

pT-TMS in Universalis Alopecia Areata

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Transcranial Magnetic stimulation (TMS) is a safe, non-invasive technique with a wide variety of diagnostic and therapeutic uses in neurological conditions. Anninos and Tsagas [1] invented a pico Tesla TMS (pT-TMS) electronic device for the therapeutic treatment of patients with a variety of neurologic diseases. It is a modified helmet containing up to 122 coils which are arranged in five array groups, so as to cover the main 7 brain regions (frontal, vertex, right and left temporal right and left parietal, occipital) of every subject. It is designed to create pT-TMS range modulations of magnetic flux in the alpha frequency range (8 - 13Hz). The pT-TMS device was configured for every individual to generate a square wave so as to be similar to the firing activity of neurons in the brain. Universalis alopecia areata is a non-cicatricial alopecia, concerning the whole of scalp hair, the eye-lashes, the eye-brows and the terminal hair of the androgen-dependent areas of the body. It is believed that immune system disorders take place in genetically predisposed subjects and a sudden passage from anagen stages (III or IV) to catagen or telogen stage, took place.

Biomagnetic measurements were performed in our lab using a one channel second order gradiometer MEG system (model 601 of the Biomagnetic Technologies Inc) located in a magnetically shielded room [2]. The MEG recordings were performed after positioning the MEG sensor 3 mm above the scalp of the patient, with the use of an optic positioning system, which was based on the International 10 - 20 Electrode Placement System. This system uses any one of the standard EEG recording positions as its origin. We used the P3, P4, T3, T4, F3 and F4 recording positions. The reference system was devised to retrieve maximal information from a specified area of the skull given that the gradiometer coil is theoretically equally sensitive to all magnetic flux lines perpendicular to a circular area of the brain. The MEG signal was band-pass filtered with cut-off frequencies of 0.1 and 60 Hz. The MEG recordings were digitized using a 12 bit precision analog to digital converter with a sampling frequency of 256 Hz, and were stored in a PC peripheral memory for off-line Fourier statistical analysis.

Various hypotheses have been formulated in order to understand the alopecia universalis physiopathology [3]. Exogenous magnetic stimulation and MEG have been applied in the treatment of our alopecia universalis case (in comparison with three other control cases). Our alopecia universalis case constitutes the first one in the literature, which has been consciously treated with exogenous magnetic stimulation. An important hair re-growth appeared progressively from the second week till the fifteenth month of the therapeutic protocol [4].

External magnetic field therapeutic action could be attributed to alterations in the activity of the pineal gland, which in turn has been shown to regulate dopaminergic, 5-HT, GABA and endogenous opioid functions. The successful pT-TMS therapeutic result verified the superiority and the safety of this management, in comparison with conventional treatments. The blockage mechanisms of alopecia areata pathogenetic processes by exogenous magnetic field, have to be further searched in the future.

Bibliography

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