Interhemispheric connectivity revealed by diffusion tensor imaging fiber tracking derived from navigated transcranial magnetic stimulation maps as a sign of language function at risk in patients with brain tumors.

OBJECTIVE Resection of brain tumors in language-eloquent areas entails the risk of postoperative aphasia. It has been demonstrated via navigated transcranial magnetic stimulation (nTMS) that language function can partially shift to the unaffected hemisphere due to tumor-induced plasticity. Therefore, this study was designed to evaluate whether interhemispheric connectivity (IC) detected by nTMS-based diffusion tensor imaging-fiber tracking (DTI-FT) can be used to predict surgery-related aphasia in patients with brain tumors.

METHODS Thirty-eight patients with left-sided perisylvian brain lesions underwent cortical language mapping of both hemispheres by nTMS prior to awake surgery. Then, nTMS-based DTI-FT was conducted with a fractional anisotropy (FA) of 0.01 and 0.2 to visualize nTMS-based IC. Receiver operating characteristics were calculated for the prediction of a postoperative (irrespective of the preoperative state) and a new surgery-related aphasia by the presence of detectable IC.

RESULTS Language mapping by nTMS was possible in all patients. Seventeen patients (44.7%) suffered from surgery-related worsening of language performance (transient aphasia...
according to 3-month follow-up in 16 subjects [42.1%]; new permanent aphasia according to 3-month follow-up in 1 patient [2.6%]). Regarding the correlation of aphasia to nTMS-based IC, statistically significant differences were revealed for both evaluated FA values. However, better results were observed for tractography with an FA of 0.2, which led to a specificity of 93% (postoperative aphasia) and 90% (surgery-related aphasia). For postoperative aphasia, the corresponding OR was 0.1282 (95% CI 0.0143-1.1520), and for surgery-related aphasia the OR was 0.1184 (95% CI 0.0208-0.6754). CONCLUSIONS According to these results, IC detected by preoperative nTMS-based DTI-FT might be regarded as a risk factor for surgery-related aphasia, with a specificity of up to 93%. However, because the majority of enrolled patients suffered from transient aphasia postoperatively, it has to be evaluated whether this approach distinctly leads to similar results among patients with permanent language deficits. Despite this restriction, this approach might contribute to individualized patient consultation prior to tumor resection in clinical practice.