POLYSOMNOGRAPHY

Juhi Jamwal, M.D., Suhail Malik, M.D.

Department of General Medicine, SKIMS Srinagar

Polysomnography (PSG) is the gold standard diagnostic test for several sleep disorders. It records, analyzes, and interprets multiple simultaneous physiologic characteristics during sleep. These parameters include brain waves, the oxygen level in the blood, heart rate and breathing, body position, eye and leg movements, and record of synchronized audiovisual monitoring. Moreover, in certain conditions, additional parameters may be included such as esophageal pH monitoring, esophageal manometry, and overnight blood pressure monitoring. The test is usually performed at a Sleep Disorders Unit within a hospital or at a Sleep Disorders center. Sleep architecture is largely divided into non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. NREM is further divided into three stages, N1, N2, and N3; N3 being the deepest stage of sleep. REM sleep alternates with NREM sleep and a normal person usually has 4 to 6 cycles of REM and NREM sleep. Monitoring of the different sleep stages, sleep interruptions, movements, and respiratory and cardiac signals are clinically helpful for identifying the nature of patient's sleep problems and assessing response to treatment. Types of PSG include, a) Diagnostic PSG, b) PAP titration PSG, and c) Split night study

INDICATIONS (American Academy of sleep medicine):

- I. Sleep related breathing disorders e.g. snoring, apneas, hypopneas, and respiratory effort
- II. related arousals (RERAs).
- III. Narcolepsy

Correspondence

Dr. Juhi Jamwal, M.D.,
Department of Medicine, SKIMS, Soura,

- IV. Parasomnias
- V. Sleep related seizure disorders
- VI. Restless legs syndrome and periodic limb movement sleep disorder
- VII. Depression with insomnia
- VIII. Circadian rhythm sleep disorder

PROCEDURE

PSG is typically performed at night. The patient may be asked to visit the sleep disorders unit a day before undergoing a sleep study to be familiar with the new sleep environment. Patient is subjected to questionnaires regarding excessive daytime sleepiness and apneas. During the pre-study evaluation, patients are given information about sleep study and patients are usually instructed to avoid naps and stimulants during the day of the sleep study. 9 Electrodes are applied on scalp in different regions [frontal, occipital,temporal,central] to record EEG,2 electrodes on outer canthus of eyes to record EOG, 3 electrodes on mandible for EMG, lead II is used to record ECG. Apneas, hypopnoea ,airflow are scored by Oronasal thermistor or nasal air pressure transducer. Respiratory effort is scored by surface diaphragmatic electrode or esophageal pressure monitoring and ventilation by pulse oximetry . EMG lectrode is placed on Tibialis anterior muscle to detect PLMS. The patient is allowed to sleep in sound proof room and lights are turned off. The room should have audiovisual monitoring also to detect altered sleep related behaviours. The recordings from electrodes are amplified and recorded in graph.

Sleep Scoring Data

Sleep Related Indices

Time in Bed (TIB), Total recording time (TRB), Total sleep

time (TST), Sleep Efficiency >90%, Sleep Latency <20 mins, REM latency 90-120 mins, Wake after Sleep Onset (WASO) <20 mins, Sleep Period Time (SPT)

Arousals

Total arousal index, Respiratory arousal index, Periodic limb movement (PLM) Arousal Index <15/hr, Respiratory Effort Related Arousals (RE Abnormal activity during the study

Periodic Limb movements index (PLMI), Bruxism, ECG

Respiratory Indices

Apnea-Hypopnea index (AHI), RERA index , Respiratory Disturbance Index (RDI), Oxygen saturation indices

Apnea/Hypopnea Index

Apnea/Hypopnea index apneas + hypopneas /total sleep time

Apneas +Hypopneas x 60/TST in minutes

0-5/hr = Normal

5-15/hr = Mild

15-30/hr = Moderate

>30/hr = Severe

CPAP Titration: once the patient is identified as having sleep apnea, another study is performed in which the technician adjusts the CPAP level during the test.

Split Night:-combines a diagnostic study & a CPAP titration study into one night

REFERENCES

1. Clete A. Kushida, Michael Littner, Timothy Morgenthaler et al. Practice parameters for the indication for polysomnography. American Academy Sleep Medicine, Sleep 2005 Vol. 28 (4)
2. Kapur VK, Auchlay DH, Chowdhari S. et al Clinical Practice guidelines for diagnostic testing for adult sleep apnea. J Clin Sleep Med. 2017; 13(3): 479-504