could show in vivo that motor activation patterns can be successfully influenced by sensoric stimulation of afferent pathways.

P 3187

fMRI detects functional plasticity of the sensorimotor cortex after upper extremity amputation

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Purpose In this study, we looked for functional plasticity in the SM1 in a patient who sustained a right upper extremity amputation.

Methods The perioral region bilaterally, the stump on the right side on the location where the former (phantom) middle finger (PMF) was sensated and the existent middle finger (EMF) on the left side was stimulated with 2 Hz. Finally the patient imagined fist clenching of the amputated and the normal hand.

All experiments were performed on a 1.5 Tesla MRI-Scanner. Post processing was done with SPM99.

Results Sensorimotor brain areas could be differentiated within both hemispheres.

Imagination of fist clenching led to a spatial difference of the activation foci in the primary motor cortex (M1) within the two hemispheres in the range of 4-12 mm.

The tactile task within the labial angle of the right perioral region lead to a cranial shift of the cortical representation of the perioral region within the contra lateral somatosensory cortex (S1) invading the former cortical representation of the amputated limb up to 15 mm.

The tactile task of the PMF within the stump showed a cranial shift on the convexity up to 8 mm in contrast to the SM1 activation focus of the EMF.

Conclusion In concordance with previous studies, we observed a clear reorganization phenomenon within SM1 of a patient with phantom limb pain after upper extremity amputation 29 years ago. The result of the current study can be interpreted as evidence for plasticity within the sensory cortex following traumatic limb amputation.

P 3188

Functional magnetic resonance imaging of the sensorimotor cortex of the lower limbs by means of a force controllable actuator

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Purpose The aim of the study was the implementation of a vibrotactile stimulation paradigm within the MR environment in healthy volunteers for further clinical application in patients with severe motor deficits.

Methods 10 healthy, male volunteers performed a foot-tapping paradigm with the right foot. In a second experimental run, the subject's sole was vibrated with a force controllable electromagnetic actuator. The vibration stimulus within a frequency range from 0–100 Hz in steps of 10 Hz was applied onto the sole of the right foot above the basic joints of the toes I–V.

All experiments were performed on a 1.5 Tesla MR-Scanner with T2*-weighted single shot echo-planar sequences. Post-processing was done with software SPM99.

Results Group analysis showed:

1. For the foot tapping paradigm (FTP) cortical brain activation within the contralateral hemisphere within the Gyrus precentralis (GPrC, MI), Gyrus postcentralis (GPoC, SI), Lobulus parietalis inferior (LPi, SII) and Gyrus cinguli (GC). Ipsilateral brain activation could be detected within the LPi, GPoC and LPs.
2. For the vibrotactile stimulation of the sole of the right foot (VPD) brain activation could be elicited contralaterally within the GPrC, GPoC, LPi, GC and Gyrus frontalis superior (GFs) and ipsilaterally within the LPi and the LPs.

Conclusion In our study, we implement an MR compatible moving coil actuator, which can easily be controlled and which can be applied for detailed functional maps of the sensorimotor cortex for the lower extremities especially for patients with spinal cord injury and damage of the long tracts.

P 3189

Thrombosis of dural sinuses: comparison of magnetic resonance imaging (MRI) and MR-angiography (MRA) with multislice (MS)-CT and CT-angiography (CTA)

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Purpose Comparison of unenhanced MS-CT combined with CTA and the "gold standard" MRI combined with MRA in the diagnosis of dural sinus thrombosis.

Material and methods In a prospective study 71 patients with the clinical suspicion of thrombosis of dural sinuses were examined with unenhanced cerebral MS-CT combined with CTA (coll. 1mm, pitch 3, 100 ml CM, flow velocity 4 ml/sec) and with cerebral MRI (TSE T2 axial, FLAIR axial, FFE coronal, TSE T1 sagittal) combined with MRA (TOF axial, PCA sagittal/axial with flow-velocity 30 sec, with MIP-reconstruction). Three-experienced radiologist evaluated all examinations for thrombosis in cerebral sinuses and graded the detectability of the concerned cerebral veins. All patients were followed either clinically or with CT or MRI to verify the diagnosis. Interobserver agreement was calculated with kappa-statistics. Examination time of CT and MRI was compared.

Results MS-CT and CTA revealed sinus venous thrombosis in 22 patients, MRI and MRA in 20 patients. Thromboses were detected with CT in 43 dural sinuses and 13 cerebral veins and with MRI in 38 sinuses and 6 cerebral veins. One patient showed dural venous fistulas with multiple venous collaterals as complication after thrombosis of dural sinuses in CTA and MRA in equal quality. CT and MRI showed in 48 patients no dural sinus thrombosis. In 2 patients, MRI could not differentiate between hypoplasia and thrombosis of transverse sinus. The interobserver agreement was 100% with CT and 94% with MRI. The average time that the examinations lasted were 10 minutes in CT and 35 minutes in MRI.

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