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Opinion

Low-Level Laser Therapy: The Importance of An Individualized Treatment Approach for Pain Management

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Pain, especially in its chronic form, is a complex process which can deeply affect an individual's life. The definition of pain, according to the International Association for the Study of Pain, is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage…" [1]. There are two major types of pain, nociceptive and neuropathic. Nociceptive pain is caused by the activation of specific pain receptors in response to noxious stimuli, while neuropathic pain reflects nervous system damage and/or dysfunction [2]. Traditional medical treatment of pain has typically included acetaminophen, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and/or opioids. NSAIDs exert their effects by reducing the sensitivity of nociceptors in the peripheral nervous system, but they can have significant or even life-threatening side effects [3]. Low-Level Laser Therapy (LLLT), on the other hand, can treat both nociceptive and neuropathic pain by interfering with action potential propagation in axons of the A-delta and C- nerve fibers [4]. It is a superior alternative to NSAIDs, without the known side effects.

Therapeutic laser systems produce light of specific wavelengths designed to stimulate biological responses on a cellular and molecular level to stimulate the elimination of pain, reduction of inflammation and acceleration of tissue healing. Research has demonstrated significant improvements in patients treated with laser with respect to parameters such as pain, functioning and quality of life [5,6]. A recent systematic review and meta-analysis concluded that LLLT is an effective treatment modality to achieve pain relief in adult patients with musculoskeletal (MSK) disorders [7]. Another meta-analysis indicated that laser irradiation on joint areas can be an effective pain relief treatment, especially when combined with exercise [8]. The authors stated that LLLT may be a good alternative to the use of NSAIDs, particularly for elderly individuals [8]. Despite the noted benefits, the challenge with laser therapy is the ability to deliver the optimal dose of light energy to the afflicted tissue depth. This can be problematic as patients present with a wide variety of physical configurations (i.e.: skin colouration, subcutaneous fat content, muscle mass, etc.), all of which directly affect photon scattering and absorption in the various tissue layers, and ultimately, the optical energy available to the cells at the afflicted target tissue depth [9,10]. Therefore, to maximize the effectiveness of a therapeutic laser system, an individualized approach to pain management is necessary.

Healthcare practitioners need to go beyond the 'one size fits all' approach to laser treatments and tailor therapy to each individual patient in order to achieve an optimal therapeutic response. An individualized approach has the potential to significantly increase the beneficial effects of LLLT. Becoming more accurate and precise in delivering the correct laser dose at the tissue surface can ensure that the correct laser dose reaches the target depth. It is well established that an optimal combination of irradiance (mW/cm2) and exposure time (seconds) exists for bio stimulation [11]. If the irradiance is lower than this optimum value, or more significantly, higher than this optimum value, the patient will experience a diminished therapeutic outcome [11]. This biphasic dose response is known as the Arndt-Schultz Law [11].

Novel therapeutic laser technology that utilizes a biofeedback mechanism, known as Cell Sensing® technology, is able to automatically adjust clinical protocol settings (i.e.: irradiance and exposure time) at the tissue surface to deliver the optimal clinical dose at the afflicted tissue depth, in direct correlation with a patient's unique physical configuration. The first law of photochemistry,

known as the Grotthuss-Draper Law, states that: "Light has to be absorbed to cause a chemical effect" [12]. Re-framing this law in the aspect of light penetration in tissue, light must be absorbed at tissue depth in order to produce a photochemical reaction at that tissue depth; therefore, more precise, repeatable and reproducible photochemical effects, like the effects that are able to reduce pain, must be exhibited at the disease site or anatomical location of the disease to achieve maximum therapeutic effect.

In scientific evaluation, this revolutionary technology has demonstrated clinically significant pain reduction for a variety of MSK conditions. A retrospective review of the treatment data collected in a cloud database demonstrated significant mean pain score reductions, as measured by a Visual Analog Scale ("VAS"), for ankle, back, knee, foot, hip, neck, shoulder, and wrist pain, as well as for muscle strains. A total of 697 patients, treated for back pain (i.e.: lumbar arthrosis, lumbar disc herniation, lumbar muscle strain, and sciatica), achieved a mean pain score reduction of 30.05% from baseline to last treatment, with an average of 9 treatment sessions. For lower extremity muscle strains (i.e.: gastrocnemius, quadriceps, and hamstrings), 101 patients were treated and evaluated for pain relief. The results showed that with 8 to 9 treatments there was a mean VAS pain score reduction of 31.83%. Undoubtedly, successful pain management relies on the ability of laser technology to deliver an optimal dose of light energy. Cell Sensing® technology provides more consistent clinical efficacy and higher safety for a patient population suffering from nociceptive and neuropathic pain, by not overdosing or underdosing the patient, especially patients who present with darker skin coloration and/or greater physical size. This type of patient-centric care is, undoubtedly, the future of laser technology.

References

1. (2017) International Association for the Study of Pain. IASP terminology.
2. Nicholson B (2006) Differential diagnosis: nociceptive and neuropathic pain. Am J Manag Care 12(9): S256-S262.
3. Slater D, Kunnathil S, McBride J, Koppala R (2010) Pharmacology of nonsteroidal antiinflammatory drugs and opioids. Semin Intervent Radiol 27(4): 400-411.
4. Cotler HB, Chow RT, Hamblin MR, Carroll J (2015) The use of low level laser therapy (LLLT) for musculoskeletal pain. MOJ Orthop Rheumatol 2(5): 00068.
5. Gur A, Cosut A, Sarac AJ, Cevik R, Nas K, et al. (2003) Efficacy of different therapy regimes of low-power laser in painful osteoarthritis of the knee: a double-blind and randomized-controlled trial. Lasers Surg Med 33(5): 330-338.
6. Dima R, Tieppo Francio V, Towery C, Davani S (2018) Review of literature on low-level laser therapy benefits for nonpharmacological pain control in chronic pain and osteoarthritis. Altern Ther Health Med 24(5): 8-10.
7. Clijsen R, Brunner A, Barbero M, Clarys P, Taeymans J (2017) Effects of low-level laser therapy on pain in patients with musculoskeletal disorders: a systematic review and meta-analysis. Eur J Phys Rehabil Med 53(4): 603-610.
8. Jang H, Lee H (2012) Meta-analysis of pain relief effects by laser irradiation on joint areas. Photomed Laser Surg 30(8): 405-417.
9. (2009) Light-based therapies for skin of color in: Baron ED (Ed.) Springer.
10. Tsai C, Chen J, Wang W (2001) Near-infrared absorption property of biological soft tissue constituents. J Med Biol Eng 21(1): 7-14.
11. Chung H, Dai T, Sharma SK, Huang Y, Carroll JD, et al. (2012) The nuts and bolts of low-level laser (light) therapy. Ann Biomed Eng 40(2): 516-533.
12. Albini A (2016) The Framework of Photochemistry: The Laws. In: Photochemistry. Springer, Berlin, Heidelberg.