Diagnosis and Treatment of Headache in the Ambulatory Care Setting

A Review of Classic Presentations and New Considerations in Diagnosis and Management

Natalie Hale, MPH, MDc[a], Douglas S. Paauw, MD, MACP[b,*]

KEYWORDS

• Primary headache • Secondary headache • Tension headache • Migraine headache • Triptans • Cluster headache • Hypnic headache • Chronic daily headache

KEY POINTS

- The 4 most common headache subtypes are tension, migraine, cluster, and chronic daily headaches.
- Headache diagnoses are generally made on clinical grounds. Imaging is often required if a secondary cause of headache is suspected.
- A number of diagnoses that have caused confusion in the past are now recognized as migrainous disorders. These include abdominal migraine, cyclic vomiting syndrome, and, more often than not, sinus headache.
- Special considerations are necessary when working up and treating headaches in pregnant women and the elderly.
- Addition of metoclopramide can improve the efficacy of oral migraine therapies and reduce nausea.
- A number of new complementary modalities show promise in the treatment of headache disorder. In particular, butterbur, a petasite, is now recognized as a highly effective preventive therapy for migraine sufferers.

INTRODUCTION

Headaches are the most prevalent constellation of neurologic disorders and are among the most common reasons patients present for care.[1] The most important first

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[a] Department of Medicine, University of Washington School of Medicine, Seattle, WA 98195, USA; [b] Medicine Student Programs, University of Washington School of Medicine, Seattle, WA 98195, USA
* Corresponding author.
E-mail address: dpaauw@medicine.washington.edu

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step in the diagnosis of headache is determining whether the headache is a primary or secondary disorder. Secondary headaches result from an underlying pathology and are generally very serious in nature and must be worked up and treated in an urgent manner. Common causes of secondary headache include subarachnoid hemorrhage, intraparenchymal bleed, temporal arteritis, mass effect from a tumor or abscess, or intracranial infection.[2] Although this article will touch on the workup of secondary headaches, it will focus on primary headache disorders, which comprise 90% of all headaches.[3]

The 3 most common types of primary headaches include tension, migraine, and cluster headaches, comprising 40%, 10%, and 1% of all headaches, respectively.[1,2] Tension headaches affect approximately half of all individuals at some point in their lifetime and have equal prevalence across genders. Although common, tension headaches are usually mild and are rarely the cause for clinic visits. The lifetime prevalence of migraine headache is 18% and these headaches are particularly common in women.[1] Cluster headaches, on the other hand, are more common in men.[2] Other types of related disorders that are discussed in this article are cyclic vomiting syndrome (CVS) and abdominal migraine. We also consider special populations, including women, who tend to experience a greater number of migraines during their menstrual cycles, and the elderly, whose headache syndromes are markedly different from those in younger age groups and for whom many of the rescue and prophylactic medications prescribed for younger populations may actually be quite harmful. This article will help practitioners differentiate complex headache disorders from one another and provides a review of the latest modalities in treatment, including lifestyle modification, complementary modalities, and nonprescription supplements. A number of case scenarios also are presented to help highlight characteristic presentations of common headache syndromes.

PATIENT HISTORY

In patients presenting with headache, the first objective is determining whether a primary or a more serious secondary headache is present.[2] The patient history is particularly helpful in differentiating between these etiologies. Primary headaches typically develop before the third decade of life and tend to have stereotyped presentations and triggers, whereas secondary headaches more commonly occur at an age older than 55, often for the first time and with a high degree of severity.[4] Secondary headaches are often described as having a “thunderclap” onset, as they appear suddenly and with great intensity. Sudden-onset, excruciatingly painful headaches may indicate several concerning pathologic processes, including hypertensive emergency, acute angle-closure glaucoma, vertebral artery dissection, intraparenchymal hemorrhage, carotid artery dissection, or subarachnoid hemorrhage. Subarachnoid hemorrhage is particularly likely when a patient older than 45 presents with the worst headache of his or her life. Both prescribed medications and drugs of abuse, including methamphetamines, cocaine, nonsteroidal anti-inflammatory drugs (NSAIDs), anticoagulant drugs, and glucocorticoids increase the risk of intracranial bleeding. Fever, altered mental status, and symptoms of infection elsewhere are suggestive of infection, whereas immunosuppression or human immunodeficiency virus (HIV) infection predispose to intracranial abscess, infection, and malignancy, all of which may cause secondary headache.[2]

Primary headache disorders are differentiated by their severity, location, frequency, and the degree of disability they cause. The most common types of primary headaches are tension, migraine, and cluster headaches. A number of tools are available

to assist practitioners in the diagnosis of these disorders, including the International Headache Society (IHS) Classification System, the Migraine Disability Assessment (MIDAS) questionnaire, and headache diaries. The MIDAS questionnaire and headache diaries kept over 4 to 6 weeks are helpful in differentiating among headache types and determining patient disability and the impact of headache on patient quality of life.[4,5] This section focuses on the typical patient histories for the 3 most common types of primary headaches and a number of rare, but related diagnoses, including chronic daily headache, CVS, and abdominal migraine. Special attention also is paid to headaches in the elderly, whose histories may differ from those provided by younger individuals (**Table 1**).

Tension Headaches

A 27-year-old computer programmer mentions that he has been having frequent headaches. He describes them as a bandlike discomfort around his scalp to the back of his head. He has found that using 600 mg of ibuprofen helps alleviate the symptoms greatly.

The patient in this case presents with the classic features of tension headache. This most common form of headaches presents with a bilateral feeling of mild-to-moderate tension and pressure.[2] The associated pain can occur anywhere from the neck to the head, but is not typically disabling. Patients will report that headache frequency is related to stress levels and that relief is generally achieved with acetaminophen or NSAIDs.[6] Tension headaches have received little research attention as compared with other primary headache syndromes, likely owing to their association with mental and physical stress and tension, but in more recent years, efforts have been made to better understand potential treatment modalities, as shall be discussed later in this article.[7] The classic features of infrequent episodic tension-type headaches are listed in **Fig. 1** and **Box 1**.[8]

Migraine Headaches

A 22-year-old woman presents for evaluation of headaches. She has had headaches for the past 6 months, occurring 4 to 5 times a month. The headaches are of great intensity, involving the right side of her head with the maximum intensity of pain occurring behind her right eye. Symptoms worsen with exertion. Her headaches last 3 to 6 hours, are sometimes associated with nausea, and, on 2 occasions, have been preceded by a scotoma in her right eye. Neurologic examination is unremarkable.

Table 1
Overview of major headache types

Headache Type	Characteristics
Tension	Bilateral nondebilitating headache, often associated with stress.
Migraine	Unilateral mild-to-severe and often debilitating headache. May be associated with aura.
Cluster	Unilateral retro-orbital headache, often associated with lacrimation, nasal drainage, and erythematous conjunctiva. Untreated, occurs daily in "clusters" of 6–12 wk, often with up to 1 y between each cluster period.
Chronic daily	Daily headaches that develop after heavy use of analgesics, NSAIDs, and migraine-specific therapies. Underlying headache disorder may be mild, but patients can develop severe headaches due to medication overuse.

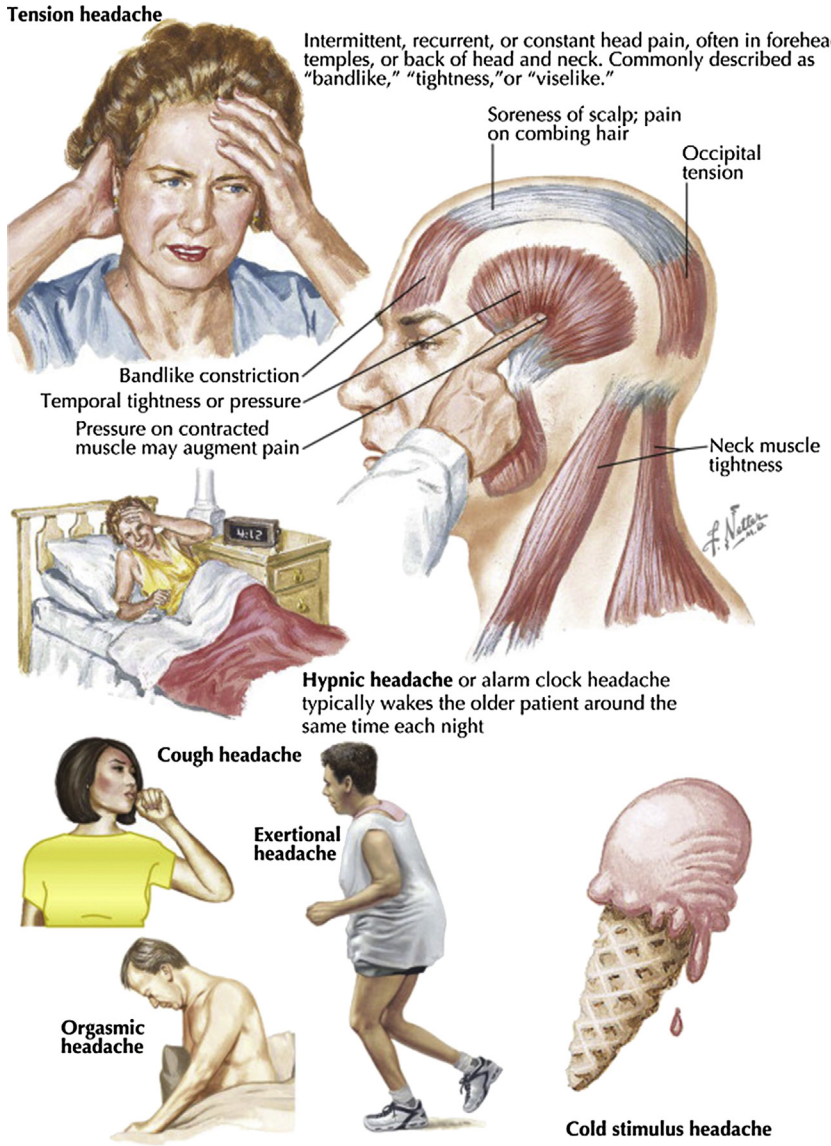

Fig. 1. Overview of common headache syndromes. (*From* Netter illustration www.netterimages.com. © Elsevier Inc. All rights reserved.)

This case exemplifies some of the hallmark characteristics of migraine headache. Patients with this condition often complain of disabling unilateral pain with possible photophobia or phonophobia, nausea and vomiting, and/or an aura.[2] Most patients experience a prodrome of symptoms, which may last for hours to days before the migraine.[4] This prodromal period is not to be confused with aura, described in the case scenario as a scotoma in the patient's right eye. The prodromal period may be characterized by mental status change, such as depression, drowsiness, restlessness, or euphoria; neurologic changes, such as photophobia, phonophobia,

Box 1
International Headache Society (IHS) tension headache criteria (infrequent episodic)

Infrequent episodes of mild-to-moderate bilateral pain, which is tightening or pressing in nature and lasts for minutes to days.

Diagnostic criteria

A. ≥10 episodes on <1 day per month and fulfilling criteria B–D

B. Duration of 30 minutes to 7 days

C. Characterized by ≥2 of the following: (1) bilaterality, (2) tightening or pressing (nonpulsating), (3) mild-to-moderate intensity, (4) not aggravated by routine physical activity, such as walking

D. Lack of nausea, vomiting, or photo-phonophobia

E. Cannot be attribute to another disorder

hypersomnolence, yawning, or decreased concentration; or other symptoms, such as gastrointestinal upset, food cravings, or temperature dysregulation.[4] Auras are seen in 15% to 20% of patients with migraine and typically last between 15 and 60 minutes.[4] Auras are most commonly visual, in which case they often present with a hemifield defect or start centrally and spread outward, but they can have sensory or motor characteristics or involve speech as well.[2–4] Migraine headaches are strongly heritable. First-degree relatives of patients with migraines without aura experience 1.4 and 1.9 times higher risks for developing migraines with and without aura, respectively. Even more strikingly, first-degree relatives of individuals with migraine with aura have a 4 times higher risk of developing migraine with aura, but no increased risk of developing migraine without aura. And twin studies of monozygotic and dizygotic twins suggest an approximately 50% rate of heritability, with the mode of heritability being multifactorial and polygenic.[9] The POUND criteria are particularly helpful in diagnosing migraine:

Pulsatile headache
One-day duration (4–72 hours)
Unilateral location
Nausea or vomiting
Disabling intensity

With 4 of 5 of these symptoms, there is a 92% probability that the patient is suffering from a migraine. If 3 of 5 are present, the probability is 64%.[10] Many patients will complain of migraine triggers. These triggers may be additive and may not always produce migraine with exposure. Examples include stress or recovery from stress, too much or too little sleep, flickering lights, or loud noises. Consumption of a number of foods or preservatives may also be responsible, such as monosodium glutamate; nitrites; the tyramine contained in wine and aged cheese; alcohol; artificial sweeteners; citrus; pickled foods; vinegars; caffeine overuse or withdrawal; or the phenylethylamine in chocolate, garlic, seeds, nuts, or raw onions. Importantly, menses is a trigger in 60% of female migraine sufferers and 14% of women with migraines experience their headaches only during menses.[3] These headaches are thought to be triggered by changing estrogen levels, which may in part explain the decrease in prevalence of migraine after age 50 and in postmenopausal women, unless estrogen replacement therapy is used (**Fig. 2**).[1]

Patients with migraine often have psychiatric comorbidities. This is particularly true in patients with migraine with aura, who are 4 to 7 times more likely to have

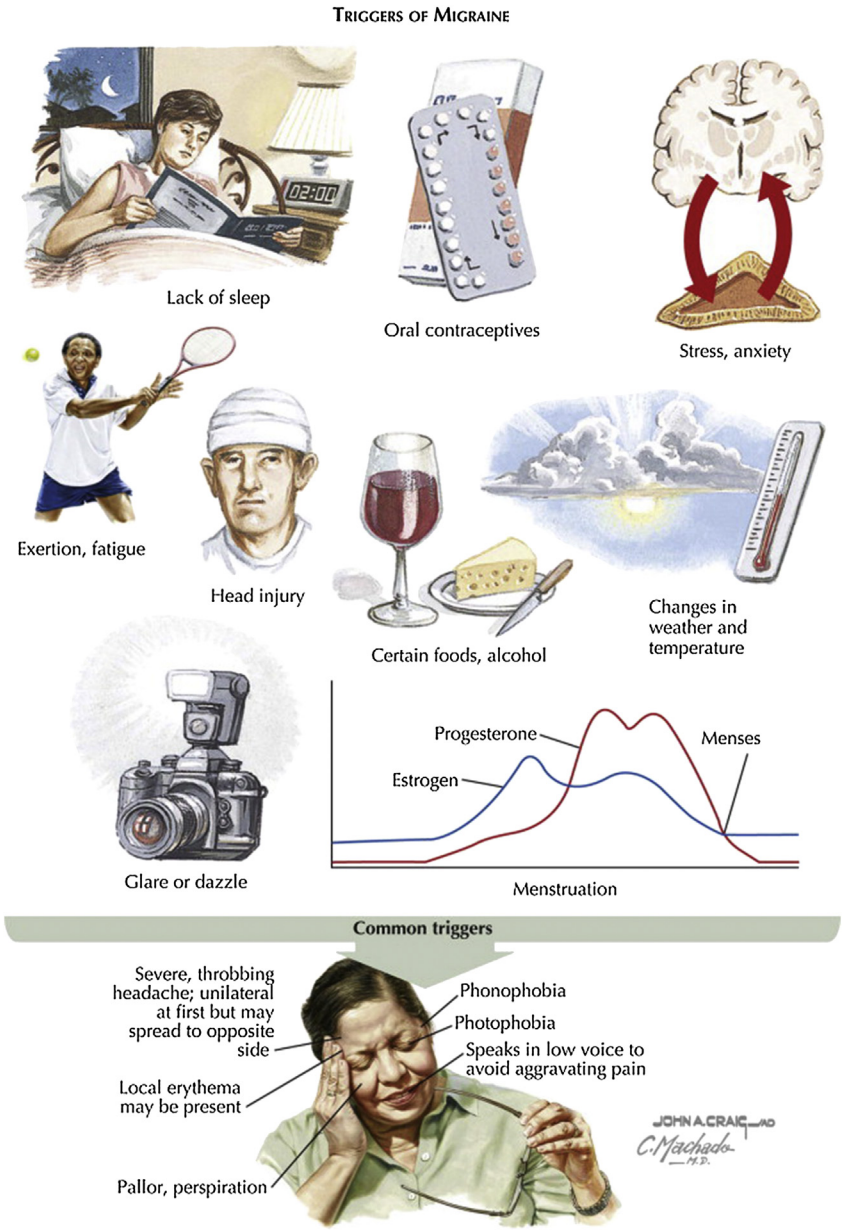

Fig. 2. An overview of migraine headache triggers. (*From* Netter illustration www.netterimages.com. © Elsevier Inc. All rights reserved.)

a psychiatric diagnosis and who are more likely to attempt suicide than patients with migraine who do not experience aura.[4] These factors emphasize the importance of collecting a complete psychiatric history in patients who suffer from migraine and screening for depression, suicidality, and anxiety disorders. The IHS guidelines for migraine headache diagnoses are listed in **Boxes 2** and **3**.[8]

Box 2
IHS migraine without aura criteria

Recurrent headache disorder, with attacks lasting between 4 and 72 hours. Headaches are unilateral, pulsating, moderate-to-severe in intensity, aggravated by routine physical activity, and often associated with nausea and photo-phonophobia.

Diagnostic criteria

A. ≥5 attacks, all fulfilling criteria B–D

B. Headache duration of between 4 and 72 hours (untreated or unsuccessfully treated)

C. ≥2 of the following characteristics: (1) unilaterality, (2) pulsating quality, (3) moderate-to-severe intensity, (4) aggravation by or causing avoidance of routine physical activity (i.e., walking)

D. Experience of at least 1 of the following: (1) nausea, (2) vomiting, (3) photophobia, (4) phonophobia

E. Not attributed to another disorder

Cluster Headaches

A 28-year-old man presents to the emergency department at 3:00 AM with severe right-sided retro-orbital pain, lacrimation, sweating, and nasal drainage. He reports that this pain awakened him from sleep and that he had a number of similar episodes, which occurred over a period of 8 weeks last year. He smokes 2 packs of cigarettes a day, as he has for the past 10 years. He is in excruciating pain and requests immediate treatment.

This patient presents with the classic signs and symptoms of cluster headache. This relatively rare condition typically causes severe, sharp, unilateral retro-orbital pain in addition to autonomic symptoms, such as lacrimation, sweating, and nasal drainage on the same side as the pain. Approximately 70% of cluster headache sufferers are younger than 30 years when the headaches begin. This condition can exist in the more common episodic form, which constitutes 80% to 90% of cases, or the more rare, but debilitating chronic form of cluster headaches. Like the headaches seen in the patient in the example, episodic cluster headaches occur every day, and often multiple times per day, for 6 to 12 weeks, followed by periods of remission of up to 12 months. Conversely, in the chronic form, episodes appear without significant periods of remission (**Fig. 3**).[2]

Box 3
IHS migraine with aura criteria

Recurrent headache disorder with associated reversible focal neurologic symptoms that develop over 5–20 minutes and last for <60 minutes. Headache with features of the aforementioned migraine without aura typically ensues following the aura, but, less commonly, headaches may lack some of the features of a typical migraine or migraine symptoms may be altogether absent.

Diagnostic criteria

A. ≥2 attacks fulfilling criterion B (as listed above in **Box 2**)

B. Migraine aura fulfilling criteria of specific aura syndromes (various neurologic symptoms, including visual and tactile disturbances, parasthesias, hemiplasia, and dysarthria)

C. Not attributed to another disorder

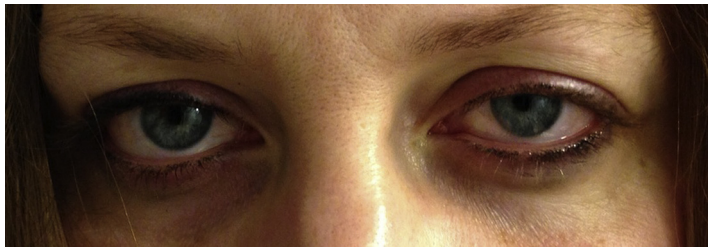

Fig. 3. Miosis, ptosis and increased lacrimation during a left sided cluster headache. (*From* Netter illustration www.netterimages.com. © Elsevier Inc. All rights reserved.)

Cluster headaches often have a strong familial pattern and are frequently misdiagnosed as migraine, sinusitis, or allergies. In fact, only 25% of sufferers receive the correct diagnosis within the first year of onset. A number of serious comorbidities are associated with cluster headaches, including depression in up to 24% of sufferers, sleep apnea, asthma, and restless leg syndrome.[2] Thus, as with migraines, it is important to collect a very complete patient history and screen patients for psychiatric comorbidities. Cluster headaches are more common in men and 87% of sufferers of chronic cluster headaches are cigarette smokers.[11] IHS criteria for cluster headache diagnosis are listed in **Box 4**.[8]

Chronic Daily Headache

Individuals experiencing headache on 15 or more days per month for longer than 3 months are considered to suffer from chronic daily headaches. Chronic daily headache is not a diagnosis itself, but instead encompasses a number of conditions, the most common of which are transformed migraines, chronic tension-type headaches, and medication-overuse headaches.[4,12] These headache subtypes are all related in that preexisting episodic headaches are converted into more severe forms through the overuse of analgesic or other antimigraine medications, including narcotics, barbiturates, triptans, and ergotamines.[4] Medication overuse is defined as the overuse of medications for at least 3 months. Although the amount necessary for each patient may differ, the amount of medication generally needed to induce medication overuse

Box 4
IHS cluster headache criteria

Severe attacks of unilateral, orbital, supraorbital, or temporal pain, lasting 15–180 minutes. Attacks occur from once every other day to 8 times per day and are associated with one of the following: conjunctival injection, lacrimation, nasal congestion, rhinorrhea, forehead or facial sweating, miosis, ptosis, or eyelid edema.

Diagnostic criteria

A. $\geq$5 attacks fulfilling the criteria B–E

B. Severe to very severe unilateral pain lasting for 15–180 minutes if left untreated

C. Accompanied by $\geq$1 of the following: (1) ipsilateral conjunctival injection and/or lacrimation, (2) ipsilateral nasal congestion and/or rhinorrhea, (3) ipsilateral eye edema, (4) ipsilateral forehead and/or facial sweating, (5) ipsilateral miosis and/or ptosis, (6) sense of restlessness or agitation

D. Attacks occur anywhere from 8 per day to every other day in frequency

E. Not attributed to another disorder

headaches is more than 14 days per month use of simple analgesics, more than 10 days per month use of migraine-specific drugs, or more than 14 days per month use of all headache medications. Risk factors for chronic daily headache includes obesity, caffeine consumption, sleep and psychiatric disorders, and the use of acute antiheadache medications on more than 10 days per month. Most patients with chronic daily headache are women with long-running histories of episodic headache disorders that transform from a more benign to a more severe form over months to years.[12] IHS criteria for the diagnosis of medication overuse headache is listed in **Box 5**.[8]

Headaches in the Elderly

The presentation of headaches in the elderly differs quite significantly from younger populations. Older patients are at significantly higher risk of secondary headache and, instead of traditional migraine symptoms, they tend to experience more aura-like migraine accompaniments. In addition, hypnic headaches, a condition unique to the elderly, cause morbidity in these patients, as do cough headaches and chronic daily headaches. The prevalence of migraines decreases with age, but the rate of chronic daily headaches actually increases, owing to the use of analgesics and other medications for the treatment of various age-related medical conditions. Vasodilators, such as nitroglycerin, nifedipine, and dypiridamole, in addition to selective serotonin reuptake inhibitors (SSRIs), serotonin norepinephrine reuptake inhibitors (SNRIs) and analgesic drugs are commonly prescribed in this population and are well known as contributors to chronic daily headache. Auralike migraine accompaniments are more prominent in this population, consisting of traveling paresthesias, scintillating scotomas, speech disturbances, and homonymous field defects. These symptoms typically demonstrate a buildup and spread of visual scintillations, a spreading of paresthesias from hands to face, or a progression from one accompaniment symptom to another, typically lasting between 15 and 30 minutes. These migraine accompaniments can be distinguished from transient ischemic attacks (TIAs), in that TIAs most commonly last fewer than 15 minutes and migraine accompaniments, unlike TIAs, show normal cerebral blood flow patterns when compared with age-matched controls. Further, visual field defects related to aura typically last between 15 and 60 minutes and involve both fields and feature bright, shimmering lights with moving shapes, whereas those associated with

Box 5
IHS medication overuse headache criteria

Headache that develops when susceptible patients use excessive amounts of a therapeutic agent. These headaches present with a mixture of tension and migrainelike qualities and are present on $\geq$15 days per month. Overuse of ergotamines, triptans, analgesics, opioids, other medications, or a combination of medications will each present with slightly different symptomatology.

Diagnostic criteria

A. Headache present $\geq$15 days per month with varying symptomatology based on therapeutic modality used

B. Medication in question used on $\geq$10 days per month on a regular basis for $\geq$3 months

C. Headache developed or markedly worsened during medication overuse

D. Headache resolves or reverts to previous pattern within 2 months after discontinuation of medication

TIAs most commonly last between 2 and 5 minutes, are usually unilateral, unmoving, and involve a darkening or dimming of the visual field. Further, aura-related paresthesias typically last for 20 to 30 minutes and come on gradually, with the first area affected typically being the last area to clear. Paresthesias related to TIAs, on the other hand, frequently arise suddenly, last for between 5 and 10 minutes, and clear in the same order that they emerged (**Tables 2** and **3**).[13]

Cough headache is typically seen in men older than 40 and is characterized by 1-second to 30-minute bouts of pain in association with episodes of coughing. Although mostly benign, a number of reports exist linking cough headache with Chiari I malformation, so these patients require magnetic resonance imaging (MRI) with sagittal views to rule out this more serious diagnosis. Finally, hypnic headaches are entirely unique to patients older than 60. These headaches awaken patients from their sleep and are almost always benign. The pain is dull and diffuse, typically lasting for 30 to 60 minutes per episode. This condition's lack of autonomic symptoms differentiate it from cluster headaches and its dull, diffuse pain pattern separates it from diagnoses like trigeminal neuralgia.[14]

The risk of secondary causes of headache increases with age. It is important to be able to differentiate potentially life-threatening causes of headache from bothersome, but more benign etiologies in this more aged population. Beyond the aforementioned TIAs, other causes of headache that must be ruled out include temporal arteritis, trigeminal neuralgia, subdural hematoma, herpes zoster, and postherpetic neuralgia. Temporal, or giant cell, arteritis (GCA) is typically seen in individuals older than 50 (mean age of patients with positive temporal artery biopsies is 73) and must be considered as a cause of headache in anyone in this age group, as the risk of vision loss is quite high, occurring in up to 15% to 20% of patients with GCA.[15,16] Patients with temporal arteritis typically complain of a throbbing pain or steady ache in their temples, scalp tenderness, a diminished pulse over a thickened temporal artery, and pain with chewing, known as jaw claudication. The symptoms with the highest likelihood ratios (LR) for GCA are jaw claudication with a LR of 4.2 and diplopia with a LR of 3.4.[15] The workup for temporal arteritis includes an erythrocyte sedimentation rate and a temporal artery biopsy, and treatment involves immediate administration of high-dose steroids.[13]

Table 2
Causes of primary headache in the elderly

Type	Description
Hypnic	Dull, diffuse pain that awakens patients from sleep, typically lasting for 30–60 min. Benign and unique to patients older than 60.
Cough	One-second to 30-min bouts of pain associated with coughing. Generally seen in men older than 40. Mostly benign, but association with Chiari I malformation. Requires MRI with sagittal views as part of workup.
Medication use/overuse	Headaches develop due to use of SSRIs, SNRIs, and vasodilators, such as nitroglycerin, nifedipine, and dypiridamole. Overuse of analgesic medications for other bodily aches and pains also may contribute.
Migraine accompaniments	Migraines decrease in frequency with age, but older patients may experience auralike migraine accompaniments. These consist of traveling paresthesias, scintillating scotomas, speech disturbances, and homonymous field defects, which may build up and spread and typically last between 15 and 30 min.

Table 3
Causes of secondary headache in the elderly

Type	Description
Temporal arteritis	Associated with a throbbing pain in the temples, scalp tenderness, a diminished pulse over a thickened temporal artery, and pain with chewing, known as jaw claudication. The workup for temporal arteritis includes an erythrocyte sedimentation rate and a temporal artery biopsy.
Trigeminal neuralgia	Common in patients older than 40. In this condition, severe, sharp, unilateral, waxing, and waning pain is seen with minor stimulation of the face, such as shaving, brushing teeth, laughing, or chewing.
Subdural hematoma	Common in the elderly after light trauma. Anticoagulant drugs and aspirin use put patients at higher risk. Suspect in older patients experiencing a dull headache in the setting of altered mental status, confusion, or personality changes.
Herpes zoster/postherpetic neuralgia	Can cause severe facial pain, with pain often preceding associated vesicular lesions. Postherpetic neuralgia causes pain that persists for >3 mo after the acute attack of zoster.
Cerebral metastases	Most commonly lung, melanoma, renal, breast, or colorectal (in descending order of prevalence of brain metastases). Melanoma has the highest propensity to metastasize to brain of all malignant tumors.[38]

Subdural hematomas also are much more common in the elderly and may be observed even after very light trauma, such as a minor head injury, or even vigorous sneezing or coughing. Anticoagulant drugs and aspirin use put patients at higher risk as well. Tears in bridging veins are most commonly responsible for subdural hematoma formation and the ensuing bleeding may not cause symptoms for days to weeks after the initial insult. Subdural hematoma should be suspected in older patients experiencing dull headache in the setting of altered mental status, confusion, or personality changes. Patients with this condition can usually just be followed closely with serial computed tomography (CT) scans, but large hematomas require urgent surgical evacuation.[13]

Specific neuropathic pain conditions are more common in the elderly population, and must be considered in any new patient complaining of new-onset headache. Idiopathic trigeminal neuralgia is common in patients older than 40. In this condition, severe, sharp, unilateral, waxing and waning pain is seen with minor stimulation of the face, such as shaving, brushing teeth, laughing, or chewing. Similarly, herpes zoster can cause severe facial pain, depending on the distribution of the reactivated virus, with pain often preceding associated vesicular lesions by several days. Further, postherpetic neuralgia results in as many as 50% of patients older than 60 and causes pain that persists for longer than 3 months following the acute attack of zoster. Thus, providers should inquire as to recent infection history in the consideration of any older patient presenting with new-onset headaches.[13]

Physical Examination

The physical examination, and particularly the neurologic examination, is important in ruling out harmful secondary headache pathologies. Physical examination findings also play a role in making the correct primary headache diagnosis, especially when autonomic symptoms are present. The physical examination for a chief complaint of headache should include vital signs; the cardiopulmonary examination; auscultation of the carotid and vertebral arteries; palpation of the head, neck, and temporal

arteries; and a complete neurologic examination focusing on fundoscopic and pupillary assessment, neck stiffness, focal weakness, sensory loss, and gait. Special attention must be given to patients with fever or altered mental status, those with neurologic signs, and older patients presenting with the first or worst headache of their life.[4] Importantly, positive neurologic signs on examination are very important predictors of central nervous system (CNS) pathology and cannot be attributed to migraine unless the patient's headaches have a pattern of presenting with the same neurologic signs.[2] With the exception of rare syndromes, such as hemiplegic migraine, the physical examination is typically negative in the case of primary headaches, making the patient history most important with respect to diagnosis.

IMAGING AND ADDITIONAL TESTING

A 46-year-old woman develops a severe headache this morning while at work. She also has nausea and has had one episode of emesis. She has shoulder and neck stiffness that developed today. She denies any history of migraine headaches or any similar headaches.

Imaging is a very important step in assessing patients with signs and symptoms of secondary headache and the case scenario exemplifies the type of situation when imaging might provide valuable insight into the patient's underlying pathology. Neuroimaging is 98.6% sensitive for serious intracranial pathology if any one of the following risk factors are present: age older than 45 years, abnormal neurologic examination, or sudden onset of headache.[10] Other conditions requiring neuroimaging in patients with new-onset headache include immunosuppression, suspected temporal arteritis, possible meningitis, or severe headache in pregnancy. Of note, HIV-positive patients presenting with headache and CD4 counts less than 300 should receive CT imaging, given the high probability of finding some underlying CNS pathology.[17] A noncontrast CT should be ordered to rule out intracranial bleeding and in the case of head trauma, although MRI is more effective in patients suspected of parenchymal pathology, such as infection, abscess, or tumor. MRI also is more helpful in the diagnosis of subdural hematoma or smaller lesions. Lumbar puncture can help diagnose infection, CNS malignancy, or subarachnoid hemorrhage, and is an appropriate follow-up test in patients with suspected subarachnoid hemorrhage who have a negative CT scan.[2]

If no abnormalities are noted on physical examination or in the patient's history, there is no need for neuroimaging. This concept is exemplified by typical migraine. If a patient has a regular pattern of migraines, no abnormalities on neurologic examination, and no changes in headache characteristics over time, they have only a 0.18% chance of having a clinically significant intracranial lesion.[3] In fact, no diagnostic tests are required to diagnose primary headache. Unnecessary exposure to CT ionizing radiation should be avoided, as it contributes a small lifetime increase in cancer risk and increases the chances of making incidental, but likely benign, findings that require further workup, likely at great cost, both financially and emotionally, to the patient.[5] **Boxes 6** and **7** are helpful in identifying patients in need of neuroimaging and clinical features that may raise one's suspicion for potentially worrisome findings that may be identified through imaging.

DIAGNOSTIC DILEMMAS AND SPECIAL SITUATIONS

The "Sinus" Headache

Recent research has brought to light that many headaches previously considered to be "sinus headaches" may actually be migrainous in nature. This is exemplified in the following case history:

Box 6
Clinical features indicating need for neuroimaging with severe acute headache

- Sudden onset
- Age >45 with no previous headache history
- Onset with vigorous exercise/sexual activity
- Altered mental status
- Trauma
- Neurologic abnormalities

A 29-year-old woman presents with frequent headaches over the past 12 months that include pressure pain on her forehead, under her eyes, and over her cheeks. She has not had any fevers or purulent nasal discharge.

In the past, this woman would likely have been described as a sinus headache sufferer, yet more recent findings have suggested that many headaches previously described as "sinus headaches" are actually migraine headaches. In one 2004 study, it was found that 88% of patients with self-diagnosed or physician-diagnosed sinus headaches actually met IHS criteria for migraine headache. These patients most commonly complained of sinus pressure, sinus pain, and nasal congestion.[18] Further, many patients previously thought to have sinus headache appear to be responsive to typical migraine therapy, with 82% being responsive to triptans and 92% responding to migraine-directed therapy in one study.[19]

Menstrual Migraines and Prescription of Oral Contraceptives in Women with Migraines

Menstrual migraines, or migraines experienced between 2 days before or 3 days after the onset of menstruation, occur in approximately 20% of women between the ages of 17 and 49, with peak prevalence in women in their 30s. It is thought that the declines of estrogen levels in the late luteal phase may be responsible for menstrual migraines. Increased levels of prostaglandins during menstruation may also play a role. Treatment of menstrual migraines is almost identical to treatment of typical migraines, with the notable exception of administration of intermittent prophylaxis, which involves therapy administered prophylactically during the perimenstrual period. NSAIDs, coxib drugs, and triptans are currently used for this purpose, and may be dosed as many as 7 days before and 6 days after the start of menses. Hormonal prophylaxis, such as percutaneous estradiol gel 1.5 mg administered perimenstrually for up to 6 cycles or continuous administration of oral contraceptives,

Box 7
Clinical features that suggest higher risks for a positive neuroimaging study

- Abnormal neurologic examination
- Personality change, cognitive deficit, memory loss
- Head trauma (within 4 months)
- History of malignancy (excluding basal cell carcinoma)
- Chronic anticoagulation
- HIV infection with CD4 count <300

also may be administered.[20] It is the opinion of these authors that, given the known risks of estrogen therapy, the continuous administration of oral contraceptives or instillation of a levonogestrel-releasing intrauterine device would be preferable to administration of estrogen for the prophylaxis of menstrual migraines. It is particularly important that women with migraines, and particularly those with migraine with aura, be prescribed progestin-only oral contraceptives or some other mode of non–estrogen-containing contraceptive, because of the increased risk of stroke in these individuals.[21]

A recent meta-analysis of 35 studies, including more than 600,000 patients, found a very strong correlation between migraine and an increased risk of stroke, with a relative risk of 2.41 overall. The risk associated with migraine with aura was even higher at 2.51; however, this value was not statistically significant. The data also suggested a stronger association between migraine and stroke in women; however, a direct comparison between genders could not be made, as the studies included did not present data separately based on gender. This increased risk may be related to increased estrogen levels, which in turn increase propensity toward coagulability, endothelial dysfunction, and inflammation.[22]

CVS and Abdominal Migraine

A number of gastrointestinal manifestations of migraine have been identified as potential causes of abdominal discomfort and nausea and vomiting. CVS and abdominal migraine have long been recognized as childhood conditions and are still considered by the IHS to be "childhood periodic syndromes" and common migraine precursors in the pediatric population.[23,24] CVS affects 2% of children, 87% of whom go on to develop migraine headaches later in life.[23] CVS is characterized by severe, recurrent episodes of nausea and vomiting, which may last for hours to days. Like migraine headaches, prodromal symptoms are often present that warn patients of an impending attack and a given patient may experience between 6 and 12 attacks per year.[25] More recently, it has become clear that CVS is a disorder that can have its primary presentation in adulthood. The prevalence is unknown, but recent studies have suggested that as many as 14% of patients in gastrointestinal motility clinics have CVS, with a mean age of onset of 25.4. The prevalence of migraine headaches in these individuals was 56% and 56% also had a family history of migraine headache. And, as with other headache syndromes described thus far, depression is prevalent in approximately 40% of patients with the adult form of CVS.[23]

Also a childhood periodic syndrome, abdominal migraine has only recently been recognized as a disorder that can occur in adult populations. Abdominal migraine is characterized by acute paroxysmal episodes of abdominal pain, with possible concomitant flushing, vomiting, pallor, anorexia, or photo-phonophobia. Headache may or may not be present with these episodes of abdominal pain and the patient is free of abdominal pain between attacks.[10] In children, 52% of patients with abdominal migraine go on to develop migraine within a decade, compared with 20% of their age-matched peers.[24] These pediatric patients are diagnosed based on the International Headache Classification System and Rome III criteria.[26,27] Although abdominal migraine has been recognized as an adult disease only relatively recently, a number of studies have identified similarities between suspected patients and have supported the notion that this condition does occur in adults and should be considered in patients complaining of recurrent abdominal pain.[26] Almost all of these patients have strong family histories of migraine and their abdominal pain tends to be nonradiating in nature, located in the midline epigastric area.[24]

TREATMENT

Tension Headaches

Although self-limiting and nondebilitating, tension headaches can be a nuisance and many patients require treatment. Identifying risk factors and triggers, such as stress and a lack of or too much sleep, is important. The mainstays of therapy are NSAIDs, acetaminophen, and aspirin.[5] With these modalities, it is important to set daily and weekly upper limits of use to prevent the development of chronic daily headache. Two prophylactic therapies have also emerged as potentially useful in decreasing the frequency and severity of tension migraines, namely low-dose amitriptyline and injection of botulinum toxin. Amitriptyline, given in doses between 10 and 75 mg daily, has proven effective in a number of placebo-controlled double-blinded studies, and research on pericranial muscle injection of botulinum toxin is also promising.[7] Other potentially helpful modalities include massage, stretching routines, regular exercise, relaxation training, and stress management.[5]

Migraine Headaches

Migraine headache sufferers require acute therapies for severe flares, in addition to prophylactic treatment aimed at reducing the frequency and severity of headaches experienced. In both scenarios, it is important to consider medical and psychiatric comorbidities and, whenever possible, offer combination therapies that treat multiple conditions with the least number of medications possible.[4] The following section will outline both acute and prophylactic modalities.

Acute therapy

Migraine headaches can be severely debilitating and, in the acute setting, the goals of therapy should be to abort the migraine headache and prevent recurrence.[5] Therapeutic modalities include nonspecific drugs, such as NSAIDs or acetaminophen, or specific therapies, such as triptans or ergotamines.[4] Acute therapy should start with an NSAID early in the onset of the migraine, followed by metoclopramide for individuals with nausea and vomiting or for those who do not respond to analgesics alone.[4] Metoclopramide can help treat the slowed gastric motility that occurs in some patients with migraine, which can promote the absorption of oral migraine therapies. In the emergency department (ED) setting, intravenous (IV) ketorolac can relieve symptoms within 1 hour and antiemetics play a role independent of their antinausea roles.[10] Metoclopramide is considered primary therapy in the ED given its lack of side effects and risk of dependency.[10] If NSAIDs and metoclopramide prove ineffective, a triptan should be used. A single triptan should be used for 3 separate migraines in different doses before trying another triptan or another class of drugs. The 3 most effective triptans in the acute setting include rizatriptan (typically at a 10-mg dose), eletriptan (80 mg), and almotriptan (12.5 mg); rapid dissolving tablets or subcutaneous injections may be used for patients with severe nausea and vomiting.[10] A combination of 900 mg aspirin in conjunction with an antiemetic may actually be as effective at 2 hours as 100 mg of sumatriptan. Further, combination triptan/NSAID drugs, such as Trexima (sumatriptan 85 mg/naproxen 500 mg) are more effective than either drug alone.[4,10] Dexamethasone IV may also be considered in the ED setting to help prevent acute migraine recurrence.[10] Ergotamine and dihydroergotamine (DHE) drugs have largely been replaced by triptans, as there is very little evidence supporting their use and they are typically not well-absorbed.[10] Finally, intranasal lidocaine may be considered as a short-term temporizing step until longer-acting therapies can be administered. This modality works quickly, but recurrence is a common problem.[10] **Table 4** draws on recommendations from the American Academy of Neurology.[28]

Table 4
Recommendations for the treatment of acute migraine

Medication	Comments
Group 1 – medications with a strong evidence base	
Triptans	
Naratriptan PO	*Grade A*. Few adverse effects.
Rizatriptan PO	*Grade A*. Occasional adverse effects.
Sumatriptan SC, PO, intranasal	*Grade A*. Occasional adverse effects; for moderate-to-severe migraines. SC and intranasal forms helpful with nausea and vomiting.
Zolmitriptan PO	*Grade A*. Occasional adverse effects.
Ergotamines	
DHE SC, IM, IV, intranasal	Frequent adverse effects; for moderate-to-severe migraines. Nasal spray and IV forms have a low recurrence rate. Nasal spray is *Grade A*.
DHE IV, plus antiemetic	Frequent adverse effects; for status migrainosus. Strongly consider in treatment of acute headache in the emergency department.
Nonspecific	
Acetaminophen, aspirin, plus caffeine PO	*Grade A*. Few adverse effects; first-line treatment for acute migraine.
Aspirin PO	*Grade A*. Few adverse effects; first-line treatment for mild-to-moderate migraines.
Butorphanol intranasal	*Grade A*. Frequent adverse effects; for moderate-to-severe migraines. Use sparingly.
Ibuprofen PO	*Grade A*. Occasional adverse effects; first-line treatment for mild-to-moderate migraines.
Naproxen sodium PO	*Grade A*. Occasional adverse effects; first-line treatment for mild-to-moderate migraines.
Prochlorperazine IV	Occasional adverse effects. Adjunct first-line therapy in emergency department or outpatient setting.

Abbreviations: DHE, dihydroergotamine; IM, intramuscular; IV, intravenous; PO, oral; SC, subcutaneous.

Data from Silberstein SD. Practice parameter: Evidence-based guidelines for migraine headache (and evidence-based review). American Academy of Neurology Quality Standards Subcommittee Report. Neurology 2000;55(6):754–62.

Pregnancy necessitates important considerations in the treatment of migraine. Migraine frequency typically decreases during pregnancy, but some women continue to experience these debilitating headaches. Many of the standard therapies, such as antiepileptics, opiates, ergotamines, and triptans, must be avoided in this population. However, metoclopramide, pyridoxine, codeine, or, if given before the third trimester, NSAIDs, would all be appropriate choices for the treatment of acute migraine in pregnant patients.[4,10] Acetaminophen, although not typically effective in acute migraine, continues to be recommended in pregnancy, given its benign side-effect profile.[10]

Prophylactic therapy

Prophylactic treatment of migraine headaches aims to decrease the intensity, frequency, and duration of migraine headaches.[4] Typically, prophylactic therapy is considered if abortive therapy is required more than 2 times per week, if the patient cannot tolerate acute therapies, if headaches significantly undermine quality of life

despite appropriate abortive therapy, or for uncommon migraine conditions, such as hemiplegic or basilar migraines.[10] Depending on the severity and frequency of migraine attacks, these drugs can be taken on different schedules. For example, if the patient has known triggers, such as exercise or changes in altitude, prophylactic therapy can be taken before these activities. For menstrual migraines, prophylactic treatment can be offered for the 1 to 8 days when the migraines are typically at their worst. Treatment also can be offered on a continuous basis for those who suffer from chronic, frequent migraines.[4] The MIDAS criteria, which assesses the number of work or school days lost during a 3-month period due to migraines, assists physicians in understanding patients' migraine-related disability.[3,4] This tool helps providers determine when chronic, daily therapy is required and, when used in a serial manner, is useful in assessing response to therapy.[3,4] **Box 8** and **Table 5** outline the MIDAS criteria and scoring system.[29,30]

Specific therapies can be derived from a number of drug classes. A large number of drugs from a variety of drug classes may be used to treat migraine headaches. These include anticonvulsants, such as divalproex sodium, gabapentin, and topiramate; antidepressants, such as tricyclic antidepressants (TCAs), SSRIs, and SNRIs, especially venlafaxine; β-blockers, such as atenolol, metoprolol, nadolol, and propranolol; serotonin antagonists, such as methysergide; neuroleptics; NSAIDs; magnesium; angiotensin receptor blockers; angiotensin-converting enzyme inhibitors; and butterbur. It is important to start with the lowest dose possible and to slowly increase dosages until an acceptable therapeutic effect is achieved.[4]

Therapies should be chosen based on the specific patient population served and individual patient comorbidities. For example, divalproex or topiramate would be appropriate for the elderly population, whereas those with comorbid insomnia or depression might be particularly well treated by TCAs or the SNRI venlafaxine. Overweight individuals would likely benefit from treatment with topiramate, and divalproex is a good choice in those with seizure disorders.[4] Menstrual migraine sufferers benefit from sumatriptan, rizatriptan, or the NSAID mefanamic acid (Ponstel) for abortive therapy,

Box 8
Migraine Disability Assessment (MIDAS) criteria

1. On how many days in the past 3 months did you miss work or school because of your headaches?
2. How many days in the past 3 months was your productivity at work or school reduced by half or more because of your headache (do not include days you counted in question 1)?
3. On how many days in the past 3 months did you not do household work because of your headaches?
4. How many days in the past 3 months was productivity in household work reduced by half or more because of your headache (do not include days you counted in question 3)?
5. On how many days in the past 3 months did you miss family, social or nonwork activities because of your headache?

Unscored section (used to further inform physician)

A. On how many days in the past 3 months did you have a headache?

B. On a scale of 0–10, how painful were these headaches on average?

Adapted from Stewart W, Lipton R, Downson A, et al. Development and testing of the Migraine Disability Assessment (MIDAS) Questionnaire to assess headache-related disability. Neurology 2001;56(Suppl 1):S20–8.

Table 5
Migraine Disability Assessment (MIDAS) scoring

MIDAS Grade	Definition	MIDAS Score
I	Little or no disability	0–5
II	Mild disability	6–10
III	Moderate disability	11–20
IV	Severe disability	21+

Adapted from Migraine disability assessment test insert. Available at: http://uhs.berkeley.edu/home/healthtopics/pdf/assessment.pdf. Accessed September 9, 2013.

and long-acting triptans, such as fovatriptan and naratriptan taken premenstrually as prophylactic therapy.[10] **Table 6** provides the most evidence-based guidelines regarding prophylactic therapies, both pharmacologic and complementary in nature, from the American Academy of Neurology and the American Headache Society.[31,32]

There is also increasing interest in nonpharmacologic approaches to the treatment of migraine headaches. From biofeedback, to osteopathic manipulative therapy, to vitamin and herbal modalities, such as petasites like butterbur, coenzyme Q10, feverfew, magnesium, and riboflavin, these new treatment options have a growing body of evidence and are increasingly used as prophylactic therapy for migraines.[3] **Table 7** reviews the evidence regarding the use of complementary modalities in the prophylactic treatment of migraine headaches.

Melatonin is another such natural therapy that may be useful not only in migraine prevention, but also the prophylactic management of cluster and tension headaches. An antinociceptive, anxiolytic, analgesic, antiallodynic, and, perhaps as it's best known, a sleep aid, melatonin has recently been proposed as a therapy for multiple types of headaches. Melatonin is found in a number of medicinal plants, including feverfew, which are commonly used in natural migraine therapy, thus raising the question as to whether it is melatonin, some other substance, or a synergism between multiple substances that leads to the headache relief attributed to these products.[33]

Acupuncture is also gaining more acceptance, as recent studies support its usefulness in the treatment of migraine, chronic tension-type, and chronic daily headaches. Acupuncture also has been found to have significant benefit with respect to health care costs, saving approximately $13,000 per quality-adjusted life-year in a recent study. It should be noted, however, that research on acupuncture has natural limitations, as the standardized approach required by research studies differs significantly from the individualized approach generally used in acupuncture practice.[34]

CLUSTER HEADACHES

This rare form of headache is generally seen in men. The rapid onset and short time to peak intensity demand that treatment be delivered quickly. Therapy involves administration of 100% oxygen at 10 to 15 L/min for 10 to 20 minutes or subcutaneous sumatriptan 6 mg. Cluster periods typically last for 6 to 12 weeks, and the goal of treatment is to combine acute and prophylactic therapy, with an emphasis on gaining control of the headaches with the latter. Prophylactic therapy should be started as soon as possible after a new cluster period begins. The calcium channel blocker, verapamil, is the first-line choice for prophylactic therapy and dosing should start at 240 mg, with upward titrations according to efficacy and tolerability. Short-course high-dose prednisone or prednisolone also may be added in the first 2 weeks as a bridging therapy until the verapamil takes full effect. Verapamil therapy should be continued until

Table 6
Traditional Prophylactic Pharmacologic Agents (based on the 2012 recommendations of the Quality Standards Subcommittee of the American Academy of Neurology and the American Headache Society)

Medication	Dose	Side Effects	Comments
Level A			
Divalproex sodium (ER)	500–1000 mg/d	Weight gain with long-term use Potential risk of pancreatitis and liver failure	Contraindicated in pregnancy
Topiramate	25–200 mg/d	Paresthesias, weight loss, gastrointestinal intolerance, somnolence	—
Metoprolol	47.5–200 mg/d	No significant adverse effects	—
Propranolol	80 mg/d	Drowsiness, sleep disturbance, weight gain, fatigue, dry mouth	—
Fovatriptan	2.5 mg twice daily	Similar to placebo	Especially useful in reducing perimenstrual migraine incidence
Level B			
Amitriptyline	10 mg daily for 3 d; 25 mg daily for 3 d; then 75 mg daily[39]	Hypersomnolence, dry mouth, difficulty with concentration	—
Venlafaxine (ER)	150 mg/d	Nausea, vomiting, drowsiness, tachycardia	—
Naratriptan	1 mg twice daily (given for 5 d, starting 2 d before onset menses)	Similar to placebo, with fewer than 10% of patients experiencing dizziness, chest pain, malaise	Useful in reducing perimenstrual migraine incidence
Zolmitriptan	2.5 mg twice or 3 times daily	Asthenia, headache, dizziness, nausea	Useful in reducing perimenstrual migraine incidence
Level C			
Lisinopril	10 mg daily for 1 wk; then 20 mg daily[40]	Cough, dizziness, tendency to faint	—
Candesartan	16 mg daily[27]	Dizziness, musculoskeletal system complaints, fatigue	—

Data from Silberstein S, Holland S, Freitag F, et al. Evidence-based guideline update: pharmacologic treatment for episodic migraine prevention in adults. Neurology 2012;78:1337–45.

Table 7
Complementary and NSAID prophylactic medications (based on the 2012 recommendations of the Quality Standards Subcommittee of the American Academy of Neurology and the American Headache Society)

Medication	Dose	Side Effects	Contraindications
Level A			
Petasites (butterbur)	50–75 mg twice daily	None	Risks of prolonged use not understood
Level B			
NSAIDs (fenoprofen, ibuprofen, ketoprofen, naproxen)	Dose dependent on drug chosen	—	Modest therapeutic benefit is observed with NSAID drugs
Magnesium	300 mg daily	—	—
MIG-99 (feverfew)	6.25 mg 3 times daily	Gastrointestinal or respiratory system disorders	—
Riboflavin	400 mg daily	—	—
Histamine SC	1–10 ng twice weekly	Transient itching at injection site	—
Level C			
Co-Q10	100 mg 3 times daily	—	—
Estrogen	Soy isoflavones 60 mg daily; dong quai 100 mg daily; black cohosh 50 mg daily; estradiol 1.5 mg gel patch	—	Helpful in reducing frequency of menstrually related migraines Limited data available regarding long-term safety
Cyproheptadine	4 mg daily	—	—

Abbreviations: NSAID, nonsteroidal anti-inflammatory drug; SC, subcutaneous.
Data from Silberstein S, Holland S, Freitag F, et al. Evidence-based guideline update: NSAIDs and other complementary treatments for episodic migraine prevention in adults. Neurology 2012;78:1346–53.

headaches have ceased for at least 7 to 14 days, and patients should then slowly be tapered off.[5] Avoidance of potential triggers, such as smoking and alcohol, should also be encouraged.[35]

Chronic Daily Headaches

For patients suffering from chronic daily headaches, providers must structure a guided medication withdrawal plan to help patients discontinue medications causing dependency. Once this has been achieved, both short-term and long-term headache management plans should be developed.[4] Behavioral modifications that may improve chronic daily headache symptoms and frequency include limiting caffeine intake, promoting good sleep hygiene, addressing psychiatric disorders, and providing training in relaxation techniques and biofeedback modalities. Discontinuation of offending drugs also should be undertaken in the case of medication-overuse headaches. Ergotamines, triptans, and NSAIDs may be withdrawn abruptly; however, patients should be tapered off of butalbital-containing analgesics and opioids over the course of

1 month. Preventive medications include tricyclic antidepressants, SSRIs, anticonvulsants, tizandine, and botulinum toxin injection, and these medications should be given at the smallest dose at which therapeutic effect is achieved and should be continued for at least 3 to 6 months once the patient is being effectively treated.[12]

Headaches in the Elderly

Treatment of migraines in the elderly presents special challenges. Given their vasoconstrictive nature, triptans, ergotamines, and DHE pose risks to individuals with cardiovascular disease. Thus, acute management in the ED should involve divalproex sodium, metoclopramide, or IV magnesium; whereas acute treatment at home can include naproxen or hydroxyzine. Some prophylactic medications, such as TCAs, can be dangerous in this population. Instead, prophylactic management should include anticonvulsants, such as divalproex sodium or topiramate, or β-blockers, such as metoprolol or propranolol.[14]

Hypnic headaches can be treated prophylactically with either 1 to 2 cups of coffee or lithium 150 to 600 mg at bedtime. Indomethacin or acetazolamide are effective in the prophylactic treatment of cough headaches. And, from a nonpharmacologic perspective, weight reduction through diet and exercise can be effective in decreasing the rate of migraines, as overweight and obese individuals are at higher risk of developing migraine headaches.[14] Finally, cough headache is most effectively treated by indomethacin, with dosages ranging from 25 to 150 mg per day; however, some patients find that the pain associated with this condition is so benign that prophylactic therapy is not necessary. For patients with Chiari I malformation, suboccipital craniectomy, with or without a C1–C3 laminectomy, generally leads to resolution of headaches.[36]

Treatment of Abdominal Migraine and CVS

Patients suspected of having abdominal migraine should be started on a trial of prophylactic topiramate therapy. Prophylactic therapies, such as divalproex sodium and propranolol, also have been considered useful. Abortive triptan therapy, preferably in a subcutaneous form, also may be used in patients who continue to experience attacks despite administration of prophylactic therapy.[24]

Acute treatment of CVS is mostly supportive, involving hydration, electrolyte management, and placement in a quiet, dark, nonstimulating environment. In combination with ondansetron, benzodiazepines, or diphenhydramine, this approach is effective in as many as 62% of cases. With respect to prophylaxis, many patients respond to traditional antimigraine therapy, such as sumatriptan, and, in one study, 86% of individuals achieved partial or complete response with the TCAs amitriptyline or nortriptyline. As with other headache syndromes, stress and anxiety reduction have proven helpful to management.[23]

FUTURE CONSIDERATIONS AND SUMMARY

Headaches represent the most common constellation of neurologic disorders and are a very common cause of morbidity, lost work time, and decreased quality of life among sufferers. In this article, the diagnostic features, workup, and treatment of common, nuanced, and difficult-to-diagnose headache conditions were addressed. The future will hold a number of changes, with respect to both the diagnosis and treatment of headache disorders. As the aging population continues to grow, primary care providers will need to become increasingly familiar with differentiating between benign primary and more serious secondary headache disorders and will need to be able to treat the headache disorders unique to the elderly. With respect to therapeutic

options, the future for treatment of the various headache disorders is promising. With the rise in popularity of complementary medical practices, there is likely to be more research on the roles of acupuncture, herbal and alternative remedies, massage therapy, and mind-body techniques. Further, new research is suggesting that neurostimulation may be useful in certain chronic, intractable headache conditions.[37] Finally, the pathophysiology of headache disorders is still poorly understood and there is great hope that better understanding of the underlying mechanics of headache might contribute to improved treatment modalities and better quality of life for patients.

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