

Circadian and Infradian Seizure Rhythms Based on Subcutaneous EEG

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Introduction

Based on patient diary or intracranial recordings, recent publications have shown that seizures have a high circadian and infradian rhythmicity for most patients (Karoly et al.,

2018). We investigate whether the same observations can be made based on ultra-long-term EEG from a minimally-invasive subcutaneous device

Methods

- Nine patients were monitored for a period of up to three months with a sub-scalp EEG monitor
- 11,774 hours of continuous EEG recorded
- 338 seizures were identified by visual analysis
- Polar histograms were used to analyze in terms of circadian and weekly rhythms
- Only patients with at least 16 recorded electrographic seizures were included in the analysis

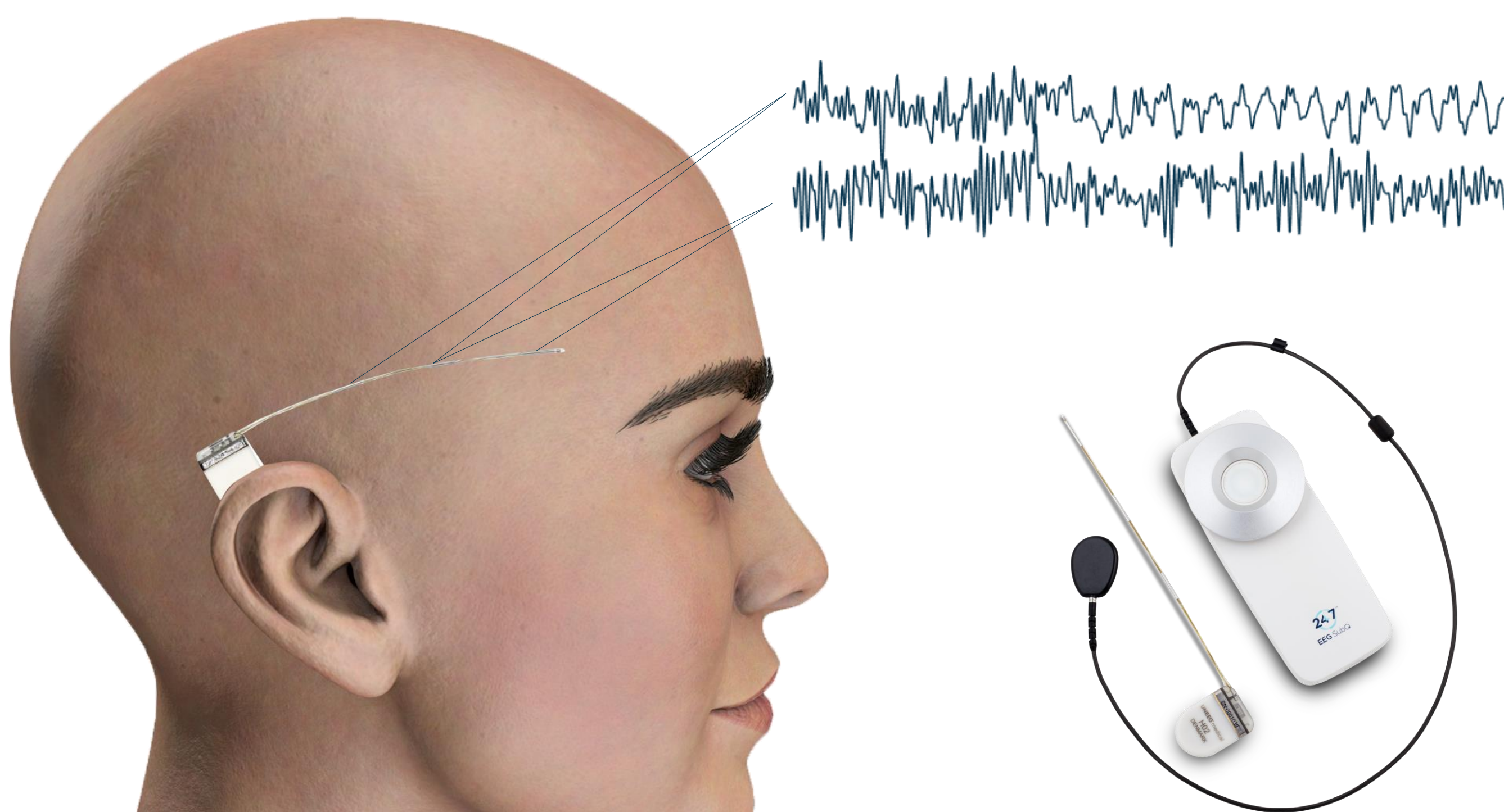


Figure 1 Illustration of the device used in the study, the 24/7 EEG™ SubQ (UNEEDG medical A/S, Lynge, Denmark). The device is implanted in the sub-scalp layer outside the skull

Results

- Four out of nine patients had at least 16 seizures for rhythmicity analysis
- At least three patients showed clear circadian rhythms (B, D, I)
- Two patients primarily had their seizures on two or three specific days of the week (B, E)
- Increased knowledge of rhythmicity can support a more personalized treatment plan
- More data for all patient would be needed to have statistical power to investigate rhythmicity extending over periods of months or seasons

Further reading: Weisdorf et al., 2018, High similarity between EEG from subcutaneous and proximate scalp electrodes in patients with temporal lobe epilepsy
Weisdorf et al., 2019, Ultra-long-term subcutaneous home monitoring of epilepsy—490 days of EEG from nine patients

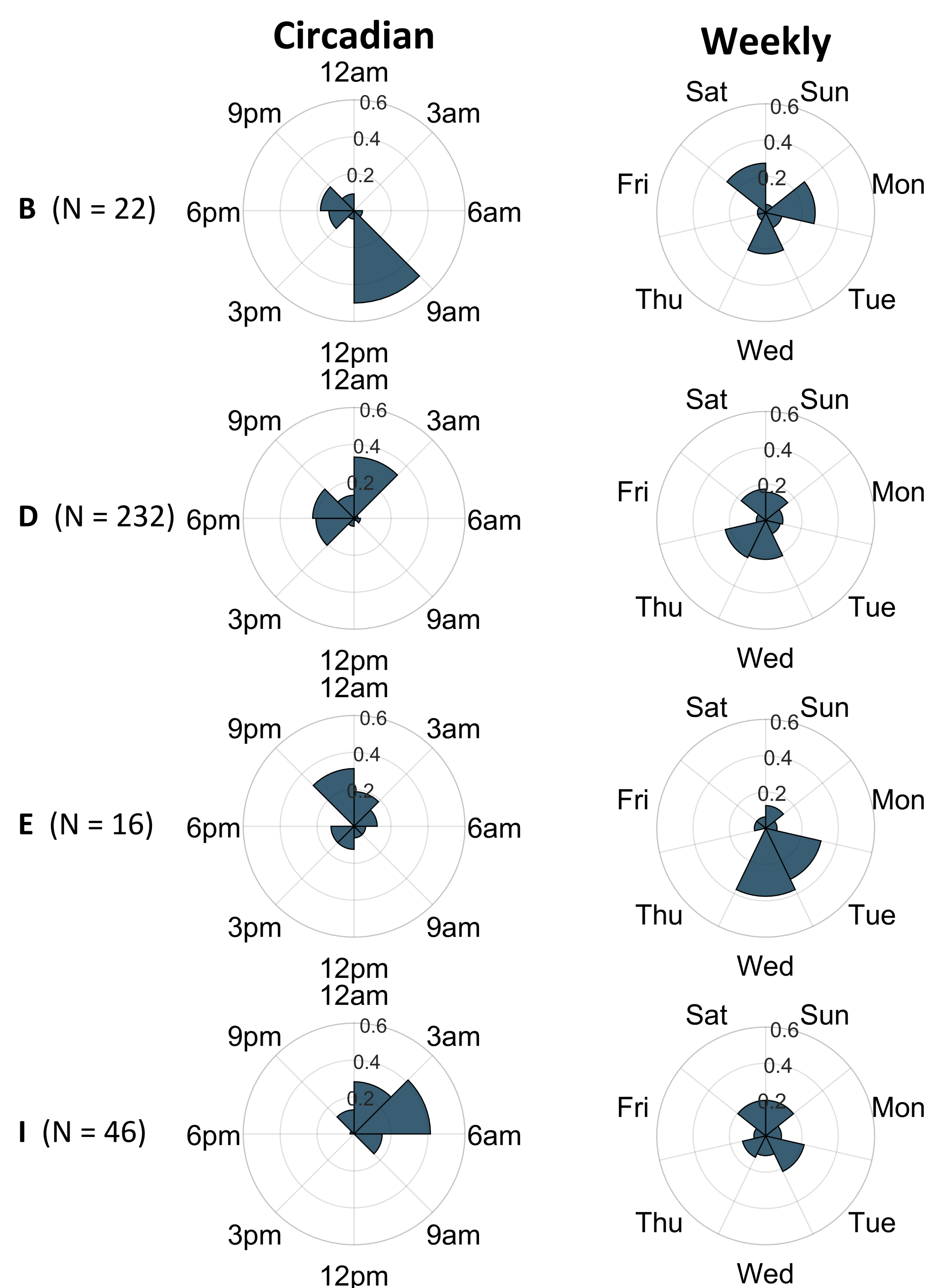


Figure 2 Circadian and weekly rhythms of electrographic seizures for patients with at least 16 recorded seizures.

Conclusions

Ultra long-term subcutaneous EEG is very suitable for analysis of seizure rhythmicity. Previous findings of circadian and weekly rhythmicity based on seizure diary or intracranial recordings were confirmed with this minimally-invasive method which accommodates the possibility of objective, unobtrusive recordings in the every-day life of epilepsy patients.