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## Case Report

# Reversible sulcal FLAIR hyperintensity on MRI in a migraine patient with aura

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### ABSTRACT

Reversible sulcal fluid-attenuated inversion recovery (FLAIR) hyperintensity is a rare imaging finding that could be seen on magnetic resonance imaging (MRI), in patients with migraine with aura. Herein, we present a patient who was admitted to the emergency department with severe headaches, numbness on the right side of the body, and visual changes. MRI showed sulcal FLAIR hyperintensity in the occipital lobes, with no other abnormality. The patient was diagnosed with migraine with aura by neurology and the follow up MRI showed resolution of the finding, supporting the diagnosis. Sulcal hyperintensity on FLAIR is a nonspecific imaging finding that can occur with or without cerebral spinal fluid (CSF) abnormality. Although, clinical correlation and CSF analysis may be required, radiologists may often be able to suggest the cause of abnormal CSF signal depending on the distribution of sulcal FLAIR hyperintensity, and the presence of additional imaging findings.

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## Case report

We present a case of a 66-year-old, right-handed woman with an episode of acute bilateral frontal headache associated with right sided numbness involving her face, arm, and leg. She also presented with visual changes characterized by sparkling lights in the periphery of her vision. She experienced dizziness hours prior to the development of the symptoms. She had past medical history of severe headaches and had recently started investigation for migraine. Neurological evaluation as

part of the Stroke protocol categorized her National Institutes of Health Stroke Scale as 1, due to her sensory symptoms on the right.

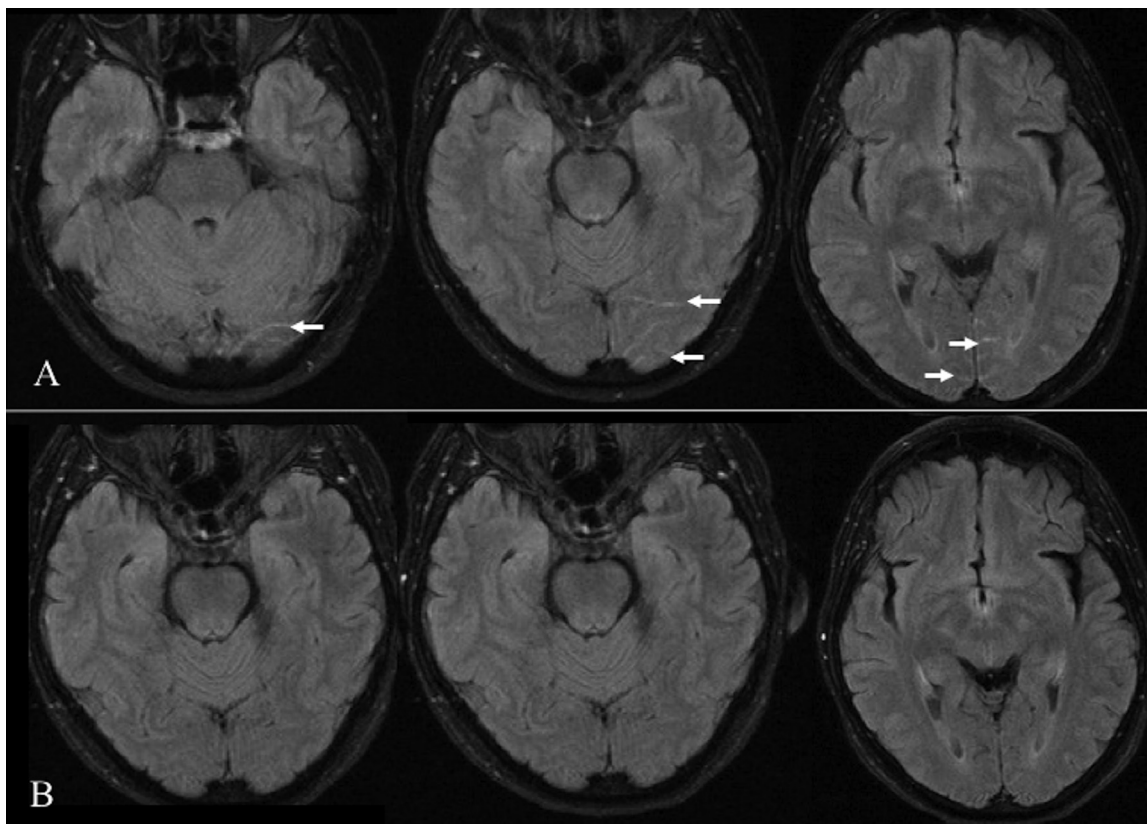
Unenhanced head CT and computed tomography angiography of the head and neck did not demonstrate areas of early ischemia, acute hemorrhage, or vessel occlusion. The patient's symptoms resolved less than 1 hour after the onset, but a Magnetic Resonance Imaging (MRI) of the brain was performed to rule out any structural cause. 1.5 Tesla MRI showed subtle fluid-attenuated inversion recovery (FLAIR) hyperintensity in some of the cerebral sulci in the occipital lobes (Fig. 1A).

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**Fig. 1 – Reversible sulcal FLAIR hyperintensity in migraine with aura. Axial FLAIR (A) MR images of the brain show hyperintensity of the sulci in the left occipital lobe (arrows). There was no restricted diffusion and the GRE sequence did not demonstrate hemorrhagic products (not shown). Follow up MRI 8 weeks after the onset of symptoms. Axial FLAIR (B) MR images show complete interval resolution of the left occipital sulcal hyperintensities**

No other abnormality was found. There was no associated restricted diffusion and the gradient echo-recalled sequence did not show areas of hemorrhage. Given the duration of the neurological symptoms and the previous medical history of severe headaches, we suggested that the isolated imaging abnormality on MRI could be related to migraine with aura. A follow-up MRI was also suggested in order to confirm the reversibility of the cerebral spinal fluid (CSF) signal abnormality in the occipital lobes. The patient was followed by neurology and diagnosed with migraine with aura. She was started on treatment with Amitriptyline and had significant improvement of her symptoms. Follow-up MRI performed 8 weeks after the onset of symptoms, and 4 weeks after starting treatment showed complete resolution of the sulcal hyperintensities in the occipital lobes (Fig. 1B). Sequences with contrast did not show any abnormal enhancement.

## Discussion

Migraine is a neurologic disorder that affects about 10%-15% of the general population and is characterized by paroxysmal attacks of unilateral throbbing headache and autonomic nervous system dysfunction. Approximately one-third of patients

with migraine experience transient neurological symptoms known as auras, which are characteristic of a variant known as migraine with aura [1]. MRI is usually performed to rule out secondary causes of headache. It may demonstrate a variety of imaging findings that have been described in the context of migraine, including white matter abnormalities, infarct-like lesions, postgadolinium meningeal enhancement, cortical swelling, or FLAIR cortical hyperintensities [1–3].

Reversible sulcal hyperintensity, is a rare imaging finding that has been described in the literature in patients with migraine with aura. To the best of our knowledge, there are only 2 cases reported in the literature showing this abnormality on MRI [2,4]. Gomez-Choco et al reported a case of a 22-year-old woman with migraine who presented with numbness and hemihypoesthesia on the right side of the face, the MRI showed sulcal hyperintensity surrounding the left temporal lobe on the FLAIR sequence, that resolved 4 days later [2]. Kang et al also reported these transient findings on FLAIR in the central sulcus and superior frontal sulcus bilaterally in a patient with migraine associated with phonophobia, photophobia, nausea, and left arm paresthesia [4]. Herein, we present a patient with transient sulcal hyperintensity on FLAIR images during a migraine attack.

Sulcal hyperintensity relates to the failure to suppress the CSF signal on the FLAIR sequence and reflects changes in

the relaxation time of CSF. It has been described in patients presenting with a variety of pathologic conditions, such as subarachnoid hemorrhage, meningitis, and leptomeningeal spread of malignant disease. Other conditions without CSF abnormality are less frequent and have also been described as cause of sulcal hyperintensity, including artifacts in patients undergoing MRI examinations while receiving supplemental oxygen, CSF flow artifact, and susceptibility artifact [5,6].

The mechanism involved in the abnormal signal intensity within the cerebral sulci in patients with migraine is not completely understood. Some studies have shown changes in the occipital lobe related to a hyper excitable visual cortex as trigger for the headache and also vasodilatation with tissue hyperoxygenation and decreased energy reserves as part of the central pain process pathway [7,8]. Gomez-Choco et al have previously described sulcal abnormalities in patients with migraine with aura and have speculated that it could be related to increased leptomeningeal vascularity with associated gadolinium leakage. In the present case, the changes are similar to what Gomez-Choco et al described, however the patient did not receive gadolinium in the first MRI [2]. Another suggested mechanism is related to increased leptomeningeal vascularity leading to plasma extravasation and increased local protein concentration in the sulci [9,10].

Sulcal hyperintensity on FLAIR however is a nonspecific imaging finding which can be seen in different entities and can occur with or without CSF abnormality. Clinical correlation and CSF analysis are usually required. Radiologists may be able to suggest the cause of abnormal CSF signal depending on the distribution of sulcal FLAIR hyperintensity and the presence of additional imaging findings [5,6]. As such and although rare, reversible sulcal hyperintensity on FLAIR should be considered in the context of patients with headache—migraine with aura.

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