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Aetiology and outcome of generalized convulsive status epilepticus in elderly

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ABSTRACT

Purpose: Convulsive status epilepticus (CSE) is a common neurologic emergency in elderly people. The current study elaborates the clinical characteristics and outcome of CSE in elderly patients.
Methods: Analysis of data of generalized CSE patients, aged 60 years and above admitted at the neurointensive care unit (NICU) was performed. The primary outcome for analysis was in-hospital mortality. The study population was divided into groups based on progression of CSE and mortality to analyze difference in study variables. Mortality of the group was analyzed using life tables.
Results: A total of 33 patients satisfied the inclusion criteria from medical records of 212 patients with CSE. Mean age of the study population was 67.0 ± 6.8 years; 69.7% were men. Acute symptomatic aetiology was the commonest cause of CSE (60.6%); nine (27.3%) patients progressed to refractory status epilepticus (RSE) of which five patients had prolonged RSE. The overall mortality was 18.2%. Complications of mechanical ventilation and mean age were higher in patients who died. Though vascular aetiology was the leading cause of CSE (39.3%), it was not associated with progression to RSE or mortality. Acute symptomatic aetiology accounted for five out of the six deaths in the entire cohort.
Conclusion: Less than one-third of elderly patients with CSE progressed to RSE. Vascular aetiology, the leading cause of generalized CSE in elderly, was not associated with progression to RSE and mortality. Acute symptomatic aetiology was associated with high mortality.

1. Introduction

Up to 40% of all cases of status epilepticus (SE) have been reported in people aged 60 years and above [1]. In nearly one-third of the older patients, the first seizure presents as SE [2]. The incidence of SE in elderly is almost twice that of general population [3]. The most common aetiology of SE in elderly includes cerebrovascular disease, infection, degenerative disease, neoplasm and trauma [4]. Potential precipitating factors may be inadequate concentrations of antiepileptic medications, alcohol withdrawal, electrolyte imbalances and metabolic derangements [5]. Status epilepticus is nearly five times more common in elderly than young adults [6]. Variations exist in the reported incidence of SE in elderly with studies in Europe reporting an annual incidence of 26.2 per 100,000 people [3]; where as those from the United States report as high as 86 per 100,000 patients aged 60 years and above [1]. Most of the studies included all the types of SE in the analysis. However, little is known about the incidence of convulsive SE (CSE) in elderly among developing countries.

Principles in the treatment of SE in elderly are different from that employed in young adults [7]. In elderly, lower clearance rates and leaner body mass results in higher serum concentrations of anti-epileptic drugs (AEDs) [8]. High prevalence of co-morbid conditions like cardiac disease, hypertension, diabetes among elderly patients with SE is documented [7]. This increases the chance of potential adverse events possibly through alterations in mechanism of AEDs by medications prescribed for co-morbidities [7]. Therefore, the treating physician should consider the circumstances and aetiology. Encouragingly, pharmacotherapy if started promptly, most of the patients respond well and also lowers fatality rate [9].

Mortality due to SE is more common in elderly where people aged between 60 and 79 years and those above 80 years had 36% and 56% higher mortality than those aged under 50 years

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[10]. Clinical presentation, age and aetiology strongly predict outcome [3]. Towne et al. [3] have also reported 100% mortality in elderly patients with SE secondary to anoxia, where manifestations of SE are subtle. In patients with ischaemic brain injury, SE is shown to increase mortality by three times [11]. On the contrary, mortality rates are lower in elderly SE patients with aetiology of subtherapeutic dosages of AEDs [12].

Most of the existing literature on the epidemiology, clinical course and outcome of SE in elderly is from the developed world and includes non-convulsive SE also. However, fastest growth in the older age group has been revealed from both developed and developing countries like India where CSE in elderly is likely to become an important health problem [3,5]. The current study elaborates the clinical characteristics and outcome of CSE in elderly patients.

2. Material and methods

This open cohort was part of a larger epilepsy registry. Analysis of data of elderly patients aged 60 years and above [10] with generalized CSE admitted between May 2005, and November 2014 in the neurointensive care unit (NICU) of Krishna Institute of Medical Sciences, a tertiary care referral centre at Hyderabad in South India was performed. The study was approved after review by the Institutional Ethics Committee.

Patients aged below 60 years of age, those with complex partial SE, absence SE, simple partial SE, myoclonic SE, psychogenic SE, hypoxia related SE and non-convulsive SE were excluded for data analysis. The information about age, gender, duration of CSE, associated co-morbidities, past history of epilepsy and/or CSE was obtained. Aetiology of CSE was classified as acute symptomatic, remote symptomatic, those with pre-existing epilepsy and cryptogenic (cause undetermined) [13]. Acute symptomatic group included patients with central nervous system (CNS) inflammatory disease (presumed encephalitis, CNS infections), acute cerebrovascular CNS disease (ischaemic stroke, cortical sinus venous thrombosis), and those with metabolic aetiologies.

2.1. Definitions

Status Epilepticus was defined as seizures lasting for more than 5 min or recurrent epileptic activity over a period of more than 5 min without regain of pre-existing level of consciousness [1]. Refractory SE (RSE) was defined as SE resistant to one first line, and one second line AED, requiring general anaesthesia (GA) [14]. Prolonged RSE was defined as CSE that continues 24 h or more after the onset of anaesthesia, including those cases in which the CSE recurs on the reduction or withdrawal of anaesthesia [15,16]. If SE recurred days after withdrawal of anaesthetic drugs and warranted re-administration of similar drugs, the length of the NICU stay included the seizure free days too. Presumed encephalitis was defined as encephalopathy (depressed or altered level of consciousness) lasting >24 h with fever, and seizures along with one or more than one of the following symptoms: focal neurological deficits, cerebrospinalfluid (CSF) mononuclear pleocytosis, electroencephalogram (EEG) or neuroimaging findings consistent with encephalitis, after excluding systemic infective causes [17] and metabolic etiologies. All patients had baseline, and follow up CT/MRI brain.

2.2. Treatment

All the patients were treated according to established guidelines [15]. The initial treatment included benzodiazepines (lorazepam or midazolam) followed by intravenous AEDs (phenytion, phenobarbitone, sodium valproate or levetiracetam alone or in combination). For GA thiopental, midazolam infusion was used. Continuous EEG monitoring was performed in 28 patients (including all patients who progressed to RSE). Appropriate management of the underlying medical/neurological condition was done.

2.3. Complications and outcome

Severe sepsis, acute kidney injury and acute hepatic failure were defined according to established guidelines [18]. The outcome was classified as death or discharge from the hospital.

2.4. Statistical analysis

After testing for the normal distribution of the data, the study population was divided into two groups based on progression of CSE and mortality. Differences between the groups for continuous variables were analyzed using independent Student's *t*-test, accounting for variance amongst group using Levene's test for equality of variance. Categorical variables were analyzed using chi-square test. A $p < 0.05$ was considered significant. Mortality of the group was analyzed using life tables. Statistical Package for Social Sciences (SPSS, ver. 17.0, IBM computers, New York, USA) was used for all statistical analysis.

3. Results

3.1. Demographic and clinical characteristics

During the study period, a total of 212 patients were admitted to the NICU with a diagnosis of CSE; of which, 33 (15.5%) were patients aged 60 years and above. The mean age of the study population was 67.0 ± 6.8 years; 69.7% were men. Six patients were aged 75 years and above. More than one third of the patients (36.3%) in the study group were known diabetics and nearly half (48.5%) of them were hypertensive. Nine (27.3%) patients progressed to RSE of which five patients had prolonged RSE (Table 1). There were no significant differences between CSE and RSE groups for demographic characteristics (Table 1). However, the mean age of patients who died was higher (65.9 ± 5.9 years vs. 71.8 ± 9.0 years; $p = 0.05$), the differences between groups divided based on mortality is summarized in Table 3.

3.2. Aetiology

Acute symptomatic aetiology accounted for 20 cases (60.6%); five had ischaemic stroke and one patient had cortical venous thrombosis. Thirteen (39.3%) patients had CNS vascular aetiology (ischaemic infarcts in 12 and cortical sinus venous thrombosis in one) and another eight had metabolic aetiology. Six (18.2%) patients had an aetiology of infections of CNS. Focal cerebral calcification and gliosis were observed in one patient each. Amongst the remote symptomatic group, seven patients had vascular aetiology. Aetiology did not differ when the study population was divided into groups based on progression of SE (Table 1) and mortality (Table 3). Acute symptomatic aetiology, did not increase the odds of progression of SE to RSE (OR 1.33, 95% CI 0.28–6.30; $p = 0.509$). Similarly, vascular aetiology also did not increase the odds of progression to RSE (OR 2.96, 95% CI 0.50–17.29; $p = 0.263$).

3.3. Clinical course and complications

In the entire cohort, 12 patients required mechanical ventilation of whom six had evidence of pneumonia. The mean duration of mechanical ventilation was 3·6 ± 6.7 days in the entire cohort. The