Extended Abstract Insights in Neurosurgery 2018
Vol.2 No.2

Cognitive Neuroscience 2018: Stimulation of cerebral neurogenesis with transcatheter intracerebral laser revascularization in patients with Alzheimer's disease - Ivan V Maksimovich - Most Holy John Tobolsky Moscow

Ivan V Maksimovich

Most Holy John Tobolsky Moscow, Russia

Background:
The research is devoted to cerebral neurogenesis after intracerebral laser revascularization (photobiomodulation (PBM)) in patients with Alzheimer's disease (AD).

Keywords: Alzheimer's disease, Dementia, Mechanisms of action, Photobiomodulation, Animal models and clinical trials

Introduction of Photobiomodulation:
Photobiomodulation (PBM) describes the therapeutic use of red or the near-infrared light to stimulate healing, relieve pain and also inflammation. It prevents tissue from dying. Photobiomodulation (PBM) used to be called as low-level laser or light therapy (LLLT). But the name was changed to reflect the fact that the term low was undefined. Lasers were not absolutely required and inhibition of some processes was beneficial. Photobiomodulation therapy (PBMT) describes the use of PBM as a treatment for various diseases or for the disorders. Photobiomodulation (PBM) was discovered over 50 years ago by Endre Mester in Hungary. Working with hair regrowth and wound healing in mice. Since then Photobiomodulation (PBM) has gradually become more accepted by the medical profession, physical therapists, and also the general public. This increase in acceptance is partly due to the increased availability of light-emitting diodes (LEDs) with wavelengths in the red and NIR regions and substantial levels of power density up to 100 mW/cm2 over fairly large areas. Most available evidence suggests that the LEDs perform equally well compared to the lasers of similar wavelengths and power density. However the LEDs have the advantages of more safety, lower cost, and better suitability for the home use.

PBM for Alzheimer's disease:
There has been a group of investigators in Northern England who have used a helmet built with 1072 nm LEDs to treat Alzheimer's disease (AD). But somewhat surprisingly no peer-reviewed publications have described this approach. However a small pilot study i.e., 19 patients that took the form of a randomized placebo-controlled trial investigated the effect of the Vie light Neuro system a combination of tPBM and intrinsic PBM on patients with dementia and mild cognitive impairment. This was a controlled single blind pilot study in humans in order to investigate the effects of PBM on memory and the cognition. 19 participants with impaired memory or cognition were randomized into the active and sham treatments over 12 weeks with a 4-week no-treatment follow-up period. They were assessed with MMSE and ADAS-cog scales. The protocol involved in clinic use of a combined transcranial intranasal PBM device, and at-home use of an intranasal only PBM device and participants or caregivers noted daily experiences in a journal. Active participants with moderate to the severe impairment showed the significant improvements (5-points MMSE score) after 12 weeks. There was also a significant improvement in ADAS-cog scores. They also reported the better sleep, fewer angry outbursts and also decreased anxiety and wandering. Declines were noted during the 4-week with no-treatment follow-up period. The Participants with mild impairment to normal (MMSE scores of 25 to 30) in both the active and also sham sub-groups showed the improvements. There are no related adverse events were reported. An interesting paper from Russia has described the use of intravascular PBM to treat 89 patients with Alzheimer's disease (AD) who received PBM (46 patients) or the standard treatment with memantine and rivastigmine (43 patients). The PBM consisted of spike a fiber-optic through a cathéter in the fémoral artery and advancing it to the distal site of the anterior and middle cerebral arteries and distribute 20 mW of red laser for 20–40 min. The PBM group had improvement in the cerebral microcirculation leading to the permanent from 1 to 7 years reduction in dementia and also cognitive recovery.

Materials and Methods:
200 patients with AD were examined. Diagnosis included a cerebral CT, MRI, SG, rheoencephalography (REG), cerebral MUGA, CDR determination, tomography dementia rating scale (TDR) and MMSE. Selected 93 patients aged 34-80 (mean age 67.5), 32 (34.40%) men, and 61 (65.59%) women. Test group 48 (51.61%) patients: pre-clinical stage (dementia at TDR-0 level)-4 patients, early stage (dementia at TDR-1 level)-16, middle stage (dementia at TDR-2 level)-21, severe stage (dementia at TDR-3 level)-7. Transcatheter intracerebral laser revascularization was performed. Control group 45 (48.39%) patients: preclinical stage (dementia at TDR-0 level)-6 patients, early stage (dementia at TDR-1 level)-13, middle stage (dementia at TDR-2 level)-15, severe stage (dementia at TDR-3 level)-11. Conservative treatment was provided with memantine or rivastigmine.

This work is partly presented at 27th International Conference on Neurology and Cognitive Neuroscience October 18-19, 2018 held at Warsaw, Poland

Results:

In the test group, all 48(100%) patients showed improvement in cerebral microcirculation and 10-20% increase in cerebral temporal lobes volume, which indicated development of cerebral reparative processes and neurogenesis. The process was accompanied by decrease in dementia level and cognitive functions restoration. Consequently, patients were transferred to a lighter TDR group. Patients with stages TDR-0 and TDR-1 had a positive effect for more than 10 years. In patients with stage TDR-2, the effect was observed for 4-5 years. In patients with stage TDR-3, the effect lasted for 2-2.5 years. While undergoing the treatment, control group patients featured further temporal lobes volume decrease, which indicated involutive changes growth and lack of neurogenesis.

In patients with early AD stages (TDR-0, TDR-1), the state stabilized for a period of 0.5 to 2 years, followed by an increase in dementia and cognitive impairment, in patients with leading AD (TDR-2, TDR-3) further increase in dementia and cognitive impairment.

Conclusion:

Transcatheter intracerebral laser revascularization (PBM) is an effective treatment for AD. The method allows revascularization of the brain causing restoration of tissue structures and neurogenesis. The resulting effect persists for a long time causing dementia regression and greatly improving the quality of patients' life.

This work is partly presented at 27th International Conference on Neurology and Cognitive Neuroscience October 18-19, 2018 held at Warsaw, Poland