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Titel des Beitrags: Microstructure of transcallosal motor fibers reflects type of cortical (re-)organization in congenital hemiparesis.

Abstract: Early unilateral brain lesions can lead to different types of corticospinal (re-)organization of motor networks. In one group of patients, the contralesional hemisphere exerts motor control not only over the contralateral non-paretic hand but also over the (ipsilateral) paretic hand, as the primary motor cortex is (re-)organized in the contralesional hemisphere. Another group of patients with early unilateral lesions shows "normal" contralateral motor projections starting in the lesioned hemisphere. We investigated how these different patterns of cortical (re-)organization affect interhemispheric transcallosal connectivity in patients with congenital hemiparesis. Eight patients with ipsilateral motor projections (group IPSI) versus 7 patients with contralateral motor projections (group CONTRA) underwent magnetic resonance diffusion tensor imaging (DTI). The corpus callosum (CC) was subdivided in 5 areas (I-V) in the mid-sagittal slice and volumetric information. The following diffusion parameters were calculated: fractional anisotropy (FA), trace, radial diffusivity (RD), and axial diffusivity (AD). DTI revealed significantly lower FA, increased trace and RD for group IPSI compared to group CONTRA in area III of the corpus callosum, where
transcallosal motor fibers cross the CC. In the directly neighboring area IV, where transcallosal somatosensory fibers cross the CC, no differences were found for these DTI parameters between IPSI and CONTRA. Volume of callosal subsections showed significant differences for area II (connecting premotor cortices) and III, where group IPSI had lower volume. The results of this study demonstrate that the callosal microstructure in patients with congenital hemiparesis reflects the type of cortical (re-)organization. Early lesions disrupting corticospinal motor projections to the paretic hand consecutively affect the development or maintenance of transcallosal motor fibers.