

## CLINICAL INQUIRIES

# When is neuroimaging warranted for headache?

Sharon Grayson, MD, Jon O. Neher, MD

Valley Family Medicine Residency, Renton, Wash

Ellen Howard, MLS

K.K. Sherwood Library at Harborview Medical Center, Seattle, Wash

### EVIDENCE-BASED ANSWER

Neuroimaging is warranted to evaluate headaches when patients present to an emergency department with signs or symptoms of an intracranial lesion. These signs or symptoms include abrupt onset of headache, focal neurological abnormalities (strength of recommendation [SOR]: **B**, based on a validating cohort study), decreased level of consciousness (SOR: **B**, based on a retrospective, nonconsecutive case study), occipitonal location, multiple associated symptoms, and age older than 55 years (SOR: **B**, based on a case-control study).

Neuroimaging is also recommended in the ambulatory setting for patients with headaches of migraine type and abnormal findings on neurological exam; that are accompanied by signs or symptoms of increased intracranial pressure; or that are new for a patient who is HIV-positive (SOR: **C**, based on expert opinion).

There are no studies or consistent opinions on the need for neuroimaging with headaches of tension type, described as the "worst ever," increasing in frequency, that awaken the patient, or are associated with nausea, dizziness, or syncope.

### CLINICAL COMMENTARY

#### Careful clinical judgment is important in decision for neuroimaging

Determining the utility of neuroimaging for headache is a taxing question for clinicians working in the emergency room or an outpatient clinic. In the county health system where I work, I find it increasingly difficult to get neuroimaging studies done within an appropriate time frame. Thus I must rely heavily on clinical judgment to determine how urgently they must be done. I also feel an ethical obligation to avoid unnecessary demands on this limited resource.

I have found the criteria recommended in this Clinical Inquiry to be most helpful in prioritizing the need for neuroimaging. These include focal neurological deficit, alteration in the character of headache, persistence of headache despite analgesics, abrupt onset, and increasing frequency and intensity of headache. In addition, I have found the persistence of the patient in returning for reevaluation to be a helpful indicator of pathology.

Zahida Siddiqi, MD

Baylor College of Medicine, Houston, Tex

#### ■ Evidence summary

A validating cohort study looked at 5 clinical warning criteria (**TABLE**) for patients seen in an emergency department for headache; 70 adults with acute headache as the chief complaint were included. All patients received computed tomography (CT) scanning as part of their evaluation. Abrupt onset and focal neurologic findings most strongly predicted intracranial lesions. Overall, 36% of the patients (25/70) had significant pathology.<sup>1</sup>

A retrospective study reviewed records of 111 patients seen in an emergency department with headache and who had undergone neuroimaging (CT or magnetic resonance imaging [MRI]). Three symptoms predicted a lesion: decreased level of consciousness (sensitivity=23%; positive likelihood ratio [LR+] =3.8), paralysis (sensitivity=25%; LR+ =3.5), and papilledema (numbers not reported). In this study, 35% (39/111) of those receiving neuroimaging had intracranial pathology.<sup>2</sup>

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A case-control study reviewed hospital records of 468 patients evaluated in the emergency department for nontraumatic headache. Neuroimaging (CT scan or cerebral angiogram) was performed for 160 of these patients. Final diagnosis and outcome was obtained at 6 months. The symptoms and their ability to predict intracranial pathology are as follows: abnormal neurologic examination (sensitivity=39%; LR+=19.5), location of headache (sensitivity=78%; LR+=4.87), age of patient (sensitivity=61%; LR+=2.26), multiple associated symptoms (sensitivity=61%; LR+=2.26), mode of onset of headache (sensitivity=78%; LR+=2.23), and presence of associated symptoms (sensitivity=89%; LR+=1.41). Again, abnormal neurologic examination was the most significant indicator for imaging. This study did not define associated symptoms nor did it specify what determined which patients were imaged.<sup>3</sup>

Information concerning the workup of headache in the ambulatory setting is limited. In actual practice, only about 3% of patients who present with a new headache in the office setting have neuroimaging ordered.<sup>4</sup> When neuroimaging is performed, about 4% of CT scans find a significant and treatable lesion (in one sample of 293 CT scans, there were 12 true-positive scans and 2 false-positive scans).<sup>5</sup> Expert guidelines regarding headaches among ambulatory patients recommend neuroimaging for migraine patients only in the presence of persistent focal abnormal neurological findings. They note insufficient evidence for recommendations concerning neuroimaging for patients with tension-type headaches. They also note insufficient evidence for or against neuroimaging when headache occurs in the presence or absence of nonfocal symptoms: dizziness, syncope, nausea, lack of coordination, the “worst headache ever,” headache that awakens the patient from sleep, and increasing frequency of headaches.<sup>6</sup>

### Recommendations from others

*Rosen's Emergency Medicine* and *Mettler's Essentials of Radiology* add the following indications for imaging in headache: signs

**TABLE**

### Five clinical warning criteria for headache

CLINICAL FEATURE	SENSITIVITY	SPECIFICITY	LR+	LR-
	FOR INTRACRANIAL PATHOLOGY			
Presence of focal neurological symptoms or findings	1.0	0.76	4.21	0
Abrupt onset	0.55	0.79	2.5	0.57
Alteration of characteristics	0.67	0.67	2.0	0.49
Increased intensity and frequency	0.39	0.73	1.44	0.83
Persistence despite analgesics	0.60	0.56	1.36	0.71

LR+, positive likelihood ratio; LR-, negative likelihood ratio.  
Source: Aygun and Bildik, *Eur J Neurol* 2003.<sup>1</sup>

and symptoms of elevated intracranial pressure (eg, papilledema); meningismus; partial seizure; nocturnal headaches that awaken the patient from sleep; increase in pain with coughing, sneezing or change in body position; sudden onset headaches that reach maximum intensity in 2 to 3 minutes; headache associated with mental status changes or decreased alertness; any new headache in an HIV-positive patient.<sup>7,8</sup>

### REFERENCES

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### FAST TRACK

**Abrupt onset and focal neurologic findings most strongly predict intracranial lesions**