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Repetitive Transcranial Magnetic Stimulation in Traumatic brain injury with Titanium Skull Plates

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BACKGROUND
Noninvasive brain stimulation techniques, such as repetitive transcranial magnetic stimulation (rTMS), have emerged as promising tools. Most studies that examine cognitive rehabilitation with rTMS have evaluated effects in patients with traumatic brain injury (TBI) as well as depression. More specifically, dorsolateral prefrontal cortex (DLPFC) stimulation has been associated with improvements in cognitive performance. Cranioplasty with titanium is usual procedure in a patient with TBI, but there is limited evidence available for the safety and efficacy of rTMS in patients with titanium skull plate.

CASE PRESENTATION
A 21-year-old male was diagnosed with severe traumatic brain injury following a pedestrian versus vehicle traffic accident a years ago. He had been received brain decompressive craniectomy and cranioplasty with titanium later. The patient physically improved to some degrees during the rehabilitation program and medication, but continued to endorse severe cognitive impairment, especially executive dysfunction and delayed psychomotor speed. So, we decided to perform the rTMS therapy for his executive dysfunction and planned to rTMS treatment course with stimulation of the left dorsolateral prefrontal cortex referred to the previous study. But, the titanium skull plate covered the target site, we couldn't use the high-frequency rTMS therapy in accordance with the previous study about the potential heating of metallic objects by induced eddy currents. As the next best thing we decided to use the rTMS protocol with the inhibitory rTMS of the right DLPFC based on the valence lateralization hypothesis. He underwent a 10-time course of inhibitory rTMS to the right DLPFC with conventional rehabilitation therapy and had some improvement in cognitive and executive functions by the end of the therapy as indicated by the hand function test and cognitive assessment tools. During the rTMS therapy showed no signs of adverse side effects as like seizure or burn.

CONCLUSION
This report suggests that inhibitory rTMS to the right DLPFC is a safe and effective treatment for the cognitive dysfunction in patients with TBI who have a titanium

cranioplasty. Further work is also required to establish guidelines regarding definitive rTMS safety and efficacy protocols for use in this patient population.