

Short Note

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Posted Date: 29 December 2023

doi: 10.20944/preprints202312.2248.v1

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*Short Note*

# The Ultimate Shake Down: Epilepsy vs. Syncope

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**Abstract:** Epilepsy, a disorder of unprovoked recurring seizures, continues to be seen as a growing medical concern worldwide. It represents the most common, non-communicable brain disorder, affecting persons of all ages. Every year over five million persons are formally diagnosed with epilepsy when seeking medical care. Often diagnosed as a young child, most persons can live a seizure-free life once there is an early diagnosis, proper patient education, and keen clinical management. However, the reoccurrence of status epilepticus, a neurological emergency, can be linked to untreated underlying causes and lead to serious morbidity and even early mortality if not properly managed. The prognosis is heavily reliant on the discovery of the underlying cause. Epilepsy, in recent times, provides a terminology for ease of identification of the associated clinical symptomology. Epilepsy, an umbrella term, can manifest differently as either idiopathic, symptomatic, or cryptogenic. However, distinguishing epilepsy from other seizure mimics is critical to preventing complications. Epilepsy research, like many other neurological symptoms, is limited in low-resource areas. Therefore, through greater awareness of epilepsy and public education campaigns, better health outcomes can be achieved. There is huge utility in clear communication of medical information among healthcare providers as well as in optimizing treatment plans.

**Keywords:** epilepsy; seizure; syncope; loss of consciousness

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## Main body:

Worldwide, the sudden visualization of shaking about the body is immediately associated with or labeled as seizures. Seizures, one of several well-known paroxysmal spells, are thought to be a direct indication of neurological abnormality. However, not every convulsive-like movement necessarily represents a seizure or moreover a chronic neurological abnormality known as epilepsy.

A seizure is defined as an uncontrolled, hypersynchronous activity of cortical neurons that results in transient neurological symptoms such as changes in memory, behavior, level of consciousness, and feelings [1]. Though visually alarming, not every seizure is one requiring emergency hospital intervention. Distinguishing seizures from other key differentials is essential to proper patient care as epileptic seizures only represent one type of paroxysmal event.

Epilepsy is a chronic medical condition of recurrent unprovoked seizures [2]. It represents the most common, non-communicable brain disorder in the world. This translates to about 61.4 per every 100,000 persons being diagnosed with epilepsy [3]. Epilepsy is more commonly seen in the young and elderly. Interestingly, epilepsy is not restricted to just one age group though it tends to peak in the elderly [4]. The elderly have a higher frequency of neurological challenges such as cerebrovascular disease or other key factors such as brain malignancies, stroke, and neurodegenerative diseases and thus are more likely to show occurrences of epilepsy. The incidence and prevalence are slightly higher in men compared to their female counterparts [4]. Every year over five million persons are formally diagnosed with epilepsy when seeking medical care.

To formally diagnose epilepsy, a patient should reach the minimum number of at least one of the developed qualifiers for diagnosis. Firstly, the patient should have at least two reflex or unprovoked seizures occurring greater than twenty-four hours apart [5]. Secondly, the patient should

have one reflex or unprovoked seizure with a likelihood of additional seizures comparable to the general recurrence risk (at least 60%) after 2 unprovoked seizures that span over the next 10 years; and a diagnosis of epilepsy syndrome [5].

Key to understanding the basis of epilepsy is being able to distinguish between provoked and unprovoked seizures. An unprovoked seizure refers to a seizure that occurs in the absence of a precipitating factor [6]. This suggests that there is no clear etiological or risk factor that leads to the manifestation of seizures. In instances where more than seven days have elapsed after an acute injury would also suggest an unprovoked seizure [6].

The causes of epilepsy vary. They can be the result of an acute central nervous system insult that can be categorized as either systemic, structural, metabolic, or even toxic. For instance, electrolyte disturbances such as hyper and hyponatremia, hypoglycemia, and hypocalcemia can lead to epilepsy [7]. Acute complications of drug use such as antidepressants and sympathomimetics can result in convulsions. Trauma such as hypoxic and traumatic brain injury, and hemorrhagic and ischemic strokes are causative agents [7,9]. Similarly, sleep deprivation, sepsis, central nervous infections, and neoplasm are causes [8,9]. Even inflammation such as via encephalitis, lupus cerebritis, and lastly a febrile state can trigger convulsions [9].

Often, seizures can be incorrectly diagnosed as syncope. This is because the symptomology can be similar and without a detailed account of the preceding events, misdiagnosis can occur. Syncope refers to the abrupt, transient, complete loss of consciousness that often results from cerebral hypoperfusion [10,18]. However, arriving at a diagnosis of syncope can often not be so clear-cut. There is a concept called convulsive syncope in which a patient may also have tonic posturing, clonic movements, or even myoclonic jerks or convulsions that mimic that of epilepsy during an event in question [12]. This change which triggers the medullary reticular formation can result in myotonic activity similar to that witnessed during a seizure.

Before convulsions, syncope can also mimic the aura occurring right before seizures. In this prodrome phase, a patient may complain of a constellation of symptoms that can include diaphoresis, nausea and abdominal pain, palpitations, visual and auditory disturbances, pallor, and lightheadedness [11]. To the untrained eye, this can lead to confusion or misdiagnosis as the clinical symptoms can appear to be very similar. Similarly, both conditions can occur acutely or abruptly with unpredictability. This startling nature of events can lead to poor recollection of the details either by the patient or historian due to the mental shock and fear that occur during the event. In some instances, syncope can also have urinary incontinence and oral automatisms that can add to the muddle [11].

Vasovagal syncope can be characterized by a loss of consciousness, circulatory impairment due to a loss of cardiovascular autonomic control, and EEG changes [17]. While in both seizures and syncope, there were jerks and tonic posturing observational studies reflect constant differences. In assessing convulsions. There were several key concepts to note. Syncope reflected less jerking and rhythmic action than syncope. Some doctors implement the 10/20 rule in which they believe less than 10 jerks would be more suggestive of syncope and more than 20 jerks being attributed to convulsive seizures. However, this is purely a suggestive means of suggesting a diagnosis and cannot be a standalone tool for diagnosis.

Syncope results from a wide range of causes as well. However, syncope can be the direct result of hemodynamic instability. Most times, syncope is often attributed to cardiovascular abnormalities [13]. This can include but is not limited to, abrupt orthostatic change and structural cardiovascular abnormalities such as outflow tract obstruction seen in aortic stenosis, pulmonary stenosis, hypertrophic obstructive cardiomyopathy, and also arrhythmias [13]. In addition, understanding the triggers that bring about the qualifying event can help to direct the clinical course. Seizures tend to have a longer identifiable trigger and can be followed by postictal confusion and fatigue.

But these two conditions are not mutually exclusive. Seizure activities can occur in about one-fifth of syncopal episodes. Similarly, occult cardiac etiology can be linked to seizures. In acute settings such as the emergency rooms, these not-so-frequent presentations can be confusing and lead to misdiagnosis if not evaluated appropriately [14]. There is also a small subset of the population that

is later discovered to have drug-resistant epilepsy and run the risk of not properly being treated or diagnosed [14]. When reviewing a patient suspected of having a seizure and having a pre-existing history that points to a cardiac condition such as coronary artery disease or left bundle branch block, an electrophysiology consult should be considered and become a part of the overall management of the patient the patient gets multi-disciplinary comprehensive care.

Distinguishing between syncope and epilepsy often depends on a detailed history and examination supported by investigations to confirm the working diagnosis. This often includes imaging such as video telemetry with simultaneous electroencephalogram and electrocardiogram readings [16]. An EEG, for syncopal episodes, however, is likely to show normal brain activity as compared to epileptiform brain activity seen in seizures [16]. In some instances, a consult from the cardiology or neurology teams can help to make clinical care optimal in more daunting cases. In more advanced centers, a head-up tilt table test (HUT) can be carried out [15]. This test aids in the identification of neurocardiogenic syncope. However, it can also diagnose other conditions such as orthostatic hypotension and autonomic dysfunction. When a baseline Head-up tilt table test is done, the patient is strapped to a table upright between 60 to 80 degrees for a minimum of 10 minutes and up to 45 minutes to carry out the testing [15]. Most healthcare facilities implement a protocol encouraging the use of intravenous isoproterenol to provoke a neurocardiogenic response. It is important to note however that this drug is contraindicated in coronary artery disease. An alternative medication, a sublingual nitroglycerin can be given instead.

It is no surprise that this can prove to be difficult in low-resource settings where the extensive catalog of imaging and investigations is not available. In these settings, there is a greater reliance on the clinical aptitude of the physician to determine the exact cause and distinguish the difference without the luxury of extensive imaging modalities.

There are also financial implications to misdiagnosis. An incorrect diagnosis can first result in continuous hospitalizations. In most countries, healthcare costs continue to rise, and repeated investigations can be costly. In addition, it can cause significant loss for the patient. This can result from increased sick time, extended time away from work or school, and a major financial loss. This can put an unnecessary strain on the healthcare system, which in most instances can already struggle with high volumes of patients through the emergency room. If litigation occurs, this can have a further financial cost to the healthcare facility.

Overall, distinguishing between syncope and seizures can be challenging initially. The exact mechanism for vasovagal syncope is not clearly understood. This can result in challenges in clearly defining the mechanism of injury. For some, they postulate the failure of sympathetic efferent vasoconstrictor traffic that is believed to result from a trigger such as pain, anger, or fear. This is a contrast to seizures that can be the result of a wide range of underlying causes [17]. However, with continued clinical experience and the refinement of core clinical skills such as history taking and physical examination, this key skill can become more developed. The reliance on ECGs, ECHOs, and basic laboratory investigations is less important when these advanced skills exist.

## **Conclusion:**

An episode of acute convulsion can be an alarming and scary encounter for most people. However, in the acute setting, it can be equally as daunting to not be able to distinguish an epileptic episode from vasovagal syncope accurately. Both conditions have similarities such as brief loss of consciousness, tonic posturing, and convulsions. It is also possible that both conditions can occur simultaneously. However, a strong clinical evaluation begins with the standard history taking and physical examination if done correctly can help to accurately distinguish between syncope and seizures. Imaging modalities such as EEG, ECG, and HUT can further help to confirm the diagnosis. Respective consults to Neurology and Cardiology can also be utilized in situations of doubt or pre-existing conditions that muddle judgment.

**Funding and Sponsorship:** "None of the authors have a financial interest in any of the products, devices, or drugs mentioned in this manuscript."

**Ethical Statement:** Being a Short note, there were no ethical issues and IRB permission is not required.

**Conflicts of interest:** The authors declare no conflict of interest.

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