guidelines After undergoing FMD assessment, each subject's CVR to hypercapnia was assessed by means of a breath-holding test and, in 20 subjects, by a CO2 inhalation test as well. Breath-holding index (BHI) and CO2-induced CVR were obtained according to previously validated criteria.
Results: CVR and FMD shear rate did not appear to correlate ($p = 0.44$). Strong association between CO2-induced CVR and BHI was observed ($p < 0.001$).
Conclusion: CVR and FMD represent two different modalities evaluating the vasomotor function. According to our data, they did not appear to correlate, probably due to differences in the vascular district evaluated and vasodilatatory stimulus used. CO2-induced CVR and apnea-induced CVR appeared to be significantly associated.

P17.17
Usefulness of ultrasonography in a diagnosis of an unusual ulnar nerve entrapment after olecranon fracture

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Introduction: It has been suggested that US is a non invasive technique that can provide useful information about the site and type of nerve lesion and also detects unexpected types nerve impairment, difficult or impossible to detect with electrophysiology alone.
Objectives: This case confirms the usefulness of ultrasound to identify nerves damage and to provide additional information to the clinical and electrophysiological examinations.
Methods: We describe the case of a 45-year old man with ulnar nerve entrapment due to a callus osseous developed around the nerve, after a traumatic olecranon epiphyseal fracture of the left arm due to a bicycle fall. The fracture was surgically treated immediately after the trauma. Four months later surgery, the patient referred to us complaining of a progressive sensitive and motor impairment of the left hand in the ulnar region. We performed clinical, neurophysiological and US evaluation.
Results: Electrophysiological examination indicated ulnar nerve damage at the elbow. Ultrasound evaluation showed an entrapment of the ulnar nerve within a hyperechoic structure compatible with of a callus osseous. The surgeon then confirmed the picture showed by ultrasounds.
Conclusions: This case confirms the role of US as a useful tool in traumatic nerve injuries. Together with neurophisiological examination, it increases diagnostic sensitivity in nerve damage, but it also provides unique information on site, type and on the aetiology of nerve damage, thus influencing management and treatment.

P17.18
Modulation of the soleus H reflex by electrical subcortical stimuli in humans

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Introduction and Objective: Over the past two decades, the H reflex has been used as a neural tool to assess the effect on the motoneuronal pool of conditioning volleys in supraspinal descending tracts elicited by transcranial magnetic stimulation (TMS) or auditory stimuli. However, the mechanisms mediating such modulation are unclear. These hypothesized neural pathways are likely to be affected by single electrical stimuli applied through the electrodes implanted in the subthalamic nucleus for deep brain stimulation (sSTNDBS).
Methods: To improve our knowledge on such mechanisms, we examined in 11 Parkinson's disease patients the effects of conditioning sSTNDBS applied contralateral and ipsilateral to the H reflex recording on the amplitude of the soleus H reflex, at inter-stimulus intervals (ISIs) between 0 and 110 ms.
Results: There was a significant main effect of the ISI ($p < 0.001$) and of the sSTNDBS stimulation side ($p = 0.019$) on the percentage change of the soleus H reflex amplitude. Contralateral sSTNDBS modulation of the soleus H reflex resembles that of TMS in healthy subjects with two facilitation periods (at 5 to 20 ms and at 60 ms) while after ipsilateral sSTNDBS there is only a single facilitatory phase peaking up at 5 ms later than the first facilitation period observed with contralateral stimulation.
Conclusions: These findings contribute to the discussion of the mechanisms underlying the excitability of the spinal alpha-motoneuron pool and the modulation of the H reflex by supraspinal stimuli.

P17.19
Hand motor source extracted from concurrent EEG–fMRI data by functional source separation

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Introduction: The combination of the optimal spatial resolution of fMRI and the millisecond temporal resolution of EEG is an attractive, non-invasive technique for the investigation of human brain function. However, before the potential strengths of EEG-fMRI technique can be fully realized, it is pivotal to achieve a good quality of EEG data recorded in the MRI environment.
Objectives: We aim to provide a more robust and spatiotemporally accurate characterization of the human motor system than has been available to date, by applying the new Functional Source Separation (FSS) approach to assess the neuronal electrical activity of primary motor cortex (M1) during fMRI scanning.
Methods: Simultaneous EEG-fMRI data were acquired in 10 subjects using an event-related design in four experimental conditions: right-hand isometric gripping at 10% of maximal voluntary contraction (MVC) with visual feedback provided to monitor the task performance; the same task at 30% MVC; and both conditions without visual feedback. All four conditions were also collected outside the MRI scanner. Raw EEG data from inside the MRI were subjected to gradient and ballistocardiogram artefact correction. Data were downsampled to 1000 Hz and digitally filtered between 1 and 40 Hz. After this, the data were used as an input for the FSS procedure (Porcaro et al., 2008; 2010).
Results: Using FSS we were able to extract the Motor Source (FS_M1) maximizing the coherence with thumb opponent electromyogram (cortico-muscular coherence, CMC) in all subjects. The FS_M1 position and its CMC were comparable for extractions inside and outside the scanner.
Conclusions: The structural-functional consistency of M1 identified by FSS from EEG inside and outside the scanner suggests that concurrent EEG-fMRI studies of performance-dependent sensorimotor network activity can help to elucidate the functional value of features relevant for movement control.

P17.20
A spatial sensitivity mapping phantom for NIRS-signal interpretation

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Introduction: NIRS is an upcoming method for clinical diagnostics, which promises to provide urgently needed information about microcirculation and related metabolic states and dynamics of metabolism in the brain. Anyway, the interpretation of the acquired signals can be difficult since all cranial structures as scalp, skull, dura mater, pia mater, gray and white matter, collectively alter the spatial sensitivity. It would be most valuable to be able to mimic experimentally the optical properties of such biological structures and processes and to study them and their influence on the signal independently and under controlled conjoint conditions. This is possible with a physical phantom.
Objective: Creation of a physical phantom, which allows spatial sensitivity mapping to investigate the effect of spatially distributed combined scattering and absorption.
Methods: A liquid phantom has been designed consisting of a tissue equivalent optical phantom which can be subdivided in different compartments and a local perturbation of adaptable optical properties, which performs program-controlled movements during NIR trans-illumination or reflection measurements.
Results: The liquid phantom has been validated by comparison of experimentally acquired spatial sensitivity maps with according simulations, which showed good agreement. Preliminary experiments concerning the influence of various optical properties of the medium and of source/detector distances have already provided valuable quantitative information.

Conclusions: The new phantom will allow in depth experimental investigation of the dependence of the NIRS-signal on various optical tissue properties (scattering and absorption) of their changes in time and space and of the source/detector configuration thus providing a basis for advanced signal interpretation.

P17.21
Infant head model including the fontanelle for reconstruction of sources of electrical activity of the brain

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Introduction: Reconstruction of sources of electrical activity in the brain becomes a common tool in neurological research and clinic. For this method an inverse problem has to be solved which results depend highly on the accuracy of the model of the head. Such available models are mostly created based on adults images and thus neglect properties and structures typical for infants. For source reconstruction this leads to unsatisfactory results. Here most intriguing is the presence of fontanelles not yet ossified parts of the skull. Source reconstruction in infants, which neglects these fontanelles, can provide seriously faulty results. So, source reconstruction in infants has to be based on adequate head models including fontanelles. To create such models regularly magnetic resonance images (MRI) T1- or T2-images are used which unfortunately not allow to identify the fontanelles. On the other hand this is possible in computer tomography (CT) images.
Objective: To create a realistic head model for newborns including the fontanelles for source reconstruction.
Methods: MRI- and CT-data of a female subject at 40 weeks gestational age has been used for coregistration of the T1- and T2-MRI data sets and stereotaxic normalization of MRI- and CT-data. Intracranial tissue has been segmented from the MR images and bone from the CT.
Results: A newborn's head model has been created consisting of white and grey matter, cerebro-spinal fluid, cranial bone, fontanelle and scalp.
Conclusions: Numerical head models containing all structures important for source reconstruction in the infant's brain can be created by combining information from the two imaging modalities MRI and CT. Such models may be further useful for morphological studies of development of cranial and intracranial structures.

P17.22
Wireless, battery operated, ultra compact near infrared spectrometer

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Introduction: Near infrared spectroscopie (NIRS) is an upcoming method to asses information concerning local hemodynamics for neurological clinical diagnostics. Until now most commercially available NIRS instruments are relatively big, heavy and inflexible in application, which is mainly due to the use of glass fibers for light transfer and photomultipliers for photon detection.
Objectives: Creation of a portable, wireless, ultra compact, battery operated continuous wave (CW) NIRS system for continuous hemodynamic monitoring.
Methods: We have designed and prototyped a compact NIRS system using LEDs as light sources and avalanche photo-detectors with a field-programmable gate array (FPGA) as central control unit. Advantages of using a FPGA are the following:
- flexibility regarding the required LED/detector configuration, to adapt the system to such hardware changes simple upgrading of the FPGA structure by software is sufficient
- parallel high speed structure of FPGA permits implementation of arbitrary online signal processing as might be necessary for clinical application
- programmable gain amplification on detector side is possible, thus entire dynamic range of 16bit ADC can be used
- implementation of an auto calibrating mode is possible.

A MATLAB GUI user interface enables simple (re)configuring of the NIRS system through wireless bluetooth module as well as data acquisition.
Results: The system has been evaluated by tests with an optical phantom and first orienting experiments on muscle and brain. Comparison with a ISS NIRS machine showed the potential of the system as a reliable NIRS tool.
Conclusions: Our wireless flexible portable autonomic CW NIRS system provides effective, high accuracy and safe NIRS signal acquisition with the central unit smaller than a cigarette box.

P17.23
Amygdalo-hippocampal deep brain stimulation in temporal lobe epilepsy

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Introduction: Amygdalo-hippocampal deep brain stimulation (AH-DBS) in temporal lobe epilepsy (TLE) has been showed encouraging with a reduction in the frequency of seizures or even a suppression of seizures.
Objectives: To evaluate the effects of parameters of stimulation (amplitude and configuration; localization of the epileptogenic zone and of the electrode).
Methods: Eight pharmacoresistant TLE patients, not candidates for ablative surgery, received chronic, DBS (130 Hz, follow-up 12–74 months): two patients with hippocampal sclerosis (HS) and six patients with non lesional TLE (NLES). The effects of intensity (stepwise increases from 0 [Off] to 2 V) and of stimulus configuration (quadripolar, bipolar), on seizure frequency and neuropsychological performance were studied. The long-term outcomes were analysed in comparison to the localizations of the epileptogenic zones and of the electrodes.
Results: The two HS patients obtained a significant reduction (65–75%) of seizure frequency with high voltage bipolar DBS (at least 1 V) or with quadripolar stimulation. Two of the six NLES patients became seizure-free, one of them without stimulation. Two NLES patients experienced a reduction of seizure frequency (65–70%); in one of both, the primary epileptogenic zone was later localized in the anterior pole of the temporal lobe. The remaining two NLES patients obtained no significant seizure reduction: in one of them, the mesial epileptogenic zone was identified as a secondary focus, in the other, the electrode was not located exactly in the mesial structures. Neuropsychological evaluation showed reversible memory impairment in two patients under strong stimulation only.
Conclusions: AH-DBS is a valuable treatment option for patients who suffer from drug-resistant TLE and who are not candidates for ablative surgery. A large zone of stimulation (high amplitude or quadripolar configuration) was needed in both HS patients. A weak stimulation and the microlesional effect were beneficial in two NLES patients. The proximity of the electrode to the primary epileptogenic zone, and the localization of this epileptogenic zone within the mesial structures, seem mandatory to the success of AH-DBS.

Poster session 18. Neurophysiology of immune-mediated diseases

P18.1
Rituximab for treatment of Neuro-Sjögren's. Case report

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Introduction: Sjögren's syndrome is a multisystemic rheumatological disorder that can affect the nervous system. Sjögren's syndrome can cause a chronic progressive dorsal root ganglionopathy, trigeminal sensory neuropathy, and cervical myelopathy. We present a case of refractory Sjögren's syndrome manifesting as all three that responded to rituximab.
Objectives: To demonstrate the value of using Rituximab as a treatment method for Neuro-Sjögren's.
Methods: Case Report. A 44 year-old female reported developing numbness and tingling in her distal extremities after contracting chicken