DIOGNOSIS OF PERIODIC LEG MOVEMENT USING EEG SIGNALS

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ABSTRACT

Periodic limb movements of sleep (PLMS) are common neurological disorders which are usually under diagnosed. As many pediatricians and pediatric pulmonologists with interest in sleep medicine will be encountering children with Restless leg syndrome (RLS) and PLMS.

Sleep Disruption Can Lead To Symptoms of Attention – Deficit Hyperactivity Disorder (Adhd) In Children. Since Periodic Limb Movement Disorder And Restless Legs Disease Can Cause Sleep Disruption.

Keywords: EEG Signals, Recording of EEG Signals, Diagnosis of Periodic Limb Movement

I. INTRODUCTION

Now a days there are many different sleep disorders which includes:Sleep apnea , Parasomnia , Insomnia, Narcolepsy, Bruxism and many others in the background Periodic limb movement disorder (PLMD) is cyclic cramping or jerking of the legs during sleep. "Periodic" refers to the fact that the movements are repetitive and rhythmic, happening about every 20-40 seconds.

Electroencephalography (EEG) is the recording of electrical activity along the scalp. EEG measures voltage variations resulting from ionic current flows within the neurons of the brain.

Magneto encephalography (MEG) is a functional neural imaging technique for mapping brain activity by recording magnetic fields produced by electrical currents happening naturally in the brain, using very sensitive magnetometers.

Sleep problems including snoring, sleep apnea, insomnia, sleep scarcity, and restless legs syndrome, are common. Good sleep is necessary for best possible health and can affect hormone levels, mood and weight.

In sleep apnea, breathing is disrupted commonly during sleep because of the way the brain functions.Narcolepsy is a neurological disorder that affects the control of sleep and wakefulness.

Periodic limb movement disorder (PLMD) is a sleep disorder categorized by rhythmic movements of the limbs during sleep.

Periodic limb movement disorder (PLMD) is repetitive cramping or jerking of the legs during sleep. It is the only movement disorder that occurs only during sleep, and it is sometimes called periodic leg (or limb) movements during sleep. "Periodic" refers to the fact that the actions are repetitive and rhythmic, happening about every 20-40 seconds.

PLMD may occur with other sleep disorders. It is often linked with restless legs syndrome, but they are not the same thing. Restless legs syndrome is a condition linking strange feelings in the legs (and sometimes arms) while awake and an irresistible urge to move the limbs to ease the sensations.

Polysomnography (sleep lab testing) is the only way to prove that you have PLMD. As you sleep in the lab, your leg movements can be recognized.

Benzodiazepines: These drugs suppress muscle contractions. They are also sedatives and help you sleep through the movements. Clonazepam (Klonopin), in particular, has been shown to reduce the total number of periodic limb movements per hour. It is probably the most widely used drug to treat PLMD.

III. EEG SIGNALS

The electroencephalogram (EEG) is a proof of the oscillations of brain electric potentials recorded from possibly 20 to 256 electrodes attached to the human scalp.

The recorded signals are transmitted to an EEG system composed of amplifiers, filters, and paper chart or computer monitor.

EEG provides a suitable window on the mind, edifying synaptic action that is moderately to strongly related with brain state. A few EEG channels and corresponding amplitude spectrum in a subject awake and calm with eyes closed. Most EEG signals originate in the brain's outer layer (the cerebral contex), believed largely responsible for our individual thoughts, emotions and behavior.

MEG (magneto encephalography) are the only widely available technologies with sufficient chronological resolution to follow these fast dynamic changes. EEG and MEG spatial resolutions are poor relative to modern brain structural imaging methods like Computer tomography (CT), positron emitted tomography (PET).

III. RECORDING OF EEG SIGNALS

Voltage traces of EEG signals recorded from each electrode pair oscillate with mixtures of component waveforms.

EEG frequency ranges are categorized as delta (1 to 4 Hz), theta (4 to 8 Hz), alpha (8 to 13 Hz) and beta (greater than 13 Hz). Very high frequencies (typically 30 to 40 Hz) are referred to as gamma activity. These distinctive labels correspond roughly to frequency bands that often dominate particular human brain states. For example, delta activity with frequencies lower than about 1 or 2 Hz is dominant during deep sleep and in many coma and anesthesia states. Alpha, often mixed with low amplitude delta, theta and beta is typically predominant in awake-resting states and in alpha coma. Different combinations of these rhythms may be associated with behavioral or cognitive state, brain location.

IV. DIAGNOSIS OF PERIODIC LEG MOVEMENT

Patient undergo a full-night video-polysomnographic study, which was carried out after a night of adaptation in a standard sound-attenuated (noise level to a maximum of 30 dB nHL) sleep laboratory room.Patient were not allowed caffeinated beverages the afternoon preceding the recording and were allowed to sleep in until their spontaneous awakening in the morning. Lights-out time was based on individual habitual bed time and ranged between 2130 and 2330. The following signals were recorded: EEG (at least 3 channels, 1 frontal, 1 central and 1 occipital, referred to the contralateral earlobe); electrooculogram (electrodes placed 1 cm above the right outer cantus and 1 cm below the left outer cantus and referred electrocardiogram (1 derivation). Electromyogram signals, in particular, were digitally band-pass filtered at 10 to 100 Hz, with a to A1); electromyogram (EMG) of the submentalis muscle, EMG of the right and left tibialis anterior muscles (bipolar derivations with 2 electrodes

placed 3 cm apart on the belly of the anterior tibialis muscle of each leg, impedance was kept less than 10 KΩ; and notch filter at 50 Hz.

V. CONCLUSION

RLS and PLMS are common neurologic disorders and increase in occurrence with age. These disruptions can be disabling conditions, causing sleep disturbance at night and too much sleepiness during the day time. Polysomnography and the suggested immobilization test are used to support the clinical diagnosis of RLS and PLMS. Although levodopa alleviates symptoms, rebound and growth occur frequently, limiting the long-term usefulness of this agent. The direct dopamine receptor agonists such as pergolide, pramipexole, ropinirole, and cabergoline have largely replaced levodopa as the most effective treatment for RLS and PLMS.RLS is a clinical diagnosis. Consider a sleep study for evaluation of associated PLMS due to the strong association of RLS with PLMS. PLMW may be an indicator of RLS and should be scored during PSG if diagnosis of RLS is suspected. However, PLMD requires PSG for a diagnosis.

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