Clinical Research

Epileptic vs psychogenic nonepileptic seizures: a video-based survey

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ABSTRACT

Psychogenic non epileptic seizures (PNES) are present in up to 30% of patients undergoing video EEG. Delay in PNES diagnosis is an average of 7.2 years. Patients are exposed to costly, hazardous medications and other iatrogenic morbidities. Our aim was to investigate the ability to correctly diagnose ES from PNES in different groups and seniorities of medical professionals based on video alone. We showed ten video episodes' recordings (5 PNES, 5 ES) to doctors and nurses from ER, Internal Medicine ward and Neurology department, and inquired about the episodes' nature. 46 participants, 26 non-neurological and 20 neurological personnel. Seniority of responders varied. Epileptologists diagnosed correctly 87.5% of cases, General neurologists 72.8%. Neurology nurses 69.8%, ER nurses 58%, Internal Medicine physicians 54.1% and ER physicians 44.4%. Statistical significant difference between the general physicians to all neurology group professions was >0.05. We pointed out the lack of awareness of first responders to patients presenting with seizures. Neurologist ability to recognize seizures using semiology alone is higher than other medical personnel. Take home messages is the need for video taking of episodes and education plan to first responders.

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1. Introduction

Psychogenic non epileptic seizures (PNES) are paroxysmal events that may appear very similar to epileptic seizures (ES), but are not caused by epileptic activity. These events are in connotation of a psychological origin, different from other epileptic imitators as syncope, hypoglycemia, movement disorders and others [1].

It is estimated that up to 30% of patients undergoing long term video EEG monitoring suffers from PNES. Furthermore 10–30% of PNES patients have comorbidity of epilepsy, which further complicates their management [2].

Ictal semiology as eye closure, pelvic thrusting, weeping, and prolonged or stereotyped seizures is usually associated with PNES, however there is no clinical phenomenon that is 100% specific to PNES or ES [2,3].

Udaya et al. classified six types of pseudoseizures; (1) Rhythmic motor PNES characterized by rhythmic tremor or rigor-like movements. (2) Hypermotor PNES characterized by violent movements (3) Complex motor PNES characterized by complex movements such as flexion, extension, abduction, adduction, rotation, with or without clonic-like and myoclonic-like components of varying combinations and anatomic distribution. (4) Dialeptic PNES characterized by unresponsiveness without motor manifestation. (5) Nonepileptic auras characterized by subjective sensations without any external manifestations. (6) Mixed PNES where combinations of above seizure types [4].

Due to the clinical similarity, misdiagnosis is common; however may also cause under diagnosis of real epileptic seizures, Parra et al. found 57% patients misdiagnosed as PNES by their physician [5].

Studies have shown a mean PNES diagnosis delay of 7.2 years [6].

Misdiagnosis of PNES as epileptic seizures exposes patients to ineffective, costly medication with hazardous side effects. Other possible iatrogenic morbidities can be caused due to parenteral medications and even tracheal intubation.

The estimated lifetime cost of PNES misdiagnosis was formerly appreciated as $100,000 per patient. With an annual cost that ranges between $650 million and $4 billion (U.S.) [7].

An earlier diagnosis of PNES will prevent inappropriate medical interventions and will psychologically prevent the "sick, disabled role" of these patients and thereby improve their prognosis and can shorten their illness [3].

To this day, there have been several studies demonstrating agreement on the semiology of epileptic seizures. Benbir et al. compared video agreement on details of the attack between two neurologists [8]. Observer agreement of seizure identification from nonconvulsive spells were appreciated in neonatal seizure identification [9] and in dogs and cats [10].

We investigated whether different groups of medical health care staff (Doctors and nurses, neurology specialists and residents and non-specialists in different seniority levels) can correctly diagnose ES or PNES based solely on video footage.

This study aimed to highlight whether further education is required, especially to first responders, to improve consistency between them and the neurologist thereby preventing unnecessary, endangering treatments.

We hypothesized that with seniority and specialty in epilepsy the percentage for correct diagnosis will be higher.

2. Methods

2.1. Video recordings

Ten video EEG recordings, 5 recordings of PNES and 5 ES, were chosen from a bank of video EEG monitoring in the department of neurology, Rambam Health Care Center. The videos were randomly ordered in a 13.40-minute long video sequence (with introduction and transitions).

The selection of the specific cases was as follows: *i*. In all cases a definite diagnosis of either ES or PNES was made by a neurologist trained in Epileptology by using the clinical semiology and the concomitant EEG. *ii*. In all selected cases motor phenomena were observed. *iii*. Different types of ESs and PNESs were selected. *iv*. The motor phenomena were as typical as possible for each type of event. In secondary generalized - the semiology included tonic clonic movements. In complex partial seizure, the semiology showed one sided automatism with contralateral dystonia and in the hypermotor seizure pronounced automatism was seen in the beginning of the seizure. The PNESs semiology contained phenomena as hyperventilation, pelvic thrusting and burst of rhythmic non variable movements, which are typically seen in PNESs [11]. *v*. In all selected epileptic seizures, the video showed the beginning, evolution and the end of seizure, all but one was shown in full. In the PNESs cases due to the length of seizures only part of the event was shown, with a distinct beginning and end in which the observer can appreciate the sudden burst of motor phenomena and the sudden cessation of movements.

Detailed descriptions of each seizure can be seen in appendix 1.

Shortly: 5 PNES videos containing generalized, hypermotor and focal seizures. 5 ES videos containing frontal hypermotor, SMA with generalization, 3 focal temporal ES; one of them with secondary generalization.

The concomitant EEG recordings was not shown to the observers.

2.2. Observers and questioners

Observers were briefed before viewing of the videos. Participants were informed that the purpose of the study is to determine their ability to identify ES from PNES. And that all data are anonymous.

A short questionnaire following introduction included details of profession and duration of experience. Following, each video presented identical questions regarding: ES presence (yes/no), specific signs that lead them to the answer.

2.3. Statistics

Statistics analysis was done using SPSS 13 for windows.

For each case, a score of 10% was given for a correct diagnosis, 0 for a wrong a diagnosis. For each participant the total grade, which is the sum of all cases ranged between 0 and 100%.

For each group a mean grade was calculated. One tail t Test was calculated to compare means between Internal group staff and Neurology group staff. One way ANOVA was calculated to compare means between all groups. Statistical significance was calculated as $\alpha < 0.05$.

Testing Reliability of the test was done by using Cronbach's test.

The ability of each case to discriminate between participants who received high grades and participants who received low grades was checked by item analysis.

Table 1
Participants demographics.

	No of participants	Seniority range in years
ER doctor	9	2–30
ER nurse	5	2–30
Internal Medicine physician	12	0.5–20
Neurology nurse	9	1–29
General neurologist/neurology resident	7	4–32
Neurologist: epileptologist	4	6–31

2.4. Ethics

All data gathering was approved by our institutional review board.

3. Results

Overall, 46 personnel participated in this study: 26 "First responders"; 9 Emergency Department physicians, 5 Emergency Department nurses, 12 Internal Medicine physicians. 20 Neurology professionals; 9 Neurology ward nurses, 7 Neurology ward physicians (specialists and residents) and 4 specialists in Epileptology.

All personnel aside from three senior epileptologists are Rambam HCC medical staff.

The seniority of participants varied from less than a year to 30 years' seniority, due to the structure of the hospital personnel most participants were either <10 years' seniority or more than 20. (Table 1).

Overall scoring of correctly diagnosing PNES vs ES: Senior epileptologists diagnosed correctly in 87.5% of cases. General neurologists correctly diagnosed 72.8% of cases. Neurology ward nurses 69.8%, Emergency room nurses 58%, Internal Medicine physicians 54.1% and emergency room physicians 44.4%. (Fig. 1).

Pairwise comparison test showed a statistical significant difference between the general physicians (ER and Internal Medicine) to all neurology group professions. Overall scoring comparison *t*-test between the groups p = 0.00015.

Applying pairwise comparisons between the different professional groups; ER physicians had significantly lower grade compared to Neurology nurses, Neurology physicians and epileptologists, with p < 0.004, p < 0.002, p < 0.000 respectively.
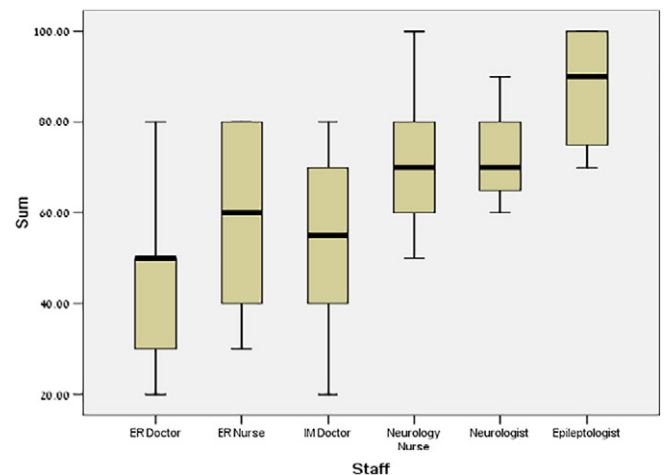
Fig. 1. Overall scoring: correctly diagnosing PNES or ES according to each professional group.