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Full Length Research Paper

Successful management of status epilepticus in a resource poor environment

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Abstract

Despite the severe lack of resources, SE (status epilepticus) can be successfully managed in a resource poor environment like Liberia. However to achieve this, injectable anticonvulsants beyond oral benzodiazepines must be readily available to make a successful therapeutic outcome possible. Additionally, active and very serious national public health education including national seizure awareness, treatment availability and health literacy campaigns are urgently necessary in Liberia to disabuse patients and their families from relying on scientifically untested and unproven traditional herbs used by traditional herbalists who have no knowledge of the pathomechanisms of epilepsy and other neurologic diseases. These two efforts will go a long way to improve the epilepsy awareness and treatment landscape in Liberia with attendant improved epilepsy stigma reduction, reduced epilepsy associated morbidity and mortality and ultimately improved survival rates from status epilepticus in Liberia.

Keywords: Status epilepticus; iv anticonvulsants; poor resources; herbalist; public health education; unscientific beliefs; depakoate; Keppra.

INTRODUCTION

Status epilepticus, (SE) a life threatening neurologic emergency with high morbidity and mortality, remains a huge problem for people with epilepsy, especially its high mortality rate in people with epilepsy living in resource poor environments. Status epilepticus is clinically defined as a continuous seizure lasting more than thirty minutes or two or more seizures without return to full baseline consciousness **(1,3).** However given the current advancement in the understanding of seizure pathophysiology including GABA ergic associated mechanisms, status epilepticus should more appropriately be classified as continuous seizure lasting more than five minutes or two or more seizures occurring without returning to baseline mentation and functionality (2,4,6,15-18, Fig.1). Currently in most countries, early treatment of SE with benzodiazepines, followed by Keppra (levetiracetam) iv is the most commonly used strategy. It is estimated that a third of patients with SE will be refractory to first line medications which will require aggressive management with second line medications such as barbiturates, propofol or other agents(2). In developing countries where facilities with assisted mechanical ventilation are not readily available, as well as very limited anticonvulsants supply due to relatively high cost and availability, lack of an effective 911 and ambulance system, inaccessible roads, very limited financial resources of the majority of Liberian patients, mortality from SE, remains high. Data on epilepsy, let alone status epilepticus is virtually nonexistent for Liberia. Since the landmark study by Gadjusek et al in 1983, to the best of our knowledge, there has been no significant advancement in the diagnosis and treatment landscape of epilepsy in Liberia despite Liberia being generally

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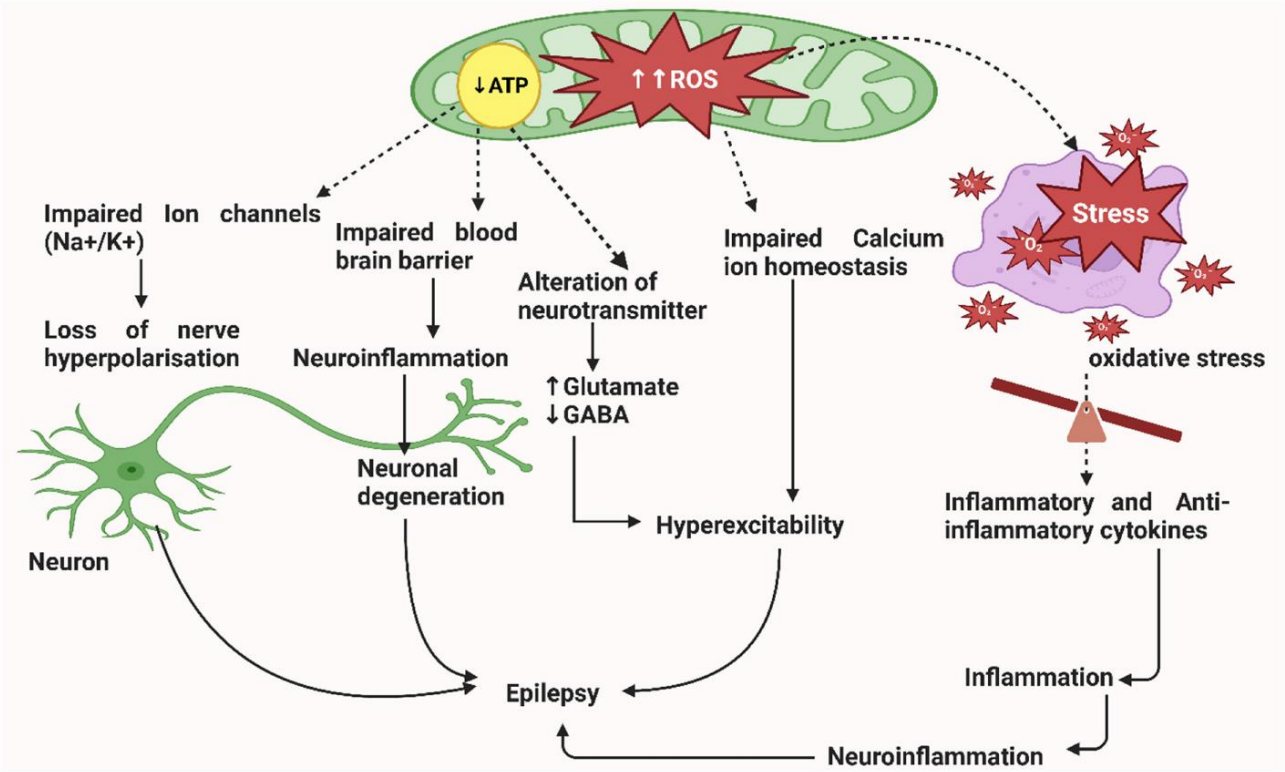
described as a country with a high prevalence of epilepsy (20,21). Given these challenging circumstances, it is important to use non sedating antiepileptic drugs (such as sodium valproate, levetiracetam, or topiramate) which however are not usually available in many third world countries due to cost issues. For example, the WHO Model List of Essential Medications 2011 edition in use in Liberia includes as anticonvulsants diazepam, phenytoin, phenorbabital and carbamazepine (WHO Model List of Essential Medicines, 2011). Newer versions of this recommended may be available but these are the currently available anticonvulsants In Liberia- with intermittent presence of Keppra. Additionally the patients' general conditions, metabolic and hemodynamic status must be attended to and stabilized. From different studies, mortality from SE varies from 3-50% in resource adequate countries. In elderly patients it is reported that refractory status epilepticus, ie lasting more than 1 hour, mortality rate is over 76%. The lifetime prevalence of SE in persons is estimated in the range of 1 to 16 percent. Precise epidemiologic data for seizures and SE are not existent for Liberia but some estimates put the mortality from SE in the range of over 90%. As per the literature, the incidence of SE in the USA rangefrom 6.2-18.3 per 100,000 population (5-7,9-14). Pseudo seizures are more fairly easily ruled out on astute clinical grounds in addition to video EEG recording and monitoring (whenever available) as well as by the inadavertent, prohibitively enormous societal stigma associated with epilepsy in many developing countries (8,19). Morbidity and mortality associated with prolonged SE include metabolic derangements, cardiac dysrhythmia, hyperthermia, pulmonary edema, autonomic dysfunction, rhabdomyolysis, permanent neurologic dysfunction, pulmonary aspiration and ultimately death.
We report herein the case of a pediatric patient with idiopathic generalized epilepsy who presented to our facility in Monrovia, Liberia, a resource poor country, with status epilepticus who was successfully managed, stabilized without neurologic nor hemodynamic sequela and discharged for outpatient followup.

CASE DESCRIPTION

Ms LY, was a 14 years old patient,41 kg, who was rushed to our center for admission by her father and other family members who was reportedly " jerking, convulsions, falling and inability to stand upright over the last three days". She was a patient who had been seen diagnosed and treated with anticonvulsants successfully at our medical center since early 2021. Her seizures were stabilized on oral Keppra bid dosing and was doing well for over a year. However, after a year, without any medically based decision making and relying more on ancient magical beliefs about epilepsy and its causations, her family abruptly stopped her medications, took her away from medical supervised treatment to seek care under a traditional herbalist in a remote village elsewhere. She was effectively lost to followup until her recent emergency presentation.
On presentation and visual inspection, she was a 14 years old girl, afebrile**,** atraumatic external milieu, but with continuous generalized seizures, semiconscious, with rapid eye blinking, unable to maintain an upright posture without assistance.
Vitals: Blood pressure: 104/60 mmHg; Heart rate: 85 bpm., Respiration; 16 bpm, Average pulse oxygenation over 92%.
Basic Labs: Malaria smear: No malaria parasite; Finger Blood sugar: 66 mg/dl. She was immediately put on a stretcher, wheeled to the emergency intake area. Due to the lack of injectable diazepam or lorazepam, Divalproex sodium 1 gram in 100 mg glucose 5% iv solution was immediately constituted and administered over a 30 minutes period. Manual aeriation techniques were used at all times to maintain adequate oxygenation during the course of her treatment. Her vitals were simultaneously monitored throughout and they were stable throughout without any errant values. After about an hour of vigilant observation, patient gradually began to arouse and was fully conscious after 2 hours and 52 minutes. She was monitored closely and once she was able to swallow her spit and swallow, she was given Keppra 500 mg orally without complications and then given a regimen of multivitamin qd and Erythromcin 500 mg po qd x 5 days in addition to Keppra 500 mg po bid. After several hours of supervision she was discharged home for outpatient followup.

DISCUSSION

Despitethe severe lack of resources, SE (status epilepticus) can be successfully managed in a resource poor environment like Liberia. However to achieve this, injectable anticonvulsants beyond oral benzodiazepines must be readily available to make a successful outcome possible. To the best of our knowledge, this is the first time that IV divalproex was used in the treatment of status epilepticus in Liberia due to the severe shortage of oral anticonvulsants, let alone injectable anticonvulsants. Adequate seizure control in people with epilepsy and successful management of status epilepticus are possible in Liberia if adequate injectable and oral anticonvulsants are available and health care professionals are sufficiently trained in current strategies of seizure and SE management. Additionally, active and very serious national public health education specifically epilepsy awareness, treatment availability options and overall improved health literacy is urgently necessary in Liberia to disabuse patients and their families from relying on scientifically untested and unproven traditional herbs used by traditional herbalists who have no knowledge of the pathomechanism of epilepsy and other neurologic diseases. These two efforts will go a long way to improve the epilepsy



treatment landscape in Liberia with attendant improved survival rates and overall very much improved quality of life of people living with epilepsy in Liberia.

Figure 1. Brief mechanism of the pathophysiology of epilepsy. Different pathways can induce this; for example, oxidative stress due to an increased circulating reactive oxygen species (ROS), which results in imbalanced inflammatory cytokines. The latter stimulates inflammation and subsequently leads to neuroinflammation. Similarly, ROS can impair calcium ion metabolism, resulting in neural hyperexcitability. The loss of mitochondrial adenosine-triphosphate (ATP) has also been implicated in the pathogenesis of epilepsy. This seems to occur in three different pathways; for instance, the alteration of neurotransmitters due to the lack of ATP can induce neural hyperexcitability by increasing glutamate and the reduction of gamma-aminobutyric acid (GABA) in a mitochondrion. Secondly, less ATP impairs the sodium and potassium ion channels, resulting in nerve depolarisation. On the other hand, the impaired brain–blood barrier (BBB) also triggers neuroinflammation, causing neural degeneration. Altogether, these mechanisms cause neuronal degeneration, which facilitates the pathogenicity of epilepsy (Wesół-Kucharska, D.; Rokicki, D.; Jezela-Stanek, A. Epilepsy in Mitochondrial Diseases—Current State of Knowledge on Aetiology and Treatment. *Children* 2021, *8*, 532).

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Appendix;
Figure culled from (Phoswa, W. N, Mogkalaboni, K., Immunologic Imbalances Associated with Epileptic Seizures in Type 2 Diabetes Mellitus, Bran Sci 2023, 13(5)) to illustrate basic pathomechanism of epileptic seizure.