

# The Study of Interictal Electro Encephalographic (EEG) patterns in different types of Seizures

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## Abstract

**Objective:** The aim of the present study was to determine Interictal Electroencephalographic (EEG) changes in different types of Seizures.

**Methods:** The study covers 80 patients with generalized seizures and partial seizures. The patients were from the neurology out patient department of Little Flower Hospital, Angamaly. Forty-eight cases out of eighty were males and thirty two were females. Selection and clinical definitions of the cases were based on a positive correlation of the following two parameters. 1. Clinical features of seizures. 2. Generalization of prevalent interictal EEG activity. Out of 80 cases; 60 cases were clinically diagnosed as having generalized seizures, It includes 42 cases with Generalized Tonic-Clonic seizures; 8 cases with absence seizures ; 5 cases with Juvenile Myoclonic Epilepsy 2 cases with infantile spasms and 3 cases with alcoholic withdrawal seizures. 20 cases showed partial seizures; it includes 18 cases with simple partial seizures and 2 cases with complex partial seizures.

**Results:** In generalized tonic- clonic seizure, the interictal EEG of 42 patients, 32 were normal record and 10 abnormal recordings. The abnormalities were polyspikes and wave discharges; spike and wave discharges; slow wave discharges and symmetrical and synchronous. The EEG recording of 8 patients with absence seizures showed 3 of them abnormal EEG recordings, while 5 showed normal EEG. EEG shows mild electrophysiological abnormalities and 3Hz generalized spike and wave discharges. The EEG recording of 5 cases with Juvenile myoclonic epilepsy were obtained, 2 of them were normal and 3 of them were abnormal. The abnormal recordings contained polyspike and wave discharges. The EEG was normal for 2 patients with infantile spasms and for 3 patients with alcoholic withdrawal seizure. The interictal EEG of 20 patients with partial seizures showed 8 normal and 12 abnormal recordings. In partial seizures the abnormality was found to be either confined to a discrete area i.e. Focal or the entire brain.

**Conclusion:** The younger males (below 35 yrs) were more prone to seizures. Over 75% of the patients had generalized seizures. The study also revealed that the temporal lobe was the most vulnerable part in partial seizures.

## I. INTRODUCTION

Electroencephalography is a technique of recording the electrical activities of the brain through the intact skull. The activity reflect the electrical currents that flow in the extracellular spaces of the brain and these in turn reflect the summated effects of innumerable excitatory and inhibitory synaptic potentials up on the cortical neurons. Electroencephalogram (EEG) exhibit fluctuations at frequencies in the range of 1 to 50Hz and amplitude fluctuations in the order of 10 to 100 $\mu$ V. Frequency is one of the important criteria for assessing abnormality in clinical EEG. It is divided into four frequency bands namely delta( $\delta$ ) frequency band under 4Hz, alpha( $\alpha$ ) frequency band from 8 to 12Hz and beta( $\beta$ ) frequency band from 14 to 30Hz. Source of EEG : Standard clinical EEG records potential difference (V) between two points; one or both of which are on the scalp. The signals of EEG are based up on the movement of electrical changes in the brain. (De Luchhi et al., 1962) When neuron not conducting an impulse there is an electrical potential difference across the membrane called resting membrane potential. It is generated by the unequal distributions of ions across the membrane that results from the difference in their permeabilities. There is greater concentration of Sodium ions outside the neuron than inside and greater concentration of Potassium ions inside than outside. There are also many negatively charged ions held inside the cell by the membrane. The resting potential makes the neuron about 70mV more negative inside than outside. The resting neurons membrane is not very permeable to sodium ions.

**Epilepsy:** Epilepsy may be defined as an intermittent derangement of the nervous system due to presumably a sudden, excessive, disorderly discharge of cerebral neurons. Each episode of neurologic dysfunction is called a seizure. Seizure may be convulsive when they are accompanied by motor manifestations or may manifest by other changes in neurologic functions like sensory, cognitive or emotional events. Epilepsy is estimated to affect between 0.5 and 2 percent of the population, and can occur at any age.

## II. MATERIALS AND METHODS

EEG was recorded using a 21 channel digital EEG machine (Recorders and medicare systems, India). It consisted of the following parts: Computer, colour monitor, keyboard, photic/head box adapter, head box with stand, photic flash with stand and printer. The recording electrodes used were metal disc electrodes coated with silver-silver chloride. They were fixed to the scalp with the help of bentonite paste, which is a good conductor and to electrode in place and provide good contact with the skull. Pre acquisition notes were prepared prior to the starting of the EEG recording. It consists of patient's name, age, sex, date and time of recording, clinical diagnosis, co-operation of the patient, last attack/seizure, last meal, sedation, medication, employment of activation procedures like hyperventilation and photic stimulation and level of alertness namely awake, drowsy, asleep or comatose. The scalp was made oil free and the electrode positions are wiped with acetone before the placement of electrodes. The

subjects were made aware of the necessity of staying calm during the entire recording period. Recording of the EEG was done with subject in recumbent position with the eyes closed and relaxed. Electrode placement over the scalp was done according to 10 – 20 system.

### III. RESULTS

Of the 80 patients, In generalized tonic- clonic seizure, the interictal EEG of 42 patients, 32 were normal record and 10 abnormal recordings. The abnormalities were polyspikes and wave discharges; spike and wave discharges; slow wave discharges and symmetrical and synchronous. The EEG recording of 8 patients with absence seizures showed 3 of them abnormal EEG recordings, while 5 showed normal EEG. EEG shows mild electrophysiological abnormalities and 3Hz generalized spike and wave discharges. The EEG recording of 5 cases with Juvenile myoclonic epilepsy were obtained, 2 of them were normal and 3 of them were abnormal. The abnormal recordings contained polyspike and wave discharges. The EEG was normal for 2 patients with infantile spasms and for 3 patients with alcoholic withdrawal seizure. The interictal EEG of 20 patients with partial seizures showed 8 normal and 12 abnormal recordings. In partial seizures the abnormality was found to be either confined to a discrete area i.e. Focal or the entire brain.

### IV. DISCUSSION

The EEG is most useful in evaluating patients with suspected epilepsy. The presence of electrographic seizure activity, i.e. of abnormal, repetitive, rhythmic activity having abrupt onset and termination, clearly establishes the diagnosis. The absence of such electro cerebral accompaniments does not exclude a seizure disorder, however, because there may be no changes in the scalp recorded EEG during simple partial seizure or complex partial seizure. It is often possible to obtain an EEG during clinical events that may represent seizures, especially when such events occur unpredictably or infrequently. The interictal EEG findings are helpful in showing certain abnormalities that are strongly supportive of the diagnosis of epilepsy. Such epileptiform activity consists of bursts of abnormal discharges containing spikes and sharp waves. The EEG findings also have been used in classifying seizure disorders and selecting appropriate anticonvulsant medication for individual patients. The findings in the routine scalp-recorded EEG indicate the prognosis of seizure disorders.

### V. CONCLUSION

The younger males (below 35 yrs) were more prone to seizures. Over 75% of the patients had generalized seizures. The study also revealed that the temporal lobe was the most vulnerable part in partial seizures.

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