

CLINICAL GUIDELINE:

IMAGING UTILIZATION IN THE AMBULATORY SETTING Migraine and Headaches



Physician Clinical Integration
Network, LLC

Scope

Migraine headaches affect almost 25% of the U.S. population [1] and are the most common pain disorder [2]. Migraine headache is the fifth most common reason why people visit the Emergency Department [3]. Neuroimaging can be a useful diagnostic tool in many disease states including head trauma and pain. However, it is not warranted in the majority of patients that present with a migraine headache [4] and can lead to unnecessary radiation exposure. It is projected a single dose of 10mSv radiation can increase an individual's lifetime risk of developing cancer or leukemia to one per one thousand [5-6].

This guideline reviews the appropriate use of neuroimaging for patients presenting with migraine headaches. Providers should use their clinical judgment, past experiences, and current evidence to determine appropriate treatment on an individual basis. The purpose of this guideline is to aid providers in selecting proper diagnostic options when treating individuals with migraine headaches.

Guidance

The PCIN Quality Committee and its designees reviewed the available information in the medical literature and societal guidelines on the evaluation and management of imaging utilization in patients with migraine and/or headaches, as well as information derived from their clinical practice to devise these guidelines.

Population Included

Patients with abnormal neurological examination, cognitive changes, immunocompromised status, HIV diagnosis, history or present diagnosis of cancer, systemic indicators such as fever, headache that worsens with exertion, atypical headache features, change in headache characteristics, headache that awakens them from sleep, a new onset of headache after the age of 40, and a diagnosis or suspicion of papilledema, glaucoma, or Lyme disease.

Exclusions

- Patients presenting with a normal neurologic examination
- Unchanged headache symptoms
- Patients requesting reassurance

Recommendations

- ✓ A thorough history, examination and comprehensive neurological examination should be performed to help determine the need for further investigations and neuroimaging studies.
- ✓ Neuroimaging should be considered if a patient presents with abnormal findings on neurological examination, cognitive changes, immunocompromised, diagnosis of HIV, history or present diagnosis of cancer, systemic indicators such as fever, headache that worsens with exertion, atypical headache features, change in headache characteristics, headache that awakens patient from sleep, a new onset headache after the age of 40, and has a diagnosis or suspicion of papilledema, glaucoma, or Lyme disease (Table 1).
- ✓ Patients presenting with a migraine headache should not undergo neuroimaging when the neurological examination is normal, when there is no change in the headache characteristics, and/or to reassure the patient.
- ✓ Electroencephalography (EEG) is not warranted in patients presenting with a migraine headache.
- ✓ The American College of Radiology's (ACR) "Appropriate Use Criteria" should be utilized for neuroimaging (Tables 3-9).

Rationale

History and Neurological Assessment

Patients presenting with chronic headaches should have a thorough history and physical examination to determine the need for further investigation and neuroimaging [4, 7-8]. Clinicians should be aware of the most common primary headache disorders which include migraine, tension-type headache, cluster headache, and secondary headache [4]. Table 2 lists systemic history information which should be included upon examination. The examination should include blood pressure, pulse, checking for bruit at neck, clinical signs of arteriovenous malformation in the eyes and head, and palpation of head, neck, shoulder, and spine for musculoskeletal malformations. A comprehensive neurological examination should be conducted to evaluate the need for further exploration, neuroimaging, and possible referral. The neurological examination should include but is not limited to the evaluation of mental status, examination of cranial nerves, sensory testing, testing of motor reflexes and cerebellar coordination, fundoscopy, otoscopy, and gait examination [4, 8].

Neuroimaging Utilization

Neuroimaging should not be routinely ordered for patients presenting with a migraine headache with a normal neurological examination [2, 8-12]. Research indicates that patients presenting with a migraine headache who had a normal neurological examination had an average of 0.18% chance of having an abnormality [10]. Neuroimaging should not be conducted for patient reassurance [8], or if it will not change the course of treatment for the individual [10]. In a study conducted by Jordan, Lightfoote, and Jordan [13], only 1% of patients who had a computed tomography (CT) had significant enough findings to change the course of management.

According to the American Academy of Neurology and the National Guideline for Care Management an EEG is not recommended in treating patients with migraine headaches. Although patients with migraine headaches have a higher photic driving response, routine EEGs are not performed at the high frequencies needed to detect a response [2]. The accuracy and sensitivity of an EEG is also considerably lower than that of a CT or MRI [2].

Migraine headaches may be the result of a secondary or underlying condition. It is important to perform a thorough history, physical and neurological examination of the patient. It is also critical to obtain a comprehensive headache assessment. Specific headache characteristics or patient history may warrant the need for neuroimaging and possible immediate intervention (Table 1).

Neuroimaging Selection

Appropriate neuroimaging selection is needed for proper diagnosis and treatment. MRI is proven to have increased sensitivity in comparison to a CT in detecting white matter and arteriovenous abnormalities, as well as posterior cranial fossa lesions [14]. Tables 3-9 illustrate the ACR's "Appropriate Use Criteria" for patient's presenting with a headache [9].

References

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Table 1

Neuroimaging Qualifications for Patients Presenting with a Headache

Certain Characteristics that Warrant Neurological Imaging Include:
Abnormal findings on neurological examination [4, 7, 10, 12]
Atypical headache characteristic [8, 12]
A headache that suddenly increases with severe intensity [4, 7-9, 12]
A headache that awakens patient from sleep [12]
A headache along with neurological symptoms such as seizures or altered mental status [4, 8-9, 11, 14]
A headache that worsens with exertion [4,8-9]
A change in headache characteristics (frequency, duration, intensity, location) [4,9,11,14]
A headache along with systemic indicators such as fever [4,8-9]
A patient who has a history of neurological signs such as numbness [4,12,14]
A patient who has a history of lack of coordination [12]
A patient who is immunocompromised [4, 7-9]
A patient who has a history or current diagnosis of cancer [4,8-9]
A patient who has severe neck stiffness [8]
A new onset of a headache after the age of 40 [4,7-9, 14]
Abnormal optic findings such as papilledema, glaucoma, or orbital bruit [4,8-9]
A patient with a diagnosis or suspicion of Lyme Disease [4]

Table 2

Systemic History

<ul style="list-style-type: none">• Age at onset• Presence or absence of aura and prodrome• Frequency, intensity, and duration of attack• Number of headache days per month• Time and mode of onset• Quality, site, and radiation of pain• Associated symptoms and abnormalities• Family history of migraine• Precipitating and relieving factors• Effect of activity on pain• Relationship with food/alcohol• Response to any previous treatment• Any recent change in vision• Association with recent trauma• Any recent change in sleep, exercise, weight, or diet• State of general health• Change in work or lifestyle (disability)• Change in method of birth control (women)• Possible association with environmental factors• Effects of menstrual cycle and exogenous hormones (women)
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Table 3**Sudden, Severe Headache or “Worst Headache of Life” - Initial Imaging**

Procedure	Appropriateness Category	Comments
CT head without IV contrast	Usually Appropriate	
CTA head with IV contrast	May be Appropriate (Disagreement)	
MRA head without and with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	
MRI head without and with IV contrast	Usually Not Appropriate	
MRI head without IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	
CT head with IV contrast	Usually Not Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	

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Table 4**New Headache with Optic Disc Edema- Initial Imaging.**

Procedure	Appropriateness Category	Comments
MRI head without and with IV contrast	Usually Appropriate	
CT head without IV contrast	Usually Appropriate	
MRI head without IV contrast	Usually Appropriate	
CTV head with IV contrast	May be Appropriate	
MRV head without and with IV contrast	May be Appropriate	
MRV head without IV contrast	May be Appropriate	
CT head with IV contrast	May be Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	

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Table 5

New or Progressively Worsening Headache with One or More of the Following ‘Red Flags’: Subacute Head Trauma, Related Activity or Event (Sexual Activity, Exertion, Position), Neurological Deficit, Known or Suspected Cancer, Immunosuppressed or Immunocompromised State, Currently Pregnant, or 50 Years of Age or Older- Initial Imaging

Procedure	Appropriateness Category	Comments
CT head without IV contrast	Usually Appropriate	
MRI head without and with IV contrast	Usually Appropriate	
MRI head without IV contrast	Usually Appropriate	
CT head with IV contrast	Usually Not Appropriate	
CTA head with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	
MRA head without and with IV contrast	Usually Not Appropriate	

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Table 6

New Headache, Classic Migraine or Tension-Type Primary Headache, Normal Neurologic Examination - Initial Imaging

Procedure	Appropriateness Category	Comments
Arteriography cervicocerebral	Usually Not Appropriate	
CT head with IV contrast	Usually Not Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	
CT head without IV contrast	Usually Not Appropriate	
CTV head with IV contrast	Usually Not Appropriate	
CTA head with IV contrast	Usually Not Appropriate	
MRV head without and with IV contrast	Usually Not Appropriate	
MRV head without IV contrast	Usually Not Appropriate	
MRA head without and with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	
MRI head without and with IV contrast	Usually Not Appropriate	
MRI head without IV contrast	Usually Not Appropriate	

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Table 7**New Primary Headache of Suspected Trigeminal Autonomic Origin - Initial imaging**

Procedure	Appropriateness Category	Comments
MRI head without and with IV contrast	Usually Appropriate	
MRI head without IV contrast	May be Appropriate	
CT head with IV contrast	Usually Not Appropriate	
CT head without IV contrast	Usually Not Appropriate	
MRA head without and with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	
CTA head with IV contrast	Usually Not Appropriate	

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Table 8**Chronic Headache, No New Features, No Neurologic Deficit, - Initial Imaging**

Procedure	Appropriateness Category	Comments
CT head without IV contrast	Usually Not Appropriate	
MRI head without and with IV contrast	Usually Not Appropriate	
MRI head without IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	
CT head with IV contrast	Usually Not Appropriate	
CT head without and with IV contrast	Usually Not Appropriate	
CTV head with IV contrast	Usually Not Appropriate	
CTA head with IV contrast	Usually Not Appropriate	
MRV head without and with IV contrast	Usually Not Appropriate	
MRV head without IV contrast	Usually Not Appropriate	
MRA head without and with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	

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Table 9**Chronic Headache, New Features or Increasing Frequency- Initial Imaging**

Procedure	Appropriateness Category	Comments
MRI head without and with IV contrast	Usually Appropriate	
MRI head without IV contrast	Usually Appropriate	
CT head without IV contrast	May be Appropriate	
CT head without and with IV contrast	May be Appropriate	
CT head with IV contrast	Usually Not Appropriate	
MRA head without IV contrast	Usually Not Appropriate	
Arteriography cervicocerebral	Usually Not Appropriate	
CTA head with IV contrast	Usually Not Appropriate	
CTV head with IV contrast	Usually Not Appropriate	
MRA head without and with IV contrast	Usually Not Appropriate	

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