Extensive peri-lesional connectivity in congenital hemiparesis

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Two patients with congenital hemiparesis (#5 and #7 in reference1) showed a striking discrepancy between large, pre- and perinatally acquired middle cerebral artery infarctions and relatively preserved sensorimotor functions. Despite the large cystic lesions, the affected hemispheres possessed spino-thalamo-cortical somatosensory afferents as well as cortico-spinal motor efferents. This was shown by magnetoencephalography during repetitive tactile finger stimulation and focal transcranial magnetic stimulation. Accordingly, magnetic resonance (MR) diffusion tensor tractography2 (figure) visualized numerous trajectories passing through the narrow bridge of preserved white matter between the lateral ventricle and the infarcted area, providing extensive structural connectivity of fronto-parietal areas with the brainstem and the cerebellum. Although these findings are suggestive of a superior reorganizational capability of the developing human brain, further studies (including tractography data from patients with similar lesions acquired later in life) will be needed to clarify this point.


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Figure. MR diffusion tensor tractography2 findings (Siemens AVANTO; 1.5 Tesla; b = 1000 s/mm²; six diffusion directions; voxel size 2 × 2 × 2 mm³; fractional anisotropy > 0.2; turning angle < 65°) of the two patients (A–C; D–F) and a healthy 21-year-old woman (G–I), displayed in random colors on unweighted (b = 0 s/mm²) diffusion images. (A, D, G) Axial planes, inferior view (red = region of interest for the tracking algorithm); (B, E, H) Coronal planes, anterior view; (C, F, I) Tilted axial planes, anterior-lateral-superior view. In the control subject, the region of interest was drawn on a diffusion color map (not shown) to include all fibers with a cranio-caudal orientation of this axial plane.
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