Features of Polysomnography

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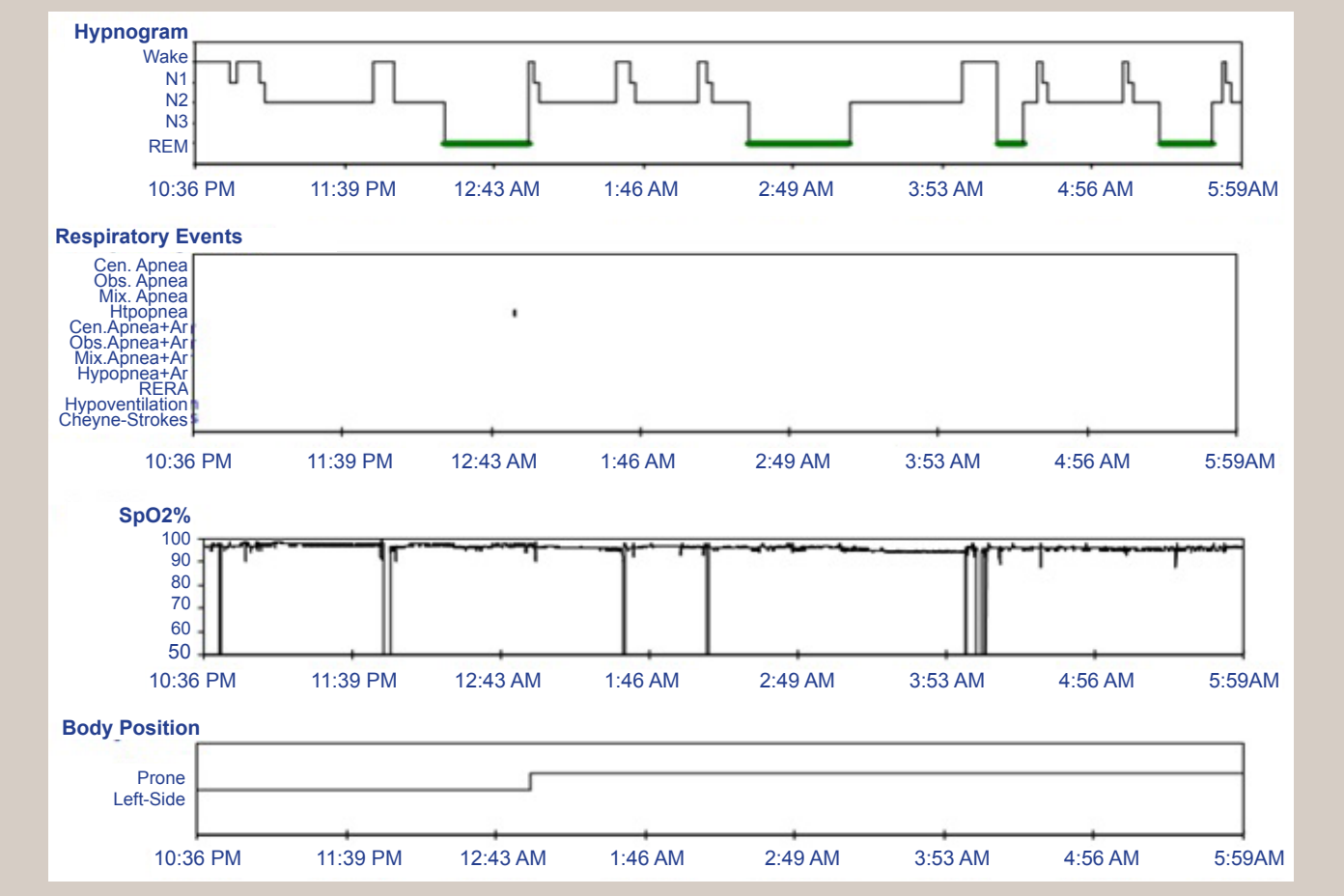
A Polysomnogram (PSG) is alternatively named a sleep study. A PSG is indicated for the evaluation of sleep disorders such as narcolepsy, limb movement disorders (LMDs), and most frequently sleep apnea. The test has historically monitored brain activity (EEG), eye movements (EOG), muscle activity (EMG), and heart rhythm (ECG). Pulse oximetry and respiratory airflow and effort were added by the 1970s. The data from the EEG, EOG, and EMG are all integrated to assign sleep stage scores to each 30 second epoch of the test. These data are summarized in a graphical summary called the hypnogram. It is used as a qualitative analysis of the transitions in between the stages of sleep. When reviewing hypnograms, physicians address parameters, such as sleep latency, Rapid Eye Movement (REM) latency, percentages of time in each sleep stage, and Wake after Sleep Onset time (WASO). All of the parameters are used to create an accurate depiction of sleep and any associated disturbances.



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Sleep onset latency (SOL) is the time it takes to transition from wakefulness to non-REM sleep. On average, the SOL should take between 10-20 minutes[1]. Short sleep latencies usually reflect increased sleepi-

ness. Long sleep latencies may occur in insomnia or as a consequence of unfamiliar surroundings in sleep centers. REM latency is a similar parameter signifying the time that it takes to reach REM sleep after the onset of sleep. Its normal value ranges from 80-120 minutes[2]. WASO is a parameter that examines the total amount of minutes awake after the first sleep epoch is achieved[3]. Therefore, as the WASO increases, sleep efficiency decreases. Using the PSG, the percentage of each sleep stage during the entire study can be computed. Stage 2 sleep normally makes up the majority of sleep (45-55%). REM sleep usually makes up 20% to 25% of sleep which is spread over four to six discrete episodes. Normal sleep has transitions between Non-REM and REM sleep every 90 minutes on average. Abnormalities in REM sleep include decreased duration of REM periods, decreased number of REM periods, and abnormal spacing of REM.

Examining respiratory effort and the pulse oximetry are also important diagnostic features. Using these data, specific indices can be obtained. The apnea–hypopnea index (AHI) is a measurement of sleep apnea. The apneas or pauses in breathing must last for at least 10 seconds and be associated with a decrease in blood oxygenation (at least 3% or greater in O_2 desaturation on pulse oximetry). The AHI, as with the separate apnea index and hypopnea index, is calculated by dividing the number of events by the number of hours of sleep. AHI values are typically categorized as 0–5/hour = normal; 5–15/hour = mild; 15–30/hour = moderate; and > 30/hour = severe[4]. The Respiratory Disturbance Index (RDI) is an extension of the AHI which includes the total number of hypopneas, apneas, and respiratory effort related arousals (RERAs). RERAs are events that cause an increase in respiratory effort that lead to arousal, but RERAs do not qualify as hypopnea or apnea. Patients with a normal AHI, but who also have an elevated RDI, have a variant of OSA called Upper Airway Resistance Syndrome. The RDI has also been shown to correlate well with excessive daytime sleepiness[3]. Snoring occurs in 30-50% of people but does not always equate with obstructive sleep apnea[5]. However, snoring can meet the criteria for RERAs and still negatively affect proper sleep. The Arousal Index is an inclusive term for all respiratory events and limb movements which result in EEG arousals. These events and the resulting indices provide quantitative measures of sleep disorders. The elements of a normal PSG must be understood in order to properly diagnose the abnormal PSG. The study shown is a normal PSG.

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