Sleep Disruption in the Intensive Care Unit

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Introduction

Sleep disruption in the critically ill adult may result in acute decrements in cognitive functioning including delirium;1 unfortunately, sleep disruption is under-diagnosed in the setting of the intensive care unit (ICU) because drug-induced immobility is frequently confused with sleep despite evidence that the restorative and reparative properties of sleep are lacking in drug-induced sedative states. The sleep stages can be assessed by polysomnography that includes high density electroencephalography (EEG). However acquisition of this quality of EEG data requires polysomnographic expertise and an electrically "quiet" environment that is not feasible in the ICU. In this study, we investigated the feasibility of monitoring sleep disruption in the ICU setting using a portable EEG monitor.

Methods

Ten patients admitted to the ICU aged ≥45 years were continuously monitored for 1271±436 min (mean±SD per patient) with SEDLine® Brain Function Monitor (Masimo Corp., Irvine CA) which provided 4 channels of real-time EEG (Fp1, Fp2, F7 and F8) sampled at 2500Hz. EEG recordings were converted to European Data Format and were scored in 30-second epochs using REMLogic™ software according to standard definitions2. We measured total sleep time, and the proportion of time patients spent in stages 1, 2, 3 and rapid eye movement (REM).

Results

In each of the patients the EEG acquisition device established fragmented sleep with frequent arousals (arousal index=26.43), and altered sleep architecture with an increase in light sleep (N1=30.76%, N2=61.81%), almost non-existent slow wave sleep (N3=0.06%) and decreased REM (REM=7.38%).

Discussion

Sleep in normal healthy subjects is distributed as stages 1 and 2 - 50-60%, stage 3 - 13-23%, and REM sleep - 20 to 25% 3,4. The stages of sleep are maldistributed in ICU patients. Our results confirm the utility of a portable monitor to measure different sleep stages. Having the ability to continuously monitor sleep in the ICU setting will facilitate clinical trials with goal-directed interventions that rectify sleep disruption. Targeting modifiable risk factors such as sleep disruption may ultimately decrease delirium and associated adverse events in the critically ill patients.

References

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