Original article

Approaches to staging sleep in polysomnographic studies with epileptic activity

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Abstract

Background: The Standardized Sleep Manual of Rechtschaffen and Kales is well established and reliable in scoring the majority of polysomnograms (PSGs) encountered in clinical practice. In patients with epilepsy, however, abnormal brain activity may confound the interpretation of sleep waveforms. Our goal is to identify features that are problematic in analyzing sleep stages in patients with epilepsy and to offer approaches to score these PSGs.
Methods: Ninety eight PSGs from 43 patients with epilepsy were scored using Rechtschaffen and Kales guidelines. Features interfering with sleep staging were noted.
Results: In scoring polysomnograms (PSGs) of patients with epilepsy we noted epileptic seizures, interictal epileptiform discharges (IEDs) and abnormal EEG background to be features of epilepsy that compromised sleep scoring. Overall, 48% of the studies in our sample contained one or more of these epileptic features to the extent that sleep scoring by standard criteria was compromised. Approaches for staging sleep in the setting of these abnormalities are outlined.
Conclusions: The Rechtschaffen and Kales method of sleep scoring is useful in staging the majority of PSGs of patients with epilepsy. However, we advocate some modifications because the abnormal electrical activity of epilepsy may interfere with accurate scoring of sleep waveforms. These approaches to scoring PSGs of patients with epilepsy will require empirical testing.
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Keywords: Sleep scoring; Rechtschaffen and Kales; Epilepsy; Seizure; Interictal epileptiform discharge

1. Introduction

A relationship between sleep and epileptic activity has been noted and appreciated by scientists for centuries. Hippocrates and Aristotle made observations that seizures are associated with sleep or sleepiness in some patients [1,2]. Yet, over 2000 years later, scientists are still exploring interrelationships between epileptic seizures, sleep, and electroencephalographic (EEG) measures of brain activity. Polysomnography (PSGs) has been widely used to investigate this interrelationship [3–6].

Especially when combined with multiple EEG channels, PSGs are also a useful clinical diagnostic tool for physicians in their treatment of patients with epilepsy. These studies may distinguish seizures from other sleep-related events, such as arousal disorders, and may diagnose sleep disorders co-existing with epilepsy. Other areas of research in epilepsy concern the influence of sleep state, circadian rhythms, and brain activity during individual stages of sleep on seizure initiation [7].

Increased study of sleep EEGs in patients with epilepsy has been facilitated by the progression from paper to digital recordings. Parameters that were 'fixed' on paper studies, such as the montage, filter settings, and paper speed can now be changed on the digital recording to customize analyses for both EEG and sleep. This technological advancement has resulted in the increased clinical and research use of sleep EEG and PSG studies. Despite these technical advances and the growing interest in the relation between sleep and epilepsy, there are no specific guidelines for staging sleep records where epilepsy is suspected or known

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