

Seizures and Epilepsy: Review Questions

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QUESTIONS

Choose the single best answer for each question.

Questions 1 and 2 refer to the following case.

A 28-year-old woman is brought to the emergency department (ED) by ambulance after she developed a generalized convulsive seizure at home. She has had neck stiffness and fever for the past several days and has been somewhat confused and not “acting like herself.” The patient is still convulsing when she arrives in the ED 20 minutes later.

1. Which anticonvulsant should be used to treat this patient?

- (A) Lorazepam 0.1 mg/kg intravenously (IV)
- (B) Phenobarbital 20 mg/kg IV
- (C) Phenytoin 7 mg/kg IV
- (D) Phenytoin 20 mg/kg IV

2. The patient stops seizing with institution of anticonvulsant therapy. A lumbar puncture is emergently performed, and analysis of the cerebrospinal fluid (CSF) reveals 9 white blood cells with a lymphocytic predominance, 32 red blood cells, a protein level of 63 mg/dL, and a glucose level of 65 mg/dL. An electroencephalogram (EEG) shows sharp wave discharges in the temporal lobes but no electrographic seizures. These EEG findings are most likely to result from infection by what organism?

- (A) *Cryptococcus neoformans*
- (B) Cytomegalovirus
- (C) Herpes simplex virus (HSV)
- (D) *Streptococcus pneumoniae*

3. A 21-year-old woman presents to the ED after experiencing a first-time convulsive seizure. A friend observed the patient suddenly falling at home and convulsing for 45 seconds. Afterwards, the patient

was lethargic for 15 minutes but then recovered completely without residual neurologic deficit. She sustained a tongue bite during the seizure and was incontinent of urine. What is the most appropriate next step in the management of this patient?

- (A) Initiate an antiepileptic drug
- (B) Obtain an EEG and a neuroimaging study
- (C) Obtain a serum neuron-specific enolase level
- (D) Perform a lumbar puncture for CSF analysis

Questions 4 and 5 refer to the following case.

A 25-year-old man presents to the neurologist for follow-up evaluation of epilepsy that started in his teens. The patient averages approximately 3 to 4 seizures per month. His seizures are preceded by a warning of déjà vu and a rising abdominal sensation, followed by lip smacking and speech arrest for 1 to 2 minutes and then postictal disorientation and amnesia.

4. What is this patient’s most likely diagnosis?

- (A) Atypical absence seizures
- (B) Gelastic seizures
- (C) Myoclonic absence seizures
- (D) Partial seizures originating in the frontal lobe
- (E) Partial seizures originating in the temporal lobe

5. Previous medications have included carbamazepine, valproate sodium, and topiramate, alone and in combination, but the patient continues to have frequent seizures. Two years prior, magnetic resonance imaging (MRI) of the brain showed a discrete lesion that was compatible with mesial temporal sclerosis (Figure). What is the most appropriate next step in this patient’s treatment?

- (A) Administer a different antiepileptic
- (B) Insert a vagal nerve stimulator
- (C) Obtain an EEG
- (D) Refer to an epilepsy surgery center
- (E) Repeat MRI of the brain

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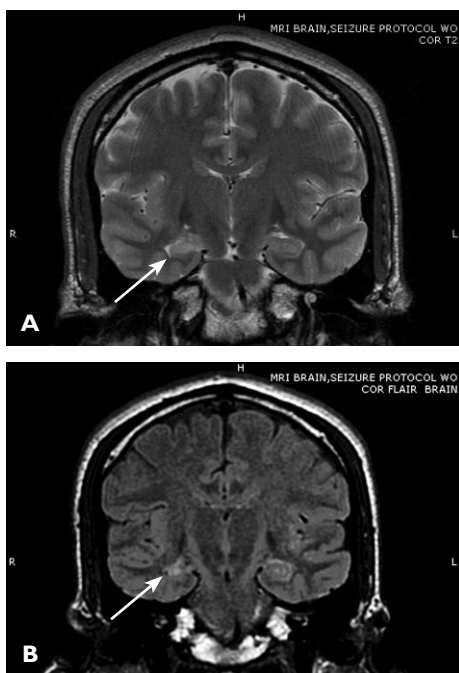


Figure. Coronal T2-weighted and fluid-attenuated inversion recovery magnetic resonance imaging of the brain of the patient described in questions 4 and 5 showing (A) decreased volume of the right hippocampal formation and (B) abnormal increased signal in the right hippocampus associated with white matter thinning (arrows).

Questions 6 and 7 refer to the following case.

A 23-year-old woman with a history of epilepsy is in a new relationship and seeks advice about birth control. Her first seizure was a generalized tonic-clonic seizure that occurred on awakening from sleep 2 years ago. Two EEGs and an MRI of the brain were unremarkable. A second seizure occurred 6 months later. She was started on valproate sodium and has since been seizure-free. She has considered many available options and conveys that her preferred method of birth control is a combined oral contraceptive pill.

6. Which of the following is an appropriate recommendation regarding birth control in this patient?

- (A) Discontinue valproate sodium and monitor for seizure recurrence
- (B) Take a birth control formulation containing at least 50 µg of ethinyl estradiol
- (C) Take a progesterone-only pill instead
- (D) There is no interaction between valproate sodium and oral contraceptive pills

7. Three years later, the patient states that she wants to stop birth control and start a family. She has not had

any seizures and remains on valproate sodium. What is the most appropriate next step in this patient's care?

- (A) Add a second antiepileptic drug since pregnancy may affect seizure control
- (B) Continue valproate sodium and begin folic acid supplementation
- (C) Discontinue valproate sodium and monitor for seizure recurrence
- (D) Obtain a repeat EEG and MRI to help guide decisions on continued use of valproate sodium prior to pregnancy
- (E) Switch from valproate sodium to another antiepileptic drug to reduce teratogenic risk

ANSWERS AND EXPLANATIONS

1. (A) **Lorazepam 0.1 mg/kg IV.** This patient has status epilepticus (SE), which is traditionally defined as a single seizure or series of seizures lasting 30 minutes or more in which the patient fails to regain consciousness between the seizures. Any seizure lasting more than 5 minutes is unlikely to stop on its own, and treatment should be initiated immediately. The initial care of a patient in SE includes airway assessment, establishing an intravenous line, monitoring hemodynamic status, aggressive supportive care, and assessing and treating any underlying metabolic, toxic, and infectious etiologies. Benzodiazepines (eg, lorazepam) are first-line therapy for SE because they are widely available, can be administered quickly, have rapid onset of action in the central nervous system, and have proven efficacy for SE. Phenytoin is recommended when a benzodiazepine fails to stop SE, and the recommended starting dose is 20 mg/kg IV at a maximal rate of 50 mg/min.¹ Calculating the appropriate dose is important because a standard loading dose of phenytoin (ie, 1000 mg or 14.3 mg/kg for an adult weighing 70 kg) is often inadequate and may prolong seizure and increase the risk of morbidity and mortality. Phenobarbital is typically used after benzodiazepines and phenytoin fail to relieve SE.
2. (C) **HSV.** Of the organisms mentioned, HSV has a predilection for the limbic system of the temporal lobe and is most likely to cause sharp wave discharges in the temporal lobes but no electrographic seizures on EEG. In a majority of cases of herpes simplex encephalitis, the EEG is abnormal and shows focal temporal changes known as periodic lateralized epileptiform discharges, which consist of repetitive spike or sharp wave discharges that are focal or lateralized over 1 hemisphere, recur at intervals of 0.5 to 5 seconds, and continue throughout most of the duration of an

EEG. Periodic lateralized epileptiform discharges are often seen in the setting of unilateral lesions such as cerebral infarctions, encephalitis, or tumors.

3. **(B) Obtain an EEG and a neuroimaging study.** A first unprovoked convulsive seizure is a common neurologic presentation in the ED. The clinician faces the challenge of determining if the patient with a single seizure is predisposed to epilepsy, which is defined as 2 or more unprovoked seizures, and if an antiepileptic drug should be initiated to reduce the probability of recurrence. Approximately 40% to 50% of patients will experience recurrence after their first unprovoked seizure.² A recent practice parameter issued by the American Academy of Neurology and American Epilepsy Society recommends that an EEG and a neuroimaging procedure (computed tomography [CT] or MRI of the head) be obtained in the diagnostic evaluation of an adult with a first unprovoked seizure.² EEG is performed to assess for electrical abnormalities of the cortex of the brain such as spikes or sharp waves, which, if present, may be consistent with the diagnosis of epilepsy. In addition, abnormalities may suggest if the epilepsy syndrome is partial or generalized and thus guide the selection of an appropriate antiepileptic drug. MRI is superior to CT for identifying epileptogenic lesions.² A higher risk of seizure recurrence after a first unprovoked seizure is associated with an abnormal neurologic examination, presence of a structural abnormality on neuroimaging, or abnormality on EEG. If 1 or more of these risk factors are present, the clinician may be more likely to recommend an antiepileptic drug. However, in the absence of risk factors, other factors may need to be taken into account. For example, a patient on anticoagulation might be at particularly high risk of significant injury if a seizure were to recur, and the clinician may lean towards treating this individual even if MRI and EEG were normal. There are insufficient data to support obtaining a neuron-specific enolase level (an enzyme released into the CSF when neural tissue is injured) in the routine evaluation of an adult presenting with an apparent first unprovoked seizure. A lumbar puncture is not necessary unless there is suspicion for an infectious or inflammatory process involving the central nervous system. This is unlikely in the case patient since consciousness was rapidly regained with resolution of the seizure.

4. **(E) Partial seizures originating in the temporal lobe.** Temporal lobe epilepsy is the most common form of epilepsy and has a characteristic presentation. An

epigastric, emotional (eg, fear), or olfactory aura may be present. The complex seizure often begins with arrest and stare, and oroalimentary and complex automatisms are common. Posturing of 1 arm may occur contralateral to the seizure focus. The postictal phase is usually notable for disorientation and amnesia. Two types of temporal lobe seizures are recognized: (1) mesial temporal lobe epilepsy, which arises in the hippocampus, parahippocampal gyrus, and amygdale; and (2) lateral temporal lobe epilepsy, which arises in the neocortex. Atypical absence seizures are characterized by prolonged staring and confusion and are commonly seen in children with mental retardation. Gelastic seizures typically manifest as sudden, unprovoked outbursts of emotion, usually laughter. Myoclonic absence seizures manifest as abrupt-onset disorientation and/or unresponsiveness accompanied by bilateral rhythmic myoclonic jerks of severe intensity. Three types of frontal lobe seizures are recognized: (1) those with supplementary motor seizures, (2) those with focal motor seizures, and (3) those with complex partial seizures. Staring unresponsiveness, tonic posturing, and bicycling movements are common manifestations of frontal lobe seizures.

5. **(D) Refer to an epilepsy surgery center.** Referral to an epilepsy surgery center should be considered as soon as first-line antiepileptic therapies become ineffective.³ Only 3% of patients with refractory seizures on 1 drug become seizure-free when taking 2 or more drugs,³ highlighting that continued attempts to treat patients with more drugs or combinations of drugs may not be beneficial. In mesial temporal lobe epilepsy, surgery is superior to prolonged medical therapy. In a study by Wiebe et al,⁴ the cumulative proportion of patients who were free of seizures that impaired awareness at 1 year was 58% in the surgical group and 8% in the medical group ($P < 0.001$). Patients who received surgery had fewer seizures that impaired awareness and had a significantly better quality of life as compared with patients who received antiepileptic drugs ($P < 0.001$ for both comparisons).⁴
6. **(D) There is no interaction between valproate sodium and oral contraceptive pills.** Some antiepileptic drugs, such as phenobarbital, primidone, phenytoin, carbamazepine, oxcarbazepine, and topiramate, are enzyme inducers and have been shown to increase the metabolism of ethinyl estradiol and progestogens.⁵ However, valproate sodium does not have this interaction and contraceptive preparations in

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normal doses can be used in patients taking valproate sodium.

7. **(D) Obtain a repeat EEG and MRI to help guide decisions on continued use of valproate sodium prior to pregnancy.** Over 90% of women with epilepsy can expect good pregnancy outcomes. All antiepileptic drugs carry some risk of teratogenicity. However, valproate sodium has the clearest and highest risk of teratogenicity, with a malformation rate of 2 to 3 times greater than the expected rate.⁶ Recurrent seizures also pose some risk to the developing fetus. Because this patient has been seizure-free for an extended period, consideration should be given to withdrawing the antiepileptic drug before she attempts to become pregnant. A repeat EEG and MRI will help to determine this patient's risk of relapse if valproate sodium was discontinued. Antiepileptic drugs should only

be discontinued before pregnancy when the risk for relapse is low. Beginning folic acid supplementation is an important step to prevent neural tube defects in all women taking antiepileptic drugs (usually 1–2 mg/day).

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