Somatosensory system in two types of motor reorganization in congenital hemiparesis: topography and function.

Abstract:
This study investigates the (re-)organization of somatosensory functions following early brain lesions. Using functional magnetic resonance imaging (fMRI), passive hand movement was studied. Transcranial magnetic stimulation (TMS) and magnetoencephalography (MEG) were used as complementary methods. fMRI data was analyzed on the first level with regard to topographical variability; second-level group effects as well as the overall integrity of the somatosensory circuitry were also assessed. Subjects with unilateral brain lesions occurring in the third trimester of pregnancy or perinatally with different types of motor reorganization were included: patients with regular, contralateral motor organization following middle cerebral artery strokes (CONTRA(MCA), n = 6) and patients with reorganized, ipsilateral motor functions due to periventricular lesions (IPSI(PL), n = 8). Motor impairment was similar, but sensory impairment was more pronounced in the CONTRA(MCA) group. Using fMRI and MEG, both groups showed a normal pattern with a contralateral somatosensory representation, despite the transhemispherically reorganized primary motor cortex in the IPSI(PL) group, as verified by TMS. Activation topography for the paretic hands was more variable than for the nonparetic hand in both groups. The cortico-cerebellar circuitry was well-preserved in almost all subjects. We conclude that in both models of
motor reorganization, no interhemispheric reorganization of somatosensory functions occurred. Also, no relevant intrahemispheric reorganization was observed apart from a higher topographical variability of fMRI activations. This preserved pattern of somatosensory organization argues in favor of a differential lesion effect on motor and somatosensory functions and demonstrates a limited compensatory potential for the latter.