

Imaging

Transient postictal MRI changes in patients with brain tumors may mimic disease progression

Michael A. Finn, MD^a, Deborah T. Blumenthal, MD^b,
Karen L. Salzman, MD^c, Randy L. Jensen, MD, PhD^{a,*}

Departments of ^aNeurosurgery, ^bNeurology, and ^cRadiology, University of Utah School of Medicine, Salt Lake City, UT 84132-2303, USA

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Abstract

Background: Transient postictal imaging abnormalities in patients with non-tumor-related seizures are well documented and include fluid-attenuated inversion recovery/T2 hyperintensity and parenchymal and meningeal contrast enhancement. In contrast, transient postictal imaging abnormalities in patients with tumor-related seizures have been poorly described. Fifty percent of patients with brain tumors have a seizure during the course of their illness and are often imaged after a seizure or after a change in seizure character or frequency. Interval changes on repeat imaging can mimic disease progression or other pathologic processes.

Methods: We describe 3 patients with brain tumors and transient postictal MRI changes that mimicked disease progression and infection.

Results: Our patients demonstrated fluid-attenuated inversion recovery/T2 hyperintensity and gadolinium enhancement on MRI studies performed shortly after ictal events. These changes were suspicious for tumor progression in 2 cases and for recurrent infection in the third. Control of seizure activity resulted in resolution of these changes on scans obtained 10 to 21 days later.

Conclusions: Imaging shortly after an ictal event can potentially mislead the clinician to interpret changes as tumor or pathologic progression. Unnecessary intervention in these patients with new and suspicious imaging findings should be avoided. We recommend repeat imaging be performed in patients with brain tumors and seizures several weeks after seizure control if clinically feasible. Further research is needed to delineate the time course of seizure-induced MRI changes.

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Keywords:

Seizure; Tumor; MRI

1. Introduction

Transient postictal imaging abnormalities have been well described in patients with non-tumor-related seizures. The imaging findings include T1 hypointensity, FLAIR/T2 hyperintensity, and parenchymal and meningeal contrast enhancement. These findings are thought to represent local hyperperfusion, edema, and vascular leak [1,5]. The differential diagnosis when assessing these imaging phe-

nomena is broad and includes vascular, neoplastic, inflammatory, and infectious disorders [3].

In contrast, transient postictal imaging abnormalities in patients with brain tumor-related seizures have been poorly described, with few cases reported in the literature [1,2,12,15]. Approximately half of patients with brain tumors have a seizure during the course of their illness [14]. These patients are often monitored with routinely acquired imaging and are reimaged at the time of a neurologic change, including after a new seizure or when seizure character or frequency changes. Interval changes on repeat imaging can mimic disease progression or other pathologic processes and have the potential to mislead the clinician. We describe 3 patients with brain tumors and

Abbreviations: EEG, electroencephalogram; FLAIR, fluid-attenuated inversion recovery; MRI, magnetic resonance imaging.

* Corresponding author. Tel.: +1 801 581 6908; fax: +1 801 581 4385.

E-mail address: randy.jensen@hsc.utah.edu (R.L. Jensen).

transient postictal MRI changes that mimicked disease progression in 2 cases and infection in 1.

2. Case 1

A 31-year-old man with a history of a right occipital lobe glioma, treated with resection, radiation, and chemotherapy 4 years earlier, presented to an outside facility after several generalized tonic-clonic seizures. An MRI scan acquired a short time after admission showed a gyriform pattern of gadolinium enhancement in the right occipital, temporal, and parietal cortices (Fig. 1A). The patient's seizures were successfully treated with phenytoin. A follow-up MRI obtained 11 days later showed complete resolution of these imaging findings (Fig. 1B).

Fifteen months later, the patient presented to an outside facility with a generalized tonic-clonic seizure. He was transferred to our institution, where his seizures continued. An MRI showed enhancement changes similar to those seen

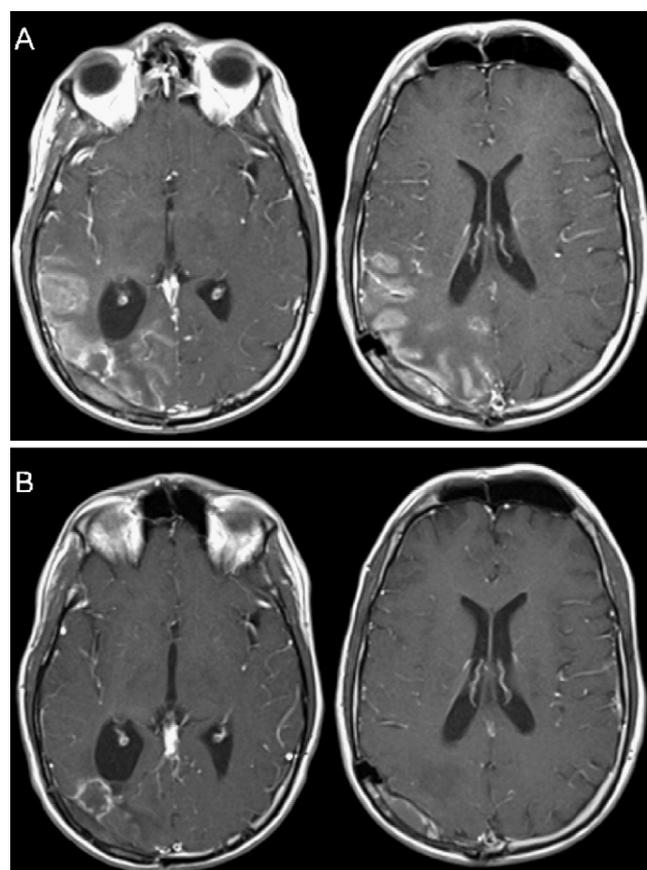


Fig. 1. Case 1: A 31-year-old man with right occipital glioma status after resection. A: Axial T1 contrast-enhanced MRI scans obtained at time of seizures. Note the abnormal gyriform and meningeal enhancement in the right occipital and posterior temporal lobes thought to be related to seizure-induced hyperperfusion and vascular leak. B: Axial T1 contrast-enhanced postictal MRI scans obtained 11 days after seizure control. The abnormal gyriform and meningeal enhancement seen in the earlier images has resolved completely. Residual linear ring enhancement is seen along the occipital lobe resection cavity, a stable finding compared with previous MRI examinations.

during the episode 15 months earlier. His seizures were again controlled with phenytoin and he was discharged shortly after admission. An MRI completed 4 days before seizure onset did not show these changes, and a follow-up scan 1 year later showed complete resolution of enhancement changes.

3. Case 2

A 43-year-old woman with a history of a left parieto-occipital anaplastic astrocytoma treated with resection, radiation, and 3 rounds of chemotherapy presented with increasing frequency of simple partial seizures over a period of 1 week. These events occurred more than 20 times a day and were characterized by right visual field obscuration, expressive aphasia, and cognitive difficulty lasting about a minute. Imaging obtained at the time of admission showed increased T2 signal and gyriform enhancement caudal to the tumor (Fig. 2B), which was not present on an MRI obtained 10 days earlier (Fig. 2A). Because her tumor had shown growth on prior scans, she was taken to the operating room for a debulking procedure. The postoperative scan showed complete resolution of the abnormal imaging findings, which were remote from the area of tumor debulking (Fig. 2C).

4. Case 3

A 56-year-old woman with a history of a right parietal meningioma treated with 3 prior resections, stereotactic radiosurgery, external beam radiation, and hormonal therapy (Fig. 3A) presented with acute onset of depressed level of consciousness, visual disturbances (flashing lights), difficulties with spatial orientation, and decreased left leg strength consistent with previous seizure episodes. Of note, the patient had a history of a wound infection at the surgical site approximately 1½ years earlier that required a rectus flap for definitive treatment. Imaging at the time of event (Fig. 3B) demonstrated new curvilinear enhancement in the left parietal region and increased edema suspicious for infection. Given that her clinical picture was not consistent with infection, she was treated for seizure control and was followed clinically. A follow-up MRI 3 weeks later demonstrated resolution of the abnormal imaging changes (Fig. 3C).

5. Discussion

Reversible radiologic abnormalities after seizures were described as early as 1973 when Prenskey et al [11] described 4 patients who had positive technetium 99m isotope scans after prolonged focal seizures. Transient changes on angiography, computed tomography, and MRI have since been described, the regions of which have been shown to correlate with EEG abnormalities and seizure semiology [3,13,18]. Magnetic resonance imaging changes include hypointensity on T1, hyperintensity on T2 and FLAIR, and

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