Results: The structure of intrinsic connectivity in both groups showed that the cerebellum has unidirectional connections with both left (dominant connection) and right BG. Unidirectional connections of the BG with SMA and SMA with cerebellum were present. In controls, the modulatory input decreased the relation of cerebellum with left BG and SMA with more pronounced symmetry of these connections. On contrary, PD patients showed an increased EC among cerebellum and both BG with more pronounced asymetry (stronger connection with left BG).
Conclusion: Our findings indicate that the PD patients and controls use identical functional circuits to maintain the successful outcome in predictive motor timing behaviour, however the strength of EC differs between these two groups.
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P6. Epilepsy (1)

P6-1
Effect of vagus nerve stimulation on EEG and seizure frequency in children with intractable epilepsy

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Purpose: To determine the outcome in children with intractable epilepsy treated with vagus nerve stimulation (VNS).
Methods: Between 2004 and 2009, 18 children with epilepsy, aged 4–18 years, refractory to at least 3 antiepileptic drugs, were implanted with the VNS therapy device. We determined mean reduction in seizure rate, 3 months versus 12 months seizure rates and seizure rate changes associated with seizure type. We also performed serial EEGs and evaluated the number of interictal discharges (IED).
Results: Reduction in mean monthly seizure frequency was 51%. Median seizure rate reduction was 53% after 3 months of implantation ($p < 0.001$) and 62% after 12 months ($p < 0.001$. The reduction in different seizure type, as tonic, atonic, tonic-clonic and myoclonic, were similar. The number of IEDs on EEG were significantly decreased after 12 months of therapy.
Conclusions: Due to long-term improvement the VNS therapy had proven to be effective in the control of intractable seizures and to decrease the number of IEDs on EEG in children.

P6-3
Removing interictal fast ripples on electrocorticography linked with seizure freedom in children

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Objective: Fast ripples (FR, 250–500 Hz) detected with chronic intracranial electrodes are proposed markers of epileptogenesis in adult patients. This study aimed to determine whether resection of FR containing-cortex recorded interictally during intraoperative electrocorticography (ECoG) was associated with postoperative seizure freedom in pediatric patients with mostly extratemporal lesions.
Methods: FRs were retrospectively reviewed in 30 consecutive pediatric cases. ECoGs were recorded at 2000 Hz sampling rate and visually inspected for FR, with reviewer blinded to the extent of resection and outcome.
Results: Average age at surgery was 9.1 years, ECoG duration was 11.8 minutes, and postoperative follow-up was 24.3 months. FRs were undetected in 6 ECoGs with remote or extensive lesions. FR episodes ($n = 273$) were identified interictally in 24 ECoGs, and in 67% FRs were independent of spikes, sharp waves, and paroxysmal fast activity. Of these 24 children, FR-containing-cortex was removed in 19 and all became seizure-free, including one child with a second surgery. The remaining 5 children had incomplete FR resection and all continued with seizures post-operatively. In two ECoGs, the location of electrographic seizures matched FR location. FR cortex was found outside of MRI and FDG-PET abnormalities in 6 children.
Conclusions: Interictal FRs were detected during short intraoperative ECoG in 80% of pediatric epilepsy cases, and complete resection of FR cortex correlated with postoperative seizure freedom. These findings support the view that interictal FRs are excellent surrogate markers of epileptogenesis, can be recorded during brief ECoG, and could be used to guide future surgical resections in children.

P6-4
Very high frequency oscillations (over 1000 Hz) in human epilepsy

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Objective: High frequency oscillations (HFO) of 100–500 Hz have been reported in epileptic human brain. However, the questions of how fast these oscillations can reach, and which frequency range is clinically important remain unanswered. We recorded interictal and ictal very high frequency oscillations (VHFO) of 1000–2500 Hz by subdural electrodes using 10 kHz sampling rate. We describe the characteristics of VHFO, and discuss their possible underlying mechanism and clinical significance.
Methods: Four patients with neocortical epilepsy (one with parietal lobe epilepsy, and three with frontal lobe epilepsy) were studied. All patients underwent intracranial EEG monitoring with subdural electrodes. After completing the routine EEG recording at a sampling rate of 200 Hz, EEG recording using a higher sampling rate of 10 kHz was conducted.
Results: Very high frequency activities of 1000–2500 Hz were detected in highly localized cortical regions (one to four electrodes in individual patient). We named these activities 'very high frequency oscillations (VHFO)'. Interictally, VHFO appeared intermittently, and were interrupted by spikes. Sustained VHFO without spikes appeared around the start of seizures.
Conclusions: We demonstrated that both interictal and ictal VHFO can be recorded by subdural electrodes. Compared to HFO previously reported, VHFO have much higher frequency, more restricted distribution, smaller amplitude, and different timing of onset. VHFO may reflect the summation of abnormal activities arising from multiple non-synchronous neuronal subgroups, and provide further insight into epileptogenesis and ictogenesis.

P6-5
The correlation between EEGs amplitude and interictal abnormalities

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Objective: To establish the relationship between EEG amplitude and interictal abnormalities.
Methods: All EEGs performed in patients older than 13 years at the Neurophysiology Dept at SQUH-Oman for an 18 months period (2006–2007) were reviewed. All EEGs were recorded over an average period of 30–40 minutes. The background EEG amplitude was determined during resting, eyes open and closed and then classified into four categories according to amplitude: (1) $\leqslant 20\,\mu V$, (2) >20-<35 μV, (3) >35-<50 μV (4) $\geqslant 50\,\mu V$. Interictal epileptiform and slow wave abnormalities were identified in each EEG during hyperventilation (HV) and the following response during photic stimulation (PS). Correlation studies between the level of background amplitude and interictal abnormalities were performed.
Results: A total of 1073 EEGs were studied from patients with age range 13–80 years Interictal resting abnormalities seen in the categories were (1): 0/34 (0%), (2): 32/160 (20%), (3): 49/171 (28.7%) and (4): 279/708 (39.4%). During HV, the abnormalities seen were: (1): 0/22 (0%); (2): 4/101 (3.96%), (3): 10/134 (7.5%) and (4): 62/562 (11.0%). During PS, the abnormalities seen were: (1): 0/32 (0%), (2): 2/149 (1.34%), (3): 3/160 (1.88%) and (4): 28/652 (4.3%). Correlation studies showed a statistically significant linear relationship between the group number (EEG amplitude) and the number of interictal abnormalities during the resting state, HV and PS with $R = 0.982$ ($p = 0.018$), 0.999 ($p = 0.000$) and 0.966 ($p = 0.034$) respectively.
Conclusions: Epileptiform abnormalities are seen with increasing EEG amplitudes. This has implications for the interpretation of EEG in the investigation of epilepsy. Further more extensive studies including sleep and prolonged recordings are needed to establish whether this limitation of the low voltage EEG can be overcome.