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Original research article

Optimal time of duration of a long-term video-EEG monitoring in paroxysmal events – A retrospective analysis of 282 sessions in 202 patients

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ABSTRACT

Purpose: To find the optimal duration of the long-term video-EEG (LTM) and assess diagnostics utility of LTM in patients with epilepsy and other paroxysmal events in terms of future diagnosis and management.

Methods: Retrospective analysis of 282 LTMs performed in the last 5 years in our Epilepsy Monitoring Unit (EMU), in 202 consecutive patients. The analysis included demographic data, monitoring time, number and type of paroxysmal events, the time until their onset, influence of LTM result on the diagnosis and future management.

Results: There were 117 women and 85 men, mean age 34.2 years. Mean duration of LTM was 5 days (3–9), with 447 paroxysmal events recorded in 131 (65%) patients. Epileptic seizures were recorded in 82% cases (in 11% associated with PNES). The remaining 18% had either PNES (psychogenic non-epileptic seizures) – 11%, or parasomnias – 7%. Only 15% of epileptic seizures took place within the first 24 h of the LTM (53% and 32% on the 2nd and 3rd day, respectively), whereas as many as 62% of PNES did (while only 28% and 10% on the 2nd and 3rd day, respectively). The LTM results changed the diagnosis in 36% of the patients, most frequently in PNES (from 2% to 14%). Altogether, it changed the management in 64% of the patients – particularly with PNES and those who underwent epilepsy surgery.

Conclusions: LTM should last at least 72 h in patients with refractory epilepsy. Most of cases with PNES could be diagnosed after 48 h.

1. Introduction

Video-EEG monitoring (VEEG) consists of a simultaneous continuous recording of the patients' clinical situation and their electroencephalographic activity. This is either short-term, performed in outpatients and lasting on average 2–8 h or long-term (LTM), done in hospitalized patients. Outpatient VEEG is preferred both in children and adults who either have very frequent paroxysmal events or in whom the seizures can

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be reliably provoked [1,2]. Main indications for LTM base on the ILAE recommendations [3] and include: classification of seizure type or epileptic syndromes, differential diagnosis between epileptic seizures and other paroxysmal events, particularly psychogenic non-epileptic seizures (PNES) and parasomnias as well as assessing candidates for possible epilepsy surgery. In fact, LTM should be performed in every patient who despite appropriate AEDs suffers from frequent seizures or displays seizures with new symptomatology [4]. Duration of the LTM depends upon the clinical problem to be solved [3]. In a patient with one type of seizures and query about their origin (epileptic or not) or about epileptic syndrome, recording one typical event would be sufficient, whereas an analysis of a single seizure can neither decide the clinical questions in patients with several types of seizures, nor in candidates for epilepsy surgery. In the latter group, precise localization seizure onset zone is crucial for achieving a satisfactory surgical result and hence, for the prognosis [5].

This study was undertaken in an attempt to establish how long video-EEG monitoring should last depending on the reason for admission and what is influence of LTM on further diagnosis and management in patients with epilepsy and other paroxysmal events.

2. Material and methods

Our Epilepsy Monitoring Unit (EMU) is located in the Department of Neurosurgery and has a single station for long-term video-EEG monitoring (LTM). The procedure is supervised by a clinical neurophysiologist and an EEG technician, as well as in certain cases, by accompanying relatives. The patient is continuously watched on a monitor in nurses station. If required, nursing staff, junior doctor, neurosurgeon on-call and neurophysiologist on-call are readily available. The patient may leave the unit only if accompanied by a member of medical staff or family. The recording system used is Beehive horizon LTM (Grass Technologies, USA), with amplifiers Aura 32 or Aura 64 LTM (32- and 64-channel digital video-EEG system). Surface gold-cup electrodes were placed on a patient's scalp according to the international 10–20 system. Moreover, single channel ECG was also recorded and displayed on the monitor along with EEG. Some patients (60%) had their antiepileptic drugs (AEDs) doses reduced in order to increase the likelihood of a seizure. However, in patients with a history of status epilepticus the medication was never reduced.

If seizures occurred less frequently than once a week, in patients on monotherapy the dose of AED was reduced by 50%, in those taking two drugs, one of them was stopped and in the case of three drugs, one was stopped and another's dose decreased by half. The reductions applied to the drugs most recently commenced. No patient had the medication withdrawn. The patients stayed in the hospital for another day after reintroduction of the full dose of AEDs. No status epilepticus or cluster seizures as a result of reduction of doses of AEDs were observed. Similarly, there were neither injuries nor other side-effects of LTMs.

In patients who had more than one LTM, also sleep deprivation was used. In patients with a single type of seizures, usually, at least two events were recorded, whereas in all others, every type of seizure had to be taped.

In patients referred for pre-surgical evaluation, three habitual seizures were presumed as minimum to localize the seizure onset zone reliably.

All referrals for the LTM came from neurologists or neurosurgeons. The diagnoses on admission were as following: drug-resistant epilepsy – 140 (69%) cases, PNES – 4 (2%), symptomatic epilepsy (a potential epileptic focus seen on MRI) – 30 (15%), paroxysmal events of unclear nature – 8 (4%), a new type of seizures – 8 (4%) or increasing frequency of seizures – 12 (6%) occurring despite of AEDs.

2.1. *Statistical analysis*

Quantitative data were given as means, median and percentages. Two-proportion Z-test was used for determining the rate of increase of paroxysmal event detection over 3 monitoring days, as well as for evaluation of the utility of LTM for reaching the final diagnosis and modifying the treatment. A $p < 0.05$ was considered as significant.

3. Results

We analyzed retrospectively all LTMs carried out in our EMU in the last 5 years. There were 202 patients: 117 (58%) women and 85 (42%) men. Their mean age was 34.2 years (range 17–70, median 34). Duration of epilepsy ranged from 2 to 18 years.

In all, we performed 282 LTMs since 49/202 (25%) patients had more than one examination, namely, there were 2 recordings in 27 cases (13%), 3 in 13 (6%) and 4 in 9 patients (5%). The mean time of a recording was 5 days (range 3–9). There were 216 examinations lasting 72 h, 40–96 h, 7–120 h and 19 taking 216 h.

447 paroxysmal events were recorded in 131/202 (65%) patients. Amongst those, 31 (24%) patients had primary generalized seizures, 62 (47%) – complex partial seizures, including secondarily generalized seizures, 14(11%) cases – both epileptic seizures and PNES, 15 (11%) patients – PNES and 9 (7%) parasomnias. Hence, 107 (82%) patients had epileptic seizures (out of these 11% both epileptic psychogenic), whereas 24 (18%) had other paroxysmal events (11% of PNES and 7% of parasomnia).

Out of 62 patients with complex partial seizures, 39 (63%) had the seizure onset in temporal lobe (in 30 (70%) patients, the seizure onset zone was located in temporal mesial structures – MTLE), in 15 (24%) patients – in frontal lobe, in 5 (8%) – in occipital lobe, and finally, in 3 (5%) cases, the seizure onset zone was not defined.

Out of 9 patients with other paroxysmal events, 1 had facio-mandibular myoclonus, 2 – periodic limbs movements of sleep (PLMS), 2 – nocturnal paroxysmal dystonia (NPD) and finally 5 – narcolepsy.

The number of epileptic seizures and PNES recorded on consecutive days is given in Tables 1 and 2 as well as shown in histograms displayed in Figs. 1 and 2, respectively.

Seventy one patients (35%) had no paroxysmal events, but 27 (38%) of them had interictal epiletiform discharges (IEDs) which in 19 (70%) cases were recorded during the sleep.