OBJECTIVE Because of its huge clinical potential, the importance of premotor areas for motor function itself and plastic reshaping due to tumors or ischemic brain lesions has received increased attention. Thus, in this study the authors used navigated transcranial magnetic stimulation (nTMS) to investigate whether tumorous brain lesions induce a change in motor cortex localization in the human brain. METHODS Between 2010 and 2013, nTMS motor mapping was performed in a prospective cohort of 100 patients with brain tumors in or adjacent to the rolandic cortex. Spatial data analysis was performed by normalization of the individual motor maps and creation of overlays according to tumor location. Analysis of motor evoked potential (MEP) latencies was performed regarding mean overall latencies and potentially polysynaptic latencies, defined as latencies longer than 1 SD above the mean value. Hemispheric dominance, lesion location, and motor-function deficits were also considered. RESULTS Graphical analysis showed that motor areas were not restricted to the precentral gyrus. Instead, they spread widely in the anterior-posterior direction. An analysis of MEP latency showed that mean MEP latencies were shortest in the precentral gyrus and longest in the superior and middle frontal gyri. The percentage of latencies longer than 1 SD differed
widely across gyri. The dominant hemisphere showed a greater number of longer latencies than the nondominant hemisphere (p < 0.0001). Moreover, tumor location-dependent changes in distribution of polysynaptic latencies were observed (p = 0.0002). Motor-function deficit did not show any statistically significant effect. CONCLUSIONS The distribution of primary and polysynaptic motor areas changes in patients with brain tumors and highly depends on tumor location. Thus, these data should be considered for resection planning.