Impairment of preoperative language mapping by lesion location: a functional magnetic resonance imaging, navigated transcranial magnetic stimulation, and direct cortical stimulation study.

Language mapping by repetitive navigated transcranial magnetic stimulation (rTMS) is increasingly used and has already replaced functional MRI (fMRI) in some institutions for preoperative mapping of neurosurgical patients. Yet some factors affect the concordance of both methods with direct cortical stimulation (DCS), most likely by lesions affecting cortical oxygenation levels. Therefore, the impairment of the accuracy of rTMS and fMRI was analyzed and compared with DCS during awake surgery in patients with intraparenchymal lesions. Language mapping was performed by DCS, rTMS, and fMRI using an object-naming task in 27 patients with left-sided perisylvian lesions, and the induced language errors of each method were assigned to the cortical parcellation system. Subsequently, the receiver operating characteristics were calculated for rTMS and fMRI and compared with DCS as ground truth for regions with (w/) and without (w/o) the lesion in the mapped regions. The w/ subgroup revealed a sensitivity of 100% (w/o 100%), a specificity of 8% (w/o 5%), a positive predictive value of 34% (w/o: 53%), and a negative predictive value (NPV) of 100% (w/o: 100%...
100%) for the comparison of rTMS versus DCS. Findings for the comparison of fMRI versus DCS within the w/ subgroup revealed a sensitivity of 32% (w/o: 62%), a specificity of 88% (w/o: 60%), a positive predictive value of 56% (w/o: 62%), and a NPV of 73% (w/o: 60%). Although strengths and weaknesses exist for both rTMS and fMRI, the results show that rTMS is less affected by a brain lesion than fMRI, especially when performing mapping of language-negative cortical regions based on sensitivity and NPV.