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TIME TO FIRST EEG SEIZURE DURING CONTINUOUS VIDEO/EEG TELEMETRY

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SUMMARY – Correlation between time to first scalp EEG seizure during video/EEG telemetry and self-reported seizure frequency was determined in refractory epilepsy patients. Eighty two consecutive epilepsy patients were preoperatively evaluated, as part of a larger study, during their video/EEG monitoring at the Adult Epilepsy Center at Washington University. Self-reported seizure frequency, time to first seizure in the monitoring unit, and clinical variables of age, sex and seizure focus localization were analyzed. Mean age of the patients was 35±11 years and 54.9% were women. In 51 patients with temporal and 19 patients with extratemporal epilepsy, the mean time to first scalp EEG seizure was 44±48 h. Self-reported seizure frequency did not predict the time to first scalp EEG seizure in the seizure monitoring unit. The majority of patients had their first scalp EEG seizure during the first two days of video/EEG telemetry. Self-reported seizure frequency was a poor predictor of time to first scalp EEG seizure. This finding suggests that patients with less frequent self-reported seizure rates should also be considered as good candidates for further evaluation, including scalp and intracranial video/EEG telemetry.

Key words: *Electroencephalography – methods; Seizures – diagnosis; Epilepsy – diagnosis; Continuous video/EEG monitoring*

Introduction

With the introduction of many new antiepileptic drugs (AED) over the past 10 years, more patients can achieve seizure freedom. Recent studies have shown that with optimal drug regimen this can be as high as 65%-70%[1]. However, some seizure types such as localization-related epilepsy are more difficult to control[1,2] than others (e.g., idiopathic generalized epilepsy) and require further electroencephalography (EEG) evaluation. A significant number of patients that continue to experience seizures have mesial temporal lobe epilepsy[3], although their seizure frequency may be decreased by optimal AEDs. Because of the refractoriness of their seizures, these patients should be included in further preoperative evaluation that usually starts with continuous video/EEG telemetry.

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Video/EEG monitoring has become a crucial part of evaluation of epilepsy patients[4-6]. It includes longer placement of scalp EEG electrodes, for several days or occasionally as long as a few weeks. The idea is to perform a simultaneous video and EEG recording of a sufficient number of patients' characteristic seizures and interictal activity, as a condition necessary for more precise lateralization and possible localization of seizure focus. Despite the fact that in the past epilepsy patients were referred for telemetry almost two decades after their first seizure, continuous monitoring has proven to be cost-beneficial and, consequently, has been introduced rapidly in many institutions.

Major outcome measures that improved following continuous monitoring were twofold: firstly, the exclusion of patients with behavioral non-epileptic events and their utilization of emergency care and use of AEDs[5]. A number of studies showed that up to 30% of patients were diagnosed solely with non-epileptic behavioral events after video/EEG telemetry[5]. Secondly, telemetry offers a superior localization of seizure focus in epilepsy patients, or can suggest the need of further intracranial video/EEG monitoring[3,7].

In this study we determined whether self-reported seizure frequency predicted the time to first scalp EEG seizure in the same consecutive patients. Our hypothesis was that epilepsy patients who reported less frequent seizures would need longer time to their first EEG seizure in the monitoring unit. This would suggest their care providers to be reluctant to proceed with video/EEG telemetry and, if indicated, offer this group of patients further preoperative evaluation.

Methods

We evaluated self-reported seizure frequency and time to first scalp EEG seizure in 82 consecutive and consented epilepsy patients admitted for preoperative assessment at the Adult Epilepsy Center at Washington University. The study was approved by the IRB. Clinical data, including their seizure factors were included in our comprehensive database.

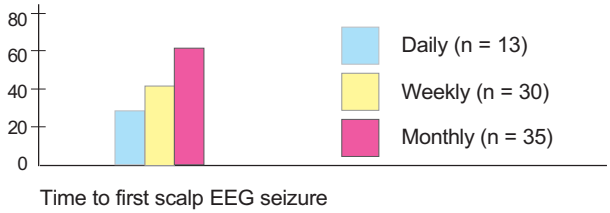
All patients had a continuous video/EEG monitoring and the onset of the EEG recording was the time when all electrodes were placed on the scalp. Time to first seizure was defined as the time to first clinical event accompanied by clear electrographic seizure activity and was measured in hours.

Correlation of self-reported seizure frequency that was defined as daily, weekly or monthly seizure occurrence on a monthly basis and then averaged for the past six months, was compared with the time to first seizure during video/EEG monitoring. We performed the Kruskal-Wallis nonparametric test to compare the three groups, using the SPSS statistical package (Version 11.0.1, SPSS Inc.). A value of $p<0.05$ was considered as statistically significant.

Results

The mean age of the patients was 35±11 years, and 54.9% were women. In 78 out of 82 patients in whom we obtained data on self-reported seizure frequency, 13 reported daily seizures, 30 had weekly seizures, and 35 had seizures on a monthly basis (Table 1). The mean time to first seizure during video/EEG telemetry in patients who reported daily seizures was 32.5±35 h. In patients who reported weekly seizures, the time to first seizure in the monitoring unit was 46.3±54 h, and in patients who reported monthly seizure rates, it was 64.4±100 h (Fig. 1). The mean time for all groups to first scalp EEG seizure was 44±48 h. When the three groups were tested for significant change in time to first EEG seizure using non-parametric test, there was no difference (Kruskal-Wallis χ^2-test 1.105; $p<0.57$).

Fig. 1. Mean time to first scalp EEG seizure and self-reported seizure frequency



Discussion

In this study we showed that self-reported seizure frequency did not predict the time to first seizure during video/EEG telemetry. This is an important finding because it suggests that a great majority of patients with refractory seizures are good candidates for video/EEG telemetry and should not be excluded from further EEG diagnosis.

Although it is difficult to predict a refractory state, self-reported seizure frequency by itself is somewhat biased in its estimate. Many studies indicate that patients underestimate their seizure frequency[8]. For example, Blum *et al.*[9] found that 30% of patients monitored in the epilepsy unit denied all their seizures. In this study more than 90% of seizures with left temporal focus were denied, and approximately 50% of seizures were denied to have originated in the right temporal lobe.

These data suggest that refractory epilepsy cannot be defined only by self-reported seizure rates, because of the

Table 1. Relation between self-reported seizure frequency and mean time to first scalp EEG seizure

Self-reported seizure frequency	n	Time to first scalp seizure (h)
Total	78	44 ± 48
Daily	13	32.54 ± 54.29 (1-117)
Weekly	30	46.32 ± 54.29 (1-185)
Monthly	35	64.43 ± 100.33 (1-550)

potential bias. A much better estimate for seizure refractoriness is failure of the first two antiepileptic drugs in the course of at least two years[10-15]. The goal should be to offer these patients EEG telemetry if further evaluation is necessary, and to select them for prospective epilepsy surgery.

In summary, our data show that self-reported seizure frequency did not correlate with the time to first event during video/EEG monitoring. The majority of patients had their first scalp EEG seizure during the first two days in the unit. We suggest, therefore, that the patients with less frequent self-reported seizure rates are equally good candidates for continuous monitoring and further EEG evaluation, including scalp and intracranial video/EEG telemetry.

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Sažetak

VRIJEME DO PRVOG EEG NAPADAJA TIJEKOM KONTINUIRANE VIDEO/EEG TELEMETRIJE

H. Hećimović i F. Gilliam

Određivala se je korelacija između vremena do prvog napadaja kod EEG vlasišta tijekom video/EEG telemetrije i učestalosti napadaja koju su navodili sami bolesnici s refraktornom epilepsijom. Prijeoperacijski su obrađena 82 uzastopna bolesnika s epilepsijom, kao dio veće studije, tijekom njihova video/EEG praćenja u Centru za epilepsiju odraslih pri Sveučilištu u Washingtonu. Analizirana je učestalost napadaja koju su naveli sami bolesnici, vrijeme do prvog napadaja u kabinetu za praćenje, te kliničke varijable za dob, spol i žarišnu lokalizaciju napadaja. Srednja dob bolesnika bila je 35±11 godina, a 54,9% bile su žene. U 51 bolesnika s temporalnom i 19 bolesnika s ekstratemporalnom epilepsijom srednje vrijeme do prvog napadaja na EEG bilo je 44±48 h. Učestalost napadaja koju su navodili sami bolesnici nije predskazala vrijeme do prvog napadaja kod EEG telemetrije. U većine bolesnika prvi je napadaj na EEG nastupio tijekom prva dva dana video/EEG telemetrije. Učestalost napadaja koju su navodili bolesnici bila je loš predskazatelj vremena do prvog napadaja na EEG. Ova studija ukazuje na to da bolesnike koji navode rjeđu učestalost napadaja treba također smatrati dobrim kandidatima za daljnju procjenu, uključujući video/EEG telemetriju.

Ključne riječi: *Elektroencefalografija – metode; Napadaji – dijagnostika; Epilepsija – dijagnostika; Kontinuirana video/EEG telemetrija*