Dynamic Chiropractic

LASERS & TENS

Photobiomodulation for Neuropathy

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Peripheral neuropathy is a general term for a series of disorders that result from damage to the peripheral nervous system. Peripheral neuropathy can affect multiple nerves (polyneuropathy) or single nerves (mononeuropathy).

Mononeuropathy is usually damage to a single nerve or nerve group by trauma, injury, local compression, prolonged pressure, or inflammation. Examples include carpal tunnel syndrome and Bell's Palsy.[1] Polyneuropathies are more common and are caused by diabetes, chemotherapy, toxic chemical exposure, chronic alcoholism, certain medications and more.[2]

Let's focus on lower extremity peripheral neuropathy caused by diabetes and chemotherapy, and how photobiomodulation (PBM, commonly known as laser therapy) with a class 4 therapeutic laser is a safe, non-invasive, effective treatment solution.

The Neuropathic Pain Problem

The number of people with diabetes worldwide is predicted to double between 2000 and 2030, approaching a pandemic level of 366 million people. Diabetic peripheral neuropathy has a lifetime prevalence of approximately 50 percent and is a leading cause for disability due to foot ulceration and amputation, gait disturbance, and fall-related injury. Roughly 30 percent of patients suffer from neuropathic pain.[3]

Chemotherapy-induced peripheral neuropathy (CIPN) is a common side effect of anti-neoplastic pharmaceuticals. It typically manifests as numbness, paresthesia, pain, and/or burning. Motor dysfunction and/or autonomic dysfunction can also occur. The prevalence of CIPN after chemotherapy is 20-51 percent, but estimates vary considerably depending on the severity threshold and mechanism of detection. Underreporting of both the prevalence and magnitude of CIPN is likely because sensory symptoms are not always apparent.[4]

PBM to Modulate Neuropathic Pain: Mechanisms of Action

In vitro and *in vivo* animal experiments show that PBM with infrared laser light can modulate neuropathic pain by altering chronic inflammation, decreasing mechanical allodynia, suppressing conduction velocity and reducing amplitude of action potentials.[5] Further animal experiments show that PBM-induced anti-nociception comes from the release of central opioids, helping with pain relief in the early stages of treatment.

Later stages of PBM treatment appear to be inducing permanent neuroplastic changes that maintain the anti-nociceptive state, without depending on opioid release in the periphery.[6]

The general mechanisms of action for PBM are numerous and involve intra- and extracellular effects, as well as effects on the cell membrane.[7] Some include the following: absorption of laser photons by water molecules to enhance microcirculation; disassociation of inhibitory nitric oxide from the cytochrome-c oxidase enzyme; activation of light-sensitive ion channels; and activation of transcription factors.[8]

Let's Look at the Research

The primary effects of PBM occur when there is direct photonic absorption by chromophores in the tissues.[9] Class 4 therapeutic lasers are FDA-cleared prescription medical devices that can deliver photons of red and infrared laser light to the large volume of tissue required for treatment of peripheral neuropathy.

One study assessed the safety and efficacy of class 4 laser therapy on pain management, functionality, systemic inflammation, and overall quality of life of patients with diabetic peripheral neuropathy. PBM treatment was delivered to the lumbar region and the plantar surface of the foot, using power levels from 2 to 8 watts. No adverse events were reported during the study period. After the 12-week intervention, pain levels were significantly lower, timed up-and-go test times (assessing functionality) were significantly improved, and serum levels of IL-6 and MCP-1 were decreased significantly.[10]

Another study investigated PBM via class 4 laser therapy for chemotherapy-induced peripheral neuropathy (CIPN). This randomized, double-blinded, sham-controlled, cross-over trial concluded, "Among patients with CIPN, PBM produced significant reduction in neuropathy symptoms." PBM treatment was delivered to the lumbar region and lower extremity, with power settings from 6.75 to 12 watts, using a combination of continuous wave and pulse frequencies up to 20,000Hz. Treatment times were 30 minutes, and there were no adverse events involving active treatment.

The modified total neuropathy score (mTNS), a validated tool that assesses six domains of sensory and motor neuropathy, was used as the outcome measure. The study found that "photobiomodulation is an effective, low-toxicity treatment for CIPN. Nearly 90% of patients experience significant improvement in mTNS scores that begins within weeks of initiating treatment and persists for at least 10 weeks after the conclusion of therapy. The benefits appear to accrue similarly to patients with variable duration and intensity of neuropathy symptoms, as well as to patients with variable chemotherapy exposures."[11]

Peripheral neuropathy is a serious problem regardless of the cause. Chiropractors are in a unique position to safely and effectively treat peripheral neuropathy with PBM delivered from a class 4 therapeutic laser.

References

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