
THE EFFECT OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION ON DORSOLATERAL PREFRONTAL GLUTAMATE IN YOUTH WITH TREATMENT-RESISTANT DEPRESSION

S. Pradhan¹, A. Kirton², G. MacQueen³, F. MacMaster⁴

¹Medicine, Royal College of Surgeons in Ireland, Dublin, Ireland ; ²Clinical Neuroscience and Pediatrics, University of Calgary, Calgary, Canada ;

³Psychiatry, University of Calgary, Calgary, Canada ; ⁴Psychiatry and Pediatrics, University of Calgary, Calgary, Canada

Major Depressive Disorder (MDD) is a debilitating psychiatric disorder characterized by feelings of low self-worth and high self-criticism. Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive intervention that modulates cortical excitability by administering pulsating magnetic fields to the scalp. Studies have shown the left dorsolateral prefrontal cortex (DLPFC) glutamate to be decreased in MDD patients. In adults, rTMS has been shown to improve mood, decrease Hamilton Depression Rating Scale scores and increase glutamate in the DLPFC.

The aim of this investigation is to determine whether this effect could be seen in adolescents. We hypothesize an increase in DLPFC glutamate levels following treatment.

Eleven treatment-resistant MDD patients (4 females and 7 males, ages 15-21) were clinically assessed and underwent baseline and post-treatment MRI scans. Treatments were performed every weekday for three weeks. Magnetic resonance spectroscopy was used to measure glutamate levels and was analysed using the LC Model method.

Seven patients were treatment responders who had a 62% decrease in Ham-D scores from 25.43 (± 7.85) to 9.57 (± 1.51) and a 30% decrease in Children's Depression Rating Scale scores from 74.43 (± 11.04) to 52.14 (± 8.99). Responders showed lower baseline glutamate levels at 8.73 (± 1.21) mmol/kg-wet-weight, which increased by 12% to 9.77 (± 1.18). Non-responders had higher baseline glutamate levels at 11.87 (± 0.47) and levels decreased by 9% to 10.75 (± 0.13).

Evidence of increases in excitatory neurotransmitter levels in the DLPFC and alleviation of symptoms indicate that rTMS exerts anti-depressant effects and can be pursued as a safe and effective therapy for adolescent MDD.