

Photobiomodulation of the Dorsal Root Ganglion for the Treatment of Low Back Pain: A Pilot Study

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Background and Objective: Chronic low back pain is a worldwide public health issue with high socioeconomic impact. The aim of this study was to determine the efficacy of laser irradiation of the dorsal root ganglion of the second lumbar spinal nerve for chronic axial low back pain compared to lidocaine injection and radiofrequency treatment.

Study Design/Material and Methods: Twenty-eight patients were randomly divided into three treatment groups: lidocaine injection, radiofrequency, or laser. The second intervertebral foramen between the second and third lumbar vertebrae was accessed by percutaneous needle puncture bilaterally, guided by fluoroscopy. In the local anesthetic group, injection of 1 ml lidocaine without epinephrine was applied through a 20-gauge (G20) Quincke tip spinal needle inserted in the second lumbar intervertebral foramen. In the radiofrequency group, the probe (150 mm long with a 5 mm active tip) was directed through a G20 needle placed in the second lumbar intervertebral foramen and neuromodulation was done with a radiofrequency of Cosman G41® in pulses of 20 ms with wash-out period of 480 ms, for 300 seconds at 42°C. A single treatment was used. In the laser treatment group, a continuous wave, 808 nm wavelength diode laser (Photon Lase III® DCM, Brazil), with an output power of 100 mW was used for a single treatment. An 18 gauge needle was placed in the second lumbar intervertebral foramen guided by fluoroscopy. Light was delivered through a 600 μm optical fiber placed in the G18 needle. The tip of the fiber extended 5 mm beyond the tip of the needle in the second lumbar intervertebral foramen. The beam spot size was 0.003 cm², irradiance=35 W/cm², exposure time=84 seconds, energy density=2800 J/cm², total energy was 8.4 J. The low back pain score was assessed by the visual analog scale (VAS) and Pain Relief Scale (PRS) pre, post procedure and in 1 month follow up. Temperature was measured using a digital thermometer.

Results: All patients in the local anesthetic and laser treatment groups reported a pain reduction of at least 50% immediately post-procedure and 10 out of 11 patients in the radiofrequency group reported a pain reduction of at least 50%. At 1 month post-treatment, the laser treatment group had the greatest number of patients who reported more than 50% pain relief based on PRS (7 out of 10 patients) while only 2 out of 7 patients and 3 out of 11 patients in the lidocaine and radiofrequency treatment groups respectively reported more than a 50% pain relief.

Conclusion: Laser irradiation caused an immediate decrease in low back pain post-procedure similar to pain reduction caused by lidocaine injection. Both lidocaine injection and laser irradiation were more effective than radiofrequency treatment for immediate and longer term (1 month post-treatment) chronic back pain.

Key words: laser irradiation; photoneuromodulation; dorsal root ganglion; back pain; lidocaine injection; radiofrequency treatment

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