



Quality of life and psychological dysfunction in traumatized and nontraumatized patients with psychogenic nonepileptic seizures (PNES)

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ARTICLE INFO

Article history:

Received 7 December 2018

Revised 4 January 2019

Accepted 17 January 2019

Available online 13 February 2019

Keywords:

Psychogenic nonepileptic seizures

Psychological trauma

Quality of life

Functional seizures

Dissociation

Somatization

ABSTRACT

Objectives: Psychogenic nonepileptic seizures (PNES) have the appearance of epileptic seizures, yet show no epileptiform discharges in the brain. The quality of life (QOL) in patients with PNES is reportedly low and trauma seems to be a relevant risk factor. The objective of this study was to examine the difference between measures of (epilepsy-specific) QOL (Quality of Life in Epilepsy Inventory; QOLIE-31p) and psychological dysfunction (trauma symptom inventory; TSI) between patients with diagnosed PNES with self-reported trauma and those without self-reported trauma.

Methods: Patients whose PNES diagnoses were through video-electroencephalogram (EEG) monitoring at the Northeast Regional Epilepsy Group between 2008 and 2018 were included. Patients who reported to have a history of psychological trauma and those who did not were assigned to separate groups. Scores from the TSI and QOLIE-31p were compared by using multivariate analysis of covariance.

Results: The total sample was comprised of 217 adult patients, 148 of which self-reported as having experienced psychological trauma in the past and 69 who did not report any psychological trauma. Traumatized patients significantly differed in terms of QOL and TSI from nontraumatized patients. Traumatized patients were demonstrated to have lower scores on the subdomain “energy” of the QOLIE-31p and the total QOLIE-31p score compared to the nontraumatized group. Similarly, the traumatized group had significantly higher scores on nearly all TSI subscales with the exception of suicidality, sexual disturbances, and somatization.

Conclusion: This study demonstrated significant differences between patients with PNES who have been psychologically traumatized and those who have not. In particular, patients with a history of psychological trauma present greater psychopathology and would possibly benefit from rapid identification and referral to trauma-based therapy. In turn, this may result in a reduction of disease burden, increase QOL, and a reduction in healthcare costs resulting from diagnostic delays and implementation of less targeted treatments.

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1. Introduction

Psychogenic nonepileptic seizures (PNES) have the appearance of epileptic seizures yet occur in absence of physiological or electroencephalographic correlates and are therefore not epileptic, rather they are of psychological origin [1]. Instead, these seizures are triggered by psychological distress, and are often associated with psychological trauma and posttraumatic stress disorder (PTSD) [2,3]. Psychological trauma seems to be a relevant risk factor in many patients with PNES as studies suggest that a history of trauma is more prevalent in this population than in patients with other conditions [4]. The most common condition misdiagnosed as epilepsy is PNES, and it is estimated

that 1 in 5 patients sent to an epilepsy center for treatment-resistant seizures are found to have PNES [5–7]. Because it can be difficult to rule-out/rule-in this diagnosis, patients with PNES can wait up to an average of 7 years before receiving the correct diagnosis [8]. Video-electroencephalogram (EEG) is considered the gold standard for the diagnosis of PNES. However, this often means that clinicians must suspect PNES in the clinic in order to request video-EEG instead of a regular EEG test [7]. Diagnostic delay is one of the reasons it is speculated that patients with PNES have poorer quality of life (QOL) compared with that of patients with epileptic seizures [9].

The QOL in patients with PNES has been the subject of previous research and publications. Studies have primarily focused on the relation between seizure variables (e.g., frequency, duration) and psychological factors (i.e., depression) to QOL and found that depression and somatic symptoms contribute to poor QOL [10–12]. In comparison to patients with epileptic seizures (including intractable epilepsy), patients with

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PNES report lower QOL; factors that have been found to contribute to reduced QOL in these patients are a diagnosis of depression, pain syndromes, older age of onset, and shorter duration of PNES [12].

Psychological trauma has long been identified as a risk factor in PNES [13]. However, not all patients with PNES report a traumatic history. A handful of studies have examined subgroups within the overarching classification of PNES [2,14–16].

The present study aimed to compare QOL and psychological dysfunction in patients with PNES who reported a history of psychological trauma to others who did not report psychological trauma. The aim is to contribute to a better understanding of subgroups and variations within patients with PNES, potentially allowing clinicians to choose the appropriate treatments for patients depending on their psychological profile.

2. Materials and methods

2.1. Study design and target population

This study employed a cross-sectional design. Data were collected consecutively at the Northeast Regional Epilepsy Group New York, USA between 2008 and 2018. Inclusion criteria consisted of adult (>18 years) patients who were with PNES diagnoses through video-EEG monitoring. Patients with dual diagnosis of epileptic seizures and PNES, and patients with an intelligence quotient (IQ) of less than 70 were excluded.

Patients' histories of psychological trauma (e.g., childhood sexual, physical, verbal, school bullying, witness of abuse, and other type of trauma) were obtained from the patients on an intake form that they filled out prior to meeting with the neuropsychologist. These were further explored during the neuropsychological intake and testing. Neuropsychological testing was conducted on an outpatient basis.

For the purpose of this study, these patients were divided into two groups (i.e., psychologically traumatized and not psychologically traumatized). Group assignment was based on self-reported information provided to the clinical neuropsychologist at the intake stage.

2.2. Outcomes measures

Epilepsy-specific QOL was measured using the Quality of Life in Epilepsy Inventory (QOLIE-31p). The QOLIE-31p is a 31-item inventory designed to measure an adult's QOL considering the patient has a diagnosis of epilepsy/seizures and asks about several aspects of health over the past 4 weeks. This inventory includes 6 domains: energy/fatigue, cognitive, medication effects, social function, seizure worry and a total score. A decision to leave out the seventh domain, emotional wellbeing, was made because mood was already measured by the TSI Depression subscale. Higher scores indicate better QOL. The test is designed specifically for people with epilepsy and, as such, addresses issues as driving, seizures, and medication [17], when administered to patients with PNES, the term "epilepsy" is replaced with "seizures".

The Trauma Symptom Inventory (TSI) and TSI 2 [18] were used to assess psychological dysfunction and trauma symptomatology, as they are designed to measure symptoms of posttraumatic stress disorder and other posttraumatic emotional problems in adults. The original TSI includes the following scales: Anxious Arousal, Depression, Anger/Irritability, Intrusive Experiences, Defensive Avoidance, Dissociation, Sexual Concerns, Dysfunctional Sexual Behavior, Impaired Self-reference, and Tension Reduction Behavior. It was replaced with the newer TSI-2 in 2011 after it was published, and replacement was recommended by the publisher. The TSI 2 is an update of the TSI that includes additional symptom clusters (Insecure Attachment, Somatic Preoccupations, Suicidality, Self-Disturbance, Posttraumatic Stress, Externalization, and Somatization) that allow a more complete evaluation of trauma- and adversity-related outcomes [19]. Of the 217 patients, 148 were tested with the TSI 2, and 69 were tested with the

TSI. Both inventories are designed to evaluate posttraumatic stress and other psychological sequelae of traumatic events. Acute and chronic symptomatology, including the effects of sexual and physical assault, intimate partner violence, combat, torture, motor vehicle accidents, and childhood abuse or neglect are evaluated.

Demographic variables that were measured consisted of sex, age, date of birth, and years of education.

2.3. Data analysis

For the data analysis IBM SPSS 25.0 was used to perform a multivariate analysis of covariance (MANCOVA) between the different variables. It was hypothesized that patients with PNES with psychological trauma had lower QOL and higher TSI scores compared with nontraumatized patients with PNES. The significance level for all analyses was set at 0.05.

In agreement with the Consolidated Standards of Reporting Trials, possible baseline differences in demographical variables were not statistically tested; instead, we used clinical judgment to see if baseline differences (if any) were deemed relevant [20].

A MANCOVA test was performed because of the possibility of testing multiple dependent variables at once; MANCOVA is capable of incorporating the correlation structure between multiple dependent variables, has a greater statistical power (compared to standard analysis of covariance; ANCOVA), and reduces the chance of augmenting a type-1 error drastically [21]. Separate MANCOVA tests for both instruments (i.e., TSI and QOLIE-31p) were done to compare the subscores of the domains for each instrument. For each model, the independent variables were age, years of education, sex, and trauma (indicating whether self-reported trauma was present or not). The dependent variables consisted of the all QOLIE-31p and all the TSI subscores. Consequently, the means of the trauma and nontraumatized groups on all subscores of both the TSI and the QOLIE-31p were compared, and the p-values demonstrated the level of significance between the groups.

Levene's test for homogeneity of covariance was performed to check whether the variance between independent variable groups was equal. Consequently, Box's M was performed as it tests the equality of covariance matrices. If the Box's M test score was significant, Pillai's trace was used, and if the Box's M test was nonsignificant, Wilks Lambda was used [21]. Partial Eta Squared was calculated to measure the proportion of variance accounted for by the trauma indicator (i.e., whether trauma was present or not based on self-reported data of the patients). Lastly, as a sensitivity analysis, data were log-transformed to account for violations to the normality assumption of MANCOVA to see if this would lead to different conclusions.

2.4. Ethics

Patients did not sign an informed consent at the start of the study. However, an institutional review board approval for an anonymous archival record review was obtained with removal of nonrelevant Personal Health Information (Copernicus IRB: NRE1-11-155). This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The Authors declare that there is no conflict of interest.

3. Results

Data were collected on 217 patients with PNES at Northeast Regional Epilepsy Group New York, USA between 2008 and 2018. Of the whole sample size, 35 patients were male, and 182 were female. These patients were divided into two groups of which 148 (68%) indicated self-reported psychological trauma and 69 (32%) that did not indicate trauma. Patients ranged between 19 and 77 years of age. Patients with trauma were on average half a year older than patients without. Furthermore, there was a significant difference in years of education

Table 1
Comparison of psychologically traumatized and nontraumatized on groups of patients with PNES^a on demographic variables.

Demographic variable	Trauma (N = 148) (Std. deviation)	No trauma (N = 69) (Std. deviation)
Sex		
Female	128 (86%)	54 (78%)
Male	20 (14%)	15 (22%)
Age mean	38.65 (12.29)	38.04 (14.01)
Female	38.75 (12.48)	36.60 (13.35)
Male	38.05 (11.23)	43.44 (15.55)
Years of education mean	13.82	14.27
Female	13.69 (2.2)	14.31 (2.33)
Male	14.65 (2.66)	14.13 (2.39)

^a Psychogenic nonepileptic seizures.

between both groups ($p = .028$) with a mean of 13.82 years of education for the traumatized group and 14.27 for the nontraumatized group (Table 1).

3.1. MANCOVA tests

In the MANCOVA on TSI scores (Table 2), Box's test of equality covariance matrices was significant ($p = .000$). However, for the MANCOVA on the QOLIE scores Box's test of equality covariance matrices was not significant ($p = .311$).

Thus, for the MANCOVA on TSI scores, Pillai's trace was used because of the violation of the homogeneity of variance–covariance assumption [21]. Using Pillai's trace, there was a significant difference ($p = .007$) between traumatized and nontraumatized patients on measures of the TSI indicating that traumatized patients, on average, score higher on the TSI subscores. This indicates higher symptomatology compared with the nontraumatized group. The covariates in the MANCOVA indicated significant differences for age ($p = .035$) and years of education ($p = .047$) and a nonsignificant difference between different sexes ($p = .368$); this indicated that those with a higher age and a lower education scored higher on the TSI.

For the MANCOVA on the QOLIE scores (Table 3), Wilk's Lambda was used because of the nonsignificant Box's test. This resulted in a significant difference between traumatized and nontraumatized patients on measures of the QOLIE-31p ($p = .008$). Traumatized patients on average scored lower on the QOLIE-31p subscore energy and on the total score, indicating poorer QOL compared with the nontraumatized group. The covariates in the MANCOVA indicated a significant difference for age ($p = .001$) and years of education ($p = .000$) and a nonsignificant score for sex ($p = .321$); this indicated that those with greater age and less education score worse on the QOLIE-31p.

Table 2
Comparison of the psychologically traumatized and nontraumatized groups on TSI mean scores^a and p scores of the MANCOVA^b test.

Subscore	Trauma ^c (Std. deviation)	No trauma ^c (Std. deviation)	p
TSI Anxious Arousal	61.76 (9.29)	53.25 (10.36)	.000
TSI Anger	54.90 (11.19)	49.46 (11.04)	.036
TSI Dissociation	62.97 (13.22)	56.93 (13.60)	.032
TSI Depression	58.09 (10.51)	50.68 (12.26)	.003
TSI Impaired self-reference	56.77 (12.47)	50.93 (11.58)	.020
TSI Somatic preoccupations General	63.93 (13.94)	57.50 (15.75)	.041
TSI Somatic preoccupations Pain	59.46 (9.97)	54.04 (13.00)	.030
TSI Somatic preoccupations	62.68 (11.83)	56.57 (14.87)	.25
TSI Suicidality	57.09 (16.50)	52.11 (14.66)	.185
TSI Dysfunctional sexual behavior	49.93 (8.67)	47.00 (4.92)	.096
TSI Sexual concerns	55.27 (12.53)	48.25 (9.85)	.015
TSI Sexual disturbance	53.57 (10.75)	47.00 (5.97)	.005

^a Trauma Symptom Inventory.

^b A one-way multivariate analysis of covariance (MANCOVA).

^c All estimates are corrected for differences in age, sex, and years of education by including them as independent variables in the model.

Table 3
Comparison of the psychologically traumatized and nontraumatized groups on QOLIE-31p^a mean and p scores of the MANCOVA^b test.

Subscore	Trauma ^c (Std. Deviation)	No trauma ^c (Std. Deviation)	p
QOLIE cognitive	42.14 (11.13)	44.82 (14.40)	.178
QOLIE energy	40.62 (9.33)	45.68 (11.75)	.001
QOLIE medication effects	47.41 (11.64)	50.33 (12.48)	.127
QOLIE social	40.56 (10.31)	43.70 (10.96)	.065
QOLIE seizure worry	41.35 (12.42)	40.81 (9.90)	.566
QOLIE total	36.01 (10.58)	40.07 (12.25)	.021

^a Quality of Life in Epilepsy-31p.

^b A one-way multivariate analysis of covariance.

^c All estimates are corrected for differences in age, sex, and years of education by including them as independent variables in the model.

The MANCOVA's of both tests indicated significant differences between traumatized and nontraumatized patients. By looking at the between-subjects' effects, it was demonstrated that this was the case for all TSI subscores except for suicide ($p = .185$), somatic preoccupations ($p = .25$), and sexual disturbance ($p = .096$). The QOLIE-31p subscores show that energy ($p = .001$) and the total score ($p = .021$) were significantly different.

Partial Eta Squared demonstrated that about 25% of the variability in the trauma/no trauma group across subvariables of the TSI and QOLIE scores is accounted for in the group levels. Data were checked for normal distribution, and although certain TSI subscores were partially normally distributed, a log transformation of the data was performed, which did not impact the results.

4. Discussion

Numerous psychiatric comorbidities have been reported in patients with diagnosed PNES, including depression [10,22], anxiety [23], PTSD [14], and personality disorders [24]. Psychogenic nonepileptic seizures are also thought to be characterized by somatization and dissociative tendencies. However, most prior studies have studied patients with PNES as one group. The present study proposed to examine two distinct subgroups in PNES, those who reported psychological trauma and those who did not, which is a reasonable approach given that the previous reports of the critical role psychological trauma appears to have in this disorder [25,26]. Similar to Reuber et al. [27], the sample with psychological trauma were characterized by significantly higher scores of somatization and dissociation, suggesting that in patients reporting trauma, more severe psychopathology is evident.

Depression and anger have been reported in PNES as important contributors to diminished QOL [12,22]. Specifically, in this study, we observed that patients who were traumatized had higher scores on nearly all psychological dysfunction subscales with the exception of suicidality, sexual disturbances, and somatization and reported significantly lower on QOL. These results suggest that patients with PNES who present with a history of psychological trauma exhibit considerably greater emotional dysfunction as compared with nontraumatized patients with PNES.

Not surprisingly, our two groups did not differ on variables such as seizure worry, medication effects, and cognitive impairments. Clearly both groups, regardless of having trauma as a risk factor, are equivalent in that they all experience seizures and these common associated issues. Therefore, they all report concerns about the possibility of having seizures and preoccupations about the effects of the medication that they are taking and may be noticing changes in their mental functioning as a result. However, significant differences were observed on total QOLIE-31p scores and on energy levels. It is not unreasonable to suspect that a psychologically traumatic history and the associated psychological symptoms impact these aspects of QOL. Moreover, it has been demonstrated that psychological disorders are associated with lower energy levels [12] and poorer QOL [22]. Similarly, studies that addressed

the differences between PNES and epilepsy in terms of QOL demonstrated that psychological factors are a stronger predictor of QOL in epilepsy and PNES than condition-related and demographic variables [28].

This study is not without limitations. First, self-reported data were used to determine whether patients belonged to the traumatized or nontraumatized groups. It is possible that patients did not report their traumatic history for a variety of reasons, including not feeling comfortable reporting it in a medical setting or posttraumatic amnesia. Second, two TSI instruments were used (TSI and TSI II) resulting in some patients measured with the TSI and others with the TSI II. In comparison to the TSI, the TSI II includes symptom clusters that allow a more complete evaluation of trauma- and adversity-related outcomes. However, in this study, the TSI and the TSI II were compared on the scales that overlapped. Third, females were overrepresented in our sample, which could be considered a limitation. Nonetheless, this difference confirms the consistency with usual rates as research has shown that NES are more prevalent in women than men [29]. Fourth, the performance of the analysis with the MANCOVA test while some of the variables were not normally distributed could give problems with the analysis even though the data were transformed [21]. Lastly, the cross-sectional design of the study hampers the ability of the study to determine causal effects.

In conclusion, a better understanding of the impact of trauma on the psychopathology within PNES subgroups could result in cost savings by streamlining the diagnostic and referral process to best-suited treatments.

5. Conclusion

These results suggest that there are identifiable subgroups in terms of QOL and psychological dysfunction (TSI). This study underscores the existence of subgroups within PNES. In particular, patients with a history of psychological trauma present greater psychopathology and would benefit from rapid identification and referral to trauma-based treatment, which can then result in a reduction in costs resulting from diagnostic delays and implementation of less targeted treatments. On the other hand, patients who lack a history of psychological trauma might be best served by more general and less intensive treatment (e.g., cognitive behavioral therapy, mindfulness-based treatments, etc.). Recognizing the differences in the broad classification of PNES will permit clinicians to make better informed decisions regarding treatment recommendations and also suggest what psychological measures might be most reasonably assessed at end of the course of treatment and at follow-up.

Future studies should aim to examine long-term outcomes of patients who have been differentiated on the presence of a history of psychological trauma. Additionally, traumatized and nontraumatized patients' response to particular treatments (e.g., cognitive behavioral therapy, mindfulness-based treatments, etc.) might be investigated adding to our understanding of differential outcomes.

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