Chapter 26
Headache

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Abbreviations

AVM	Arteriovenous malformation
CDH	Chronic daily headache
CVT	Chronic venous thrombosis
GCA	Giant cell arteritis or temporal arteritis
HC	Hemicrania continua
LP	Lumbar puncture
MO	Medication overuse
PH	Paroxysmal hemicranias
SAH	Subarachnoid hemorrhage
SDH	Subdural hematoma
SUNCT	Short-lasting unilateral neuralgiform headache
TAC	Trigeminal autonomic cephalalgia
TMJ	Temporal mandibular joint
TTH	Tension-type headache;

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Introduction

Headache is a common neurological complaint in the outpatient setting [1]. The importance of proper diagnosis is crucial to our management. Most headaches are of benign etiology and fall under the category of primary headache disorders. Tension-type headache is more common than migraine headache [2]. However, migraine headaches tend to be disabling and cause functional impairment leading patients to seek medical assistance more frequently for this ailment [2]. Cluster headaches fall under the category of trigeminal autonomic cephalalgia and this disorder has a prevalence of less than 1% [3]. It is important to recognize the characteristics and diagnostic criteria of primary headaches to assist with management. As an initial first step in our assessment, it is important to focus on key aspects of the history and physical examination to exclude secondary causes of headache which may stem from other systemic, neurological, psychiatric, or traumatic etiologies. Once these "red flags" in the history and physical examination are excluded, one can focus on the more common primary etiologies of headache (Fig. 26.1).

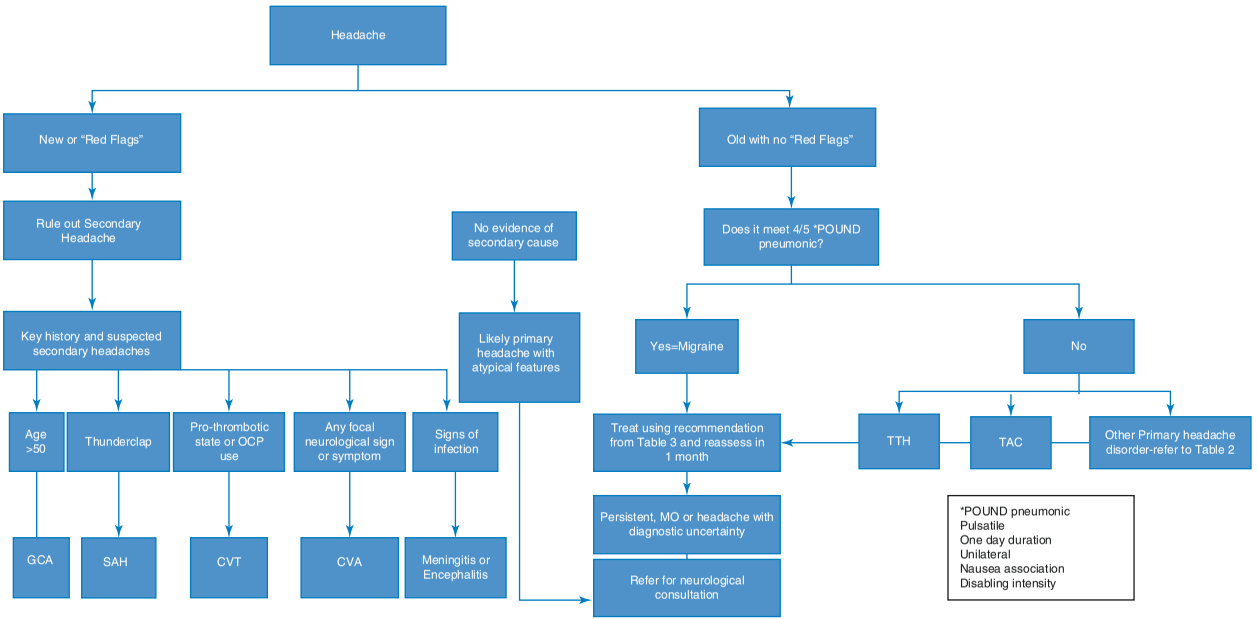

FIGURE 26.1 Headache algorithm

Key History and Physical Exam

A complete history and physical examination are essential in the assessment of any headache. When done properly, the potentially dangerous causes of headache which may warrant emergent intervention can be identified. The following features in the history have been underlined to highlight information which may support a secondary cause of headache (refer to Table 26.1).

History

Age: New headache in a patient above 50 years should raise concerns for temporal arteritis, acute angle-closure glaucoma, and malignancy in the right context [1, 4–6], particularly if associated with visual disturbance, jaw claudication, polymyalgia, cough, or weight loss.

Onset and Characteristic: An abrupt onset of maximum intensity is suggestive of an ominous or secondary cause for the headache. These symptoms fall under the umbrella term of "thunderclap headache" typically described by patients as "the worst headache of my life" and warrants immediate attention with imaging and lumbar puncture when imaging is nonrevealing and our clinical suspicion is high. Etiologies

Table 26.1 Differential diagnosis as outlined by the International Headache Society

Primary headache	Secondary headache based on "red flags"
1. Tension-type headache (TTH) 2. Migraine 3. Trigeminal autonomic cephalalgias (TACs)	Look for clues in your history, physical exam, laboratory studies, and imaging to guide your differential diagnosis when a secondary headache is suspected.

Table 26.1 (continued)

Primary headache	Secondary headache based on "red flags"
4. Other primary headache disorders • Primary cough headache • Primary exercise headache • Primary headache associated with sexual activity • Primary thunderclap headache • Cold stimulus headache • External pressure headache • Primary stabbing headaches • Nummular headache—Coin shaped • Hypnic headache—Only during sleep • New daily persistent headache	1. Headache attributed to infection. 2. Headache attributed to trauma. 3. Headache attributed to a vascular disorder (CVA, SAH, SDH, arteritis, unruptured vascular malformation, carotid or vertebral artery disorder, genetic vasculopathy, pituitary apoplexy, and other acute intracranial disorders such as those resulting from an endovascular procedure or conditions less clearly understood such as reversible cerebral vasoconstriction syndrome. 4. Headache attributed to other nonvascular intracranial disorder (cerebrospinal fluid pressure—High or low), noninfectious intracranial inflammatory diseases, intracranial neoplasm, seizure, Chiari malformation) 5. Headache attributed to substance exposure, use, or withdrawal (including those prescribed, illicit, and contained in food). 6. Headache attributed to a disorder of homeostasis (hypoxia, hypercapnia, dialysis, hypertension, hypothyroidism, fasting, etc.) 7. Headache attributed to disorder of facial or cervical structures. 8. Headache attributed to psychiatric disorder.

which may present this way include subarachnoid hemorrhage, cavernous venous thrombosis, pituitary apoplexy, hypertensive emergency, arterial dissections, and acute angle-closure glaucoma, which require emergent intervention [1, 4, 5].

Duration and Relevant *Past Medical History*: Persistent or progressive headache in a patient with a past medical history of cancer, HIV, Lyme disease, systemic vascular disorder, or hypercoagulable state warrants further workup of secondary causes. Additionally, patients with a past medical history of a primary headache such as migraine may be at increased risk of developing brain lesions including posterior circulation stroke-like lesions [7]. A new headache or prior changes in the characteristics of a known headache disorder warrant further investigation.

Medications: Use of anticoagulants, NSAIDs, steroids, or drugs of abuse such as cocaine place patients at an increased risk of intracranial bleed and can be an indication for neuroimaging [1]. The use of birth control pills is associated with increase in migraine severity but also an increased risk of CVT [8, 9].

Context: Headache in the setting of trauma, uncontrolled hypertension, motor, sensory, cerebellar, personality, or cognitive change warrants imaging to further investigate the neurological symptom. The presence of systemic symptoms should precipitate additional considerations. In patients who were hospitalized with COVID-19, headache was considered a presenting symptom and this diagnosis should be considered in the appropriate clinical context [10].

Aggravating factors that raise intracranial pressure such as exertion, cough, and lying down may reflect an intracranial etiology and require additional investigation [4].

Location: Careful history and palpation over maxillary and frontal sinuses, orbits, temporal artery, TMJ, ears, occipital nerve, and upper posterior neck can reveal pain from various secondary headaches and neuralgias [5].

Physical Examination

Relevant Vital Signs: Hypertension and obesity can point towards a secondary diagnosis of hypertensive encephalopathy, pseudotumor cerebri (idiopathic intracranial hypertension), or more benign causes of secondary headaches such as sleep apnea in the appropriate context. Fever, rash, and/or meningismus must be worked up immediately for infectious etiology and an LP must be performed.

Palpation: Palpation over maxillary and frontal sinuses, the orbits, the temporal artery, and TMJ as well as the ear, occipital nerve, and upper posterior neck can reveal pain stemming from myofascial or joint dysfunction among other secondary headaches and neuralgias [5].

Funduscopic and Full Neurological Examination: Papilledema and any focal neurological sign or symptom other than typical visual or sensory aura ("typical" only if patient has a history of a similar pattern lasting 60 min or less) necessitate further investigation, such as neuroimaging, to rule out mass lesion and serologic testing to rule out collagen vascular disease [4, 5].

Once the red flags in the history and physical exam have been excluded, the diagnosis of primary headache syndrome should be investigated. Various tools are available to aid in the diagnosis of primary headache disorders. Some of these tools include headache questionnaires and diaries to aid in determining the frequency and disability caused by the primary headache [11, 12]. To begin classifying primary headaches, identifying a potential migraine headache is a reasonable start. Migraine headache is a frequent cause of severe headache that is often not diagnosed and treated properly leading to significant disability [13]. The five criteria most predictive of migraine can be remembered by the POUND mnemonic (pulsatile quality, one-day duration, unilateral, nausea or vomiting with disabling intensity) [14, 15]. Patients meeting 4/5 of the POUND criteria have a greater than 90% chance of a having a migraine headache [14, 15].

Further evaluation and diagnosis of primary headache etiologies are outlined by the International Headache Society (refer to Table 26.2). Once an accurate history is obtained, primary headaches can be classified based on four main categories to aid with management.

Table 26.2 Diagnostic criteria of primary headache disorders as outlined by the International Headache Society

1. Tension-type headache (TTH) diagnostic criteria.

At least two of the following four characteristics:
- Bilateral location
- Pressing or tightening (nonpulsating) quality
- Mild or moderate intensity
- Not aggravated by routine physical activities such as walking or climbing stairs

Both of the following:
- No nausea or vomiting
- No more than one of phonophobia or photophobia

Lasting 30 min to 7 days and not better accounted for by another international classification of headache disorders, third edition (ICDH-3) diagnosis

2. Migraine headache diagnostic criteria

The diagnostic criteria for migraine headache from the international headache society is as follows:

A. at least five attacks fulfilling criteria B to D
B. Headache attack lasting 4–72 h (untreated or unsuccessfully treated)
C. Headache has at least two of the following four characteristics:
   - Unilateral location
   - Pulsating quality
   - Moderate or severe pain intensity
   - Aggravation by or causing avoidance of routine physical activity
D. during headache at least one of the following:
   - Nausea and/or vomiting
   - Phonophobia and photophobia

Not better accounted for by another ICDH-3 diagnosis

Table 26.2 (continued)

3. Trigeminal autonomic cephalalgias (TACs) which include cluster headache

Five attacks of severe, unilateral pain lasting 15–180 min with either of the following autonomic features ipsilateral to the headache:

- Lacrimation or conjunctival injection
- Rhinorrhea or nasal congestion
- Eyelid, forehead, or facial swelling
- Miosis
- Ptosis
- Ear fullness

Or

A sense of restlessness or agitation

Attacks occur in "clusters" lasting for weeks or months following a period of remission lasting months to years. Chronic is defined by a remission of less than 1 month.

4. Other primary headache disorders
   - Primary cough headache
   - Primary exercise headache
   - Primary headache associated with sexual activity
   - Primary thunderclap headache
   - Cold stimulus headache
   - External pressure headache
   - Primary stabbing headaches
   - Nummular headache—Coin shaped
   - Hypnic headache—Only during sleep
   - New daily persistent headache

Tension-type headache (TTH) is the most common primary headache disorder [16, 17]. TTH is usually mild in severity and relieved with over-the-counter medication. A large number of patients suffering from TTH have pericranial muscle tenderness making the palpation of pericranial muscles in the physical exam essential. Additional TTH subtypes are further described based on the frequency of episodes per month.

Migraine headache is the second most common type of primary headache disorder but tend to be the most disabling, leading patients to seek medical attention most frequently for this condition [16]. Subtypes of migraine are categorized as migraine without aura and migraine with aura. An aura is a transient neurological symptom during or preceding headache but can occasionally occur without headache. An aura may include visual, sensory, language, motor, brainstem, or retinal manifestations [12]. Most neurological symptoms last 1 h but motor disturbances may last up to 72 h [12]. Any headache with an acute neurological manifestation warrants intracranial imaging oftentimes making the diagnosis of migraine with aura a diagnosis of exclusion. Chronic migraine is differentiated from episodic migraine if the attack occurs >15 days per month for more than 3 months with features of migraine at least 8 days per month [12]. Chronic migraine warrants preventive treatment and a neurological consultation.

The least common type of primary headache disorders fall under the category of trigeminal autonomic cephalalgia of which cluster headache is the most common. Other trigeminal autonomic cephalalgias have similar symptoms but diagnostic criteria differ based on frequency and duration of symptoms [18]. Cluster headaches last 15–180 min, and paroxysmal hemicrania (also described as indomethacin-responsive headache) occurs several times a day and last 2–30 min, while hemicrania continua is present for greater than 3 months. Other short-lasting neuralgiform headache attacks such as SUNCT also fall under this category [18].

Once a primary headache disorder is diagnosed, treatment options can be explored (refer to Table 26.3). Once adequate treatment is initiated, it is important to reassess response and the frequency of both recurrent headache and medication use. Primary headache disorders that are frequent and chronic leading to the use of medication >10 days per month for more than 3 months can result in medication overuse headache [19, 20] which warrants a different treatment approach and a neurology consultation. In patients with con-

Table 26.3 Treatment of common primary headache disorders

Type	TTH	Migraine	Cluster	CDH attributed to MO
Treatment options	Aspirin, acetaminophen, NSAIDs, or combination of aspirin, Tylenol, and caffeine typically enough to provide relief. Frequent TTH respond best to abovementioned therapy in addition to therapy aimed at reducing stress, anxiety, and depression [23]. Muscle relaxation to reduce stress and muscular pain is also recommended [20].	Mild: NSAIDs ± metoclopramide. Refractory or severe: Triptan Ergotamine Frequent attacks (>5 days per month) need preventive treatment with beta blockers, amitriptyline, venlafaxine, and/or antiepileptic such as valproic acid and topiramate [20, 23]. Additional preventive therapies with onabotulinumtoxinA and monoclonal antibodies targeting calcitonin gene-related peptide (CGRP) or the CGRP receptor may be considered by neurology specialists [22]. Additional acute and preventive therapies including lasmiditan, a selective 5-HT receptor agonist, as well as monoclonal antibodies targeting calcitonin gene-related peptide (CGRP) or the CGRP receptor may be considered by the neurology specialist [24]. In selective cases noninvasive neuromodulation therapies (transcranial nerve stimulation, vagal nerve stimulation, and supraorbital nerve stimulation) may be considered by the specialist for the treatment and prevention of migraine headaches [25]	Oxygen Triptan Ergotamine—Before anticipated attack Persistent or frequent need preventive treatment with short course of steroids plus verapamil, valproate, and/or lithium in refractory cases [20, 23]	Withdraw overused medication and allow headache to revert to episodic pattern [17]. Behavioral therapy and acute treatment of primary headache disorder are recommended [19].

Adapted from references [15, 17, 19, 20, 22–25]

traindications to pharmacological options, a neurology consultation for consideration of nonpharmacological treatment with transcranial magnetic stimulation or vagal nerve stimulation can be considered [21, 22].

Melatonin and supplements including magnesium may be helpful in the prevention of migraine headaches but larger clinical trials are needed to determine the effects of such treatment [26, 27].

Discussion of migraine treatment and prevention should also include trigger avoidance and behavioral modification. Relaxation via biofeedback training and cognitive behavioral therapy has decreased the frequency of attacks in many and has helped promote lifestyle changes necessary for optimal health and symptom control [28]. These alternative and complementary therapies should be offered to patients when available.

Clinical Pearls

- The initial assessment of headache requires a through history and complete physical examination to exclude secondary causes of headache which may be life-threatening.
- Once these red flags are identified, it is important to proceed with neuroimaging and/or LP for proper diagnosis. In the absence of positive findings if clinical suspicion remains high, treatment may be warranted pending further investigation as in the case of temporal arteritis.
- Once secondary causes of headache are excluded, one can start considering more common benign primary headaches. To begin classifying primary headaches, identifying migraine headaches is a reasonable start.
- Patients meeting 4/5 of the POUND criteria have a greater than 90% chance of having migraine headaches and should be treated accordingly. Exclusion of POUND criteria should prompt further evaluation of other primary headache etiologies.
- All primary headaches can develop into chronic primary headaches if duration of headache fits this description. However, the most common type of chronic headache

remains medication overuse as a complication of persistent symptoms highlighting the need for reassessment once therapy is commenced.
- Persistent symptoms despite treatment warrants further workup to rule out secondary causes and a formal neurology consult.

Do Not Miss this!
Most headaches are of benign etiology but secondary etiologies can be life-threatening and must be ruled out. Trauma, age above 50 years, systemic signs, immunocompromised state, or any neurological symptom should prompt neuroimaging and additional investigations to rule out suspected etiology.

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