

SHORT REPORT

Outpatient video EEG recording in the diagnosis of non-epileptic seizures: a randomised controlled trial of simple suggestion techniques

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Objective: To assess the yield of recorded habitual non-epileptic seizures during outpatient video EEG, using simple suggestion techniques based on hyperventilation and photic stimulation.

Design: Randomised controlled trial of "suggestion" v "no suggestion" during outpatient video EEG recording.

Setting: Regional epilepsy service (tertiary care; single centre).

Participants: 30 patients (22 female, 8 male), aged over 16 years, with a probable clinical diagnosis of non-epileptic seizures; 15 were randomised to each group.

Main outcome measures: Yield of habitual non-epileptic seizures recorded, and requirement for additional inpatient video EEG.

Results: 10/15 patients had habitual non-epileptic seizures with suggestion; 5/15 had non-epileptic seizures with no suggestion ($p = 0.058$; NS); 8/9 patients with a history of previous events in medical settings had non-epileptic seizures recorded during study. Logistic regression analysis with an interaction clause showed a significant effect of suggestion in patients with a history of previous events in medical settings ($p = 0.003$). An additional inpatient video-EEG was avoided in 14 of the 30 patients (47%).

Conclusions: Habitual non-epileptic seizures can be recorded reliably during short outpatient video EEG in selected patients. Simple (non-invasive) suggestion techniques increase the yield at least in the subgroup with a history of previous events in medical settings. Inpatient video EEG can be avoided in some patients.

Non-epileptic seizures of psychogenic origin (non-epileptic seizures) are often misdiagnosed as epilepsy.¹ A recent estimate suggests the prevalence of non-epileptic seizures may be as high as 33/100 000 of the population.² Such patients represent 10–50% of referrals to specialist epilepsy units.³

Misdiagnosis of non-epileptic seizures has important implications for patients and health care providers. Not only is there failure to implement appropriate psychological treatment, but the unnecessary use of anti-epileptic drugs and the treatment of "pseudostatus epilepticus"⁴ carry significant risks. Correct diagnosis of non-epileptic seizures is associated with a reduction in health care costs.⁵

Video electroencephalographic (video EEG) monitoring is the gold standard investigation, usually during specialist inpatient assessment. Access to this expensive resource is limited in the United Kingdom. Previous non-randomised studies have shown that provocation techniques can produce a useful yield of recorded non-epileptic seizures. Techniques described

include injections of saline,⁶ the application of a tuning fork or an alcohol soaked pad⁷ to the forehead, head up tilt testing,⁸ hyperventilation,^{9,10} and photic stimulation.¹⁰ The use of provocation techniques, particularly those that are invasive or less honest, remains controversial.^{9,11,12} However, some patients have non-epileptic seizures during entirely standard EEG recording, raising the question of whether provocative techniques are necessary.

Our primary aim in carrying out this study was therefore to measure the difference in attack rate between groups of patients randomised to either outpatient video EEG recording plus simple suggestion techniques or to standard outpatient video EEG recording alone. Our secondary aim was to measure the number of patients who, as a result of the diagnostic information gained, did not subsequently require inpatient video EEG.

METHODS

Approval was obtained from the Southern General Hospital NHS Trust ethics committee.

Patient selection

Patients were recruited from a specialist non-epileptic seizures outpatient clinic, between March 2000 and February 2001. Inclusion criteria were: a clinical diagnosis of probable non-epileptic seizures, ability to give informed consent, and age over 16 years. We excluded patients with more than one attack type, those with suspected coexisting epilepsy, and those with only nocturnal attacks, these being considered likely to require inpatient video EEG.

Randomisation and consent

It was explained that video EEG recording of attacks was necessary for diagnosis, and that a psychological cause for the attacks was being considered. After agreeing to take part in the study, patients were randomised to "suggestion" or "no suggestion" groups, using computer generated numbers.

Those in the suggestion group were told that hyperventilation and photic stimulation would be performed during the EEG in an attempt to induce their usual attack. The no suggestion group was told only that outpatient video EEG recording would be carried out. An information sheet reinforcing this was supplied. All patients were asked to attend for the test with a relative or friend who had seen their previous attacks.

Outpatient video EEG

Outpatient video EEG recording was carried out within one to four weeks of initial assessment. Standard EEG and EEG recording equipment was used, with a digital video camera.

For the suggestion group, a doctor (AMcG) was present, as well as the EEG technician, and the history briefly reviewed. It was explained again that hyperventilation ("deep breathing

test”) and photic stimulation (“flashing light test”) might bring on attacks. The consent form was signed at this stage. Any clinical change occurring during recording (for example, shaking of a limb, apparent unresponsiveness) was commented on by AMcG, for reinforcement. Verbal instructions were given to each patient in as standardised a manner as possible. Any recorded events were discussed with the patient’s relative to confirm whether typical or not.

The no suggestion group had a standard EEG recording carried out by a technician, also recorded on digital video. Consent was obtained in the same way as for the suggestion group. A doctor was available should an event occur, in which case it was reviewed with an eyewitness.

RESULTS

Thirty patients were included, 22 female and eight male. Fifteen patients were randomised to each group. There were no significant differences in terms of age, sex, duration of history, previous exposure to EEG recording, or attack frequency.

All patients who fulfilled selection criteria were invited to take part. Four patients failed to attend on more than one occasion and were excluded. Three additional patients were initially randomised (two to the suggestion group and one to the no suggestion group) but were excluded when additional history (at the time of recording) suggested possible coexisting epilepsy.

In the suggestion group, 10 of the 15 patients had events that were electroclinically non-epileptic seizures and were confidently identified as being habitual by eye witnesses. Five of the 15 in the no suggestion group had habitual attacks.

Two of the 15 patients in whom habitual non-epileptic seizures were recorded had events recorded on video without a simultaneous EEG—one (in the suggestion group) had an attack during electrode application, the other (in the no suggestion group) had an attack as she was leaving the room after the test. Both attacks were clinically habitual non-epileptic seizures.

Two other patients (one in each group) had non-habitual non-epileptic seizures.

Nine patients had a history of previous attacks occurring in medical settings; eight of these had habitual non-epileptic seizures recorded during the study. Six of the nine had had similar attacks during previous EEG recordings. Three patients in this group also had attacks in the waiting area either before or after the test.

Statistical analysis

The influence of suggestion and previous history of medically triggered events was analysed by forward stepwise logistic regression, including an interaction term. In univariate analysis, “suggestion” was not independently predictive ($p = 0.058$), but “history of previous events in a medical setting” and the interaction term were both significant. In multivariate analysis, the interaction term remained a significant predictor of attacks ($p = 0.003$), while a history of previous events was not an independent predictor.

Subsequent inpatient video EEG requirement

The 15 patients in whom no habitual event was recorded were offered inpatient videotelemetry, as was one patient with definite non-epileptic seizures, who was subsequently found to have interictal epileptiform abnormalities. Follow up data will be presented at a later stage. Inpatient videotelemetry was therefore avoided in 14 of the 30 patients (47%).

DISCUSSION

Previous studies of inpatient video EEG have shown high yields of non-epileptic seizures with provocation techniques (82–90% of patients^{6 10 13}). A non-randomised outpatient study

using saline injection¹⁴ induced attacks in 66% of patients, with a spontaneous attack rate of 29%, figures closer to our own.

While we did not find a significant effect of suggestion overall, we did show that the likelihood of producing attacks was increased in patients with previous events in medical settings. These patients may have been particularly suggestible. That as many as one third of the no suggestion group had habitual non-epileptic seizures implies that the EEG procedure itself has a suggestive effect. Video recording and consent of the patient before the recording was done may have exaggerated this. The manner in which a provocative technique is presented appears to be more important than the particular method used.^{10 15}

The fact that similar attacks had occurred in six of the 30 patients during previous EEG recordings suggests that a valuable diagnostic opportunity may have been overlooked on those occasions. Routine use of video during standard EEG could help to maximise such opportunities.

Having no good data on which to base a power calculation before starting this study, we chose 15 per group, based on a pragmatic estimate from available data. A post-hoc power calculation indicates that 40 patients would be required in each group to demonstrate a significant difference, assuming that the proportions found in our study were correct.

In agreement with others,^{9–11} we consider the use of non-invasive techniques, combined with patient information that is as honest as possible, to be ethically acceptable. The degree of honesty compatible with a positive effect of suggestion is perhaps surprising: we told patients that psychological attacks were being considered, and that recording these was necessary for diagnosis. The fact that 50% went on to produce attacks suggests, as is widely accepted, that the majority of such patients are not malingering, and may not be resistant to a psychological diagnosis.

The technique used in this study is not suitable for all patients with suspected non-epileptic seizures—prolonged inpatient video EEG recording is likely to be necessary where epileptic seizures are also suspected; where there are different types of attack; where events are nocturnal; or where eye witness accounts are insufficient for clinical diagnosis. Expert knowledge of epileptic and non-epileptic seizures, and video EEG recording of events, is required; not all epileptic seizures are accompanied by EEG change, and in both epileptic and non-epileptic seizures the EEG may be obscured by artefact. As hyperventilation and photic stimulation may rarely provoke epileptic seizures in certain circumstances, a simultaneous EEG recording is crucial. Evidence must be obtained that the patient’s habitual (and only) type of attack has been recorded.

Non-epileptic seizures are a common problem. Correct and timely diagnosis may improve outcome¹⁶ and saves medical costs,³ but is limited by relative scarcity of inpatient video EEG resources. A short outpatient video EEG allows prompt diagnosis of non-epileptic seizures in a proportion of patients who would otherwise require inpatient recording, and appears to be particularly useful where there is a history of previous attacks occurring in a medical setting.

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