Donald L. Renfrew, MD
Radiology Associates of the Fox Valley, 333 N. Commercial Street, Suite 100, Neenah, WI 54956

CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 65 year old man with two recent episodes of mental confusion has the first seizure of his life about three hours before presentation, and now has a post-ictal headache. What is the most appropriate initial imaging study?

(a) plain films of the skull
(b) ultrasound of the carotid arteries
(c) urgent CT of the head
(d) no imaging study is necessary in this situation

RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

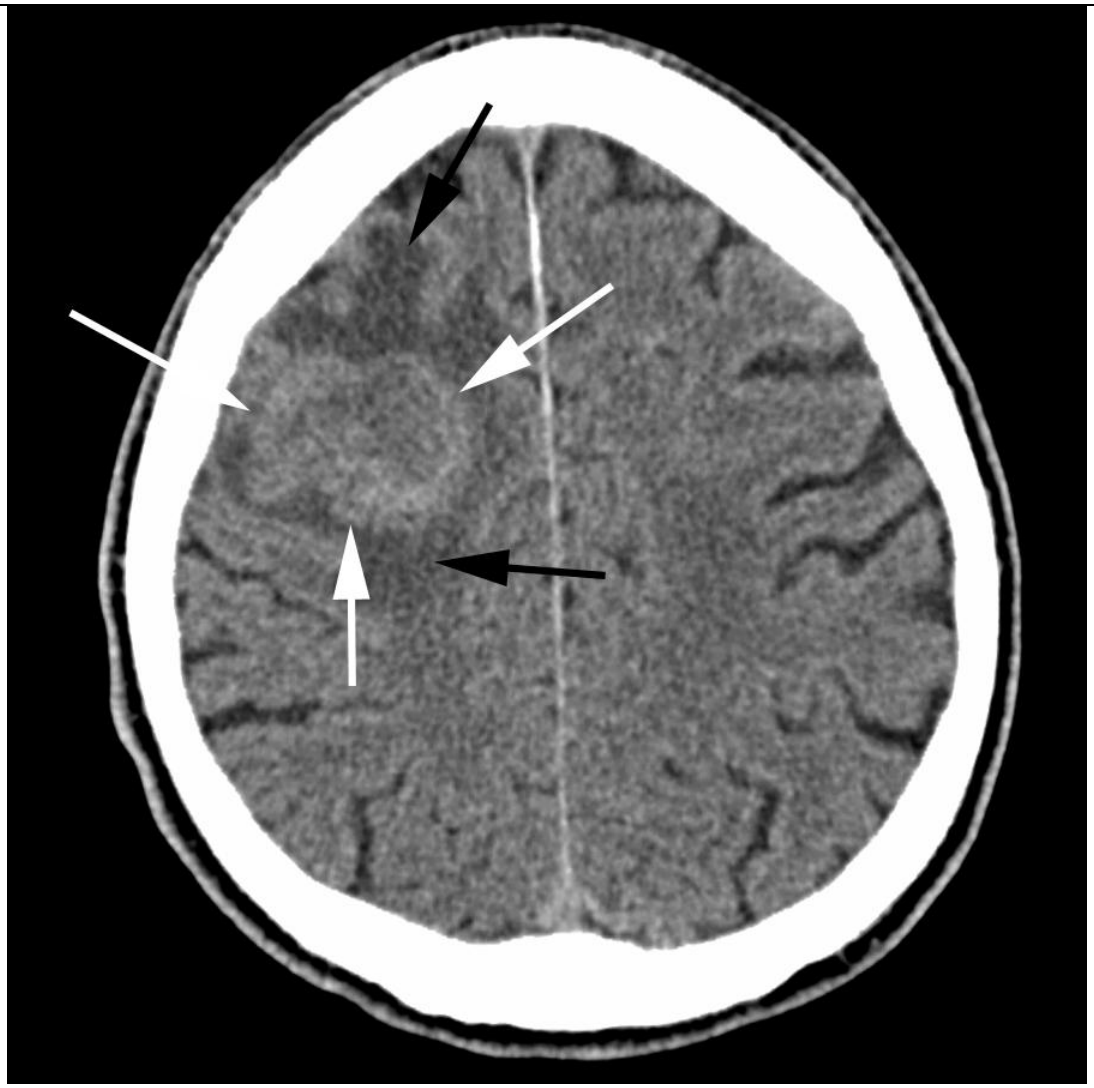
A 65 year old man with two recent episodes of mental confusion has the first seizure of his life about three hours before presentation, and now has a post-ictal headache. What is the most appropriate initial imaging study?

(a) plain films of the skull
(b) ultrasound of the carotid arteries
(c) urgent CT of the head
(d) no imaging study is necessary in this situation

Answer: (c), urgent CT of the head. First time seizures in an adult usually result in a visit to the emergency room, although the line between the emergency room and the clinic is blurred by same-day appointments and/or walk-in clinics. The first order of imaging business with a seizure patient is to evaluate the patient for any gross intracranial pathology such as a tumor or hemorrhage, which can be accomplished rapidly with a head CT. If MR is immediately available, this represents a reasonable alternative, as it is actually more sensitive to some processes that may produce seizure (e.g., subtle, infiltrative primary brain tumors). Usually, however, it is easier and faster to obtain an emergency non-contrast head CT.

Plain films of the skull provide little information of value in patients with seizures, and (a) is incorrect. Ultrasound of the carotid arteries is usually undertaken to evaluate for carotid stenosis or a source of plaque in patients with known or suspected strokes, but is not helpful in the evaluation of seizure patients, and (b) is incorrect. Imaging is necessary in these cases, so (d) is also incorrect.

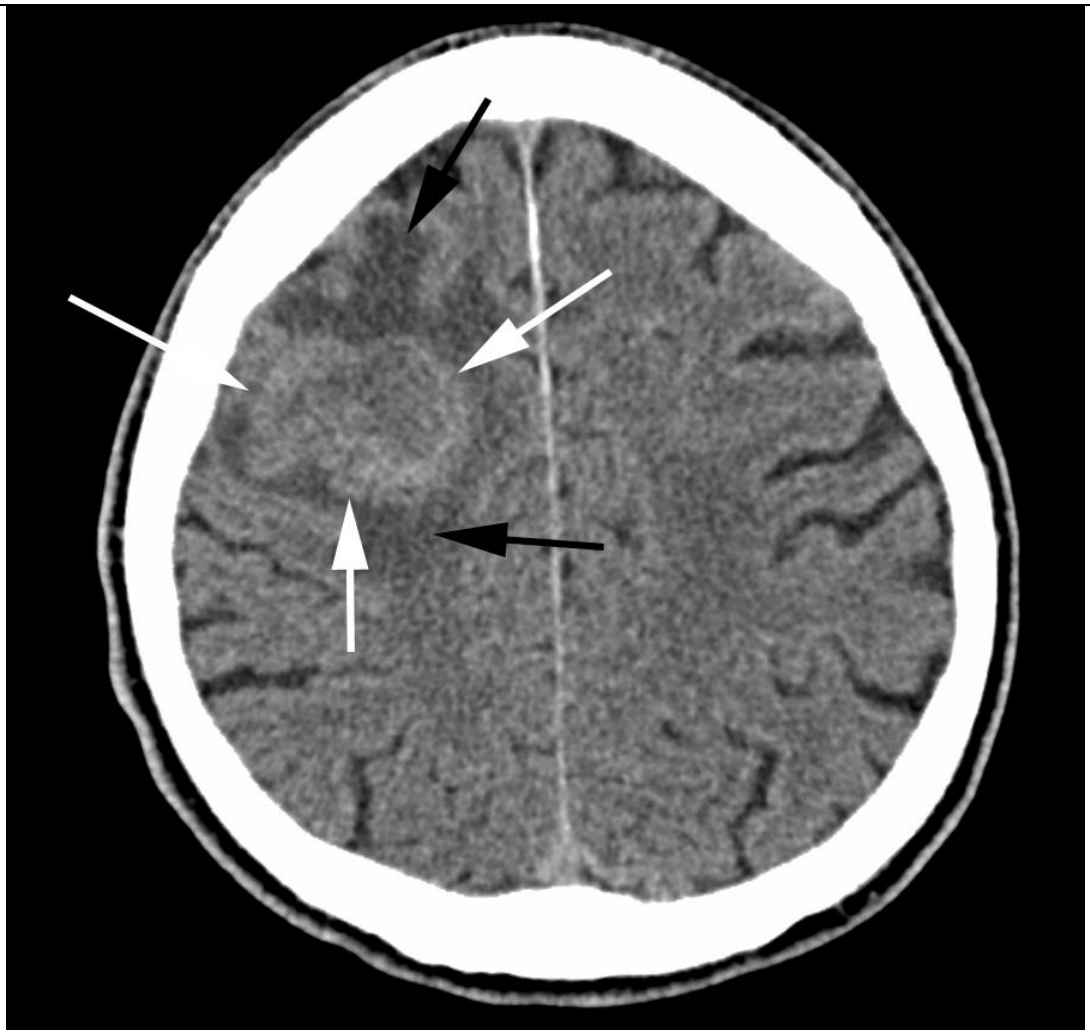
IMAGING STUDY AND QUESTIONS



Imaging questions:

1) What type of study is shown in the figure?
2) What is the abnormality indicated by the white arrows?
3) What is the abnormality indicated by the black arrows?
4) What is the most likely diagnosis?
5) What are the next steps in management?

IMAGING STUDY QUESTIONS AND ANSWERS



Imaging questions:

1) What type of study is shown in the figure? Unenhanced head CT.
2) What is the abnormality indicated by the white arrows? There is an isodense to slightly hyperdense mass in the right frontal lobe.
3) What is the abnormality indicated by the black arrows? Low density surrounding the brain mass, compatible with vasogenic edema.
4) What is the most likely diagnosis? Intraparenchymal brain tumor, most likely a metastatic lesion although differentiating primary and metastatic lesions when a single mass is identified may be impossible.
5) What are the next steps in management? Neurologic/neurosurgical referral and brain MR, along with a work-up for possible primary tumor.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

A subsequent MR (not shown) was performed, which demonstrated a solitary brain tumor. Subsequent work-up included a chest, abdomen, and pelvis CT study as well as a PET-CT study; these imaging examinations failed to demonstrate any lesion suspicious for a primary malignancy that might represent the source of an intra-cranial metastasis. The patient did have a 50+ pack-year history of cigarette smoking.

Resection of the brain lesion was performed, and non-small cell carcinoma was found.

SUMMARY

Presenting symptom: Neurologic symptoms generally need to be placed in one of several categories to plan imaging. In this case, the patient had an obvious seizure.

Imaging work-up: Seizure victims typically undergo a CT study after their first seizure to check for obvious blatant intracranial pathology (such as the patient presented here demonstrated). Patients with epilepsy are usually referred to a specialist for further evaluation and treatment, and will eventually undergo MR imaging.

Establishing the diagnosis: When a seizure patient has an obvious intracranial mass, it is assumed that the mass caused the seizure. Tissue characterization is necessary. If the patient has a known extracranial tumor that may account for a metastatic intracranial deposit, it is usually assumed that the brain mass represents a metastatic deposit and appropriate treatment (radiation, chemotherapy, possible surgical debulking) is performed. If the patient does not have a known malignancy, appropriate diagnostic studies (complete history and physical examination, mammography for females, PSA and prostate exam for males, possible imaging including, as in this case, CT of the chest, abdomen, and pelvis and PET-CT) may be performed to search for an occult primary tumor. When all of these studies fail to demonstrate any obvious source of a primary tumor, resection (rather than simply biopsy) is generally performed.

Take-home message: Patients having their first seizure are usually seen in the emergency room. The initial imaging study of choice is usually an unenhanced CT study.

FURTHER READING

Harden CL, Huff JS, Schwartz TH et al. Reassessment: neuroimaging in the emergency patient presenting with seizure (an evidence-based review): report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology 2007;69:1772-1780.

Hirsch LJ, Arif H. Neuroimaging in the evaluation of seizures and epilepsy. UpToDate, accessed 10/21/09.

Renfrew, DL. Stroke, Seizure, Multiple Sclerosis, and Dementia. Chapter 4 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at www.symptombasedradiology.com.