Epilepsy Research (2013) 103, 106—109

journal homepage: www.elsevier.com/locate/epilepsyres

SHORT COMMUNICATION

Structural epilepsy occurrence in vegetative and minimally conscious states

Sergio Bagnato[a,b,*], Cristina Boccagni[a,b], Giuseppe Galardi[a,b]

[a] *Unit of Neurophysiology, Rehabilitation Department, Fondazione Istituto, San Raffaele — G. Giglio, Cefalù, PA, Italy*
[b] *Unit for Severe Acquired Brain Injuries, Rehabilitation Department, Fondazione Istituto, San Raffaele — G. Giglio, Cefalù, PA, Italy*

Received 18 May 2012; received in revised form 8 September 2012; accepted 22 September 2012
Available online 12 October 2012

KEYWORDS
Consciousness disorders;
Epilepsy;
Epileptic seizures;
Focal seizures;
Generalized seizures;
Symptomatic epilepsy

Summary The occurrence of epileptic seizures was retrospectively evaluated in 96 patients in a vegetative or minimally conscious state during a three month period of hospitalization. Structural epilepsy was detected in 23 patients (24%) and its occurrence was three times greater in patients in a vegetative state than in those in a minimally conscious state. The occurrence of structural epilepsy did not affect the recovery of consciousness.

Introduction

Epileptic seizures (ES) are a potential aftereffect of a brain injury, and have been described following traumatic brain injury, cerebral hypoxia, and stroke (Claassen et al., 2007; Ferguson et al., 2010; Lu-Emerson and Khot, 2010; Beghi et al., 2011). Two main types of ES may appear following an acute brain injury. Acute symptomatic seizures are events occurring in close temporal relationship with acute brain damage (within one week) (Beghi et al., 2010). Structural epilepsy (previously known as symptomatic epilepsy) occurs after diseases or injuries producing structural changes in the brain (Berg et al., 2010) and it induces ES after the acute phase.

Patients who fail to wake or die after a coma following a severe brain injury develop specific disorders of consciousness known as vegetative state (VS) and minimally conscious state (MCS). Patients in VS appear awake but fail to show signs of self-awareness or environmental awareness (Monti et al., 2010). Similar to patients in VS, patients in MCS appear wakeful and, in addition, they exhibit inconsistent, fluctuating, but reproducible signs of awareness (Giacino et al., 2002).

The presence of ES caused by structural epilepsy may have significant clinical impacts in patients with disorders of consciousness. For example, ES may delay the clinical recognition of an improvement in the level of consciousness or interfere with the recovery of consciousness, as most available antiepileptic drugs have cognitive effects (Cavanna et al., 2010). As no data concerning this topic currently exist, the primary aim of the current study was to describe the occurrence of ES due to structural epilepsy in a large population of patients in VS or MCS at the beginning of a rehabilitative treatment. In addition, as a secondary aim, we

* Corresponding author at: Rehabilitation Department, Fondazione Istituto ''San Raffaele — G. Giglio'', Viale G. Giardina, 90015 Cefalù, PA, Italy. Tel.: +39 921920357; fax: +39 921920253.
E-mail address: sergiobagnato@gmail.com (S. Bagnato).

0920-1211/$ — see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.eplepsyres.2012.09.008

evaluated whether the patients' level of consciousness three months after the beginning of the rehabilitative treatment was affected by the presence of structural epilepsy.

This work may introduce new knowledge with strong implications for clinical care, diagnostic procedures, and rehabilitative programs in patients with disorders of consciousness following an acute brain injury.

Methods

Patients

This study was conducted with 96 patients (62 males and 34 females, mean age 46.1 ± 19.1 years) suffering from severe disorders of consciousness following acute traumatic, vascular, or hypoxic cerebral injuries. The mean time between the acute brain injury and the admission to our department was 56.1 ± 26.8 days. A total of 59 patients in VS and 37 in MCS participated in the study (see Table 1 and Supplementary Table 1 for more detailed descriptions).

All patients were admitted to our department to perform an intensive neuro-rehabilitation program following severe acquired brain injuries; all patients came from neurosurgery, neurology, and intensive care units. Direct nursing supervision 24 h a day is organized in our department. The diagnosis of VS and MCS was made at admission by a multidisciplinary team (neurologist, neuropsychologist, and speech therapist) according to the diagnostic criteria for VS (Royal College of Physicians, 2003) and MCS (Giacino et al., 2002). We included in the study all the patients admitted to our department from January 2005 to October 2011 who fulfilled the following criteria: (1) a diagnosis of VS or MCS at admission to our department following a traumatic brain injury, stroke, or cerebral hypoxia; (2) a period of time between the acute brain injury and the hospitalization in our department that was longer than one week (to exclude acute symptomatic seizures); (3) a hospitalization in our department lasting at least three consecutive months. Patients with a previous history of ES, traumatic brain injury, stroke, cerebral hypoxia, neurodegenerative diseases, tumors, or infections of the central nervous system were excluded.

This study was performed according to the Helsinki declaration and approved by the Ethical Committee of the Fondazione Istituto San Raffaele G. Giglio (Cefalù, Italy).

Evaluation of ES occurrence

The occurrence of ES was retrospectively obtained from clinical documentation during a period of time lasting three months after the admission to our department. ES associated with specific causes such as metabolic disorders, febrile illness, or other conditions that may induce acute symptomatic seizures (Beghi et al., 2010) were not reported.

Correlation between structural epilepsy and cognitive outcome

We used the levels of cognitive function (LCF) scale (Hagen et al., 1972) to evaluate the recovery of consciousness and cognitive functions of the patients. This scale is based on eight levels: levels 1 and 2 define patients in VS, level 3 defines patients in MCS, while the other levels denote a progressive improvement of cognitive functions; level 8 describes patients with cognitive functions close to their pre-morbid abilities. LCF score assessment is routinely conducted daily in our department. We used a two-way repeated measures ANOVA with the factor *group* (patients with ES versus patients without ES) as the between-subject factor and the factor *time* (LCF score at admission versus LCF score at 3 months) as the within-subject factor. Conditional to a significant F value, post hoc comparisons were performed using the Tukey honest significant difference test. For all analyses, $p < 0.05$ was considered statistically significant.

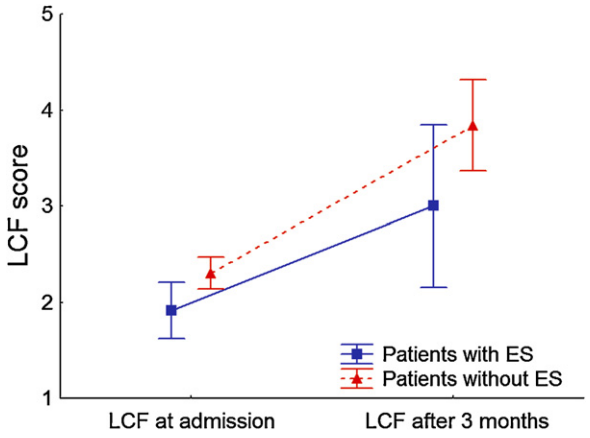

Figure 1 Level of cognitive function (LCF) at admission to our department and three months later in patients with and without epileptic seizures (ES). Vertical bars denote 95% confidence interval.

Results

ES were present in 23 of 96 patients (24%). Nineteen patients with ES were in VS at the admission to our department (32% of the patients in VS), while only four were in MCS (10.8% of the patients in MCS). Ten patients had focal seizures, nine patients had generalized seizures, while four patients had both focal and generalized seizures. The mean number of ES was 4 ± 4.4 in the three month period of evaluation (see Table 2 and Supplementary Table 1 for more detailed descriptions).

Mean LCF scores at admission were 1.9 ± 0.7 and 2.3 ± 0.7 for patients with and without ES, respectively. Mean LCF scores after three months were 3 ± 1.7 and 3.8 ± 2.1 for patients with and without ES, respectively. ANOVA showed a significant effect of the factor *time* ($F_{1,94} = 40.1$; $p < 0.001$), due to an overall improvement of the LCF scores in patients with and without ES ($p < 0.001$). Moreover, it showed a small yet significant effect of the factor *group* ($F_{1,94} = 4.1$; $p = 0.04$) due to the fact that the overall LCF score (at admission plus after three months) was lower in patients with ES than in patients without ES. Finally, the *group by time* interaction did not show any significant difference in the LCF variation after three months between patients with and without ES ($F_{1,94} = 1.2$; $p = 0.3$) (Fig. 1).