

### Brain Stimulation for Adolescent Depression

A. Kirton<sup>1</sup>, L.M. Langevin<sup>2</sup>, T.C. Wilkes<sup>3</sup>, Y. Jasoui<sup>3</sup>, M. Sembo<sup>2</sup>, F. MacMaster<sup>2</sup>

<sup>1</sup>Paediatrics, Alberta Childrens' Hospital, Calgary, Canada ; <sup>2</sup>Psychiatry, Alberta Childrens' Hospital, Calgary, Canada ; <sup>3</sup>Psychiatry, Foothills Medical Centre, Calgary, Canada

---

**Background:** Repetitive transcranial magnetic stimulation (rTMS) is an emerging intervention for treatment resistant major depressive disorder (MDD) in adolescents. Though rTMS is an effective technique, positive responses are not universal. As MDD is associated with alterations in brain chemistry, we investigated metabolite concentrations as a biomarker for predicting treatment response. We hypothesized that lower baseline glutamate levels would predict beneficial rTMS treatment response and associate with lower MDD scores post-treatment.

**Methods:** Anatomical and spectroscopy data was collected on a 3.0T GE MR750w. A 15-weekday rTMS treatment was applied targeting the left dorsolateral prefrontal cortex (DLPFC).

**Results:** No significant adverse events were reported. Depression and anxiety scores decreased with rTMS ( $p < 0.001$ ). At baseline, responders had lower left DLPFC glutamate concentration ( $p = 0.047$ ) that increased with rTMS compared to non-responders ( $p = 0.01$ ) and correlated with the change in Hamilton depression rating scores (HAMD;  $r = 0.58$ ,  $p = 0.02$ ). Reduced DLPFC thickness was observed in responders ( $p = 0.009$ ), and was also associated with greater change in HAMD ( $r = -0.56$ ,  $p = 0.03$ ). Lower left DLPFC cerebral blood flow at baseline was associated with greater change in Children's Depression Rating Scale ( $r = -0.62$ ,  $p = 0.02$ ) and Beck Depression Inventory scores ( $r = -0.59$ ,  $p = 0.03$ ).

**Conclusions:** rTMS is an effective and safe treatment for adolescents with MDD. Measures of glutamate and cortical thickness in the left DLPFC may provide tractable predictions of rTMS treatment response in youth, leading to more personalized therapy regimens.