

Influence of Low Intensity Light Waves on Neuronal based Activities in TBI Patient

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Abstract: Infrared light therapy is a form of light therapy, which involves getting exposed to sufficient intensity of infrared light to experience health benefits. NIR light therapy involves shining concentrated wavelengths of light between 810nm to 850nm onto bare skin. The treatment is based on the irradiance and radiance factors of the light photons interacting with light-sensitive molecules within each cell. As NIR light photons reach these molecules, this stimulates the cells' mitochondria to produce more adenosine triphosphate (ATP), which fuels cellular energy production. This, in turn, energizes all cells irradiated by the light. Cell-protecting factors such as antioxidants are released to counteract cell degeneration from inflammation. And, the cells are able to perform their functions more efficiently, including repair and regeneration. This heightened functionality has anti-aging benefits as well as the ability to treat the underlying causes of many diseases and disorders. The infrared spectrum is between 700 nm to 0.1 mm in wavelength, which can be divided into near, mid, and far-infrared spectrum. The longer the wavelength, the lower the frequency and the further the light can penetrate tissues. Different kinds of infrared wavelengths have different health benefits. NIR- Near-infrared light, with wavelengths between 700 – 1400 nm, generates the most heat but does not penetrate deep into human tissues. In addition, the 760 – 895 nm range of infrared light can stimulate the mitochondria function, which can increase metabolism, improve tissue repair, and reduce inflammation. Mid-NIR - Mid-infrared light, with wavelengths between 1400 – 3000 nm. It penetrates deeper than near-infrared light and generates more heat than far-infrared light. Mid-infrared light can help expand blood vessels and increase circulation so that blood can reach injured or inflamed areas of the body. Far-infrared light, with wavelengths between 3000 nm – 0.1 mm. Far infrared penetrates deepest into the tissues. Its health benefits come from both generating heat and other properties. Far-infrared light can potentially reduce inflammation and oxidative stress. It increases circulation, improves blood vessel and heart functions, reduces pain and fatigue, and normalizes blood pressure.



1. Introductions

The case of a baby girl aged 7 years (2019) with TBI with wear off year (2017) 2 years was to be dealt. With the reworked history the baby girl was suffering with TBI due to high fever causing;

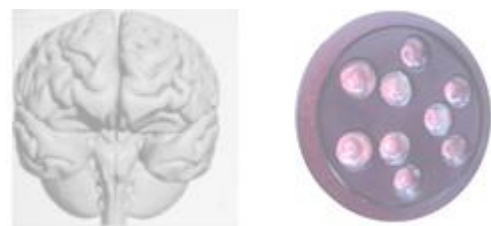
- Severe cerebral and cerebellar atrophy, including atrophy of thalami. Apart from this the white matter changes in the bilateral periventricular white matter of questionable significance
- Large areas of restricted diffusions in almost entire cerebral parenchyma. Bilaterally.
- Mild leptomenigeal, with sever meningoencephalitis

She had lost the movements of limbs, speech, controls, recognition and cognitive functions completely with severe neuronal damage. The parents and the respective doctors had done whatever the best in their capacities and abilities.

2. Aim

Our main aim was to trigger and normalise cerebral blood flow along with the regeneration of affected thalamic and

respective regions. The aim was also to observe the retinal movements while reducing the Oculomotor Dysfunction which got developed coz of TBI.



3. Method

The non-invasive low-intensity light therapy was considered for the next couple of months. The default mode network-DMN plays a critical central role in normal brain activities, presenting greater relative deactivation during more cognitively demanding tasks. After deactivation, it allows a distinct network to activate. This network (the central executive network) acts mainly during tasks involving executive functions.

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The procedure of red or near-infrared (NIR) light to stimulate or regenerate tissue is known as photobiomodulation. It was discovered that NIR (wavelength 710–940 nm) and red (wavelength 600 nm) (LEDs) can penetrate through the scalp and skull and have the potential to improve the subnormal, cellular activity of compromised brain tissue.

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Based on this, different experimental and clinical studies were done to test LED therapy for TBI, The patient was subjected to LILT (690~910 nm) on an alternate day basis with a head wrap around device for 20 minutes in the morning along with the spine cord subjected to (640~840 nm) on alternate day basis. Along with this, the patient was given thyme-leaved gratiola (Btahmi) and promising results were found. It leads us to consider developing different approaches to maximize the positive effects of this therapy and improve the quality of life of TBI patients.

4. Results

The significant improvements in holding saliva, and reduction in Oculomotor Dysfunction were noticeable in 6 months. The therapy was continued and in a span of 14 months from the commencement of the therapy (still ON) the movement of the limbs, improvement in metabolism, speech, cognitive functions and recognition have been observed.

The Medacsis-LILT therapy is being continued with the hope that this baby girl will be back to some normalised condition in the next 1-2 years from now (March 2021)

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