease, efficiency, specificity, comfort, as patients feel better toward laser than sharp tools. On the other hand laser therapy has some drawbacks like high cost for the equipment, additional training and education. Furthermore, more than one laser maybe be needed for different treatments aspects and its operation requires protective measures such as glasses etch. Laser could be emitted either constantly or at stable or irregular pulses. Lasers commonly used in medicine are divided in different categories regarding the physical construction (gas, liquid, solid, semiconductor), the type of the medium (e.g. He-Ne, Er: YAG) and the degree of the exposure hazards (Class I-IV).

In addition, based on the energy level lasers are devised into high, medium and low level energy lasers. Low level energy laser produces power less than 250mW, LLLI is called "cold laser". "Photobiostimulation" was inserted actually as a general term including LLLT and, wavelengths both in visible region (380-700nm) and infrared and near infrared region (700nm-1100µm) of the electromagnetic spectrum. LLLT includes only low level 'cold lasers'. It affects cell proliferation, differentiation and interaction, inducing finally alterations that could have a beneficial effect on

therapeutic treatment. LLLT applications are reported at the Table 1 below.

Table 1.

Soft Tissue Applications	Hard Tissue Applications
Wound healing, Synovitis, Gingivitis, Aphthous stomatitis, Arthritis Alveolitis, Pulpotomy, MJ pathology, HSV ulceration, Mucositis, Acute abscesses, Periodontitis, Neuronal regeneration, Periapical granulomas, Pericoronitis, Post-herpetic neuralgia, Chronic orofacial pain , Acute sinusitis, , ost-extraction pain Plaque formation, Bone regeneration,	Dentinal hypersensitivity, Periodontal ligament pain during tooth movement, Destruction of bacteria by laser, Photosensitization

Applications of LLLT in the Field of Dentistry [2]

LLLT & TMJ Disorders

LLLT is reported as a modern treatment modality in case of Temporomandibular joint Disorders (TMD) [3]. TMD is a term used to describe a number of clinical problems involving the temporomandibular joint and masticatory muscles and other associated structures. It is considered as the most common cause of non-dental pain located at orofacial region. Epidemiological studies shows that affects women in the 30-year-old age group. Also, it is considered a public health problem as it affects 5% to 12% of the world population [4]. Etiology is multifactorial and is commonly related to trauma, neoplasia, stress and anxiety, occlusal

interferences, poorly positioned teeth, bruxism, tooth/ teeth loss, poor relationship of bone bases, parafunctional movements, deleterious habits, and intrinsic temporomandibular joint problems, which may or may not appear in combination.

Signs and symptoms of TMD may include pain, impaired jaw function, malocclusion, deviation from the midline on opening or closing the jaw, limited range of motion, joint noises and locking [5,6]. LLT therapy has a biological effect on local circulation when applied. The regulatory effect of LLLT on blood flow in the tender areas may be one of the mechanisms that results in pain relief [7]. LLLT has been shown to cause vasodilation by triggering the relaxation of smooth muscle associated with endothelium, which is highly relevant to the treatment of joint inflammation. This vasodilation increases the amount of oxygen to treated cells, and also allows for greater traffic of immune cells into tissue. These two effects contribute to accelerated healing [8]. Authors investigated the effect of LLLT alone or in combination with splint therapy on pain and jaw movement at TMD patients. Four treatment protocols were investigated. Patient who treated at Group 1 with LLLI at 8j/cm², Group 2 with LLLI at 8j/cm² and OS, Group 3 with OS protocol and Group 4 with LLLI at 0,1j/cm² (placebo group).

Clinical examination was contacted at three time points before, after and one month after the treatment. Two sessions of LLLI per week were performed for four consecutive weeks (Biolase, Epic X, InGaAs Psemi-conductor diode laser, 940 nm, in continuous mode, 0.2 W). Drugs were forbidden. Patients with systematic diseases, neurological and psychological problems were excluded. Visual pain scale (scale: 0-10) was completed at examination appointments. Before treatment all patients reported 6 to 7 score in visual scale pain. Patients reported at: Groups 3 and 2 score 2 after treatment and 1 month later; Group 1 score 2 after treatment and 4, 1 month later and Group 4 score 3 after treatment and 6, 1 month

later. These results lead to the conclusion psychological factors may affect the outcome of LLLT initially. OS and LLLI presented efficacy on pain management. LLLI is a none invasive treatment with no side effect. Identification of pain biomarkers and investigation of molecular pathway of LLLI could clarify pain pattern and lead to the establishment of treatment protocols, effective on painful symptoms.

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