

Value of MRI in the Evaluation of Patients with Seizures: An Illustrative Case

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Abstract

We describe a patient with a past medical history of hypoxic brain injury who presented with headache of three day's duration following a seizure. During the seizure, loss of consciousness and backward fall resulted in head trauma. Computerized tomography (CT) imaging demonstrated a subdural hematoma. Subsequent imaging with magnetic resonance imaging (MRI) revealed an additional mass lesion, suspected to be either a ganglioglioma or dysembryoplastic neuroepithelial tumor (DNET).

CASE REPORT

A sixty year-old man presented with complaints of headache posteriorly, as well as back and left-sided rib pain. He related that he had a seizure three days prior to presentation. During the seizure he lost consciousness and fell backward striking the back of his head on the ground. The patient complained of headache since that event. His history included hypoxic brain insult 38 years earlier during inadvertent inhalation of carbon monoxide. Since his hypoxic injury, the patient had cognitive problems identified as affecting abstract thinking and following complex commands. He also has a partial complex seizure disorder. As a result of his hypoxic injury, the patient was unable to provide further detailed history.

At the time of presentation, the patient was alert and oriented to person, place, and time. He followed simple commands but did not follow complex commands. Cranial nerves I-XII were intact. Strength was full, graded 5/5 throughout. Sensation was intact grossly to pin and light touch. Deep tendon reflexes were 1+ throughout with the exception of Achilles reflexes that were absent bilaterally. Babinskis were absent bilaterally. Cerebellar testing demonstrated no dysmetria on finger to nose.

The patient was found on admission to have a phenytoin level of 3.3 mcg/ml and a carbamazepine level of 4.8 mcg/ml. CT scan of the brain demonstrated a small to moderate sized acute subdural hematoma along the left side of the tentorium measuring 5 mm in width and 16 mm in length. There was also a small area of encephalomalacia in

the superficial cortex of the right parieto-occipital region consistent with an earlier infarct. The patient was admitted.

MRI of the brain demonstrated the subdural hematoma already noted on CT. However, in addition, MRI demonstrated a small, 11 mm by 19 mm, isosignal mass arising from a location adjacent to the tentorium extending into the medial aspect of the left temporal lobe, producing a small rim of edema within the temporal lobe. (See images 1, 2 and 3). There was no enhancement of this lesion following administration of gadolinium and magnetic resonance angiography of the brain was normal. Considerations include ganglioglioma and DNET.

Figure 1

Image 1: T2 FSE FLAIR axial

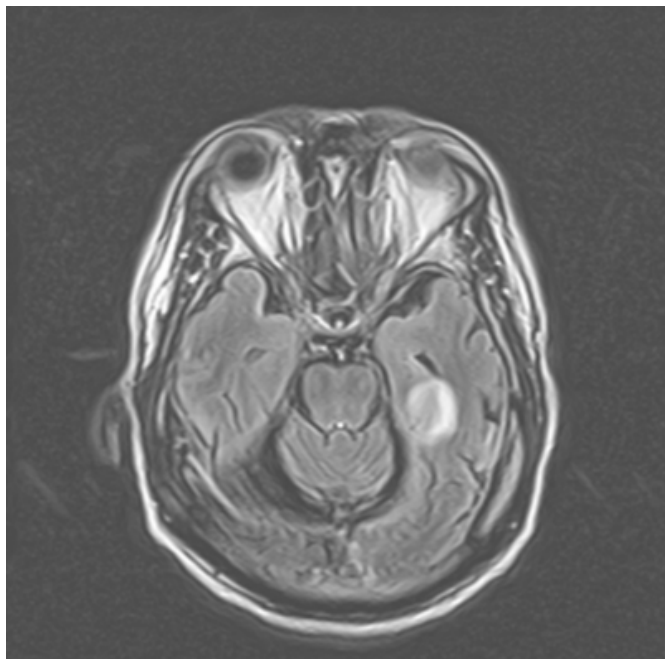


Figure 2

Image 2: T2 FSE coronal

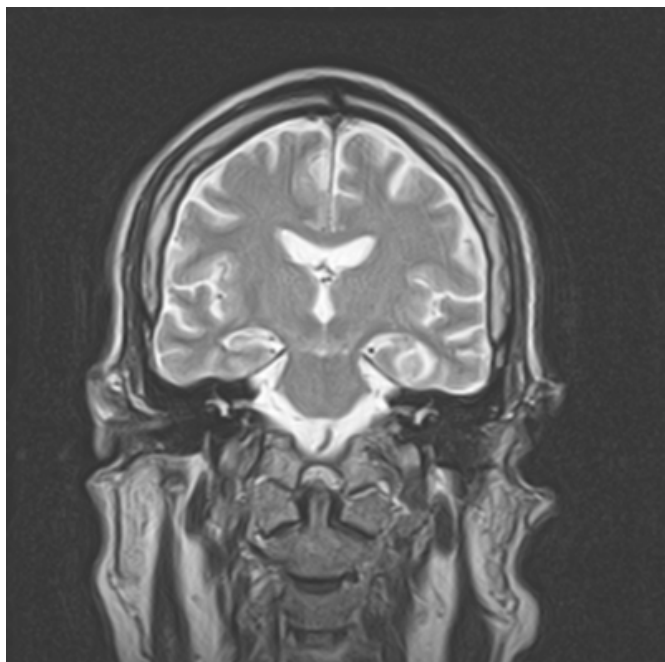
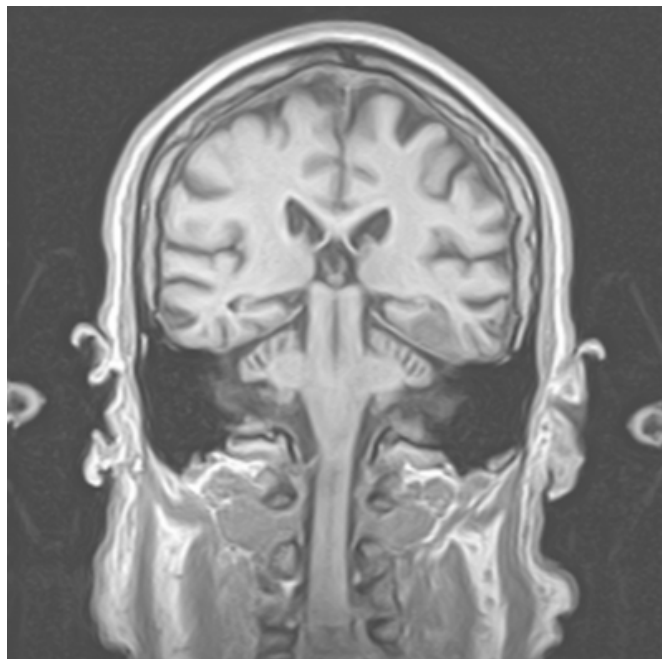


Figure 3

Image 3: T1 coronal



CT chest, abdomen and pelvis were undertaken and no additional primary or secondary tumor was identified. Subsequent CT scans demonstrated a slow, gradual resolution of the subdural hematoma. The patient's antiepileptic medication levels became therapeutic on his original dosing regimen while hospitalized. There were no additional seizures noted. The complaints of back pain and left rib pain were attributed to a rib fracture detected on chest x-ray and presumed to have occurred during the patient's fall. The patient was discharged with follow up arranged in neurology and neurosurgery outpatient clinics.

DISCUSSION

This patient has a long history of seizures classified as complex partial as the patient has a sense of an impending problem prior to his appearing to be unresponsive according to witnesses. In addition, there have been episodes of secondary generalization with clonic activity described. The patient has been minimally compliant with scheduled outpatient visits. As a result, the patient has been seen infrequently, and only over the past three years.

The patient had outpatient CT scans prior to admission that were negative for structural abnormalities or hemorrhages. MRI of his brain was repeatedly ordered prior to admission but the patient never kept these appointments.

Details of his carbon monoxide inhalation and resultant cerebral insult 38 years earlier are incomplete due to his

inability to characterize what transpired. Both his cognitive impairment and seizures were attributed to hypoxic brain injury. However, the patient's structural brain lesion was unknown. The limited number of outpatient visits and lack of MRI of the brain contributed to the brain lesion remaining undetected for an indeterminate length of time. MRI supported his brain lesion to be either a ganglioglioma or DNET.

Gangliogliomas and DNETs are both benign, mixed neuronal-glial cell central nervous system lesions occurring in children and young adults. Gangliogliomas were first described in 1930 by Courville and DNETs more recently in 1988 by Daumas-Duport. ^(1,2) In the United States, gangliogliomas are said to account for 0.4 to 7.6% of pediatric CNS neoplasms and 1.3% of those in adults. ^(3,4,5)

Among a cohort of patients under 20 years of age who had neuroepithelial tumors, the prevalence of DNETs was 1.2% as reported by Rosenberg et al. The same study reported a prevalence of 0.24% in a cohort of patients over 20 years of age with neuroepithelial tumors, and a prevalence of 0.63% for patients without age restriction with neuroepithelial tumors. ⁽⁶⁾

Histologically, both tumors have neuronal and astrocytic components with DNETs also containing oligodendrocytes. In addition, both of these tumors have a predilection for the temporal lobes and commonly present with a medically intractable seizure disorder. ^(7,8) MRI is the imaging modality of choice, though frequently it is difficult to differentiate between the two tumors. ^(9,10) Gross total resection is the preferred treatment which often reduces/eliminates seizure occurrence and provides an excellent long term survival. ⁽⁷⁾ Rarely, these tumors may be associated with a postoperative disorder, with features of paranoia, depression, and psychosis. This psychosis does not seem to accompany other tumor types resected for intractable epilepsy. ^(11,12)

In a study by King et al., MRI of brain was completed on 263 patients with unexplained seizures. MRI detected lesions felt to be potentially responsible for partial seizures in 38 of the patients. Twenty-eight of the patients with lesions on MRI subsequently had a CT scan of brain with contrast. Among these 28 patients, only 12 had the finding identified on CT scan. In addition, CT scans failed to detect tumors in 8 patients that were evident on MRI. ⁽⁹⁾

Additionally, Zentner et al. performed CT scans of brain without contrast on 17 patients with ganglioglioma. Tumor

was reported as undetectable on CT without contrast in 2 cases. Of 14 patients who had CT with contrast, the tumor was undetectable in a single case. ⁽⁷⁾

Ostertun et al. released a report on MR and CT evaluation of DNET. The authors cite detection of all 10 DNETs by CT. Even with a detection rate of 100%, the authors state that CT scan generated images that only delineated the lesions as benign tumors. MRI yielded images with greater resolution such that tumor components could be distinguished. ⁽⁸⁾

Intermittent seizures associated with gangliogliomas have been reported with duration as great as 45 years. ⁽⁷⁾ Furthermore, these have been characterized as slow-growing tumors. DNETs are also known to be slow-growing. Both types of tumor have a predilection for the temporal lobes. Provided that the left temporal mass lesion in our patient is a slowly enlarging tumor, this may be etiologic for a component of the patient's cognitive impairment and his development of a seizure focus. This case further illustrates the importance of high resolution imaging of brain structures in the evaluation of the patient with cognitive deficits and in the investigation of the etiology of seizures.

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