

Pain in the Head

CHAPTER HIGHLIGHTS

- Key features used to differentiate among common causes of headache include identification of unilateral or bilateral pain, pain duration, and preferred activity or behaviors during a headache episode.
- New-onset headache, headache beginning after age 50, posterior head pain, and neurological complaints each suggest that a work-up for secondary causes of headache will be needed.
- Migraine is the most common chronic headache seen in primary care practices.
- Daily headache diaries are important tools for accurately assessing headache patterns.

* * *

This afternoon, you have five new patients who range in age from 12 to 75 years old. Each patient comes to the office with a chief complaint of *a pain in the head*. They have each diagnosed themselves with sinus headache and have had variable success with over-the-counter (OTC) sinus remedies. They each come to the office seeking antibiotics. Here are the stories each patient tells your nurse:

Patient 1: Mrs. Franklin is a 48-year-old accountant. “I used to get terrible migraines with my menstrual periods. I’d throw up and spend the day in bed with a washcloth over my eyes. My migraines got better after I had my kids, but since I’m starting menopause, I’ve been getting terrible sinus headaches.”

Patient 2: Steven is a 12-year-old seventh-grade student. His mom brought him in for headaches. “Steven only gets headaches during the school year. I’m sure it’s just stress and struggling with school. He missed school twice this month already for the headaches, but then he was fine by mid-morning. His headaches are nothing like my migraines, so I’m guessing they’re stress or maybe sinus headaches.”

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- Patient 3: Mr. Hillman is a 45-year-old jazz pianist. “My wife’s beginning to think I’m just crazy. These horrid headaches make me want to blow my head off. I only get them in the spring and fall, so my wife thinks they might be allergies from my sinuses. I don’t know what I’d do if I got one of these while performing.”
- Patient 4: Ms. Inglis is a 35-year-old homemaker. “I’ve had migraines since I was 13, but now I wake up everyday with a headache. They seem to worsen when the weather changes or is about to change, so it’s got to be sinuses.”
- Patient 5: Mrs. Jeffries is a 75-year-old hospital volunteer. “I suffered with migraines my whole life, spending a couple of days every month in bed. These thankfully stopped when I was in my 50s. I can’t believe I’ve started having headaches again. My migraines were like a spike through my eye and these are on my right forehead, so I think my sinuses must be acting up.”

1. EVALUATING HEAD PAIN

Although more people in the general population experience a tension-type headache than a migraine, the vast majority of people suffering from headaches seeking treatment actually have migraines. More than 90% of 1203 patients consulting their primary care doctors for headache were diagnosed with migraine as the cause for their complaint (1). Despite the overwhelming prevalence of migraines in primary care patients with a headache, patients themselves are often convinced that their headaches are related to sinus disease. Headache features that are characteristically linked to the sinuses commonly occur in migraine. A clinical assessment of nearly 3000 patients who were self- or physician-diagnosed with sinus headache resulted in a migraine diagnosis in 80% (2). In addition to typical migraine features (such as throbbing pain, photophobia, phonophobia, and nausea), those patients with migraine also endorsed a variety of “sinus” symptoms: sinus pressure (84%), sinus pain (82%), nasal congestion (63%), runny nose (40%), and watery eyes (38%). Moreover, migraine pain usually affects those areas near the facial sinuses. A survey of 1283 migraine patients found the most common pain locations were around the eyes (67%), temple (58%), and forehead (56% [3]). About half of migraineurs identify changes in weather as a possible migraine trigger, although only 24% feel that weather changes will *usually* trigger a migraine (4). Interestingly, patients with a migraine with eye pain are more likely to report weather changes as a trigger (3).

Although the chief complaints and brief histories in the five patients mentioned earlier are typical, none has provided enough information to formulate an educated diagnosis. Despite the fact that each patient has the same primary

Table 1
Common Causes of Head Pain

Disease category	Specific diseases
• Idiopathic	◦ Migraine ◦ Tension-type headache ◦ Cluster headache
• Musculoskeletal	◦ Temporomandibular dysfunction ◦ Cervical myofascial or joint dysfunction
• Inflammatory/ autoimmune	◦ Acute infection (e.g., upper respiratory infection, meningitis) ◦ Temporal/giant-cell arteritis ◦ Systemic lupus erythematosus
• Systemic illness	◦ Anemia ◦ Thyroid disease
• Intracranial pathology	◦ Tumor ◦ Vascular malformation or aneurysm ◦ Subdural hematoma ◦ Cerebrovascular disease

complaint, differences in history and examination can provide ready clues to diagnostic possibilities (Table 1). Although migraine is a very common cause of chronic headache, headaches may be caused by a wide variety of medical conditions. The most common cause of acute or new-onset headache is acute viral or bacterial infection. Trauma is another common cause of new headache. A review of 288 randomly selected cases of children coming to the emergency room with the main complaint of headache showed that headache was caused by upper respiratory tract infections in more than 60% of cases, with migraine accounting for only 16% of headache conditions (5). A similar survey of 150 children visiting an emergency room for severe, acute headache identified a diagnosis of upper respiratory infection in 57% and migraine in only 18% of cases (6). Headache may also occur with viral illnesses and other infections in adults. In older adults, other important causes of acute headache include trauma, hemorrhage, tumor, and giant-cell arteritis. Headache features that suggest intracranial pathology include recent change in headache pattern, patient age over 50 years old, posterior head pain, and additional neurological complaints (7). Extracting important features to distinguish among common disorders depends on a targeted evaluation that focuses on high-yield questions and examination findings that help distinguish among the many possible causes of head pain (Table 2).

Table 2
Distinguishing Characteristics of Common Recurring Headaches

	Location	Duration (hours)	Activity during headache
• Migraine (adults)	Unilateral (affected side should at least occasionally vary)	8–24	Reduced productivity, lays down, seeks dark and quiet retreat
• Migraine (kids)	Bilateral forehead	1–4	Brief curtailment of activity
• Tension-type	Bilateral	8–24 or constant	No interference
• Medication overuse	Bilateral	Constant with fluctuating severity	No interference
• Cluster	Unilateral eye (affected side will never vary)	0.5–1.5	Avoids laying down, paces, smokes, showers, hits head

Table 3
Keys to a Targeted Evaluation of Head Pain

• History	<ul style="list-style-type: none"> ◦ Clarify pain location—complete pain drawing ◦ Clarify duration of headache—new onset versus chronic ◦ Note typical activity during headache episode ◦ Record pain precipitants ◦ Identify pain pattern—intermittent versus constant, duration of each headache episode ◦ Identify additional medical conditions ◦ Record headache and pain medication usage, including over-the-counter medications ◦ Obtain complete review of systems
• Physical examination	<ul style="list-style-type: none"> ◦ Musculoskeletal exam: ROM and tenderness cervical spine and temporomandibular area ◦ Neurological exam: mental status exam, cranial nerve screen (including fundoscopic exam), extremity strength, reflexes, sensation, and gait
• Testing	<ul style="list-style-type: none"> ◦ Blood tests for medical conditions as indicated (e.g., thyroid tests, autoimmune testing) ◦ X-ray of the cervical spine for mechanical signs ◦ CT scan or MRI of brain for new-onset worrisome headache or patient with neurological deficits ◦ Lumbar puncture if suspicious of bleed or infection ◦ Erythrocyte sedimentation rate and temporal artery biopsy in patients with new headache after age 50 without obvious diagnosis

ROM, range of motion; CT, computed tomography; MRI, magnetic resonance imaging.

1.1. Developing a High-Yield Targeted Evaluation of Head Pain

Evaluations of patients with head pain should be targeted to specific likely clinical scenarios to help confirm or refute clinical diagnoses. The same evaluation principles apply to each patient regarding features in the history, physical examination findings, and the need to proceed with testing. Details of the targeted examination are outlined in Table 3. In most cases of chronic headache, pain is focused at the forehead, eyes, and cheeks. Therefore, the pain drawing in patients with a headache is most useful for identifying associated pain conditions, such as fibromyalgia. When the history seems complicated or confusing, ask your patients suffering from headaches to complete daily headache diaries by recording pain severity and medication use for several weeks (Fig. 1). Diaries can help identify headache patterns and triggers. Premonitory changes or prodromes occur in about one-third of migraineurs, typically within 6 hours of headache onset (8). The most common prodromes are fatigue, mood changes, and gastrointestinal symptoms, each occurring in about one-quarter of all migraineurs. Identifying consistent prodromal symptoms allows patients to identify the very early stages of migraine and receive treatment before pain and other disabling symptoms begin.

1.2. Applying the Targeted Exam to Each Patient

Pain drawings showed head pain only in three patients, with additional unrelated low back pain for Ms. Inglis and knee pain for Mrs. Jeffries. The results of the targeted evaluation are provided for each patient in Tables 4–8. Review each patient's findings, decide if additional testing is necessary, and formulate a likely diagnosis. Then read the following sections to compare your interpretations with the patients' diagnoses in the clinic.

1.2.1. Patient 1: Mrs. Franklin—48-Year-Old Accountant (Table 4)

Mrs. Franklin reports intermittent, unilateral headache that changes sides and is associated with reduced work productivity. She retreats to dark, quiet isolation during headache episodes. She also has evidence of cervical musculoskeletal abnormalities, with no neurological deficits. No additional testing was ordered, and she was diagnosed with migraine.

Like Mrs. Franklin, patients often fail to recognize their headaches as migraines, especially if they do not go to bed or vomit with their headaches. The frequent location of migraine and other chronic benign headaches over the sinuses often leads to a misinterpretation of an idiopathic headache disorder as recurring sinusitis or "sinus" headache. In addition, many OTC sinus remedies are also effective for migraine. Most sinus remedies contain an analgesic and an antihistamine. A recent study compared the efficacy of the intravenous, migraine-specific, acute care medication dihydroergotamine (DHE-45) with intravenous diphenhydramine (Benadryl®) in 80 migraineurs (9).

Daily Headache Diary

Name: _____
Date: _____ / _____ / _____

Time of Day	Severity						Medications
	0	1	2	3	4	5	
Morning							
Noon							
Evening							
Bedtime							
List non-medication treatment strategies used:							

Migraine Symptoms

- ☐ One-sided pain
- ☐ Throbbing or pulsing
- ☐ Decreased activities
- ☐ Reduced lights
- ☐ Reduced noises
- ☐ Avoided smells
- ☐ Nauseated or vomited

Prodrome & aura

- ☐ Fatigue
- ☐ Mood change
- ☐ Digestive/stomach problem
- ☐ Neck or head pain
- ☐ Eye problem or vision change
- ☐ Sensitivity to lights or noise
- ☐ Dizziness
- ☐ Difficulty concentrating
- ☐ Food craving
- ☐ Aura
- ☐ _____
- ☐ _____
- ☐ _____

Triggers

- ☐ Menses
- ☐ Stress
- ☐ Glare
- ☐ Skipped a meal
- ☐ Overslept
- ☐ Too little sleep
- ☐ Odor
- ☐ Change in weather
- ☐ Exercise
- ☐ Alcohol
- ☐ Over 2 cups of caffeine beverage
- ☐ Chocolate
- ☐ Tomato/tomato sauce
- ☐ Peanut butter
- ☐ Processed meats
- ☐ Canned food
- ☐ Chinese food
- ☐ Aspartame
- ☐ Broad beans
- ☐ _____
- ☐ _____
- ☐ _____

Fig. 1. Daily headache diary. (Reproduced with permission from ref. 9a.)

Both treatments effectively reduced migraine pain. Interestingly, diphenhydramine provided better immediate, short-term pain reduction, whereas DHE-45 provided a better accumulated, long-term response.

Musculoskeletal abnormalities frequently occur in patients with migraine, as well as tension-type headache. A comparison of patients with headache and headache-free controls found cervical posture abnormalities in 90% of headache sufferers versus 46% of controls, and myofascial dysfunction in 81% of patients with headaches versus 54% of controls (10). Abnormalities in headache sufferers were similar for patients diagnosed with migraine, tension-type,

Table 4
Results of Targeted Evaluation for Patient 1:
Mrs. Franklin—48-Year-Old Accountant

Targeted assessment	Findings
History	<ul style="list-style-type: none"> ◦ Pain usually affects her forehead, eye, and cheek on one side of the head. Pain is usually on the left but occasionally on the right. Sometimes the pain switches sides during an attack. ◦ Headaches began around 13 years old. Headache pattern has been stable for the last 2 years. ◦ Work productivity suffers during a headache. Goes into office and tries to dim lights and be left alone. ◦ Headaches first began with menarche, improved during pregnancy, then worsened when she began getting hot flashes. ◦ Headache is intermittent but occurs about 3 days per week. Each episode lasts about 12 hours. ◦ General health is good. ◦ Over-the-counter sinus remedies are effective if she catches her headache early. ◦ ROS remarkable for obesity.
Physical exam	
• Musculoskeletal	◦ Mildly decreased cervical ROM. Bilateral neck tenderness to palpation. Jaw opens without discomfort; masticatory muscles nontender.
• Neurological	◦ Normal neurological examination.

ROM, range of motion; ROS, review of systems.

or combined migraine and tension-type headache. Identification of musculoskeletal dysfunction is usually most significantly related to headache pathology for those patients in whom neck motion or palpation directly aggravates or precipitates head pain.

Headache pattern and severity generally change during a patient's lifetime. In women, headaches typically begin with menses, improve with pregnancy, worsen in early menopause, and improve in later menopause (11). Estrogen acts as an important neuromodulator, with cycling affecting several neurotransmitters important for migraine, including serotonin, norepinephrine, dopamine, and γ -aminobutyric acid (12). This important relationship between estrogen and pain-modulating neurotransmitters results in increasing headache susceptibility when estrogen cycles from high to low levels (such as with menstruation), and reduced headache susceptibility when estrogen is maintained at a high level (such as with pregnancy). Variability of estrogen levels during the perimenopause period often results in migraine aggravation when women are experiencing other estrogen-related perimenopausal symptoms, such as hot flashes.

Table 5
Results of Targeted Evaluation for Patient 2:
Steven—12-Year-Old Student

Targeted assessment	Findings
History	<ul style="list-style-type: none">◦ Pain is across his forehead.◦ Headaches began around age 7 without any inciting event.◦ Pain is intermittent, with each episode lasting about 3 hours.◦ He wants to lie down when a headache occurs, but after sleeping for 1 hour, he will awake feeling fine.◦ No health concerns.◦ No medications.◦ ROS unremarkable.
Physical exam	
• Musculoskeletal	◦ Normal musculoskeletal exam.
• Neurological	◦ Normal neurological exam.
ROS, review of systems.	

Imaging studies for headache are generally reserved for patients with traumatic or progressive headache, an abnormal neurological examination, or failure to respond to standard headache therapies. Magnetic resonance imaging scans will show small, nonspecific white matter bright spots in about 30% of migraineurs (13). Interestingly, these white matter lesions have not been consistently correlated with headache duration, severity, or frequency, suggesting that they are not indicative of progressive central nervous system damage. Additionally, studies have failed to correlate these findings with neurological loss or increased risk of dementia (13,14).

1.2.2. Patient 2: Steven—12-Year-Old Seventh-Grader (Table 5)

Steven reports bifrontal headaches of relatively brief duration. He endorses no associated migrainous features and has no additional neurological complaints. His examination is unremarkable. No additional testing is ordered, and he is diagnosed with migraine.

Childhood migraine is underrecognized because parents often do not realize that migraine can begin before adolescence, and headache features are often different in children compared with adults. In early childhood, about 5% of children have migraine. Peak age of migraine onset is earlier in boys than girls (age 5 versus 12 years [15]). In girls, migraine onset is often linked with menarche. Childhood migraine episodes are generally shorter in duration than adult migraine. In about 20% of children and adolescents, migraine attacks last less than 2 hours (16). In addition, children are less likely to endorse migraine descriptors like aura, unilateral pain, throbbing, photophobia, phonophobia, and nausea on interview, although at least some of these features will be recog-

nized in the majority of child migraineurs when diaries are reviewed (17). Rather than describing sensitivities to noise and light, children may report that they “feel better” if they go to the nurse’s office or lay down in bed. Asking children to draw a picture of what they feel like when they have a headache can be another effective tool for identifying migraine features (18).

Migraines also tend to occur in relation to school stress, with most children experiencing headaches during the school day and being headache-free for after-school activities, weekends, and school vacations. A survey of almost 2000 adolescent migraineurs revealed that migraine most commonly occurred during school time, typically on Monday through Wednesday between 6 AM and 6 PM (19). The strong influence of school stress on pediatric migraine frequently leads to the false interpretation by peers, teachers, and parents that the reports of headache are fictitious excuses to avoid schoolwork rather than a physiological reaction to school-related stressors.

As in Steven’s case, neuroimaging is usually not necessary in children presenting with headaches. A meta-analysis of five studies evaluating 526 children with headaches who underwent neuroimaging identified abnormalities in 55 children, although 41 of these were incidental or nonsurgical. In the 14 children with surgical pathology (3% of the total sample), all of the children had abnormal neurological examinations (20). Even in children presenting to the emergency room with headaches, imaging studies generally identify significant pathology only in children with traumatic headaches, history of a neurological disease (e.g., hydrocephalus), or an abnormal neurological examination (21). As in adults, imaging studies for headaches are generally reserved for children with a traumatic or progressive headache, an abnormal neurological examination, or failure to respond to standard headache therapies.

1.2.3. Patient 3: Mr. Hillman—45-Year-Old Pianist (Table 6)

Mr. Hillman describes brief duration, excruciating, nocturnal, unilateral eye pain. During attacks, he is driven out of bed, and even engages in self-destructive behavior (hitting a book against his head). No additional testing is ordered and he is relieved to hear that he is not losing his mind, but has a typical pattern of cluster headache.

Cluster headaches are best recognized as a severe eye pain lasting less than 2 hours. Unlike patients suffering from migraine who want quiet solitude free from sensory stimuli during an attack, patients with a cluster headache are very active during their headaches, seeking lots of sensory stimuli by pacing, showering, and smoking during attacks. Cluster headaches characteristically occur about 90 minutes after sleep initiation, although daytime episodes occur in many patients suffering from cluster headaches. Attacks tend to “cluster” into nightly attacks for about 6 weeks, followed by months or years free from any headaches. These attacks characteristically occur during the spring and fall.

Table 6
Results of Targeted Evaluation for Patient 3:
Mr. Hillman—45-Year-Old Pianist

Targeted assessment	Findings
History	<ul style="list-style-type: none">◦ Pain is always behind his right eye.◦ Headaches began about 10 years ago without inciting event.◦ Pain occurs only in the spring and fall, every night for 6 weeks. Each headache attack lasts about 45 to 90 minutes.◦ Gets up out of bed, smokes, and paces. Wife worries because he bangs books against his head during an episode.◦ Good general health.◦ No medications.◦ ROS remarkable for shortness of breath related to smoking and moderate alcohol consumption.
Physical exam	
• Musculoskeletal	Normal musculoskeletal exam.
• Neurological	Normal neurological exam.
ROS, review of systems.	

Medical books and diagnostic criteria often focus on associated autonomic symptoms during cluster attacks, such as lacrimation, rhinorrhea, and pupillary constriction. In the clinic, patients suffering from cluster headaches rarely endorse these features, perhaps because they are too distracted by the severity of their eye pain to worry about other bodily changes. Migraineurs, on the other hand, often do endorse tearing eyes and a runny nose. Clinicians should ask patients suffering from cluster headaches about their behavior during attacks, reassuring patients that self-inflicting pain at the location of the headache during an attack is not uncommon in patients suffering from cluster headaches, although it should be discouraged (22).

Cluster headache used to be considered a “man’s” headache. Although cluster headaches used to have a 6:1 male predominance in epidemiological studies in the 1960s, this dropped to about a 2:1 male predominance in the 1990s (23). Researchers postulate that increased smoking and other lifestyle changes in women over the last few decades may have resulted in this change.

1.2.4. Patient 4: Ms. Inglis—35-Year-Old Homemaker (Table 7)

Ms. Inglis has a history of menstrual migraine and still gets intermittent severe headaches. She also reports daily mild headaches. Although she reports using OTC agents only 3 days a week, a review of her headache diary shows that she actually uses several doses of analgesic every day, switching among different analgesic products every 3 days. Her examinations are unremarkable and she is given two headache diagnoses: (a) intermittent migraine that results

Table 7
Results of Targeted Evaluation for Patient 4:
Ms. Inglis—35-Year-Old Homemaker

Targeted assessment	Findings
History	<ul style="list-style-type: none"> ◦ Holocranial pain ◦ Headache began in adolescence without inciting event. ◦ Initially, severe headaches occurred only with menses. For the last 3 years, she has a bothersome headache every day that lasts all day. She also gets a severe headache once or twice a week. ◦ Daily headache does not interfere with routine. Puts child down for a nap when she gets a severe headache and lies down with a washcloth over her forehead. ◦ Good general health. ◦ No prescription medications. Advil®, Excedrin®, and Tylenol®, each 3 days per week. ◦ ROS remarkable for chronic low back pain and excessive worrying.
Physical exam	
• Musculoskeletal	◦ Mildly decreased cervical ROM with mild tenderness to palpation bilaterally. Normal jaw movement without tenderness.
• Neurological	◦ Normal neurological exam.

ROM, range of motion; ROS, review of systems.

in once- or twice-weekly isolation in a quiet environment with a washcloth blocking out light, and (b) daily probable medication-overuse headache.

In the patient suffering from a headache, daily or near daily treatment with analgesics changes serotonin receptor activity, resulting in decreased neuronal responsiveness to analgesics and increased susceptibility to headache (24). Medication overuse (previously called *rebound*) headache should be considered in all patients reporting daily or near daily headaches. Like Ms. Inglis, most patients underreport pain medication use. For this reason, the diagnosis is often missed at the first evaluation, but is identified at a later visit when a headache diary has been reviewed.

Daily analgesic use will not cause headaches to develop *de novo* in the non-headache patient; however, excessive or daily acute-care medication use will generally result in worsening of underlying headaches and the development of a chronic daily headache in patients with an underlying headache condition, especially migraine. As seen in Ms. Inglis, the usual story of medication-over-use headache is a change in headache pattern from intermittent migraine to a daily tension-type headache. Every patient reporting frequent headache should be repeatedly queried about medication overuse and required to complete a headache diary to log both headache and medication use. All acute-care medi-

Table 8**Results of Targeted Evaluation for Patient 5:
Mrs. Jeffries—75-Year-Old Hospital Volunteer**

Targeted assessment	Findings
History	<ul style="list-style-type: none"> ◦ Pain is located on the right temple and forehead. ◦ Migraines that put her to bed began in childhood but went away after menopause. The current headaches began about 4 months ago without inciting event. ◦ Pain is beginning to affect her mood, but it does not interfere with activities. ◦ Pain is constant with fluctuating severity. Pain is severe with brushing the scalp. ◦ General health is fair, with treated hypertension and hypercholesterolemia. ◦ ROS remarkable for low-grade fevers.
Physical exam	
• Musculoskeletal	◦ Moderately restricted cervical ROM and diffuse muscle tenderness. Neck movements do not affect head pain.
• Neurological	◦ Normal neurological exam.

ROS, review of systems; ROM, range of motion.

cations (triptans, ergotamine, analgesic or analgesic combinations, opioids, and butalbital combinations) may contribute to a medication-overuse headache. Probable medication-overuse headache should be considered in patients with benign headache taking any acute-care medication or combination of acute-care medications on a regular basis 3 or more days per week. Switching among different acute care agents on different days does not minimize the risk of medication-overuse headache. To avoid aggravation of headache by medication overuse, patients should have at least 5 days per week during which they use no acute-care medication.

1.2.5. Patient 5: Mrs. Jeffries—75-Year-Old Hospital Volunteer (Table 8)

Mrs. Jeffries reports a lifelong history of migraine, which resolved following menopause. She now describes a new-onset, unilateral pain, and low-grade fevers. She has cervical musculoskeletal dysfunction, which does not appear to aggravate her head pain, and a normal neurological examination. Because of her age and recent onset of a new type of headache, additional testing is needed. Temporal or giant-cell arteritis needs to be considered in all patients over 50 years old with a new-onset headache. The likelihood of vasculitis is high in Mrs. Jeffries owing to her age and scalp sensitivity. She was evaluated with an erythrocyte sedimentation rate (ESR) and a temporal artery biopsy. The presumptive diagnosis of temporal arteritis was confirmed by a highly elevated ESR and the subsequent biopsy.

Temporal arteritis, or giant-cell arteritis, is experienced as head pain or scalp tenderness, often associated with fatigue with chewing, visual disturbance, and low-grade fever. Temporal arteritis may also occur in patients with polymyalgia rheumatica, with head pain associated with proximal limb stiffness and weakness, fatigue, and weight loss. Temporal arteritis is a medical emergency that should be considered in the differential diagnosis of new headache in elderly patients because of the significant risk for vision loss and stroke. Visual ischemic complications occur in 26% of patients, and irreversible blindness occurs in 15% of patients with biopsy-proven temporal arteritis (25). Stroke, usually in the vertebrobasilar distribution, occurs in about 3% of patients with temporal arteritis (26).

Evaluation begins with a hematocrit and ESR. Patients with strong presumptive diagnoses of temporal arteritis or anterior ischemic neuropathy should be treated with steroids presumptively, immediately after blood work is obtained. A temporal artery biopsy should be performed within 2 to 3 days of initiating steroid therapy. Inflammatory changes in temporal arteritis often skip areas of the blood vessels, so a minimum of 1 cm of artery should be removed to improve diagnostic yield (27).

2. TREATING HEAD PAIN

Disease-specific restorative treatments may be used to treat probable medication-overuse headache in Mrs. Inglis and temporal arteritis in Mrs. Jefferies. Treating migraine and cluster headache will necessitate long-term chronic pain management.

2.1. Migraine

Migraine treatment is determined by headache severity and frequency. Infrequent headaches (regularly occurring ≤ 2 days per week) may be managed by acute or flare therapy (Table 9). Analgesics (including aspirin or nonsteroidal anti-inflammatory drugs) are usually effective for milder migraines that are not disabling or associated with severe nausea. Analgesic-caffeine combination products (such as Excedrin[®]) provide superior relief of migraine compared with analgesics alone. In a placebo-controlled study of 72 migraineurs treating three headache episodes, adding 100 mg of caffeine to diclofenac significantly increased response rate (28). One hour after treatment, headache relief was achieved by 41% with diclofenac plus caffeine, 27% with diclofenac alone, and 14% with placebo. This benefit may also be achieved by combining an analgesic with a caffeine-containing beverage (such as Motrin[®] plus a cup of coffee or can of cola). Severe or disabling migraines are best treated with a fast-acting triptan (sumatriptan, rizatriptan, eletriptan, zolmitriptan, or almotriptan). Most patients will respond to at least

Table 9
Targeted Treatment of Migraine

	Nonmedication	Medication
• Restorative treatment	◦ None	◦ None
• Preventive therapies	◦ Relaxation ◦ Biofeedback ◦ Stress management ◦ Aerobic exercise	◦ Antidepressants ◦ Antihypertensives ◦ Anti-epileptics
• Flare techniques	◦ Relaxation ◦ Biofeedback ◦ Stretching exercises	◦ Analgesics ◦ Dihydroergotamine ◦ Triptans

one of three triptan trials (29). Combining a triptan with an analgesic may improve both the amount and duration of headache relief (30). Patients with long-lasting, severe migraine attacks may prefer DHE-45 or a long-acting triptan (naratriptan or frovatriptan). Both DHE-45 and the triptans may cause a small constriction to the coronary arteries, so they should be avoided in patients with uncontrolled hypertension, a history of heart attack or stroke, or a high risk for ischemic heart disease. Patients with frequent migraine (headaches typically occurring >3 days/week) are candidates for preventive therapies. First-line migraine preventive medications include antidepressants, antihypertensives, and anti-epileptics. Selecting preventive therapy is often based on concomitant treatment of comorbid conditions, such as depression, anxiety, or hypertension. Combining both medication and first-line nonmedication treatments (e.g., relaxation and biofeedback) maximizes headache reduction (31).

Treatment of early menopausal symptoms with hormone replacement therapy may result in alterations in migraine, with an equal number of women typically reporting headache worsening or improvement (32). A prospective, longitudinal study of 54 menopausal women compared headache activity before and after treatment with intermittent oral, continuous oral, or continuous transdermal estrogen replacement (33). Continuous, transdermal estradiol was least likely to aggravate migraine. Exacerbation of chronic headache related to estrogen replacement may be managed by reducing estrogen dosage or elimination of an estrogen cycling product. Changing the type of estrogen may also be helpful. For example, estrone is less likely to aggravate headache than estradiol (34).

Mrs. Franklin was provided with an educational flyer on migraine (Box 1). Because of the frequency of her headaches, she was initially treated with preventive therapy. She had previously been treated with an antidepressant

Box 1
Educational Flyer for Migraine

What is a migraine?

Migraine is an intermittent, disabling headache. Migraines do not cause a constant or everyday headache. A migraine is often a throbbing or pounding pain on one side of the head. The pain often affects the forehead, eye, or cheek, so many people mistake their migraines for sinus pain. Migraines usually make people less productive, and some people with migraines need to lie down. Most migraine sufferers would prefer to go to a dark, quiet room during an attack. Many people feel sick to their stomachs and some vomit with a migraine.

Migraines usually run in families. Researchers believe that migraine sufferers inherit a slight imbalance in brain pain chemicals, including serotonin, norepinephrine, and dopamine. These same chemicals are important for many other body functions, such as mood and normal blood pressure. For this reason, several medications that were designed to treat other medical conditions (such as depression and high blood pressure) also have been found to help correct the chemical imbalance of migraine.

How is migraine treated?

Migraine treatment is divided into *acute* and *preventive* therapies. Acute treatment is used to relieve a specific migraine episode, such as taking Excedrin® or Imitrex® when you have a migraine. Acute treatments work best if you take them before your migraine gets really severe. Some people get a warning before a migraine begins, such as feeling tired, getting irritable, having stomach problems, or seeing spots or zigzag lines. Using acute migraine treatments during these migraine warnings can reduce migraine pain for many people.

Acute treatments should *not* be regularly used more than 2 days per week. If you usually have headaches more than 2 days per week, your doctor will probably suggest you also use a prevention therapy. Effective prevention medications include mood elevators (such as Elavil® and Tofranil®), blood pressure pills (such as Inderal® and Blocadren®), and seizure medicines (such as Depakote® and Topamax®). Although all of these medications were originally developed for other health problems, they all correct the chemical imbalances seen in migraine sufferers and decrease the number of migraine attacks.

Nonmedication treatments are also effective migraine preventive therapies:

- Stress management
- Relaxation and biofeedback
- Lifestyle adjustments: avoid fasting, eliminate nicotine, and get regular sleep
- Regular aerobic exercise: walking, biking, swimming

Where can I learn more about migraines?

Good information about migraine and its treatment can be found at these websites:

- www.dawnmarcusmd.com
- www.achenet.org
- www.headaches.org

for migraines, which caused substantial weight gain. Owing to her continued excessive weight, she was treated with topiramate (Topamax[®]) to help reduce migraines and obesity. She was also advised to begin a daily walking program and scheduled to meet with a pain psychologist for training in relaxation techniques and stress management. Once the overall frequency and severity of her headaches decreased, she found that those headaches that did occur responded well to Excedrin. About once each month she would have an incapacitating migraine that responded well to rizatriptan (Maxalt[®]).

2.2. Migraine In Children and Adolescents

The primary goal for treating pediatric migraines is to minimize interference with development and to maximize school attendance and participation. Because of the short duration of most migraines, school absence is typically not needed. Children may need a brief visit to the nurse, particularly if they feel nauseous, but they should generally be able to return to classes within an hour after receiving treatment. School is important for social and emotional development, in addition to intellectual growth. Frequent school absence creates a sense of isolation and fear of both academic and social deficiencies, additional stressors that may further aggravate pain complaints. Family therapy will be necessary when parents are hesitant to insist on school attendance. This therapy will help parents develop strategies to ensure school participation, as well as identification of manipulative behaviors that erode parents' resolve to encourage activity normalization.

Both nonmedication and medication therapies can effectively manage chronic headaches in children and adolescents. Stress management, relaxation, and biofeedback are effective nonmedication headache therapies for pediatric patients (35,36). Ibuprofen and triptans are valuable and safe acute therapies for pediatric migraine, although dose adjustments are needed (37–40). Generally, triptans are administered at about half of the starting adult dose in adolescents. Nasal spray and orally disintegrating triptans may be particularly useful in children. Preventive therapy with antidepressants and antiepileptics can be helpful in children with frequent and recalcitrant migraine not responding to nonmedication therapy, although side effects must be closely monitored (especially effects on cognition, energy level, weight, and menstruation [41–44]).

Steven was given an educational flyer (Box 2) and attended four training sessions including biofeedback and stress management. He also began eating breakfast each morning before school and going to bed at a regular time rather than staying up to fall asleep in front of the television. His mother met with the school teacher and nurse and informed them that Steven's doctor wanted him to go to the nurse when a migraine first began for a dose of ibuprofen with a drink of cola. Steven was to return to class after 15 minutes, unless he was

Box 2**Supplemental Educational Flyer for Migraine in Kids*****Do kids really get migraines?***

Migraine headaches often start in childhood. About 10% of all kids get migraines. Headaches usually start in early childhood in boys and during adolescence in girls. Migraines typically run in families, so your parents, aunts, cousins, or grandparents may also remember getting headaches. You may have inherited your tendency to get migraines from them. Sometimes you are the first person in your family to get migraines.

Once you have a tendency to get migraines, many things can trigger a headache episode. Common triggers include missing meals, staying up too late, and stress. Stress comes from changes in your usual routine. Both bad changes (such as a hard math class, moving, or your parents getting divorced) and good changes (such as making a new friend, starting a new elective class, or getting a new baby brother) trigger stress changes in your body. School stress is the most common trigger for migraines in kids. Most kids find their migraines occur during school hours. This can make kids, their parents, and their teacher think the headaches may be just an excuse to get out of a tough class or homework. The good news is that many migraine treatments can block stress from triggering a migraine.

Should I stay home from school if I've got a migraine?

Your most important job is doing well in school. Just like grown-ups go to work every day, kids are also expected to do their job at school every day. You should usually be able to go to school when you have a migraine. Most migraines only last a couple of hours, so there is no need to miss a whole day of school. Have one of your parents talk to the school nurse about your migraines and give the nurse your usual treatment. Many kids will go to the nurse when they start to get a bad headache. They can take their migraine medication and practice some relaxation techniques. After 15 to 20 minutes, you should return to class.

What can I do to make my migraines better?

Your doctor can give you medications. There are also a number of things you can do to help reduce your migraines:

- Go to bed before 10 PM every night. Do not watch TV or eat snacks in bed.
- Get up at least 45 minutes before you need to leave for school and eat a good breakfast.
- Do not skip lunch at school.
- Set aside a regular time and spot to do your homework after school. Do not do homework in front of the TV.
- Get regular exercise every day. You can walk, bike, swim, or join a sports team at school.
- Spend time doing fun things with your friends. Try to minimize time alone watching TV or playing computer or video games.
- Participate in a fun after-school activity, such as a sport, the marching band, or the school newspaper.

Table 10
Targeted Treatment of Cluster Headache

	Nonmedication	Medication
• Restorative treatment	◦ None	◦ Steroids
• Preventive therapies	◦ Avoid alcohol ◦ Avoid nicotine	◦ Verapamil ◦ Anti-epileptics
• Flare techniques	◦ None	◦ Oxygen

vomiting. Steven had no more school absences and briefly saw the nurse twice during the next month for migraines. His mother helped reinforce regular sleeping and eating habits and encouraged him to become more physically active by joining the middle school track team. As is typical in many boys, Steven's migraines dissipated during his teenage years.

2.3. Cluster Headache

The intensity of each individual cluster headache attack is so severe that therapy must focus on prevention (Table 10). Most people experience mild and less frequent attacks when the cluster period first begins, with attacks becoming more severe and frequent during the middle of the cluster period. Preventive treatment is most effective when initiated at the first sign of a new cluster period. First-line preventive therapy is 240 to 480 mg of verapamil daily. Patients failing to achieve a response may alternatively try an anti-epileptic, such as valproate, gabapentin, or topiramate. In patients with infrequent cluster episodes that do not respond to preventive therapy, 10 to 60 mg of prednisone daily may be used for 1 week. One hundred percent oxygen delivered by face mask at 7 L/minute for 10 minutes may provide effective rescue therapy. Analgesics and triptans used for migraine are generally ineffective rescue therapies for cluster headache because pain relief is not expected to begin until after the usual cluster attack has already ended. Anecdotally, some recalcitrant patients with cluster headaches achieve headache prevention from a bedtime dose of a long-acting triptan, such as frovatriptan (45). Successful cluster treatment typically results in reduced frequency and duration of headache episodes. The intensity of each individual headache episode, however, is typically not reduced. For this reason, reduction in headache frequency is the main target of cluster headache therapy.

Mr. Hillman was given an educational flyer about cluster headaches (Box 3) and was relieved to hear that he was not crazy and that other people get head-

Box 3
Educational Flyer for Cluster Headache

What is cluster headache?

A cluster headache is much less common than a migraine or a tension-type headache. Cluster headaches typically occur in groups, or *clusters*. Most people will be headache-free for months to years and then wake up one night with an excruciating pain in their eye. This pain is so severe, they usually cannot lie still, and they will pace around the room, smoke, or shower. Some people press their head against the wall or floor or even hit their head during an attack. After about 45 to 90 minutes, the pain will go away. Once a cluster has started, many people know that they will have three to four severe attacks every night for the next 6 weeks. Some people also get cluster headaches during the day.

Researchers believe that a cluster headache is caused by chemical imbalances in histamine and serotonin. Why these imbalances occur in some people and why the headaches cluster is a mystery. Curiously, most people have their clusters in the spring and fall. Unlike migraines, cluster headaches do not tend to run in families, so your family may think you are going crazy when you describe these severe attacks or they see you running around with a headache.

How is cluster treated?

When your cluster first begins, you should start taking a prevention medication. The most effective medication to prevent cluster headaches is verapamil (Calan[®] or Isoptin[®]). Your doctor will have you take this every day during your usual cluster period. If this does not work, you may need to try a different prevention medication or take steroids (prednisone) for a few days. Your doctor may also have you breathe 100% oxygen during those headaches that are not prevented. For many people, oxygen makes the individual attacks less severe. Make sure you take a small oxygen tank with you to work or while running errands if you get cluster headaches during the daytime hours.

Both nicotine and alcohol are believed to aggravate cluster headaches. Some people find their cluster attacks are less frequent when they quit smoking. During a cluster period, avoid both nicotine and alcohol.

Where can I learn more about cluster headache?

Good information about cluster and its treatment can be found at these websites:

- www.achenet.org
- www.headaches.org
- <http://familydoctor.org/035.xml>

aches just like his. He was started on verapamil (Calan[®]) and given an oxygen tank to keep at his bedside and take to work during his cluster period. He returned after 1 week with no improvement and was prescribed a 1-week course of prednisone, with good resolution of his headaches. He was also instructed to call the office as soon as he experienced his first attack in his next cluster so that verapamil could be started right away. Preventive therapy is generally most

effective when given during the first 2 weeks of a cluster period. As in Mr. Hillman, if treatment is first initiated in the middle of a cluster period, when attacks are at their most severe, steroids are often needed.

2.4. Probable Medication-Overuse Headache

Daily or near daily acute migraine medication increases both headache frequency and severity and makes other preventive therapies ineffective. Medication-overuse headache improves only after discontinuation of the offending medication(s). Analgesics may be abruptly discontinued, whereas butalbital products and opioids should be tapered to minimize withdrawal symptoms. Regrettably, improvement typically takes about 6 to 8 weeks for most patients, with significant improvement occurring in more than 80% of patients after 4 months (46). During the first month after medication discontinuation, or while tapering off of butalbital or opioids, patients may be treated with low-dose, twice daily non-ibuprofen nonsteroidal anti-inflammatory drugs or tramadol. Both of these analgesics have a low likelihood for producing medication-overuse headache. After 1 month, standard migraine preventive therapies may be initiated. Because preventive therapies will not be effective if used concomitantly with daily acute care therapies, therapies that previously failed while also overusing acute therapy may be re-tried at this time.

Headache sufferers with comorbid anxiety often overuse acute medications to help tranquilize symptoms of anxiety and to alleviate fear of severe headaches. Ms. Inglis was given an educational flyer about probable medication-overuse headache (Box 4) and encouraged to visit reputable headache websites to learn more about medication-overuse headache. She was asked to eliminate all currently used migraine remedies and was prescribed 500 mg of naproxen (Naprosyn®) twice daily, with one permitted additional dose daily for severe headache. She was advised to meet weekly with the nurse practitioner and pain psychologist to reinforce the diagnosis of medication-overuse headache, encourage avoidance of overused medications, and begin stress management and relaxation skills. Ms. Inglis was incredulous that her pain pills could possibly be worsening her headache and demanded alternative treatment. When no alternative plan was offered, she angrily challenged, "Fine. I'll try this for 1 month, but when I end up in the emergency room, it'll be your fault!" She sheepishly returned to see her primary care doctor in 4 weeks, apologizing for her earlier outburst and noting that her headaches really did not get any worse when she stopped using all of the OTC medications. "I guess you were right and they weren't really helping after all." She was also starting to notice that she no longer had headaches all the time; they now only occurred 4 days a week. She continued to work with the pain psychologist and was prescribed imipramine (Tofranil®) as a headache-preventive therapy because of her

Box 4

Educational Flyer for Probable Medication-Overuse Headache

What is medication-overuse headache?

If you get headaches, taking too many pain medications can actually make your headaches worse. If you get headaches most days and take a pain medication at least 3 days every week, you probably have a worsening of your headaches from the medication, or *medication-overuse headache*. These headaches used to be called *drug rebound headaches*.

Headache treatments are divided into *acute* and *preventive* therapies. Acute therapies treat the headache you have right now. When you take an acute pain or migraine pill every day or nearly every day, your brain changes its chemistry. The nerves get bored of the same pain killers and begin to ignore them. The nerves also ignore your body's naturally produced pain killers. This causes you to get more headaches. So you'll find that the more pills you take, the less they seem to help. This problem happens with all medications designed to treat a migraine episode, including prescription pain killers (Fiorinol®, Fioricet®, Stadol®, Vicodin®), triptans (Imitrex®, Maxalt®, Zomig®, Axert®, Relpax®), and over-the-counter medications (Motrin®, Excedrin®, Tylenol®). Daily or near-daily use of acute therapies also prevents headache preventive treatments from working. So sometimes the reason nothing seems to help your headaches is because excessive acute medication use is blocking the effectiveness of other therapies.

How is medication-overuse headache treated?

Everyone says, "Once my headaches are better, I'll be happy to get rid of all of these pills." Unfortunately, your headaches cannot get better until the medication has been out of your system for about 6 weeks. Your doctor will have you stop or slowly discontinue your daily medication. Over the next month, your doctor may have you take an anti-inflammatory medication (such as Aleve®) or tramadol (Ultram®) for your headaches.

Once you have been off of your overused medicine, you and your doctor will need to reassess your headache pattern. If you are still having frequent headaches, you will need to start a preventive medication. Effective headache prevention includes medications (such as Elavil®, Tofranil®, Inderal®, and Depakote®) and nonmedication techniques (such as relaxation, biofeedback, and stress management). If you now have infrequent headaches, you may be able to restart acute medications as long as you have at least 5 days each week when you do not use any acute therapy.

Where can I learn more about medication-overuse headache?

Good information about medication overuse headache and its treatment can be found at these websites:

- www.dawnmarcusmd.com
- www.achenet.org
- www.headaches.org

comorbid anxiety. Four months later, she was having two migraine episodes monthly, which were well managed with eletriptan (Relpax[®]) plus naproxen (Naprosyn). Imipramine was tapered off and she continued to experience infrequent, easily treated migraines.

2.5. Temporal or Giant-Cell Arteritis

Patients with temporal arteritis with visual complaints should be urgently treated with intravenous steroids (e.g., 1000 mg of methylprednisolone daily pulsed in two to four divided doses for several days). Patients without visual complaints are typically treated with 60 to 100 mg of oral prednisone daily. Headache should resolve within several days after initiating steroids. Prednisone dosage should be gradually tapered during the first month of treatment so that most patients will be taking about 40 mg daily after 4 weeks. Prednisone is maintained for about 6 to 18 months, with the dosage decreased by 10% per week, or 2.5 to 5 mg every 1 to 2 weeks to a maintenance dosage of 10 to 20 mg daily. The tapering schedule is dependent on maintenance of symptomatic control and reduction in ESR. Remember that small increases in ESR often occur during steroid tapering and should not result in increasing steroid dose if the patient remains asymptomatic. Because treatment is started before a diagnosis is complete, the treating physician must not feel obligated to maintain a full 6 to 18 months of treatment in patients for whom the diagnosis has been ruled out (e.g., negative ESR and negative biopsy). This is particularly true because of the serious adverse events associated with chronic steroid use (cataracts, glucose intolerance, osteoporosis and aseptic necrosis of the femoral head, myopathy, infection risk, etc.). Mrs. Jeffries was treated with oral prednisone with good symptomatic relief after 2 days and a successful gradual taper over 12 months.

3. SUMMARY

Headache is a common symptom associated with a wide variety of medical conditions. Most new headaches are related to infections or trauma. Chronically recurring headaches that bring patients to their primary care doctors are most commonly migraine. Distinguishing migraine from other common causes of headache requires an evaluation of pain location, duration, and associated behaviors. Daily headache diaries are helpful for identifying headache and medication use patterns. Patients must be reminded to record all headaches (not just the most severe ones) and both prescription and OTC medication use to achieve an accurate picture of their headache patterns. Most headaches can be effectively controlled using medication and nonmedication treatments.

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