A 72 year old woman is brought to the ED by EMS with altered behavior and unusual movements. She was preparing for bed when she was noted to be acting in a peculiar manner. The patient is unable to speak and is having jerking muscular movements. The patient has no history of seizures. There is a history of stroke two years previously with residual mild right-sided hemiparesis. There is no history of trauma. The patient has a history of hypertension and takes a diuretic.

On physical examination her vital signs are blood pressure 120/80, pulse 90, respiratory rate 14, temperature 99, pulse oximetry 98% saturated on supplemental oxygen. She appears alert with her eyes open but is unable to speak. She does appear to look towards the examiner when questions are asked but is unable to follow commands and gives no clear sign of understanding the commands. The right side of the patient’s face, her torso, and her right upper extremity are having a continuous rhythmic motion [see video]. Cranial nerves appear intact with the exception of facial twitching. Deep tendon reflexes are difficult to obtain because of movements.

Questions:

1. Is the patient having a seizure? What type?
2. What is a basic classification of seizure types?
3. What is status epilepticus and when is status epilepticus a medical emergency?
4. When is an EEG indicated in the emergency department?
Learning Points

1. What is status epilepticus?
   Typically status epilepticus is defined as 30 minutes of continuous seizure activity
   or a series of seizures without return to full consciousness between the seizures. Many feel that pathophysiologic studies suggest that a shorter period of seizure activity causes neuronal injury and suggest 20 minutes or briefer times define status epilepticus. A consensus panel states that aggressive treatment for generalized convulsive status epilepticus should be initiated when a seizure has persisted 10 minutes and further states that patients still seizing on arrival to the emergency department should be aggressively treated. There is controversy in the term “nonconvulsive status epilepticus” (NCSE). Currently, nonconvulsive status epilepticus is best reserved for absence status epilepticus and partial complex status epilepticus. The term “subtle status epilepticus” is more correctly used to indicate patients that have evolved from generalized convulsive status epilepticus or are in a comatose state with epileptiform activity.

2. Why is status epilepticus a medical emergency?
   Generalized tonic-clonic (GTC) status epilepticus injures the brain even if acidosis, ventilation, and hemodynamic factors are controlled. Studies indicate that the longer GTC status continues, the less likely it is to terminate spontaneously. Secondary complications may further injure the brain.

3. When is an EEG indicated in the emergency department?
   Recommendations have been made to obtain emergency EEG for persistent altered consciousness, refractory status epilepticus, pharmacologically managed sedation and coma, and for the diagnosis of viral encephalitis as well as for a variety of other clinical conditions including coma and brain death.

4. The most compelling argument for emergent EEG is for the detection of generalized convulsive status epilepticus that may have evolved into subtle status epilepticus with continuing abnormal electroencephalographic discharges. In spite of recommendations, a recently published multicenter survey of management of patients with seizures revealed that EEG was uncommonly performed in ED’s and only rarely in the ED for the indication of status epilepticus. A survey of medical directors of accredited North American clinical EEG laboratories and directors of facilities offering accredited EEG fellowships revealed that the majority of facilities required neurologic consultation or other specialized consultation before emergent EEG could be obtained.

   In spite of recommendations, no clear guidelines mandate EEG use by emergency physicians. Neurologic consultation is the pathway for assistance in problematic cases.
What is status epilepticus and when is status epilepticus a medical emergency?

A publication by the World Health Organization defined status epilepticus as “a condition characterized by an epileptic seizure that is sufficiently prolonged or repeated at sufficiently brief intervals so as to produce an unvarying and enduring epileptic condition.” Typically, status epilepticus is defined as 30 minutes of continuous seizure activity or a series of seizures without return to full consciousness between the seizures. This definition is imprecise and investigators in the area often use their own criteria. Note that these definitions are based on clinical observations rather than EEG or any other physiologic monitoring. Many feel that pathophysiologic studies suggest that a shorter period of seizure activity causes neuronal injury and makes seizure self-termination unlikely and suggest 20 minutes or briefer times define status epilepticus. A consensus panel states that aggressive treatment for generalized convulsive status epilepticus should be initiated when a seizure has persisted 10 minutes and further states that patients still seizing on arrival to the emergency department should be aggressively treated. Other investigators note that the chance of a seizure self-terminating without interventions decreases as the seizures continue for as short a period as 4 minutes. The implications of this shortened time definition are great for emergency services; many more dispatches for seizures should be treated as status epilepticus.

One useful way to sort status epilepticus (SE) is to divide SE into classifications similar to seizures. The term “simple” in this scheme implies that an isolated area of the cortex is involved with resulting focal motor, sensory, special sensory, or other phenomena with full consciousness preserved. Again, the term “complex” in seizure classification means that consciousness is altered. The term “generalized” means that the abnormal electrical activity involves all areas of the cortex; motor movements are typically seen but notable exceptions exist as describe below. One seizure type may evolve into another seizure type. For example, a simple motor seizure may evolve into a complex partial seizure with altered consciousness; at times this state may persist for hours or days with minimal or no associated motor activity; the terminology for this would be “partial complex status epilepticus.”

Absence seizures (also known as petit mal) are a primarily generalized seizure type involving all cortical areas at once; this is typically a seizure disorder of childhood with a characteristic EEG pattern. At times, absence seizures may persist with minimal motor movements and altered consciousness for hours or days. Absence status epilepticus and complex partial status epilepticus are often grouped under the term “nonconvulsive status epilepticus” and are referred to at times as twilight or fugue states.

There is controversy in the term “nonconvulsive status epilepticus (NCSE). Currently, nonconvulsive status epilepticus is best reserved for absence status epilepticus and partial complex status epilepticus. The term “subtle status epilepticus” is more correctly used to indicate patients that have evolved from generalized convulsive status epilepticus or are in a comatose state with epileptiform activity.
Table—Clinical classification of status epilepticus

overt generalized convulsive status epilepticus (continuous convulsive activity and intermittent convulsive activity without regaining full consciousness)

subtle generalized convulsive status epilepticus following generalized convulsive status epilepticus with or without motor activity

simple status epilepticus (consciousness preserved)
  simple motor status epilepticus
  sensory status epilepticus
  aphasic status epilepticus

nonconvulsive status epilepticus (consciousness impaired; twilight or fugue state)
  petit mal status
  complex partial status epilepticus

Table—Classification of status epilepticus according to need for aggressive treatment

Status Epilepticus Requiring Immediate, Aggressive Treatment
Continuous generalized convulsive activity with impaired consciousness lasting greater than 5 minutes*

Serial seizures without return to full consciousness between seizures

Subtle generalized convulsive status epilepticus- coma with minimal or no associated motor activity †
  -consider if post-ictal state is not improving in 20 minutes*
  -may evolve from generalized convulsive status epilepticus

Status Epilepticus That Possibly Benefits From Aggressive Treatment
(evidence of CNS injury from seizures is not as clear)
complex partial status epilepticus (twilight or fugue state)†

Status Epilepticus Requiring Treatment, Time Indeterminate
(no data to suggest that rapid cessation of seizures is necessary to prevent neuronal injury)
Absence status epilepticus (spike-wave status epilepticus)†
simple motor status epilepticus (epilepsia partialis continua)†

*time is arbitrary; see text for details
†EEG may be required for diagnosis
When is an EEG indicated in the emergency department?

Are there clinical conditions that are time-critical and when information obtainable only from an EEG will immediately will influence management and outcomes? Recommendations have been made to obtain emergency EEG for persistent altered consciousness, refractory status epilepticus, pharmacologically managed sedation and coma, and for the diagnosis of viral encephalitis as well as for a variety of other clinical conditions including coma and brain death.

The most compelling argument for emergent EEG is for the detection of generalized convulsive status epilepticus that may have evolved into subtle status epilepticus with continuing abnormal electroencephalographic discharges. Some have noted that nonconvulsive status epilepticus may persist after control of generalized convulsive status epilepticus and suggest that EEG monitoring be immediately available after the control of convulsive status epilepticus. Continuous EEG monitoring for patients with status epilepticus that is refractory to optimal doses of a benzodiazapine and phenytoin is recommended as well.

In spite of recommendations, a recently published multicenter survey of management of patients with seizures revealed that EEG was uncommonly performed in ED’s and only rarely in the ED for the indication of status epilepticus. Most EEG’s were performed at one institution in the study likely reflecting local practice pattern. A survey of medical directors of accredited North American clinical EEG laboratories and directors of facilities offering accredited EEG fellowships revealed that the majority of facilities required neurologic consultation or other specialized consultation before emergent EEG could be obtained.

Case Outcome

The patient was treated with a parenteral benzodiazepine (lorazepam) 2mg with seizure termination and return to alertness. Emergency EEG was not obtained. Parenteral phenytoin was then administered at 20mg/kg over one hour. CT scan showed evidence of an old stroke with no new lesions. She was discharged home on oral phenytoin after a brief stay in the hospital.
References


