**MOTIVATION**

- Spectral analysis of the electroencephalogram (EEG) of patients with disorders of consciousness can identify features that may indicate abnormal cortical dynamics.
- Few prior clinical studies have identified EEG changes in sleep or wakefulness as potential indicators of a recovery process.

**Focusing on the sleep EEG recorded in a longitudinal study of patients with traumatic brain injury, we apply quantitative methods (power spectra and coherence), to identify potential biomarkers of the recovery process.**

**RESULTS**

**Novel features of power and coherence spectra**

**Patient 1**
- Female: 22 yo at time of injury
- Stroke due to basilar artery occlusion with brainstorm infarct
- Severely impaired motor function

**Spectra in the Sleep State**

**Coherence**

**Patient 3**
- Male: 20 yo at time of injury
- Left tempoparietal intra-cranial hemorrhage
- Died on day 14 after sustaining the injury

**Changing in the spindle frequency range**

**Summary**

- Visual inspection of the EEG shows that T2, spindles appear in the occipital regions.
- Spectral shape is generally similar at visit 1 and visit 2.

**Patient 4**
- Male: 19 yo at time of injury
- Severe closed head injury - TBIs
- On testing across examination period subject demonstrated increased motor control and improved impulse control

**CONCLUSIONS**

- Spectral analysis of the EEG reveals longitudinal changes in power spectra and coherence associated with behavioral recovery and metabolic change in all subjects.
- In Patients 1 and 2, the sleep records from the first visit reveal globally coherent oscillations (5 Hz and 16 Hz) absent of normal sleep. These are not present in the second visit. The change over time suggests the dissolution of aberrant pathological processes, and correlates with recovery of normal sleep as assessed by visual inspection in both subjects.
- In Patients 3 and 4, the overall shape of the power spectrum is preserved across both time points in the frontal, temporal and parietal regions. Both show a slight increase in frequency of the peak within the spindle range.
- The presence of ~14 Hz peak in the second visit of Patient 3 accompanied by an increase in intra-hemispheric coherence in the spindle frequency at ~14 Hz in the intact hemisphere and inter-hemispheric coherence in the occipital regions suggest the reappearance of features typical of normal sleep.