A study found that transcranial magnetic stimulation tractography has significant predictive value for permanent deficits. A study directly compares the predictive value of transcranial magnetic stimulation tractography and Task-based functional magnetic resonance imaging tractography in the same cohort of glioma patients.

Methods: Clinical outcome data were collected from charts of patients with motor eloquent glioma and preoperative fMRI and TMS studies. The primary outcome was a new or worsened motor deficit present at the 3-month postoperative follow-up, which was termed a “permanent deficit.” Postoperative MR images were overlaid onto preoperative plans to determine which imaging features were resected. Multiple fractional anisotropic thresholds (FATs) were screened for both TMS and fMRI tractography. The predictive value of the various thresholds was modeled using receiver operating characteristic curve analysis.

Results: Forty patients were included in this study. Six patients (15%) sustained permanent postoperative motor deficits. A significantly greater predictive value was found for TMS tractography than for fMRI tractography regardless of the FAT. Despite 35% of patients showing clinically relevant neuroplasticity captured by TMS, only 2.5% of patients showed a blood oxygen level-dependent signal displaced from the precentral gyrus. Comparing the best-performing FAT for both modalities, TMS seeded tractography showed superior predictive value across all metrics: sensitivity, specificity, positive predictive value, and negative predictive value.

The results from this study indicate that the prediction of permanent deficits with TMS tractography is superior to that with fMRI tractography, possibly because TMS tractography captures clinically relevant neuroplasticity. However, future large-scale prospective studies are needed to fully illuminate the proper role of each modality in comprehensive presurgical workups for patients with motor-eloquent tumors [1].

TMS has been shown to be clinically accurate and effective in mapping cortical motor areas and applicable to the functional assessment of motor tracts following stroke, for example. Many hundreds of studies have been published indicating that repetitive TMS (rTMS) may also have multiple therapeutic applications. Techniques and protocols for individually targeting and dosing rTMS urgently need to be developed in order to ascertain the accuracy, repeatability and reproducibility required of TMS in clinical applications [2].

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