Differential spindle expression dependent upon thalamic nuclei lesioned by stroke

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Background

Impaired sleep consolidation has been associated with slower functional recovery^[1,2,3,4]. Also, homeostatic regulations are global and local phenomena which are involved in the neuronal plasticity ^[5,6].

An ischemic stroke within the thalamus is resulting from a thrombus in one of the perforating arteries irrigating the thalamus. Different vascular territories can be encountered and leading to different clinical outcomes^[7]. From clinical observations, lesions in inferolateral cluster are associated with ataxia or executive dysfunctions^[7], while lesions in paramedian were reported to: \downarrow wakefulness, \uparrow sleep quantity, \uparrow NREM1%, \downarrow sigma power, \downarrow spindles parietal ^[7,8,9,10]. However, the thalamic nuclei contribution in sleep-wake regulation is debated^[11].

Hypotheses

- Stroke encompassing the thalamus are negatively impacting the propagation of spindles
- The impact on the spindles propagation is dependent on the composition of thalamic nuclei involved in the lesion



Discussion

Differential spindle expression

- We proposed a quantifiable way to distinguish thalamic strokes in a context of sleep investigations
- Specific thalamic strokes are negatively impacting a sleep marker:
 - IL|MD → less spindles in number (mean 1573.4, controls 2127.8) and in efficiency (power analysis)—> higher NREM1 proportion (Δ+10.63; t-test p-value 0.032)—> less consolidated sleep—> increased reported sleepiness (SSS_e Δ+1.88; t-test p-value 0.022; SSS_m Δ+1.56; t-test p-value 0.039)
 - VL|VPL → more spindles in number (mean 2073.7) and in efficiency (power analysis) —> lower NREM1 proportion —> more consolidated sleep —> lower reported sleep iness
- The spindles were affected more at the beginning of the night were spindles have been reported to be more local (and less affected at the end of the night when the spindles are more global).
- Sleep consolidation and post-stroke recovery

Outlooks

Ongoing analyses are performed to better described local emergences of channel clusters different in IL|MD than in VL|VPL.

Further works would need to be addressed to better understand what drive the cortical states to be able to better target with sleep-related therapies.

References

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Glossary

NREM: non-rapid eye movement sleep IL: intralaminar nuclei (>5%) MD: medio-dorsal nuclei (>5%) VL: ventral lateral nucleus (>5%) VPL: ventral postero-lateral nucleus (>5%)

LMM: linear mixed-effects models

SSS_{e/m}: Stanford sleepiness scale performed at evening or morning

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