

## **A European questionnaire survey on epilepsy monitoring units' current practice for postoperative psychogenic nonepileptic seizures' detection**

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## **Abstract**

**Background:** In cases undergoing epilepsy surgery, postoperative psychogenic nonepileptic seizures (PNES) may be underdiagnosed complicating the assessment of postsurgical seizures' outcome and the clinical management. We conducted a survey to investigate the current practices in the European epilepsy monitoring units (EMUs) and the data that EMUs could provide to retrospectively detect cases with postoperative PNES and to assess the feasibility of a subsequent postoperative PNES research project for cases with postoperative PNES.

**Methods:** We developed and distributed a questionnaire survey to 57 EMUs. Questions addressed the number of patients undergoing epilepsy surgery, the performance of systematic preoperative and postoperative psychiatric evaluation, the recording of sexual or other abuse, the follow-up period of patients undergoing epilepsy surgery, the performance of video-electroencephalogram (EEG) and postoperative psychiatric assessment in suspected postoperative cases with PNES, the existence of electronic databases to allow extraction of cases with postoperative PNES, the data that these bases could provide, and EMUs' interest to participate in a retrospective postoperative PNES project.

**Results:** Twenty EMUs completed the questionnaire sheet. The number of patients operated every year/per center is 26.7 ( $\pm 19.1$ ), and systematic preoperative and postoperative psychiatric evaluation is performed in 75% and 50% of the EMUs accordingly. Sexual or other abuse is systematically recorded in one-third of the centers, and the mean follow-up period after epilepsy surgery is  $10.5 \pm 7.5$  years. In suspected postoperative PNES, video-EEG is performed in 85% and psychiatric assessment in 95% of the centers. An electronic database to allow extraction of patients with PNES after epilepsy surgery is used in 75% of the EMUs, and all EMUs that sent the sheet completed expressed their interest to participate in a retrospective postoperative PNES project.

**Conclusion:** Postoperative PNES is an underestimated and not well-studied entity. This is a European survey to assess the type of data that the EMUs surgical cohorts could provide to retrospectively detect postoperative PNES. In cases with suspected PNES,

most EMUs perform video-EEG and psychiatric assessment, and most EMUs use an electronic database to allow extraction of patients developing PNES.

## **Introduction**

Psychogenic nonepileptic seizures (PNES) are paroxysmal events with motor manifestations and/or disturbances of sensation and responsiveness, which resemble epileptic seizures, without being related to epileptic discharges in the electroencephalogram (EEG) and not due to other readily identifiable pathophysiological changes [1, 2].

Psychogenic nonepileptic seizures continue to represent a serious diagnostic challenge, and the diagnostic difficulties are enhanced by the fact that a proportion of patients have epilepsy and PNES concurrently or sequentially. If one condition follows the other, epilepsy is mostly the initial disorder [3, 4]. Consequently, epilepsy can be considered as a risk factor for PNES development [3].

The de novo development of PNES has been described after brain surgery for indications other than refractory epileptic seizures, but, nevertheless, PNES are more likely to occur after epilepsy surgery [5–11].

This phenomenon is often underdiagnosed and underestimated, complicating the assessment of postsurgical seizures' outcome and the clinical management. To obtain a clear picture of the entity, it is important to estimate postoperative PNES prevalence, assess potential risk factors as preoperative psychiatric disease, report the diagnostic procedures used for their detection, and identify characteristic PNES manifestations and associations.

The primary aim of our study was to assess the current practice and the data that the epilepsy monitoring units (EMUs) surgical cohorts could provide to retrospectively detect cases with postoperative PNES. Toward this goal, we developed and distributed a questionnaire to gather information from European EMUs regarding the data that they could provide for postoperative PNES detection.

## **Material and methods**

This is a questionnaire-based survey conducted in European EMUs. Epilepsy monitoring units' persons in charge were provided with a formulated questionnaire sheet sent by email.

All EMUs persons in charge were provided with a cover letter to describe the background and the aims of the survey, the names, and addresses of the researchers and explain why the respondent was selected. Nonrespondents to the questionnaire received up to 3 electronic requests to complete the questionnaire.

The questionnaire was built by SM, GR, and PR. The questionnaire was based on the parameters of interest of postoperative PNES to be explored with a manageable number of questions without eliminating entire domains or important constructs of information [12].

The questionnaire consisted of 9 questions addressing 1) the number of patients undergoing epilepsy surgery per year; 2) the performance of systematic preoperative psychiatric evaluation, answered with yes/no; 3) the performance of systematic postoperative psychiatric evaluation, answered with yes/no; 4) the recording of history of sexual or other abuse, answered with systematically/only reported by patients/ no; 5) the follow-up period of patients undergoing epilepsy surgery; 6) the performance of video-EEG in suspected postoperative PNES, answered with yes/no; 7) the postoperative psychiatric assessment in cases with suspected postoperative PNES, answered with yes/ no; 8) the existence of an electronic database of patients undergoing epilepsy surgery allowing extraction of cases with postoperative PNES and the type of information that these data could supply, as demographics, the age at epilepsy onset, the duration of epilepsy, the epilepsy type, the seizures' frequency, the age at epilepsy surgery, the surgical procedure, the operative side, the surgery complications, the postoperative follow-up period, the postoperative time of development of PNES, the methods used for PNES diagnosis, PNES frequency, manifestations and similarities to preoperative seizures, and the seizures outcome at the time of PNES onset, answered with yes/no (if no, please specify how could these data could be provided); and 9) the interest of EMUs to participate in a postoperative

PNES project, answered with yes/no (Table 1). Ethical approval was obtained by each participating centre, as required by local regulations.

## **Results**

Fifty-seven EMUs were contacted, and twenty centers responded and completed the sheet. Twelve centers responded that they could not supply us with the information requested in the questionnaire or were not interested to participate in the survey, and twenty-five centers did not respond.

According to the data sheets completed and returned, approximately 26.7 ( $\pm 19.1$ ) patients are operated every year/per center for refractory focal epilepsy.

A systematic preoperative psychiatric evaluation is performed in 15 centers (75%).

A systematic postoperative psychiatric assessment is performed in 10 centers (50%). History of any abuse is systematically recorded in 7 centers (35%), and patients are asked directly for any abuse as part of the regular interview. In 7 centers (35%), any incidence of abuse is recorded if reported by the patient, but it is not systematically explored during the interview.

The mean follow-up period after epilepsy surgery is  $10.5 \pm 7.5$  years.

A video-EEG is performed in cases with suspected postoperative PNES in 17 centers (85%), and a psychiatric assessment is conducted in cases with suspected PNES in 19 centers (95%).

An electronic database that would allow to extract all the information required for a subsequent research postoperative PNES project is used in 15 centers (75%).

All EMUs that completed and returned the questionnaire sheet expressed their interest to participate in a subsequent retrospective postoperative PNES project (Table 2).

## Discussion

This is the first survey to assess the type and the bulk of data that the EMUs surgical cohorts could provide to retrospectively detect postoperative PNES and assess the feasibility of a subsequent research postoperative PNES project.

Postoperative PNES occur in 1.8% to 8.8% of patients undergoing epilepsy surgery with the highest frequency being reported by Glosser (8.8%) [5–11].

The female gender has been proposed as the main risk factor, followed by the presence of a preoperative psychiatric disorder, mainly depression [10, 11]. Not all EMUs carry out systematic preoperative and postoperative evaluation. Psychiatric evaluation is an essential key for the definition of etiology and diagnosis of PNES and the identification of psychiatric comorbidities [13], and it is rather doubtful whether centers without systematic psychiatric evaluation could participate in a postoperative PNES project.

Traumatic life events, particularly sexual abuse, have been identified as risk factors for PNES [14]. Given the focus on PNES as a comorbidity of epilepsy, trauma and sexual abuse are regarded as less significant etiological risks [15, 16], potentially explaining why only few centers systematically report sexual or any other abuse.

It has been described that most cases with postoperative PNES occur within 6 months after epilepsy surgery [11, 17]. In a case series study, patients developed psychogenic nonepileptic attacks (PNEA) after the first year following epilepsy surgery even 10 years after the surgery [10]. The fact that there are centers with a shorter than 10 years period of follow-up introduces the risk of cases with PNES being missed in the process of a PNES project.

The definitive diagnosis of PNES is quite difficult and should include all available data. Although there are certain clinical features during events, which could help to distinguish PNES from epileptic seizures, it is not always easy to make a diagnosis of PNES on a clinical ground alone, and video-EEG telemetry remains the gold standard in PNES diagnostic work-up [18–20]. Video-EEG in cases with suspected PNES was conducted in most centers, while of high interest is the finding that psychiatric

assessment was conducted in cases with suspected PNES in almost all centers (95%) in accordance with Parra et al. recommendation [7].

The low response rate is the main limitation of our survey. The low response rate does not allow our results to be used to draw conclusions for the whole Europe, but they are still indicative for the current practice in European centers.

Conclusively, the high clinical impact of postoperative PNES recognition and accurate diagnosis is essential for adopting appropriate preventative and therapeutic strategies. Postoperative PNES is an underestimated and not well-studied entity. This is a European survey to assess the type of data that the EMUs surgical cohorts could provide to retrospectively detect postoperative PNES.

#### **Declaration of competing interest**

None of the authors has any conflict of interest to disclose.

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**Table 1. EMUs**

EMU	Country (City)
UCL Queen Square Institute of Neurology, Department of Clinical and Experimental Epilepsy	United Kingdom (London)
Department of Neurology, Department of Clinical Neurophysiology and MEG, VU University Medical Center	Netherlands (Amsterdam)
Epilepsy Center, University Medical Center	Germany (Freiburg)
Moscow Research and Clinical Center for Neuropsychiatry, Russian National Research Medical University	Russia (Moscow)
Psychiatry Department, Strasbourg University Hospital	France (Strasbourg)
National Centre for epilepsy, Oslo University Hospital	Norway (Oslo)
Division of Clinical Epileptology and Experimental Neurophysiology, "Carlo Besta" Neurological Institute Foundation	Italy (Milan)
Oberärztin Station Gastaut / IME, Epilepsiezentrum	Germany (Kork)
Epilepsy Surgery Centre IRCCS NEUROMED	Italy (Pozzilli)
Refractory Epilepsy Centre at Cliniquesuniversitaires Saint-Luc, University Hospital	Belgium (Brussels)
EEG/Sleep Laboratory. Department of Neurosciences, Hospital de Santa Maria – CHLN, University Hospital	Portugal (Lisbon)
Department of Neurology, Hospital RuberInternacional& Hospital La Luz	Spain (Madrid)
Epilepsy Surgery Center, Department of Neurosurgery, St. Ivan Rilski University Hospital	Bulgaria (Sofia)
Epilepsy center, Department of Neurology, University Hospital	Croatia (Zagreb)
Department of Neurology, Istanbul University Cerrahpasa Faculty of Medicine	Turkey (Istanbul)
Department of Clinical Neuroscience, Institute of Neuroscience and Physiology, Gothenburg University	Sweden (Göteborg)
Department of Neurology Clinic B, The Cyprus Institute of Neurology & Genetics, Cyprus School of Molecular Medicine	Cyprus (Nicosia)
National Institute of Psychiatry and Neurology, Department of Neurology, University of Pécs	Hungary (Budapest)
Academic Neurology Unit, Royal Hallamshire Hospital, University of Sheffield, Sheffield, United Kingdom	United Kingdom (Sheffield)
Paracelsus Medical University Salzburg, Department of Neurology, Christian Doppler University Hospital	Austria (Salzburg)

Table 2. The questionnaire sheet

How many patients your center estimates for epilepsy surgery are operated per year?

Do you perform a systematic preoperative psychiatric assessment in your patients?

Yes/No

Do you perform a systematic postoperative psychiatric assessment in your patients?

Yes/No

Do you record the history of sexual or other abuses?

Yes/No/Only when reported by the patient

For how long do you follow-up your patients after epilepsy surgery?

In suspected post-operative PNES cases, do you perform video-EEG?

Yes/No

In suspected PNES cases, do you perform psychiatric assessment?

Yes/No

Do you have an electronic database that would allow extracting patients from your epilepsy surgery program who suffered preoperative or postoperative PNES?

Yes/No (in that case please specify)

Would your center (yourself or one of your colleagues) be willing to participate in a retrospective postoperative PNES project?

Yes/No