Dorsolateral prefrontal cortex

The DLPFC is also the endpoint for the dorsal pathway (stream), which is concerned with how to interact with stimuli. An important function of the DLPFC is the executive functions, such as working memory, cognitive flexibility, planning, inhibition, and abstract reasoning.

The Notch signaling pathway is activated after Spinal Cord Injury, leading to hypomyelination in the dorsolateral prefrontal cortex (dIPFC), and DAPT can inhibit the Notch signaling pathway and improve mechanical and thermal hyperalgesia thresholds. These findings provide a new target for the treatment of neuropathic pain caused by SCI¹.

A study aimed to explore the cognitive function changes by rTMS over the bilateral dorsolateral prefrontal cortex (DLPFC) in Alzheimer's disease (AD). We evaluated the feasibility of rTMS application for mild cognitive dysfunction in patients with AD in an open-label trial (UMIN000027013). An rTMS session involved 15 trains at 120% resting motor threshold on each side (40 pulses/train at 10 Hz). Efficacy outcome measures were changes from baseline in cognitive function, assessed based on the AD Assessment Scale-cognitive subscale, Mini-Mental State Examination, Japanese version of Montreal Cognitive Assessment (MoCA-J), Behavioral and Psychological Symptom of Dementia, and Instrumental Activity of Daily Living scores. Sixteen patients with AD underwent five daily sessions of high-frequency rTMS over the bilateral DLPFC for 2 weeks. All participants completed the study; no major adverse effects were recorded. The MoCA-J score increased by 1.4 points (\pm 0.15%) following 2 weeks of stimulation. At 1 month following rTMS cessation, all cognitive functional scores returned to the original state. Our findings suggest that the DLPFC plays an important role in the neural network in AD ².

Intermittent theta-burst stimulation (iTBS), a novel repetitive transcranial magnetic stimulation (rTMS) technique, appears to have antidepressant effects when applied over left dorsolateral prefrontal cortex (DLPFC). However, its underlying neurobiological mechanisms are unclear. Proton magnetic resonance spectroscopy (Proton magnetic resonance spectroscopic imaging) provides in vivo measurements of cerebral metabolites altered in major depressive disorder (MDD) like N-acetyl-aspartate (NAA) and choline-containing compounds (Cho).

Zavorotnyy et al. used MRS to analyze the effects of iTBS on the associations between the shifts in the NAA and Cho levels during therapy and MDD improvement.

In-patients with unipolar MDD (N = 57), in addition to treatment as usual, were randomized to receive 20 iTBS or sham stimulations applied over left DLPFC over four weeks. Single-voxel Proton magnetic resonance spectroscopic imaging of the anterior cingulate cortex (ACC) was performed at baseline and follow-up. Increments of concentrations, as well as MDD improvement, were defined as endpoints. They tested a moderated mediation model of effects using the PROCESS macro (an observed variable ordinary least squares and logistic regression path analysis modeling tool) for SPSS.

Improvement of depressive symptoms was significantly associated with a decrease of the Cho/NAA ratio, mediated by NAA. iTBS had a significant moderating effect enhancing the relationship between

NAA change and depression improvement.

These findings suggest a potential neurochemical pathway and mechanisms of antidepressant action of iTBS, which may moderate the improvement of metabolic markers of neuronal viability. iTBS might increase neuroplasticity, thus facilitating normalization of neural circuit function ³⁾.

1)

Li C, Huang S, Zhou W, Xie Z, Xie S, Li M. Effects of the Notch Signaling Pathway on Secondary Brain Changes Caused by Spinal Cord Injury in Mice. Neurochem Res. 2022 Feb 24. doi: 10.1007/s11064-022-03558-4. Epub ahead of print. PMID: 35211828.

Mano T. Application of Repetitive Transcranial Magnetic Stimulation over the Dorsolateral Prefrontal Cortex in Alzheimer's Disease: A Pilot Study. J Clin Med. 2022 Feb 1;11(3):798. doi: 10.3390/jcm11030798. PMID: 35160250; PMCID: PMC8836442.

Zavorotnyy M, Zöllner R, Rekate H, Dietsche P, Bopp M, Sommer J, Meller T, Krug A, Nenadić I. Intermittent theta-burst stimulation moderates interaction between increment of N-Acetyl-Aspartate in anterior cingulate and improvement of unipolar depression. Brain Stimul. 2020 Mar 27;13(4):943-952. doi: 10.1016/j.brs.2020.03.015. [Epub ahead of print] PubMed PMID: 32380445.

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