

Expert Opinion

A Left Frontal Secretory Meningioma Can Mimic Transformed Migraine With and Without Aura

Randolph W. Evans, MD; Josefine S. Timm, MD; David S. Baskin, MD, FACS, FAANS

Key words: secretory meningioma, transformed migraine, chronic migraine, migraine with aura, brain tumors, neuroimaging

(*Headache* 2015;55:849-852)

Of all the migraine mimics,¹ some patients are especially anxious about the possibility of brain tumors as the cause of their chronic migraines.² Is there reason for concern?

CASE HISTORY

This is a 47-year-old female with headaches that had been occurring daily for 2 months and prior twice a week for 1 year. She described a bifrontal throbbing with an intensity of 2-4/10 associated with nausea at times, light and noise sensitivity, but no vomiting. She would take acetaminophen, and the headache would last a couple of hours. For the prior 3 months, every few days, she would see the edge of a broken glass

flashing on and off in the right field of vision, which would be small, expand, and then break up. The visual changes would last about 30 minutes. They began before the headache and resolved as the headache was starting. Stress was a trigger for the headaches.

She had a prior history of a different type of headache since her teens that had occurred once a week described as a pressure on the sides, as well as the occipital and bifrontal areas with an intensity of 2/10. (The headaches were described in a prior office visit 2 years earlier when seen for myofascial neck pain by one of the coauthors, R.W.E.) There was no nausea/vomiting, light or noise sensitivity, or aura. She took acetaminophen with relief in 1-2 hours.

There was a past medical history of hypothyroidism, hyperlipidemia, and depression (on fluoxetine 40 mg daily for several years). Neurological exam was normal.

Magnetic resonance imaging (MRI) of the brain showed a 3 × 2.5 × 2.5 cm left medial anterior inferior frontal extra-axial dural-based homogeneously enhancing mass with vasogenic edema, marked mass effect on the left frontal horn, and anterior corpus callosum, and 16-mm subfalcine herniation from left to right (Figs. 1 and 2). When completely resected 3 weeks later, the pathology was a secretory meningioma. Postoperative MRI scans showed no residual tumor.

From the Department of Neurology, Baylor College of Medicine, Houston, TX, USA (R.W. Evans); Neuroradiology, Houston, TX, USA (J.S. Timm). Neurosurgery Residency Training Program, Department of Neurological Surgery, Methodist Neurological Institute, Houston, TX (D.S. Baskin); Neurological Surgery, Weill Medical College, Cornell University, New York, NY (D.S. Baskin); Houston Methodist Kenneth R. Peak Brain & Pituitary Tumor Treatment Center (www.houstonmethodist.org/peakcenter), Houston, TX, USA (D.S. Baskin). Neuroradiology.

Address all correspondence to R.W. Evans, Department of Neurology, Baylor College of Medicine, 1200 Binz #1370, Houston, TX 77004, USA, email: revansmd@gmail.com.

Accepted for publication March 23, 2015.

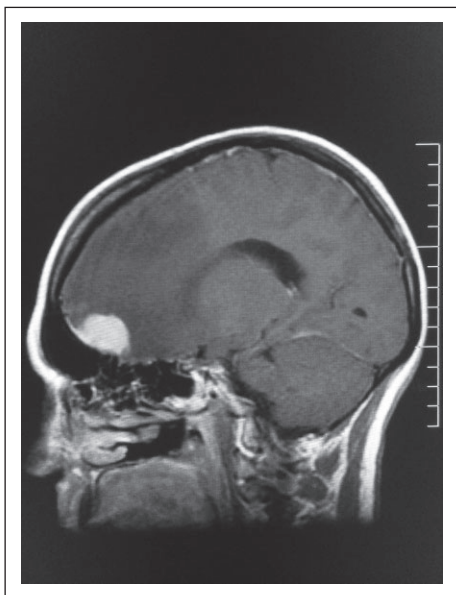


Fig 1.—The T1 sagittal image with contrast shows the enhancing dural-based mass.

When next seen 13 months later, she reported that the headaches and aura present preoperatively were gone right after surgery. She had a postoperative headache that was different (could not recall the specifics) but which resolved within 1 month. She then had a headache about once a month, described as a

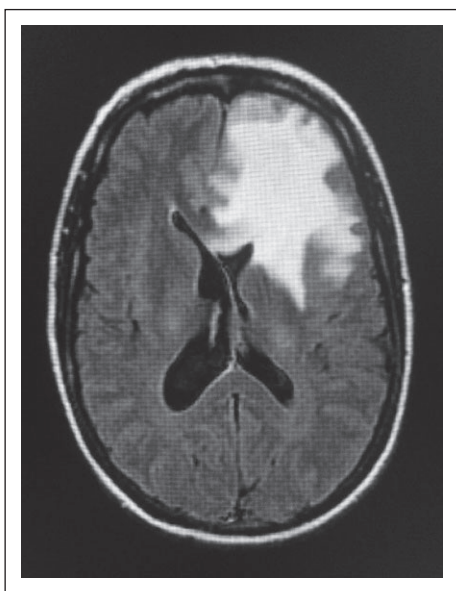


Fig 2.—The axial T2 fluid-attenuated inversion recovery image shows extensive vasogenic edema.

bifrontal pressure without associated symptoms with an intensity of 3/10. The headache was relieved within an hour with acetaminophen 500 mg or diphenhydramine 25 mg. She had no further auras.

Questions.—How often is neuroimaging abnormal in patients with chronic migraine? What is a secretory meningioma? What types of meningiomas cause disproportionate edema? How often do brain tumors and meningiomas cause migraine-like headaches? Can meningiomas cause migraine with aura?

EXPERT OPINION

Yield of Neuroimaging in Chronic Migraine.—In a retrospective series of 402 adults (286 women and 116 men) referred to the neurology service with chronic headaches with a duration of 3 months or more, and no other neurological symptoms or findings, major abnormalities (a mass, caused mass effect, or was believed to be the likely cause of the patient's headache) were found in 15 patients (3.7%), including a glioma, meningioma, metastases, subdural hematoma, arteriovenous malformation, 3 with hydrocephalus, and 2 Chiari I malformations, including 0.6% with migraine.³ In another retrospective series of 306 adults (170 woman and 136 men) with chronic or recurrent headache for 1 month or more with no other neurological symptoms or focal findings on neurological examination, and no prior head surgery, head trauma, or seizure, 0.7% had clinically significant abnormalities (a pituitary macroadenoma and subdural hematoma).⁴

A prospective study was performed in Spain of 1876 consecutive patients (1243 females and 633 males) aged 15 years or older with a mean age of 38 years, with headaches that had an onset at least 4 weeks previously and who were referred to 2 neurology clinics, with one third of the headaches new onset and two thirds present for more than 1 year.⁵ Neurological exams were normal in 99.2%. Migraine was diagnosed in 49%, tension type in 35.4%, and cluster in 1.1%. Computed tomography (CT) scans were performed in 1432 patients, MRI scans in 580, and 136 patients underwent both studies. Twenty-two patients (1.2%) had significant abnormalities, including 17 with normal neurological examinations (0.9%) who had the following findings: pituitary adenoma ($n = 3$),

large arachnoid cyst ($n = 2$), meningioma ($n = 2$), hydrocephalus ($n = 2$), Arnold-Chiari type I malformation, ischemic stroke, cavernous angioma, arteriovenous malformation, low-grade astrocytoma, brain stem glioma, colloid cyst, and posterior fossa papilloma (1 of each). Fourteen patients had incidental findings, including 3 pineal cysts, 3 intracranial lipomas, and 8 arachnoid cysts. MRI performed in 119 patients with normal CT revealed significant lesions in 2 cases: a small meningioma and an acoustic neuroma. No saccular aneurysms were detected; MR angiography was not obtained.

Therefore, the finding of a symptomatic lesion responsible for the headaches had a low probability in a large population but not for this patient. Callaghan et al report that neuroimaging is frequently ordered during outpatient headache visits (12%), with nearly \$1 billion in annual costs in the United States and “optimizing headache neuroimaging practices should be a major national priority.”⁶ They might suggest that the scan in this case was not indicated because of the low pretest probability. However, if we had not ordered the scan, what of the potential harm to the patient and our potential medico-legal liability exposure?⁷ This case illustrates that limiting imaging may miss the rare patient with a brain tumor and seemingly transformed migraine as well as isolated unchanged migrainous headaches.⁸

Secretory Meningioma.—In 1922, the word “meningioma” was first used by Harvey Cushing to describe a tumor originating from the meninges.⁹ Meningiomas, which arise from meningotheial (arachnoidal) cells, have an annual incidence of 7.8 per 100,000 population and account for 20% of all primary tumors.¹⁰ Twenty-five percent are symptomatic on presentation, with headache being the most common presenting symptom (36%).

Secretory meningiomas are an uncommon subtype of benign meningiomas with glandular lumina with secretory globules variably accounting for 1.2-9.3% of meningiomas. In a series of 44 patients, the mean age was 58 years (range, 35-78 years).¹¹ There was a female preponderance as in other studies (8:1 female to male ratio), which may reflect this meningioma’s high rates of progesterone and estrogen receptors.

Peritumor Edema.—In 41-64% of cases, there is severe, nearly hemispheric peritumoral edema disproportional to tumor size,¹¹ which may be due to activation of vascular endothelial growth factor, mast cells, hypoxia-induced factor 1, aquaporin 4, aquaporin 5, matrix metalloproteinase-9, and interleukin 6 individually or in combination.¹² Similarly, peritumoral brain edema is also frequently observed in cases of microcytic and angiomatous meningiomas.

Brain Tumors and Migraine-Like Headaches.—In a series of 111 consecutive adults with primary or metastatic brain tumors, headaches were present in 48%. Migraine-type was present in 9%, although all had atypical features and 1 was similar to migraine with aura.¹³

In a prospective series of 279 patients aged 15 years and older with intracranial tumors, 139 reported headaches probably related to headaches, of which 6.7% could be classified as migraine without aura.¹⁴ Of the 75 meningiomas, 58.7% were associated with headaches.

In another prospective series of 206 patients aged 16 years and older with brain tumors, 98 reported headaches (55.1% not classifiable) attributed to the tumors, of which 13.3% could be classified as migraine and 2% as chronic migraine.¹⁵ In all but 1 patient, migraine was associated with at least 1 atypical feature. Of all tumors, headaches were associated with a frontal location in 45.8% and occipital location in 75%. Of the 50 meningiomas, 48% were associated with headaches (45.8% of these were tension-type). Progressive headaches were reported by 29.2% of those with meningiomas as compared with 60% of those with secreting adenomas and 40% with glioblastoma multiforme.

Meningiomas and Headaches.—Schankin et al performed a prospective study of 58 patients with meningioma, of whom 23 (40%) had meningioma-associated headaches.¹⁶ The pain was migraine-like in 5 (22%) and tension-type headache-like in 13 (57%). Thirty-one percent had daily headaches and 22% had less than weekly headaches. The locations of the headaches were as follows: bilateral, 48%; unilateral, 13%; mainly right, 26%; and mainly left, 13%. For migraine-like headaches, risk factors were a positive history of migraine and a bone-invasive growth

pattern. There were no secretory meningiomas in the cohort. However, comparing the other features of the patient's meningioma with this cohort, tumor-associated headaches were present in the following: frontal lobe location of tumor, 28%; <10 cm², 55%; frontal, 28%; left-sided, 35%; not bone-invasive, 72%; and large surrounding edema, 12%.

Meningiomas and Migraine With Aura.—Migraine with aura has rarely been reported with meningiomas. There is a case report of a 66-year-old woman with migraine with visual aura due to a right occipital fibroblastic meningioma that resolved after surgery.¹⁷ There is another case of a 55-year-old male with a right face and right arm sensory aura evolving over 1-5 minutes, followed by a left hemicranial throbbing headache meeting migraine criteria responding to triptans with a left anterior parietal meningioma.¹⁸ The episodes ceased following surgery.

We are not able to locate a similar case of a migraine mimic with aura or transformed migraine mimic with and without aura due to a left frontal meningioma. The pathogenesis is not known but might include traction on vascular structures, cranial or cervical nerve compression, peripheral sensitization with neurogenic inflammation, and central sensitization through trigeminovascular afferents on the meninges and cranial vessels.¹⁹

REFERENCES

1. Evans RW. Migraine mimics. *Headache*. 2015;55:313-322.
2. Howard L, Wessely S, Leese M, et al. Are investigations anxiolytic or anxiogenic? A randomised controlled trial of neuroimaging to provide reassurance in chronic daily headache. *J Neurol Neurosurg Psychiatry*. 2005;76:1558-1564.
3. Wang HZ, Simonson TM, Greco WR, Yuh WT. Brain MR imaging in the evaluation of chronic headache in patients without other neurologic symptoms. *Acad Radiol*. 2001;8:405-408.
4. Tsushima Y, Endo K. MR imaging in the evaluation of chronic or recurrent headache. *Radiology*. 2005;235:575-579.
5. Sempere AP, Porta-Etessam J, Medrano V, et al. Neuroimaging in the evaluation of patients with non-acute headache. *Cephalalgia*. 2005;25:30-35.
6. Callaghan BC, Kerber KA, Pace RJ, Skolarus LE, Burke JF. Headaches and neuroimaging: High utilization and costs despite guidelines. *JAMA Intern Med*. 2014;174:819-821.
7. Evans RW. Headaches and neuroimaging. *JAMA Intern Med*. 2015;175:312.
8. Hawasli AH, Chicoine MR, Dacey RG Jr. Choosing wisely: A neurosurgical perspective on neuroimaging for headaches. *Neurosurgery*. 2015;76:1-5.
9. Cushing H. The meningiomas (dural endotheliomas): Their source, and favoured seats of origin. *Brain*. 1922;45:282-316.
10. Sherman W. Meningiomas. In: Greenamyre JT, ed. *MedLink Neurology*. San Diego: MedLink Corporation. Available at: www.medlink.com (last updated April 6, 2012).
11. Regelsberger J, Hagel C, Emami P, Ries T, Heese O, Westphal M. Secretory meningiomas: A benign subgroup causing life-threatening complications. *Neuro-Oncol*. 2009;11:819-824.
12. Shibuya M. Pathology and molecular genetics of meningioma: Recent advances. *Neurol Med Chir (Tokyo)*. 2015;55:14-27.
13. Forsyth PA, Posner JB. Headaches in patients with brain tumors: A study of 111 patients. *Neurology*. 1993;43:1678-1683.
14. Pfund Z, Szapáry L, Jászberényi O, Nagy F, Czopf J. Headache in intracranial tumors. *Cephalalgia*. 1999;19:787-790.
15. Valentinis L, Tuniz F, Valent F, et al. Headache attributed to intracranial tumours: A prospective cohort study. *Cephalalgia*. 2010;30:389-398.
16. Schankin CJ, Krumbholz M, Sostak P, Reinisch VM, Goldbrunner R, Straube A. Headache in patients with a meningioma correlates with a bone-invasive growth pattern but not with cytokine expression. *Cephalalgia*. 2010;30:413-424.
17. Shimizu Y, Yamane K, Tsutsumi Y, Sato K, Yamaguchi K. [A case of migraine with aura associated with meningioma]. *Rinsho Shinkeigaku*. 1993;33:396-399.
18. University of South Alabama Headache Center. Meningioma mimicking late-onset migraine with sensory aura. *Headache*. 2004;44:289.
19. Goffaux P, Fortin D. Brain tumor headaches: From bedside to bench. *Neurosurgery*. 2010;67:459-466.