



SLEEP RELATED EPILEPSY

A case study on sleep disorder in epileptic population

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Abstract: Epilepsy is one of the most common neurological condition, which has drastic effects on an individual's lifestyle. However we do not have a complete understanding of manifestation or pathophysiology of seizures or epileptic conditions. This case study aims to bring out the strong association between sleep and epileptic triggers. Sleep disorders, sleep disturbance or poor quality of sleep are some of the frequently observed comorbid conditions in epileptic populations. In addition sleep deprivation highly influences the seizure triggers. The strong relationship between sleep and circadian rhythm influences the frequencies of the epileptic trigger in an individual. Some of the sleep syndromes are categorized under sleep-related epilepsy. The effects of sleep on seizure occurrence is varied, with respect to different types of epilepsy. On the other hand, sleep quality is affected due to the antiepileptic drugs (AED) or other treatments administered to the patient or due to epilepsy which occurs during sleep stages. The side effects of antiepileptic drugs (AED) may also alter sleep cycles. Sleep studies are proven important in treatments for epilepsy which can help in monitoring diagnosis, treatment and prognosis of the patients.

Keywords - Epilepsy, sleep disorders, pathophysiology, sleep related epilepsy.

I. INTRODUCTION

Epilepsy is one the chronic neurologic disease. The impacts of childhood epilepsy depends on various factors such as diagnosis, severity of the seizures and prognosis. A seizure is nothing but a paroxysmal alteration of neurologic function which is caused by the excessive or hyper firing of the neurons in the brain. Epileptic seizure is a seizure caused due to abnormal neuronal firing from a non-epileptic event. Epilepsy can also be called a condition which is caused due to recurrent unprovoked seizures. However there are numerous underlying cause for an epilepsy. Sufficient sleep plays a vital role in overall health for all age groups. Unfortunately sleep disruptions are some of the commonly observed comorbidity in epilepsy. Sleep and epilepsy are important aspects to be known in neurophysiology. Understanding these two phenomena is very essential to interpret brain function and activities. In Clinics, numerous patients are observed to have either sleep disorders, epilepsy or epilepsy during sleep stages [1]. The Electroencephalography (EEG) is majorly used in diagnosis of epilepsy. It has also played an important role in the development of clinical and experimental protocols and approaches for understanding sleep and epilepsy [2]. Sleep and epilepsy are thought to have extensive interactions and proven to have strong effects on each other [3]. Sleep disorders and epilepsy are discriminated in clinical settings, as sleep conditions affect onsets and manifestation of epilepsy and vice versa [4].

II. EPILEPSY

The international league against epilepsy (ILAE) classified epileptic seizures and epilepsy syndromes in their publish work. Table [1]. Epilepsy is a chronic neurologic disease which is unprovoked, recurrent or intermittent with sudden discharge of neuronal activity. The international league against epilepsy (ILAE) classified the episodes further as (a) at least two unprovoked or reflex occurring seizures within 24 h; (b) one unprovoked or reflex seizure with frequent recurrence or any unprovoked occurrences within 5 – 10 years and (c) any diagnosis of other epilepsy syndrome [d]. An epileptic seizure is a continuous occurrences of signs and symptoms which is due to excessive neuron activity in the brain. Epileptic seizures can occur as a cause of many types of brain diseases. The basic understanding of epilepsy explains that epileptic disorders are not singular diseases, but they are reflections of many forms of brain dysfunctions which may be a result genetically disorders, infection, stroke, trauma, and birth defects or unknown predispositions. Seizure can be focal, partial or generalized. A generalized seizure is a seizure that arises simultaneously from both hemispheres (bilateral). A focal seizure is a seizure which is within networks limited to one cerebral hemisphere or lobe of the brain. Epilepsy's are classified into different epileptic syndromes based on seizure type and other factors, like electroencephalography findings, age of onset, clinical course, other neurological findings, etc.

The subtypes of generalized seizures are absence seizures, generalized tonic-clonic seizures (GTCS), myoclonic, tonic and atonic. Absence seizures which are also called petit mal involve unresponsive behavior with staring to external stimuli. GTC seizures which is also called grand mal consist of bilateral symmetric or asymmetric convulsive movements or jerking of all extremities. Epilepsy syndromes based on their symptoms were further classified as symptomatic or cryptogenic with known causes and idiopathic not known. The international league against epilepsy (ILAE) has taken in account factors such as knowledge of genetic and structural abnormalities which includes syndrome diagnosis along with the functional impairment's.

Table 1 Classification of epilepsies and epileptic syndromes by the ILAE (1989) [5]

Epilepsy types	Seizure type and frequency
Localization-related (focal) <ul style="list-style-type: none"> • Idiopathic 	Focal, various motor seizures, occur in clusters
Localization-related (focal) <ul style="list-style-type: none"> • Symptomatic or cryptogenic 	Focal, rolandic seizures, frequent
Localization-related (focal) <ul style="list-style-type: none"> • Symptomatic or cryptogenic 	Focal, autonomic seizure, rare
Generalized <ul style="list-style-type: none"> • Idiopathic 	Generalized, tonic-clonic seizure, rare
Generalized <ul style="list-style-type: none"> • Symptomatic or cryptogenic 	Generalized, tonic-clonic seizure, moderate

III. SLEEP RELATED EPILEPSY

There are some epilepsy syndromes which have tendency to manifest predominantly during sleep or after arousal from sleep 15- 30 minutes after awakening. The current classification of sleep disorders, has mentioned few types of epileptic symptoms which happen during sleep stages such as benign epilepsy of childhood with Centro temporal spikes (BECT), Nocturnal frontal lobe epilepsy (NFLE), benign epilepsy with occipital paroxysms (BEOP), generalized tonic-clonic seizures on awakening etc. These types of seizures produces continuous spike wave (CSWS) during non-rapid eye movement (NREM) sleep which indicate a sleep- related epilepsy. The Characteristics of these sleep-related epilepsy syndromes and their onsets are summarized in [Table [2]]

Nocturnal frontal lobe epilepsy (NFLE) is an idiopathic epilepsy syndrome which originates from the frontal lobe and it is characterized by seizures occurring exclusively during sleep. The seizure onset is most commonly during childhood. Generalized tonic-clonic seizures also known as Grand Mal seizures, is an idiopathic generalized epilepsy syndrome. This seizures often occur after arousal and sometimes occur when the patients are relaxed. The onset of this syndrome is during early adulthood or adolescences. Benign epilepsy of childhood with Centro temporal spikes BECT, also known as benign Rolandic epilepsy, is one of the common epilepsy syndrome in children. It is a benign idiopathic localization-related epilepsy that occurs in the rolandic area of the brain. Early-onset childhood occipital epilepsy, also called as Panayiotopoulos Syndrome, is another type of age-related to benign idiopathic localized epilepsy. It has an onset during early childhood 3-6 years. Continuous spike wave CSWS, also called as electrical status epileptics of sleep (ESES), is an epileptic encephalopathy characterized by continuous and diffuse spike-waves that continuous through slow-wave sleep but not during REM sleep. Most of the CSWS despite being detected in sleep EEG are not apparent. Although CSWS is associated with mental disorders with intellectual and cognitive disabilities. The spike-waves occur during sleep are predominant in the temporal lobe characterizing cognitive decline.

Table 2 Characteristics of sleep-related epilepsy syndromes [3], [6-13]

Epilepsy syndrome	Relation to sleep
Nocturnal frontal lobe epilepsy	Seizure occurrence in sleep
Generalized tonic-clonic seizures on awakening	Seizure occurrences mostly after awakening
Benign epilepsy of childhood with Centro temporal spikes	Seizure occurrences in post-ictal and awakening
Early-onset childhood occipital epilepsy	Seizure occurrences in sleep stage 0 or early onset of sleep
Continuous spike waves during non-rapid eye movement sleep	Spike wave diffusion during sleep

IV. METHODOLOGY

All patients visiting to the Departments of Neurology and Pediatrics, Institute of child health and hospital for children, India, July 2019 to September 2019 with suspected epilepsy were evaluated and were further studied. Detail history and thorough neurological examination was noted. Inclusion criteria for the study are clinical evidence of generalized seizures on awakening and no evidence of neurological or intellectual deficit. We excluded metabolic disorders and structural abnormalities. The above mentioned criteria was strictly followed and sleep EEG was recorded using digital EEG machine. All patients were subjected to one routine EEG before a sleep EEG was performed. If the patient was taking treatment, it was not altered before the procedure. During the EEG recording all precautions were taken not to alter the patient's sleep routine. The patients were dressed according to their comfort, had their regular meals and went to bed 1 hour before their usual bedtime. The level of illumination in the room was kept according to the patient. Recordings were performed using 16 channel EEG. Fig [1] Recordings were started at least half an hour before the patient's usual bedtime and continued throughout sleep and 1 hour after final awakening. An awakening was scored when there was a return of the patient's waking background sustained for at least 30 seconds. The whole EEG was reviewed and analyzed for different stages of sleep and for spikes, poly spikes, sharp waves and slowing as per standard practice.

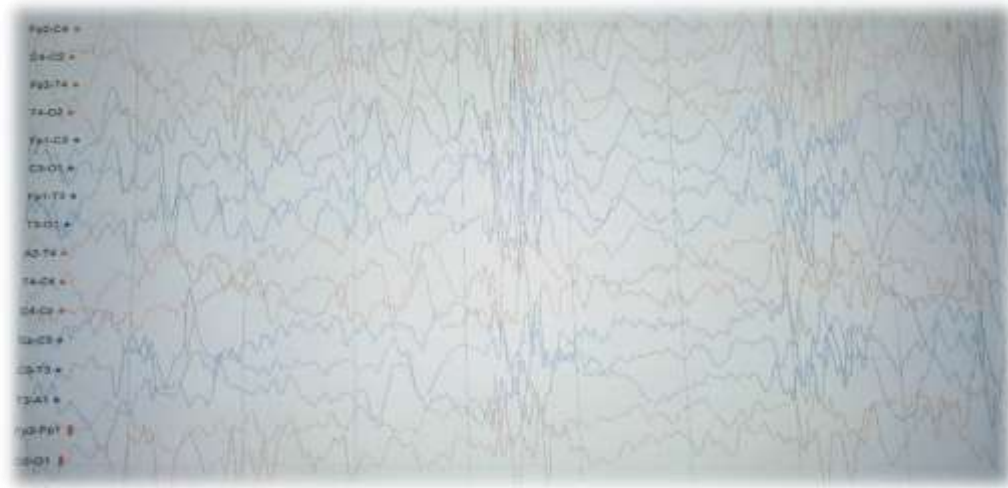


Figure 1. VEEG with frequent generalized spike /spike and wave discharges

IV. RESULT

It is analyzed that patients with epilepsy and those with poor seizure control have poor sleep quality, sleep arousal and fragmentations. Sleep disturbances in patients with epilepsy are highly common. Epileptic seizures that occurs during sleep reduces the quality of sleep. Epileptic seizures can disrupt sleep architecture and result in sleepiness during the day. Sleep disorders are common co morbid condition in epileptic population which has significant effect on their quality of life when compared to those with good sleep.

V. CONCLUSION

Epilepsy is a chronic brain disorder which is characterized by frequent seizures. There are many clinical symptoms and diagnosis for epilepsy. However sleep and epilepsy syndromes strongly interact with each other. Some of the syndromes that caused a seizure are mostly influenced by the sleep or circadian rhythms, while many seizures also happen during sleep. Sleep deprivations are few of the major causal effects on epilepsy. The relationship of the seizure frequency and sleep and circadian rhythms is important in the diagnosis and treatment of epilepsy syndrome. Furthermore, sleep is influenced by epilepsy, as there are high occurrence of sleep disorders among patients with epilepsy, and seizures during sleep lead to sleep deprivation. In addition, antiepileptic drugs tend to alter sleep cycle. In this study, we have described the interactions between sleep and epilepsy.

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