Therapeutic Effects of 10-HzPulsed Wave Lasers in Rat Depression Model: A Comparison Between Near-Infrared and Red Wavelengths

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Background and Objective: The application of transcranial low-level light/laser therapy (tLLLT) in the range of red to near-infrared (NIR) spectrum for psychological disorders is a new area that is attracting growing interest in recent years. The photomodulation effects of NIR and red coherent lights on the activity of cytochrome c oxidase in neuronal cells of brain have been recently introduced. This study, therefore, sought to compare the therapeutic effects of 10-Hz pulsed wave NIR (810 nm) laser with red (630 nm) laser using the same delivered energy density and Citalopram in rat chronic mild stress (CMS) model of depression and anxiety.

Materials and Methods: CMS procedures (for 4 weeks) were used to induce stress. GaAlAs diode laser with red and NIR wavelengths on 10-Hz pulsed wave (50% duty cycle) were used to perform tLLLT treatment for three weeks. An energy density of about 1.2 J/cm2 per each session was delivered through a light spot with a diameter of 3-mm to the prefrontal cortex for both wavelengths. Citalopram (10 mg/kg, Intraperitoneal) was administered for twenty-one consecutive days to the drug group.

Results: The findings of the present study showed an increase in swimming and decrease in immobility time, for both NIR laser and Citalopram groups compared to the stress group in forced swimming test. Anxiety-like behaviors showed insignificant decrease in all treatment groups in elevated plus maze test. The induction of stress significantly increased serum cortisol levels and treatments with both red laser and Citalopram decreased it. Hyperglycemia induced by CMS returned to normal levels in all treatment groups. The assessment of body weight also showed a significant increase in NIR laser group compared to the stress group by the end of the experiment.

Conclusions: This study showed that non-invasive tLLLT using 10-Hz pulsed NIR laser light was as effective as Citalopram and more effective than red laser in the treatment of depressive-like behaviors and may help improve tLLLT as an alternative non-pharmacological treatment of psychological disorders such as depression.
Lasers Surg. Med.48:695–705, 2016.