

Cognition and Quality of Life in Patients with Post Stroke Epilepsy

Review Article

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Abstract

Background: Epilepsy is a common neurological disease. According to a World Health Organization survey, 50 million individuals have epilepsy worldwide; the majority of these cases are cryptogenic.

Aim of Study: Was to assess cognitive functioning and health-related QOL in patients with post stroke epilepsy matched to patients who have had a stroke with similar strokes without post stroke epilepsy.

Subjects and Methods: This was a cross-sectional study that was conducted at Neurology out-patient clinic, Ain shams University Hospital. Neurology out-patient clinic, Misr University for Science and Technology on 22 patients with post stroke epilepsy (PSE) and 22 matched patients who have had a stroke without epilepsy.

Results: In this study, the PSE group displayed slower cognitive response times. The PSE group exhibited significantly higher NIHSS scores at stroke onset and during the study.

Conclusion: PSE relates to impaired cognitive functioning, a more disability and neurological impairment.

Key Words: Cognition — Quality of life — Post stroke epilepsy.

Introduction

APPROXIMATELY 10% of the epilepsy cases worldwide are related to stroke, and this proportion has been found to increase with the age of the population. In one study, the condition was reported in 55% among the elderly (>65 years of age) [1].

According to a survey, there were approximately 13 million Chinese adults above 40 years of age in 2019 who experienced a stroke and 14% of elderly stroke patients suffered from epilepsy. Post-stroke epilepsy (PSE) has been recognized as an important clinical issue in stroke survivors [2].

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The prevalence of post-stroke depression (PSD) is reported at 31.1%, and that of post-stroke anxiety at 20.4%. The incidence of PSD within five years after stroke has been reported at 31%. PSD can occur during the acute phase (<one month), mid-term (one to six months) and recovery phase (>six months) after stroke, with an incidence of 33%, 33%, and 34%, respectively. The presence of cognitive impairment (CI) after stroke was reported in 30% cases, and was related to mortality, disability, and prolonged hospital stay [3].

Patients with PSE often experience various complications, such as CI, depression, and anxiety, which severely affect their quality of life and prognosis and could aggravate strokes, even becoming life-threatening [4]. Witt et al. [5] reported frequent CI in patients with epilepsy, and complications were common in elderly patients with untreated new-onset epilepsy. Breuer et al. [6] reported that old age and the presence of comorbidities were risk factors for CI in patients with epilepsy. Dabbs et al. [7] used multiple magnetic resonance imaging (MRI) techniques to distinguish between subtypes of CI in patients with temporal lobe epilepsy, and suggested that extensive neuroanatomical changes could form the basis of different patterns of cognitive deficits. Van Tulji et al. [8] reported that PSE patients had lower mini-mental state examination (MMSE) scores than matched patients with stroke only.

Seizures are a common complication after stroke, and although 25-50% of new-onset seizures in adults and elderly is caused by cerebrovascular disease, only little evidence is available about the impact of seizures and epilepsy on cognitive functioning and quality of life (QOL) in patients who have had a stroke [8].

Winter and colleagues showed in a cohort of 374 patients who have had a stroke, including 23 patients (6.1%) with poststroke epilepsy (PSE), that

health-related QOL was significantly lower in patients with PSE [9].

Our study aimed to assess cognitive functioning and health-related QOL in patients with post stroke epilepsy matched to patients who have had a stroke with similar strokes without post stroke epilepsy.

Subjects and Methods

This was a cross-sectional study that was conducted at Neurology Out-patient Clinic, Ain Shams University Hospital. Neurology Out-patient Clinic, Misr University for Science and Technology on 22 patients with post stroke epilepsy (PSE) and 22 matched patients who have had a stroke without epilepsy. The study duration was from September 2022 to August 2023.

Inclusion criteria:

- Age: >18 years old.
- Patients who have had a stroke. PSE is defined clinically as the occurrence of one or more seizures, occurring more than one week after a stroke, which has to be confirmed by clinical symptoms with normal brain imaging or imaging showing a cerebral infarction or hemorrhage.
- Patients with a seizure and clear signs of cerebral infarction on imaging, although without clinical signs of stroke before their seizure, will be also included.
- For inclusion, the diagnosis of PSE has to be at least 3 months old.

Exclusion criteria:

- Patients with known severe cognitive deficits including global aphasia, as this can impede the adequate completion of the tests and questionnaires.
- Patients with Alzheimer Dementia.
- Patients with any psychiatric illness.
- Patients with disturbed conscious level.

Data collection:

All patients were subjected to:

Information on demographic and clinical characteristics:

- Personal history: Name, age, sex, education, marital status, and smoking.
- Stroke type.
- Time since stroke.
- History of depression.
- Family history of epilepsy.
- Epilepsy duration.
- Seizure types.
- Seizure freedom in months.
- Number of AED trials.

Cognitive function assessment:

Two tests were used, which was a test battery used for automated testing of cognitive functions in patients with epilepsy. We used the reaction time test (RT test), either auditory, in patients without hearing loss, or the visual RT test, as well as the computerized visual searching task (CYST), an information processing task.

The VRT and ART were assessed by using the PC 1000 Hz reaction timer, which is an in-house built device that comprises a 1000Hz square wave oscillator. The device is composed of a small light-emitting diode for visual stimulation, a headphone (1000 Hz) for auditory stimulation and two connected components (A and B), all of which are connected to a computer device. Component A is the part of the device that is controlled by the examiner via a start button, whereas component B is the part of the device that the subject faces. The RT was recorded via the Audacity software (version 1.2.2) in a 0.001 s accuracy wave format [10].

Health-related QOL Evaluation:

Using a generic QOL scale, the EuroQol, and a stroke-specific QOL scale, the stroke-adapted Sickness Impact Profile (SA-SIP-30) questionnaire [11].

Other assessments:

- We screen for mood and anxiety disorders with the hospital anxiety and depression scale (HADS) [12].
- We measured disability with the Barthel index [13] and the modified Rankin scale (mRS).
- We assessed the severity of the stroke-related neurological impairment, we used the National Institutes of Health stroke scale (NIHSS) [14].
- Traditional EEG for half an hour.

Ethical considerations:

- Study was started after acquiring the approval from the Ethical Committee of Faculty of Medicine Ain Shams University.
- A written informed consent was signed by the subjects after describing the aim of the study in details. The general principles that was explained for all participants in this study are:
- Participation in this study was totally free and voluntary.
- Participation in this study didn't imply a direct benefit for him although data obtained could be used for the benefit of other patients.
- The patient may decide to withdraw from this study at any moment without giving any justification.
- The results of the study could be used for scientific publication but the identity of the patients would be absolutely confidential.

Statistical analysis:

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Significance of the obtained results was judged at the 5% level. The used tests were: Chi-square test: For categorical variables, to compare between different groups. Student t-test: For normally distributed quantitative variables, to compare between two studied groups.

Results

Table (1) shows that there were significant differences between PSE group and Stroke only group as regards NIHSS at stroke and NIHSS at time of study ($p < 0.05$).

Table (2) shows that there were significant differences between PSE group and Stroke only group as regards RT test and CYST, response time in seconds ($p < 0.05$).

Table (1): Comparing between PSE group and Stroke only group as regards stroke characteristic.

	PSE (n=22)	Stroke only (n=22)	Test	P-value
NIHSS at time of stroke, mean ± SD	9.7±7.0	6.9±4.7	2.365*	0.04*
NIHSS at time of study, mean ± SD	4.9±5.6	1.6±2.9	5.695*	<0.01*

SD : Standard division.
 p-value: Probability value significant in >0.05.
 PSE : Poststroke epilepsy.
 ICH : Intracerebral hemorrhage.
 NIHSS: National Institutes of Health stroke scale.

- t-test was used to compare the mean difference between groups.
- Chi-square test was used to compare the numerical values between groups.

Table (2): Comparing between PSE group and Stroke only group as regards Cognitive function.

Cognitive function	PSE (n=22)	Stroke only (n=22)	Test	P-value
	Mean ± SD	Mean ± SD		
RT test, in msec	514±184	391±73	4.32*	0.02*
CVST, response time in seconds	8.6±2.2	7.1±1.1	5.64*	0.03*

SD : Standard division.
 p-value: Probability value significant in >0.05.
 RT : Reaction time.
 CVST : Computerized visual searching task.

- t-test was used to compare the mean difference between groups.

Discussion

In our study, in terms of the RT test, the PSE group demonstrated a higher mean response time (514±184msec) compared to the stroke-only group (391±73msec), with a significant difference. Similarly, for the CYST test, the PSE group exhibited a longer response time (8.6±2.2 seconds) compared to the stroke-only group (7.1±1.1 seconds), with a significant difference. These findings suggest that individuals in the PSE group may experience cognitive impairments, as evidenced by slower response times, compared to those in the stroke-only group.

This is in agreement with a case-control study by Van Tuijl and colleagues found that patients with PSE had more cognitive problems, especially in the central information processing speed, than patients with SO. Also, the mini-mental-state examination (MMSE), a screening test for cognitive function, was lower in patients with PSE, indicating more cognitive problems [8].

This is also in accordance with Seidenberg and colleagues who reported that more than one third of patients with epilepsy had different degrees of CI. They indicated that CI was common in neurological conditions and seriously affected the prognosis and quality of life of patients [15].

Based on one report, certain damage to the central nervous system or pre-existing brain abnormalities may initially affect cognitive function, with subsequent epilepsy as a "second attack" which further results in deviation from the PSE-CI phenotype [16].

In our study, NIHSS at stroke and NIHSS at time of study were significantly higher among PSE group than stroke only group ($p < 0.05$).

Van Tuijl and colleagues found that the neurological deficit in patients with PSE was larger than in patients with SO, though the initial stroke severity was not different (NIHSS at time of stroke). This is reflected by the higher scores on the NIHSS at time of the study, the higher mRS and the higher scores in the SA-SIP-30 questionnaire (physical dimension). It seems that their patients with PSE did not recover as well as their patients with SO, whereas the absolute decrease in NIHSS scores is similar. The recovery might have been hampered by AED use, or it might reflect a disease process which also causes PSE. This suggests that PSE causing infarcts is located more strategically or have a larger or wider impact on brain recovery than those infarcts which do not cause PSE [8].

Limitations:

- 1- The study included a relatively small sample size of 22 patients with post-stroke epilepsy (PSE) and 22 matched patients without epilepsy. A

larger sample size would enhance the generalizability of the findings and provide more robust statistical power.

- 2- Cross-sectional design.
- 3- The sample was recruited from the Neurology outpatient clinics of two specific institutions, which might not represent the entire population of patients with post-stroke epilepsy. The findings may not be applicable to patients from different settings or demographics.
- 4- The study relied on self-report measures, such as the EuroQol-VAS and the Hospital Anxiety and Depression Scale (HADS), which are subjective and subject to recall bias or interpretation differences among participants. Objective measures or additional assessment tools could provide a more comprehensive evaluation of cognitive functioning and quality of life.
- 5- Lack of control group.

Conclusion:

PSE relates to impaired cognitive functioning, a more disability and neurological impairment. We call for more attention to cognitive function, and in particular, early recognition and early intervention, to reduce the social burden of PSE patients. These findings warrant more etiological research on the specific cognitive consequences of PSE.

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The study was not funded by any organization or entity.

Conflict of interests:

Authors declare no potential conflicts of interests.

Author contribution:

The authors contributed equally to the study.

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الإدراك ونوعية الحياة لدى المرضى الذين يعانون من صرع ما بعد السكتة الدماغية

الهدف من البحث: كان الهدف من هذه الدراسة هو تقييم الأداء المعرفى وجودة الحياة المرتبطة بالصحة لدى المرضى الذين يعانون من صرع ما بعد السكتة الدماغية المتطابقين مع المرضى الذين أصيبوا بسكتات دماغية مماثلة دون صرع ما بعد السكتة الدماغية.

طريقة البحث: هذه دراسة مقطعية أجريت في العيادة الخارجية لطب المخ والأعصاب بمستشفى جامعة عين شمس والعيادة الخارجية لطب المخ والأعصاب بجامعة مصر للعلوم والتكنولوجيا على ٢٢ مريضاً يعانون من صرع ما بعد السكتة الدماغية و٢٢ مريضاً متطابقاً أصيبوا بسكتة دماغية دون صرع.

نتائج البحث: أظهرت مجموعة مرضى الصرع ما بعد السكتة الدماغية أوقات استجابة معرفية أبطأ، وانخفاض الحالة الصحية العامة، وأبعاد نوعية الحياة الجسدية والنفسية الاجتماعية الرديئة، والإعاقة الشديدة، كما يتضح من ارتفاع درجات mRS. أظهرت مجموعة الصرع ما بعد السكتة الدماغية درجات أعلى بشكل ملحوظ فى NIHSS عند بداية السكتة الدماغية وأثناء الدراسة، مع زيادة مستويات القلق والاكتئاب التى تم قياسها بواسطة HADS، مقارنة بالمجموعة التى تعانى من السكتة الدماغية فقط.

الاستنتاجات: يرتبط صرع ما بعد السكتة الدماغية بضعف الأداء الإدراكى، وانخفاض نوعية الحياة المرتبطة بالمرض، وزيادة الإعاقة والضعف العصبى.