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Evaluation of Changes in Preoperative Cortical Excitability by Navigated Transcranial Magnetic Stimulation in Patients With Brain Tumor

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Abstract

Background: This prospective study aimed to evaluate the cortical excitability (CE) of patients with brain tumors surrounding or directly involving the **corticospinal tract** (CST) using navigated transcranial magnetic stimulation (nTMS). **Methods:** We recruited 40 patients with a single brain tumor surrounding or directly involving the CST as well as 82 age- and sex-matched healthy controls. The patients underwent standard nTMS and CE evaluations. Single and paired pulses were applied to the primary motor area (M1) of both affected and unaffected cerebral hemispheres 1 week before surgery. The CE parameters included resting motor threshold (RMT), motor evoked potential (MEP) ratio for 140 and 120% stimulus (MEP 140/120 ratio), short-interval intracortical inhibition (SICI), and intracortical facilitation (ICF). Motor outcome was evaluated on hospital discharge and on 30-day and 90-day postoperative follow-up. **Results:** In the affected hemispheres of patients, SICI and ICF were significantly higher than in the unaffected hemispheres ($p=0.002$ and $p=0.009$, respectively). The 140/120 MEP ratio of patients' unaffected hemispheres was lower than that in controls ($p=0.001$). Patients with glioblastomas (GBM) had a higher interhemispheric RMT ratio than patients with grade II and III gliomas ($p=0.018$). A weak correlation was observed among the RMT ratio and the preoperative motor score ($R^2=0.118$, $p=0.017$) and the 90-day follow-up ($R^2=0.227$, $p=0.016$). **Conclusion:** Using preoperative nTMS, we found that brain hemispheres affected by tumors had abnormal CE and that patients with GBM had a distinct pattern of CE. These findings suggest that tumor biological behavior might play a role in CE changes.

Keywords: brain tumor; cortical excitability; glioblastoma; motor outcome; neuromodulation; transcranial magnetic stimulation.

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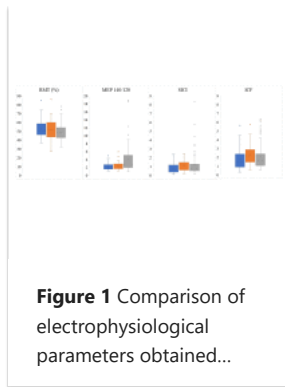


Figure 1 Comparison of electrophysiological parameters obtained...

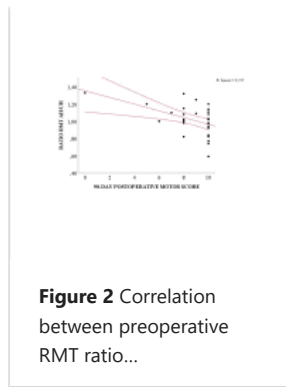


Figure 2 Correlation between preoperative RMT ratio...

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