

The Role of Ambulatory EEG in the Investigation of Paroxysmal Events

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Abstract

Aim

To examine how frequently 24-hour ambulatory EEG (AEEG) and 24-hour home video-telemetry provided useful information in clarifying the diagnosis.

Methods

We retrospectively reviewed 47 studies performed by the St. James's neurophysiology department on patients referred by the neurology department.

Results

Events were captured in 34/55 patients (62%). Epileptic events were recorded in 10/34 (29%) and the non-epileptic events in 24/34 (71%). 42 (76%) of the patients had epilepsy, 32% of their events captured were epileptic. Events were captured in seven out of eight home video-telemetry studies of which 57% were epileptic events.

Conclusion

In conclusion, both 24-hours AEEG and home video-telemetry are valuable tools for investigating paroxysmal events of uncertain nature, particularly in patient with learning disability.

Introduction

Electroencephalography (EEG) is important in the investigation of seizures. It assists in diagnosing epilepsy and in classifying the underlying epileptic syndrome. EEG's yield can be increased if accompanied by sleep deprivation ¹.

When uncertainty in diagnosis remains, prolonged video-EEG provide an effort to capture an event and clarify its nature, it is the gold standard ². Such monitoring performed as an inpatient, is however only available in some centers, is expensive and inconvenient for some patients ⁴.

The Kings College group has pioneered the use of home video-telemetry in the UK and found it to be both cost and diagnostically effective⁵. Since 2009, the department of clinical neurophysiology in St James's Hospital in Dublin has undertaken 24-hour AEEG and more laterally since 2017 it has the capacity to carry out 24-hour home video-telemetry monitoring.

The purpose of this work was to examine how frequently 24-hour AEEG and 24-hour home video-telemetry provided useful information in clarifying the diagnosis.

Methods

Twenty-four-hour AEEG has been performed in the St James's Hospital, department of clinical neurophysiology from 2009 to 2019. And since 2017 we have been able to perform 24-hour home video-telemetry. All the patients were referred from St. James's neurology department. XLTEK/Natus AEEG system was used for all patients, using the standard 10-20 electrode placement. The test duration ranged from 17 to 27 hours.

All patients had at least previous routine EEG in the department before proceeding to the test. Instructions were given to patients and their carers on how to push the event button and fill in the event diary. The AEEG settings' and disconnection were within the Department of Clinical Neurophysiology whereas in the case of 24-hour video-telemetry recordings, physiologists visited the patients' home both for set-up and disconnection. The camera of 24-hour video-telemetry was set up in a fixed location deemed to be most appropriate. Recordings were reviewed both by the physiologist who had undertaken the study and by a consultant in Clinical Neurophysiology. The number of studies where events were captured was determined.

Results

We reviewed the results of 55 individuals referred for 24-hour AEEG or 24-hour home video-telemetry. There were 36 (65%) female and 19 (35%) male with a mean age of 37 years, (range 17-93).

All the patients tolerated the test and no technical issues such as electrode loss were encountered. Forty-two patients had an existing diagnosis of epilepsy (76%) and were being treated with anti-epileptic medication.

The majority of patients were referred so the nature of their events could be clarified. 3/55 (5.45%) had a learning disability.

In total, 233 events were captured. Events were captured in 34 out of 55 patients (62%). The Fig.1(A) illustrates the nature of the events. 10/34 patients had events that were epileptic in nature (29%) and 24/34 (71%) had no EEG correlate Fig.1(B). Of the 42 patients with epilepsy 28 (66%) had events of which 32% were epileptic in nature and 68% were non-epileptic.

Of the 20 patients with no events captured, seven had less than two events per week preceding the study.

Home video-telemetry recording was employed in 8/55 patients; three of them had history of nocturnal events. Paroxysmal events were captured in 7/8 patients (88%), 4 of the 7 were epileptic (57%).

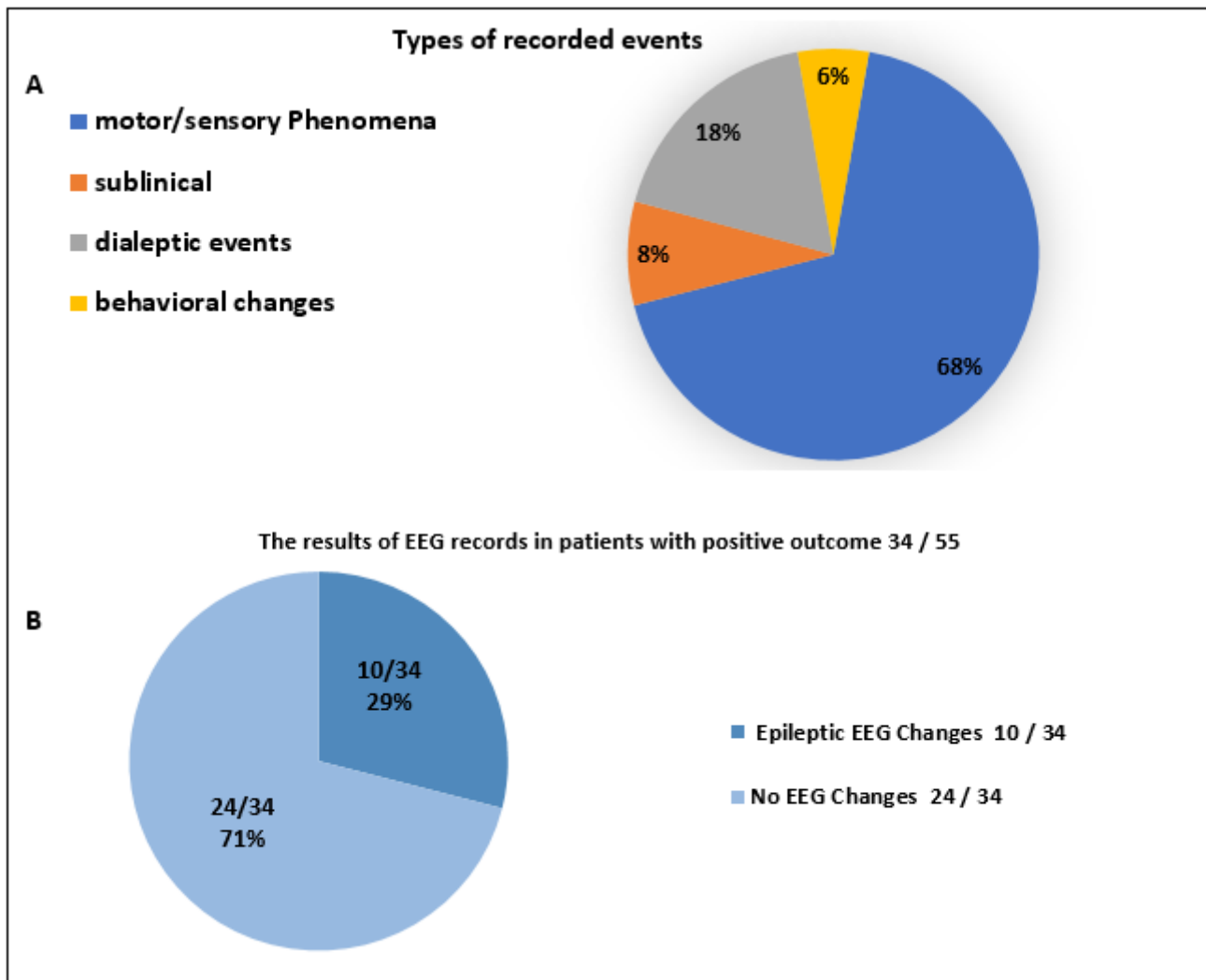


Fig 1: (A) Showa the types of events recorded. **(B)** Shows the percentage of patients who had epileptic changes in the EEG record during their events (dark section).

Discussion

At least one event was captured in 62% of cases, providing valuable information on the nature of the events captured. We considered whether having less than two events weekly before the study might influence the chances of capturing an event, but this factor was not statistically significant (Fisher's exact test $P > 0.5$). It is notable that non-epileptic events were captured in those with an existing diagnosis of epilepsy and it is well recognized that a proportion of those with epilepsy will also have non-epileptic events and that the diagnosis of epilepsy can be a challenge^{5,6}.

Our total outcome was comparable to other studies^{9,10}. In Faulkner et al⁹ study, 4-5 days of recording had been employed to prove the utility of prolonged outpatient EEG recording in seizures' investigations, however, the total yield was only 6% higher than our results.

The implementation of video recording with the AEEG increased the yield of the test and provided more information about the investigated events. Our home video-telemetry recordings captured events in 88% of subjects, which is comparable with the (90%) outcome of Alix JJ et al¹⁰ when long term EEG was performed on children between 3 to 16 years. Additionally, the implementation of video records aided in the interpretation of AEEG⁴.

In conclusion, both 24-hours AEEG and 24-hours home video-telemetry are valuable tools for investigating paroxysmal events of uncertain nature and may be particularly useful in certain groups of patients with learning disability who may not tolerate inpatient admission.

Declaration of Conflicts of Interest:

The authors declare no conflicts of interest.

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