

The significance of EEG recording in confirming the diagnosis of epilepsy in cases referred for the 1st time

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ABSTRACT

Aim: To discuss the significance of EEG as a routine clinical diagnostic tool in first recording of newly discovered or suspected cases of epilepsy.

Method: The study has included 246 patient referred for the first time in year 1992 by neurologist and psychiatrist to a private EEG clinic with good description suggesting the diagnosis of epilepsy, the cases were 124 females and 122 males. The positive specific + nonspecific and the negative recording results were correlated according to the type of seizures, sex and age of the patients and then compared with other studies to see how much EEG recording is précised in confirming the clinical diagnosis of epilepsy.

Result: The EEG recording for the 1st time of 246 patient showed 141 (57.4%) cases had positive findings including specific and non-specific abnormality while 105 patients (42.6%) had no evidence suggestive of epilepsy similar result of 60 % had been found by Kugler 1964.

Conclusion: Although EEG has an important rule in confirming the clinical diagnosis of epilepsy it has failed in many ways to satisfy early expectation as a diagnostic aid but it can merely serve to diminish the probability of its existence.

Key words: Epilepsy, Electroencephalogram, specific and non specific EEG changes, negative changes.

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INTRODUCTION

EEG is an important investigation tool used by neurologist and psychiatrist to confirm or exclude the clinical diagnosis of a wide range of brain's abnormalities with especial rule in the diagnoses of epilepsy, these abnormalities are usually inter-ictal and might take the form of spikes sharp waves or complexes of spike and wave either alone or in association with slow wave activity, more over it might be focal, multifocal, symmetrical or asymmetrical, synchronous or asynchronous, i.e. it can be specific or non-specific epileptic discharge, however scalp recording may fail to elicit any evidence of epilepsy especially in patients with Jacksonian or psychomotor attacks,⁽¹⁾ because the discharge may remain subcortical or shows no hypersynchronization in spite of excessive neuronal discharge. Many studies have been done in this field and it was found that positive records "presence of epileptic activity" was obtained on the 1st recording in about 56% of patients.⁽²⁾ Subsequent recordings an additional 26% of patients had positive records so that only 18% of patients had consistently negative records,^(3,4) age, both at onset of seizures and time of recording clearly influence the

findings of positive results, so that below 10 years approximately 80% had positive records, while in subsequent age there was continuous decline. So that after age of 40 only one third of patient has persistently positive recordings.⁽⁴⁾ The type and frequency of seizures also influence the results, so that 95% of patients with absence show positive results and frequent seizures are more likely to show positive evidence of abnormality suggestive of epilepsy.⁽⁵⁾

Aim of the study: In this study we discuss the issue of significance of EEG as a routine clinical diagnostic tool in a "first recording" of newly discovered or suspected cases of epilepsy, aiming for better handling and management of cases and to avoid mal uses or abuses of EEG as an investigation aid to the clinical diagnosis of epilepsy.

Definitions:

1. Reference for epilepsy: Attack when epilepsy "various seizures" are strongly suspected and well described mostly associated with eye witness information.^(6, 7, and 8)
2. Specific epileptic features "abnormality":

A. *Clear cut local abnormality: Definite local or focal abnormality affects an area extending from one electrode up to one quadrant. This applies to spike and sharp wave complexes with or without diffuse slow waves. (6, 7, and 8)*

B. *Clear paroxysmal abnormality: Definite complexes of spikes and slow wave regular 3 C/S or irregular or slow waves accompanied by sharp components with or without diffuse slow waves.*

C. *Generalized repetitive complexes: Groups of two or more waves of any types including spikes which are clearly distinguished from the background activity and which recur with a well recognized form.*

3. Non-specific epileptic features "abnormality": Distinctly separate areas of local or focal abnormality are present in both or one hemisphere for instance bilateral temporal discharges of spikes or sharp waves or multifocal abnormality which includes spikes and sharp waves with or without diffuse slow waves.^(6,7,8)

MATERIALS & METHODS

A. The study has included 246 patients referred in the year 1992 by neurologists and psychiatrists to a private EEG clinic with good description suggesting the diagnosis of epilepsy, the cases were 124 females and 122 males.

B. Of them 175 with a provisional diagnosis of grand mal, 65 with temporal lobe epilepsy and 6 with the diagnosis of petit mal seizures.

C. The recording was done on 8 channels EEG machine and read by experienced specialist. The recording included mono polar and bipolar montages with routine activation procedures, hyperventilation and photicstim.

D. The positive specific + nonspecific and the negative recording results were correlated according to the type of seizures, sex and age of the patients, and then compared with other studies to see how much EEG recording is precised in confirming the clinical diagnosis of epilepsy.

RESULTS

1. Regarding the type of seizure, the finding showed 175 patients (71.2 %) had grand mal seizure, 65 patients (26.4 %) had temporal lobe seizure, and 6 patients (2.4 %) had petit mal seizure (table 1).
2. In general the EEG recording for the 1st time of 246 patients showed 141 (57.4%) had positive findings including specific and non-specific abnormality while 105 patients (42.6%) had no evidence suggestive of epilepsy (table 2).
3. In grand mal seizure group the result showed, 114 patients (65.2 %) had positive findings, 52 (45.6%) of them with specific abnormalities and 62 (54.4 %) with non-specific abnormality, while 61 patients (43.8 %) showed negative record (table 3).
4. In temporal lobe seizure group the result showed 22 patients (33.8 %) had positive findings, 9 (40.9 %) of them with specific abnormalities, and 13 (59.1 %) with non-specific abnormalities while 43 patients (66.2 %) had negative records (table 4).
5. In group with absence (petit mal) the results showed 5 patients (83.3 %) had positive findings 4 (80 %) of them with specific abnormalities and one (20%) with non-specific abnormalities, while one patient (16.7%) had negative record (table 5).
6. Regarding sex factor 70 (56.4%) out of 124 female patients had positive findings and 54 (43.6%) showed no evidence of epilepsy, while in males 71 (58.1%) out of 122 patients had positive findings and 51 (41.8 %) had no evidence of epilepsy in their record (table 6).
7. Regarding age factor the results were as follows:
 - A. Age group 5 months- 10 years. 34 (80.9 %) out of 42 cases had positive activity, while 8 (19.1%) of them had no evidence of epilepsy in their record.
 - B. Age group 11-20 years, 64 (68.1 %) out of 94 cases had positive activity, while 30 (31.9%) of them showed no evidence of epilepsy in their records.
 - C. Age group 21-30 years, 23 (34.9%) out of 66 cases had positive findings, while 43 (65.1%) of them showed no evidence of epilepsy in their records.
 - D. Age group above 31 year, 20 (45.5%) out of 44 cases had positive findings, while 24 (54.5%) of them showed no evidence of epilepsy in their records (table 7).

Table (1): No. and percentage of type of seizures

Type of Epilepsy	No. of cases	Percentage
G.M. seizures	175	71.2 %
T.L. seizures	65	26.4 %
P.M. seizures	6	2.4 %
Total No.	246	100 %

Table (2): Positive VS. Negative findings

Results	No. of cases	Percentage
Positive Specific findings	9	40.9 %
Positive Non –specific findings	13	59.1 %
Total positive	22	33.8 %
Negative findings	43	66.2 %
Total cases	65	100 %

Table (3): EEG findings in G.M seizures

Results	No. of cases	Percentage
Positive Specific findings	52	46.6 %
Positive Non-specific findings	62	54.4 %
Total positive	114	65.2 %
Negative findings	61	34.8 %
Total cases	175	100 %

Table (4): EEG findings in T.L. seizures

Results	No. of cases	Percentage
Positive findings	141	57.4 %
Negative findings	105	42.6 %
Total	246	100 %

Table (5): EEG findings in P.M. seizures

Results	No. of cases	Percentage
Positive Specific findings	4	80 %
Positive Non-specific findings	1	20 %
Total positive	5	83.3 %
Negative findings	1	16.7 %
Total cases	6	100 %

Table (6): Males VS. Females

Age range	Results	No. of cases	Percentage
5 months-10 years	Positive epileptic features	34	80.9 %
	Negative findings	8	19.1 %
	Total No.	42	100 %
11-20 years	Positive epileptic features	64	68.1 %
	Negative findings	30	31.9 %
	Total No.	94	100 %
20-30 years	Positive epileptic features	23	34.9 %
	Negative findings	43	65.1 %
	Total No.	66	100%
31 years & over	Positive epileptic features	20	45.5 %
	Negative findings	24	54.5 %
	Total No.	44	100 %

Table (7): Age correlation

Results	No. of cases	Percentage
Females (Total)	124	100 %
Positive epileptic features	70	56.4 %
Negative findings	54	43.6 %
Males (Total)	122	100 %
Positive epileptic features	71	58.1 %
Negative findings	51	41.9 %

DISCUSSION

Although Electroencephalogram has an important role in confirming the clinical diagnosis of a wide range of brain abnormalities especially epilepsy, it has failed in many ways to satisfy early expectation as a diagnostic aid for many reasons, in the 1st place it can be normal in patients with obvious dysfunction, if reliance is put upon a single recording. It is probably true to say that a normal EEG never exclude any clinical condition, but can merely serve to diminish the probability of its existence.

Kugler in 1964 had found that suspicions of abnormality of brain structure or function were confirmed by EEG in 60 % of cases referred for the 1st time.⁽⁹⁾

In our present study we have found a similar result that is 57.4% of the 246 cases recorded for the 1st time has shown positive epileptic discharges, where as 42.6 % had no evidence of abnormality suggestive of epilepsy in their EEG recording this can be explained by:

- a- A routine exam, is essentially a sampling procedure, if the recording continues

uninterrupted for one hour, this will consumes less than 5 % of the day. Where as inter-ictal abnormality occurs infrequently, the sampling time may be so short that no abnormality appears, therefore repeated recordings is of great value in diagnosis if epileptic clinical evidence is clear. ^(9,10)

- b- Certain types of epilepsy may occur without any evidence on the scalp EEG recording especially Jacksonian and psychomotor seizures. Here some discharges may remain limited to subcortical structure or excessive neuronal discharge may fail to reach surface electrodes. ⁽²⁾
- c- The influence of subjective factor, in the interpretation of the findings which makes preconceived opinion particularly is more dangerous.

Regarding the types or epilepsy, our study showed that positive and negative EEG finding of grand mal and petit mal epilepsies were corresponding to the previous studies especially that of Kiloh *et al*, 1972.

Where as in temporal lobe epilepsy we found higher percentage (66.2 %) of negative results this can be explained

simply in that we used in our study only 8 channel scalp machine, while others had used more advanced recording machine of more than 16 channels or has employed sphenoidal electrodes to disclose deeper abnormalities. ⁽¹⁾

Regarding sex we found no difference between female and male patients that is both sexes have close positive and negative EEG findings. Similar findings were found in the other studies Kiloh *et al*, 1972. ⁽¹⁾

Regarding age, children and younger patients have shown higher percentage of positive EEG findings, that is 80.9 % in age group 5 months- 10 years and 68.1 % in age group 11-20 years. This can be explained in that children and younger age groups had so many reasons to have epilepsy than older patients' e.g. febrile convulsion, increased genetic and accidental factors, ^(11, 12) and while in age group 21-30 years and group above 31 years the result is reversed. Consequently in age group 21-30 the finding was 34.9 % positive and 65 % negative and in above 31 years group 45.5 % positive and 54.5 % had no evidence of epilepsy in their records. This can be explained by:

- a- Older patients had less chance to have febrile convulsions than younger age groups.

- b- The genetic factors of brains abnormalities are more likely to appear in younger patients than older groups, more over older patient are more likely to have subcortical focal and psychomotor epilepsy than younger patient who is more likely to suffer from generalized seizures; therefore they show more EEG findings on scalp recording. (13, 14)
- c- The referred cases were highly suspected cases of epilepsy according to the referring clinical information.

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