

## Original Article

## IS 20 MINUTES DURATION OF EEG MANDATORY?

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**Objective:** Our hypothesis was that an EEG recording of 20 minutes' duration would yield more information than a 10-minute EEG in capturing epileptiform abnormalities.

**Methods:** The study was conducted in electrophysiology section of neurology department of services hospitals, Lahore during 2012. Total 171 consecutive EEG patient were evaluated.

**Results:** We prospectively studied 171 consecutive EEGs (patients of 16-29 years old) of 20 minutes' duration performed at Services Hospital. Although the majority (89%) of interictal EEG abnormalities can be identified within the first 20 minutes of a routine EEG, extending the time of a routine EEG may increase the yield. The single electrical abnormality was found to appear between 11 to 14 minutes.

**Conclusion:** It should be emphasized that every EEG should be done for atleast 20 minutes duration as recommended, especially when the first 10 minutes are normal.

**Key words:** Epilepsy; EEG; EEG duration; Pakistan.

### Introduction

The electroencephalogram (EEG) which is entirely harmless and relatively inexpensive, is the most important investigation in the diagnosis and management of epilepsies providing that it is properly performed by experienced technicians and carefully studied and interpreted in the context of a well-described clinical setting by experienced physicians.<sup>1</sup> More than one-half of children and adults currently referred for a routine EEG are suspected of suffering from or do suffer from epilepsies. The EEG is indispensable in the correct syndromic diagnosis of these patients.<sup>2,3</sup> American Clinical Neurophysiology Society guidelines require a minimum of 20 minutes of artifact-free recording for routine EEGs.<sup>4</sup> Studies have shown that the greatest yield of interictal abnormalities during video EEG monitoring are found within the first 24 hours of recording.<sup>5</sup> However, the ideal length of time for routine EEGs has not clearly been established. Because sleep is known to activate interictal epileptiform activity, it is important to determine if lengthening the record duration from 20 to 40 minutes increases the likelihood of obtaining sleep.<sup>5</sup> In clinical practice, the duration of routine, outpatient, interictal EEGs varies widely between institutions. In some centers, they are reported to be of at least 120 minutes in duration, whereas others suggest that recordings of only 10 to 15 minutes are sufficient.<sup>6</sup> However, recording durations of 20 to 40 minutes are common in clinical practice.<sup>6</sup> Sleep deprivation before the EEG has been shown to increase the yield for interictal

epileptiform discharges (IEDs).<sup>7</sup> Between 29% and 56% of patients with epilepsy have IEDs on a single outpatient EEG of at least 30 minutes duration.<sup>6</sup> When the routine EEG is repeated, IEDs are seen in 82% of people with a clinical diagnosis of epilepsy after an average of six EEGs, but the yield of a single extended recording EEG has not been well established.<sup>6</sup> Another study has reported that in patients with epilepsy who are admitted to an epilepsy monitoring unit, only 37% have IEDs during the first 20 minutes of recording, but 89% have IEDs within the first 24 hours.<sup>5</sup>

EEG results can provide support for the diagnosis of a specific epilepsy syndrome, such as a generalized onset epilepsy, and aid in identifying the seizure focus in localization related epilepsy. The presence of epileptiform discharges on an interictal EEG is also associated with an increased risk of recurrent seizures after a single unprovoked seizure. The aim of our study was to determine whether a routine EEG of 20 minutes yields more information than a 10-minute EEG in capturing epileptiform abnormalities and in obtaining sleep.

### Methods

The present study was conducted at Services Institute of Medical Sciences and Services Hospital, Lahore, Pakistan. This prospective study was carried out in 2012 and included 171 patients who were admitted with the primary diagnosis of Epilepsy. All the patients were between 15-30 years of age. Patients Having other co-morbidities were excluded from this study. We studied 150 consecutive and sequential

EEGs with a duration of 40 minutes, performed. All EEGs were digital and performed using the standard 10-20 electrode placement. The following data were obtained: age of the patient; time at which the EEG was recorded, before or after noon; presence of EEG abnormalities within the first 10 minutes of recording; presence of EEG abnormalities captured exclusively in the second 10 minutes of recording; presence or absence of sleep; latency to sleep onset; and presence of abnormalities during sleep. All EEGs were read by certified electroencephalographer. Participants gave written informed consent after the purpose of the study had been explained to them. The ethics committee of the hospital approved the study.

**Statistical analyses**

An independent sample t test was done to assess the correlation between whether sleep was achieved and the age of the patient. Abnormalities were defined as epileptiform sharp-wave or spike-wave activity or any areas of abnormal slowing. The statistical packages SPSS (Version 20) and MS Excel (MS Office 2010) were used.

**Results**

A total of 171 patients fulfilling the inclusion criteria were enrolled to measure whether a routine EEG of 20 minutes yields more information than a 10-minute EEG in capturing epileptiform abnormalities and in obtaining sleep. A total of 171 routine EEGs of 20 minutes' duration were reviewed. The age range of these patients was 16-29 years. Out of 171, 108 patients (63%) were males while 63 patients (37%) were females (**Table 1**).

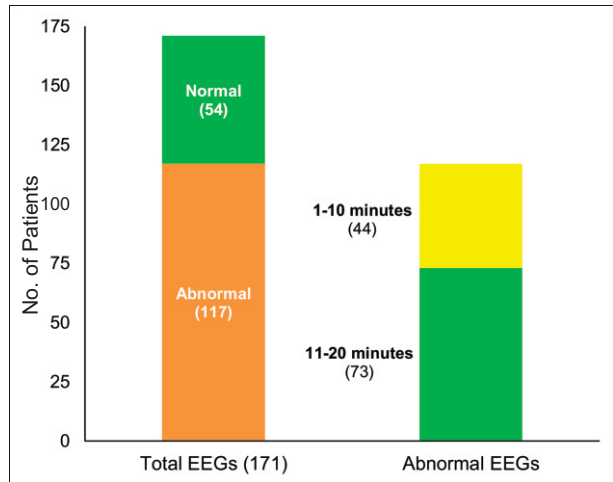
In our study, 117 EEGs (68%) were identified as abnormal. Of the 117 abnormal EEGs, 73 (62%) were abnormal within 11 to 20 minutes of recording and remaining 44 (38%) showed abnormalities out of this range (**Fig-1**).

**Table-1:** Gender distribution of all patients included in this study.

Gender	No. of Patients	Percentage
Male	108	63%
Female	63	37%
Total	171	100%

**Discussion**

It is well known that the likelihood of finding



**Fig-1.** Proportion of abnormal EEGs in patients with Epilepsy.

interictal abnormalities is directly proportional to the length of the EEG recording. However, in our current health care environment, testing such as EEG should be both cost effective and time efficient. Capturing sleep is one of the ways in which the yield of an EEG can be improved.<sup>9</sup> This brings to mind the question of what should be the ideal length of time for a routine EEG. Narayanan et al.<sup>5</sup> found that 37% of their epilepsy patients aged 10 years or older had epileptiform activity in the first 20 minutes.<sup>5</sup> In Taiwan, Lee et al.<sup>9</sup> studied the latency to first epileptiform discharge in 863 EEG recordings of varying duration and found that 64% occurred within the first 30 minutes of recording.<sup>9</sup> Reardon et al.<sup>10</sup> from Australia analyzed 420 25-minute EEGs and compared interictal epileptic discharges in the first 15 minutes versus the next 10 minutes. They found that the 15-minute recordings failed to record abnormalities in 6.3 % (8/128) of their population. This was very similar to a recent study from the United Kingdom by Agbenu et al.<sup>8</sup> which analyzed 297 pediatric EEGs of 20 minutes duration and compared the first 10 minutes of the record with the subsequent recording. Of the 109 abnormal EEGs (37 %), 17 patients (16 %) showed an abnormality seen only in the last 10 minutes of the record, and of these 7 (6.42 %) were abnormal only in the last 5 minutes.<sup>8</sup> These results are interesting to compare with our study, which showed abnormalities in 68%, and similar to the preceding studies in that the majority (62%) of studies had abnormalities within the first 11-20 minutes.

Reardon et al.<sup>10</sup> and Agbenu et al.<sup>8</sup> both make the case for reducing EEG recording time below 20 minutes. Potential benefits include the ability to perform more

EEGs in the same amount of time as well as reducing the length of time required for the child to cooperate with the procedure and possibly reducing the cost of the study.<sup>11</sup> Reducing the length of EEG recordings can also lighten the burden of physician reading time, allowing opportunities to read more EEGs or attend to other patient care responsibilities.<sup>11</sup>

### Conclusion

Our study suggests that the majority of abnormalities on routine EEG are seen within the 11-20 minutes of recording however increasing

EEG duration may significantly increase the yield. Obtaining sleep increases the yield of epileptiform activity. Abnormalities detected with an EEG recording of 20 minutes can minimize the need for further long term recordings, leading to more economical and time efficient care. The conclusion of this study is that a routine EEG of 20 minutes optimizes the likelihood of capturing both awake and sleep states while still being cost-effective.

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