

AN ADOLESCENT MALE WITH AN ARTERIOVENOUS MALFORMATION PRESENTING WITH REPRODUCIBLE SEIZURES

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□ Abstract -- The patient who presents with new onset seizure is a difficult but common problem in emergency medicine. It is more difficult to make a specific etiologic diagnosis when the seizure patient is without fever, focal neurological deficit, prior medical history, electrolyte or acid-base imbalance. Such a patient with new onset seizures presented to our emergency department. The seizures were induced by a specific right arm position. The patient's initial evaluation included a normal physical examination, screening chemistries, and an unenhanced computed tomography (CT scan) of the head. Subsequent contrastenhanced head CT scan and eventual magnetic resonance imaging (MRI) of the brain revealed a large arteriovenous malformation (AVM). The differential diagnosis of seizures is long and involved, but a majority of these diagnoses can be ruled in or out by simple and inexpensive screening examinations. Occasionally, more involved studies are indicated than the routine electroencephalogram (EEG) and CT scan. CT scan with contrast, angiography, and magnetic resonance imaging (MRI) may be required to elucidate the cause of the seizure. Of these, angiography and MRI are the most sensitive for AVM, but contrast CT scan is the most readily available with acceptable sensitivity and is therefore potentially more beneficial.

□ Keywords-arteriovenous malformation (AVM); seizure; pediatrics; case report

A 13-year-old male presented to the emergency department with new onset seizure. This occurred in conjunction with the patient's placing his right hand on top of his football helmet during football practice. His right arm became numb and paralyzed. He subsequently experienced a Jacksonian, then generalized tonic-clonic seizure. He was released after an unclear history as to the events as well as a normal physical examination, complete blood count, chemistries, and an unenhanced head CT scan were obtained (Figure 1). An electroencephalogram was scheduled for the next day. At home the patient was demonstrating to his parents how he had positioned his right hand over his head when, again, his right upper extremity became numb and paralyzed. His parents described an initial focal seizure of his right arm, followed by a generalized tonic-clonic seizure. Upon return to the emergency department, vital signs were normal, the patient was afebrile but postictal. No other neurological deficits were noted. The patient had no prior relevant medical history, no recent head or neck trauma, and no recent headaches or visual changes. A contrast-enhanced head CT scan as well as subsequent MRI revealed a large temporoparietal arteriovenous malformation (Figures 2 and 3). The patient was treated with Dilantin and admitted for further evaluation and therapy. A 2-year follow-up visit revealed that the family had opted to defer surgery but anticipates surgical resection when the patient is older. The patient continues to have occasional focal seizures, but oral medications (Tegretol and Depacote) have prevented any further generalized seizures. The consulting neurologist for the case has made the diagnosis of 'reflex sensory seizures,' which are seizures that are induced by a similar movement or activity (for example, playing cards, drawing, or typing) (1) and, given the location of the AVM, certainly could be induced by this particular arm position.

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DISCUSSION

The differential diagnosis of seizure is broad (2) (Table 1). Most causes are easily ruled out by simple screening examination (history, physical examination, complete blood count, chemistries, EEG, and CT scan). Other patients will require more expensive and invasive procedures, for example, lumbar puncture, contrast CT scan, electroencephalogram, or angiography, in order to make the diagnosis. In this case a noncontrast head CT scan was normal and an enhanced CT scan led to the proper diagnosis arteriovenous malformation.

Arteriovenous malformations are thought to be present in approximately 0.14% of the population. There is an equal male/female distribution, and the majority become symptomatic and present prior to the age of 40, with a peak incidence between 20 and 40 years of age (3,4). Cerebral hemorrhages and seizures are the leading clinical presentations. Although headache and some focal neurological deficits have been described (5,6), a computer-assisted review of

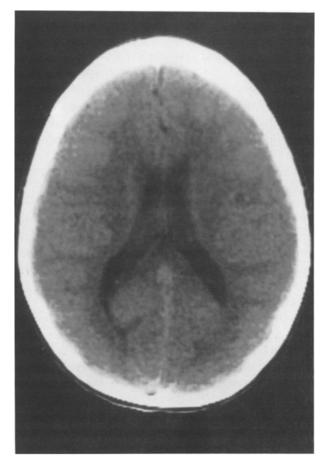


Figure 1. Cerebral CT scan without contrast.

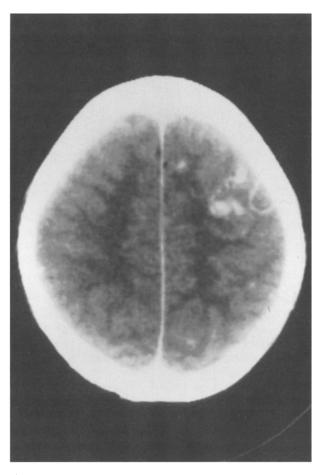


Figure 2. Cerebral CT scan with contrast.

the literature failed to reveal any reported case of a focal seizure induced by arm position. Symptoms increase in incidence during adolescence, menstrual periods, and pregnancy (7). Larger AVMs (>7 cm³) tend to present later in life, and seizure is often the presenting symptom. Smaller AVMs (<7 cm³) present earlier in life, and more often serious hemorrhage is the initial symptom (4,7).

The most accurate diagnostic test for AVM is angiography. In one study (9), angiography was sensitive in 100% of cases. That same study showed that an unenhanced CT scan was 86% sensitive, and contrast-enhanced CT scan was 93% sensitive. Electroencephalogram was useful with 88% sensitivity. In another study (8), of 50 patients with AVMs demonstrated by angiography, 8 patients had no findings suggestive of such on plain scan.

Emergency management includes anticonvulsants and neurosurgical consultation. The details of surgical therapy are beyond the scope of this paper, but the natural history of nonoperative AVM involves an incidence of bleeding in 1% to 4% of patients per

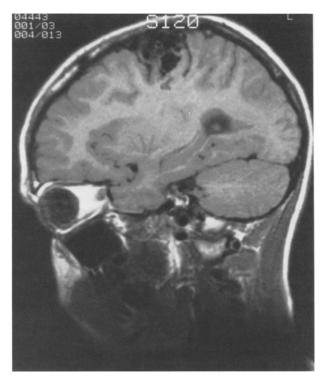


Figure 3. Cerebral MRI.

year and a 1% per year risk of death. Mortality associated with hemorrhage is approximately 10% for the initial event, 13% for the second bleed, and 20% for subsequent hemorrhages (4,9,10,11).

In conclusion, we have presented the case of an adolescent male with an arteriovenous malforma-

Table 1. Seizure Etiologies

Infections	
Meningitis	
Encephalitis	
Cerebral abscess	
Metabolic	
Hypoglycemia	
Electrolyte imbalances	
Hypoxia	
Poisonings	
Carbon monoxide	
Salicylic acid	
Ethanol	
Tricyclic antidepressants	
Cerebral vascular disorders	
Cerebral arterial thrombus	
Arteriovenous malformation	
Vasculitis	
Subarachnoid hemorrhage	
Trauma	
Increased intracranial pressure	
Subdural hematoma	
Intracerebral hemorrhage	
Cerebral neoplasm	
Idiopathic	
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tion, presenting with reproducible focal seizure initiated by arm position. The differential diagnosis for such a case is large, but many items may be eliminated by simple screening procedures. Although both MRI and angiography are more sensitive for AVM, a contrast-enhanced head CT scan is often more readily available, can differentiate between tumor, AVM, and intracranial hemorrhage, and is therefore of more benefit. The emergent treatment consists of anticonvulsant therapy and neurosurgical consultation.

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