The Clinical Features of Migraine With and Without Aura

Patients often mistake their disorder for something else.

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Migraine is one of the disorders most commonly seen by neurologists and ophthalmologists. Only about 56% of migraineurs know that they have the condition, however, because they often misdiagnose their headaches as ocular strain, sinus headaches, or stress headaches.

EPIDEMIOLOGY

In a given year, migraine has a prevalence of 12% (17.1% in women and 5.6% in men).[1] Annually, some 35 million people suffer migraine in the United States. The cumulative incidence of this disorder by age 85 is 18.5% in men and 44.3% in women, with onset before the age of 25 in 50% of cases, before the age of 35 years in 75%, and over the age of 50 in only 2%.[2] The median age of onset is 25 years. Approximately 8% of boys and 11% of girls have migraine.[3] Chronic migraine—with attacks occurring on 15 or more days per month for at least 3 months—affects about 3.2 million people per year in the United States, 80% of whom are women.[4]

MIGRAINE WITHOUT AURA

Clinical Features

Pain is unilateral in 60% of cases and bilateral in 40%. Approximately 15% of migraineurs report so-called side-locked headaches in which migraine always occurs on the same side. The pain is often more intense in the frontotemporal and ocular regions before it spreads to the parietal and occipital areas. Any part of the head or face may be affected, including the parietal region, the upper or lower jaw or teeth, the malar eminence, and the upper anterior neck. Throbbing pain is present in 85% of episodes of migraine, although up to 50% of patients describe steady pain during some attacks. As many as 75% of migraineurs report unilateral or bilateral tightness, stiffness, or throbbing pain in the posterior neck along with head pain. The neck pain can occur during the migraine prodrome, the attack itself, or the postdrome.[5] (See *Criteria for Migraine Without Aura*.)

Migraines last 4 to 72 hours if left untreated or if unsuccessfully treated. One that persists for more than 72 hours is termed *status migrainosus*. Without treatment, 80% of patients experience moderate to severe pain, and 20% have mild pain. Usually increased by physical activity or movement, the pain is associated with nausea in about 80% of episodes, vomiting in about 30%, photophobia in about 90%, and phonophobia in about 80%.[6]

When patients deny a history of light and noise sensitivity, physicians should ask the following questions:

CRITERIA FOR MIGRAINE WITHOUT AURA[1]

- Headache attacks last 4 to 72 hours.
- Headache has at least two of the following characteristics:
  - unilateral location
  - pulsating quality
  - moderate or severe intensity
  - aggravation by routine physical activity
- During headache, at least one of the following occurs:
  - nausea and/or vomiting
  - photophobia and phonophobia
- At least five attacks occur fulfilling the aforementioned criteria.
- History, physical examination, and neurologic examination do not suggest any underlying organic disease.

1. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders. 3rd ed (beta version). *Cephalalgia*. 2013;33(9):629-808.

TABLE. FEATURES OF SOME PRIMARY HEADACHES

Feature	Migraine	Episodic Tension-Type	Episodic Cluster
Epidemiology	• 18% of women • 6% of men • 4% of children before puberty	• 90% of adults • 35% of children aged 3-11 y	• 0.4% for men • 0.08% for women
Female/male	• 3/1 after puberty • 1/1 before puberty	5/4	1/5
Family history	80% of first-degree relatives	Frequent	Rare
Typical age at onset, y	• 92% before age 40 • 2% after age 50	20-40	20-40
Visual aura	In 30%	No	Occasional
Location	• Unilateral, 60% • Bilateral, 40%	Bilateral > unilateral	Unilateral maximal orbital, supraorbital, and/or temporal
Quality	Pulsatile or throbbing in 85%	Pressure, aching, tight, squeezing	Boring, burning, or stabbing
Severity	Mild to severe	Mild to moderate	Severe
Onset to peak pain	Minutes to hours	Hours	Minutes
Duration	• 4-72 hours • 2-72 hours in children	Hours to days	15-180 minutes
Frequency	Rare to frequent	Rare to frequent	1-8 per day during clusters
Periodicity	Menstrual migraine	No	Yes. Average bouts 4-8 weeks. Average 1 or 2 bouts yearly
Associated features	• Nausea in 90% • Vomiting in 30% • Light and noise sensitivity in 80%	Occasional nausea	• Ipsilateral conjunctival injection and/or lacrimation in 95% • Nasal congestion and/or rhinorrhea in 77% • Ptosis and miosis in 30% • Eyelid edema in 21%
Triggers	Present in 85%	Stress, lack of sleep	Alcohol, nitrates
Behavior during headache	Still, quiet, tries to sleep	No change	Often paces
Awakens from sleep	Can occur	Rare	Frequently

Data adapted from Evans RW. Diagnosis of headaches. In: Evans RW, Mathew NT, eds. ***Handbook of Headache***. 2nd ed. Philadelphia: Lippincott, Williams & Wilkins; 2005:14-15.

- During a headache, would you prefer to be in bright sunlight or in a dark room?
- During a headache, would you prefer to be in a room with loud music or in a quiet room?

Approximately 20% of patients become aware of associated light and noise sensitivity because of the aforementioned questions.[7]

In general, 25% of migraineurs suffer four or more severe attacks a month, 35% have one to four severe attacks per month, 38% experience one or fewer severe attacks per month, and 37% have five or more headache days per month.[1] In one study, during migraine attacks, most migraineurs (53.7%) reported severe impairment or the need for bed rest, whereas only 7.2% reported no attack-related impairment. Over a 3-month period, 35.1% of the migraineurs had at least 1 day of restricted activity related to headache.

Migraine triggers are present in 76% of migraineurs. One study reported the following triggers from affected patients: stress, 89%; female hormones, 65%; not eating,

57%; weather, 53%; physical exhaustion or travel, 53%; sleep disturbance, 50%; perfume or odor, 44%; bright lights, 38%; neck pain; 38%; alcohol, 38%; smoke, 36%; sleeping late, 32%; heat, 30%; food, 27%; and exercise, 22%.[8]

Cranial autonomic symptoms are caused by parasympathetic activation of the sphenopalatine ganglion during an attack that innervates the tear ducts and sinuses. At least one symptom is present in 56% of migraineurs, usually bilaterally and not present during each attack. The most common are forehead/facial sweating, conjunctival injection and/or lacrimation, and nasal congestion and/or rhinorrhea.[9] Migraineurs and some physicians misdiagnose the headaches as "sinus," because the pain occurs in the face or forehead, a change in weather is a common trigger, and the presence of cranial autonomic symptoms seems like sinus symptoms. Migraines are confused with stress or tension-type headaches, because they commonly occur in the neck and are often triggered by psychological stress. The table compares the features of migraine, tension-type, and cluster headaches.

Benign Episodic Unilateral Mydriasis

Benign episodic unilateral mydriasis is transient and isolated with normal vision and pupillary reactivity to light. In young adults or children, the disorder may occasionally accompany migraine headaches (although cases have been described without accompanying headache).[10] Lasting 15 minutes to 24 hours and often associated with blurred vision, episodes average two to three per month. Ocular and motility abnormalities are absent. The pupil dilates due either to parasympathetic insufficiency of the iris sphincter or to sympathetic hyperactivity of the iris dilator muscle. Angle-closure glaucoma should be excluded.

MIGRAINE WITH AURA

Epidemiology

In a given year in the United States, the prevalence of migraine with aura is 5.3% in women (30.8% of female migraineurs) and 1.9% in men (32% of male migraineurs).[6] As many as 81% of those who have migraine with aura also have attacks of migraine without aura.[11]

The reported age of onset is between a mean of 11.9 years (range, 4-17)[12] and a mean of 21 years (range, 5-77).[13] In one study, 54.9% of patients suffered less than one attack per month, and 9.7% reported more than three attacks per month.[14] In another study, the mean number of episodes/year/patient was 29 (ranging from less than 1 to 156).[15]

Clinical Features

In a study of 362 patients suffering from migraine with aura—at least in some attacks—99% had a visual aura, 54% had a sensory aura, and 32% had an aphasic aura.[16] Most had a combination of aura symptoms as follows: 28% had a visual and sensory aura; 25% had a visual, sensory, and aphasic aura; 6% had a visual and aphasic aura; and 39% had a visual aura exclusively. When more than one aura symptom occurred, they did so in succession in 96% versus simultaneously in 4% of patients. Ninety-one percent experienced a gradual onset of visual aura symptoms. The mean age of the patients in this study

CRITERIA FOR MIGRAINE WITH AURA[1]

- At least two attacks of aura occur with migraine headache.
- The migraine aura fulfills criteria for one of the subforms of aura with migraine headache.
- The symptoms are not attributed to another disorder.

Subforms of aura—The International Headache Society's criteria recognize six subforms of aura with migraine headache:

- typical aura with migraine headache
- typical aura with nonmigraine headache
- typical aura without headache
- familial hemiplegic migraine
- sporadic hemiplegic migraine
- basilar-type migraine

Typical aura—a "typical" aura fulfills the following criteria of the International Headache Society.
First, the aura has at least one of the following characteristics without motor weakness:

- Fully reversible visual symptoms, including positive features (eg, flickering lights, spots, or lines) and/or negative features (eg, loss of vision)
- Fully reversible sensory symptoms, including positive features (eg, pins and needles) and/or negative features (eg, numbness)
- Fully reversible dysphasic speech disturbance
- Second, the aura has at least two of the following characteristics:
- Homonymous visual symptoms and/or unilateral sensory symptoms
- At least one aura symptom that develops gradually over 5 minutes or longer and/or different aura symptoms that occur in succession over 5 minutes or longer
- A duration of 5 to 60 minutes for each symptom

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was 46 years (range, 12-90). (See *Criteria for Migraine With Aura*.)

The "classic" visual aura is the fortification (looks like a fortified town as viewed from above) spectra or teichopsia ("seeing fortifications"), which is a jagged figure with fortification lines arranged at right angles to one another beginning from a paracentral area, which usually spreads outward, leaving visual loss behind. There are often scintillations, which may be white or gray or have colors similar to a kaleidoscope in a semicircle or C shape surrounding the scotoma or area of visual loss. Scintillating scotomata are typically in one hemifield, with visual field defects beginning around fixation and spreading outward. The symptoms reported by patients, however, may be quite variable.

Approximately 50% of patients report that the visual auras begin in the periphery, whereas the remaining 50% see them starting in or adjacent to the center of the visual field. In a series of 122 clinical patients,[17] the laterality of the visual auras was reported as follows: always on the same side of vision (right or left), 22.1%; one sided but not always on the same side, 23.8%; always on both sides of vision, 23.8%; and sometimes on one side, sometimes on both sides, 29.5%.[18] The reported color of the visual auras was always black-and-white (30.3%), always black and silver (20.5%), always colorful (18%), both black-and-white and colorful (22.2%), and colorless (9%). The visual phenomena were described with the following characteristics and percentages of patients: blurred vision, 54.1%; small, bright dots, 47.5%; zigzag lines, 41.8%; flashes of bright light, 38.5%; "blind spots," 33.6%; flickering light, 30.3%; "like looking through heat waves or water," 24.6%; blindness in half of a visual field, 23.8%; white spots, 22.1%; colored dots/spots of light, 19.7%; curved or circular lines, 18.9%; small, black dots, 17.2%; bean-like forms such as a crescent or C shape, 16.4%; black spots, 14.8%; and tunnel vision, 9.8%. Less common visual auras include corona phenomena, palinopsia,[18] metamorphopsia, macropsia, micropsia, telescopic vision, teleopsia, mosaic vision, and multiple images.

According to the International Classification of Headache Disorders, third edition (ICHD-III), the typical duration of migraine aura is 5 to 60 minutes. The ICHD-III labels aura lasting longer than an hour but less than a week as probable migraine with aura. Visual aura has reportedly lasted more than 1 hour in 6% to 10% of patients.[19] Other aura symptoms enduring more than 1 hour are somatosensory aura in 14% to 27% of patients and aphasic aura in 17% to 60%.

A sensory aura consists of numbness, tingling, or a pins-and-needles sensation. The aura, which is usually unilateral, commonly affects the hand and then the face, or it may affect either one alone.[20] Paresthesia of one side of the tongue is typical. Less often, the leg and trunk may be involved. A true motor aura is rare, but sensory ataxia or a heavy feeling is often misinterpreted as weakness. Patients frequently report a speech disturbance when the spreading paresthesias reach the face or tongue. Slurred speech may be present. With involvement of the dominant hemisphere, paraphasic errors and other types of impaired language production and comprehension may occur. Rarely, other aura symptoms may be described, including déjà vu and olfactory and gustatory hallucinations.

Migraine aura is considered by many to be a distinct phase of the migraine attack preceding the headache. In a prospective study of 861 attacks of migraine with aura in 201 patients, however, during the aura phase, 73% of attacks were associated with headaches; 54% of the headaches fulfilled migraine criteria during the first 15 minutes of the aura's onset.[21] Aura follows headache in approximately 3% to 8% of cases.[16] The headache may be contralateral to the side of the visual aura, ipsilateral in up to 62% of patients for some attacks,[17] or bilateral.

Migraine Aura Versus Cerebral Ischemia and Seizures

Unlike symptoms due to cerebral ischemia, visual or sensory auras from migraine typically spread slowly across the visual field or body part followed by a gradual return to normal function in the areas first affected after 20 to 60 minutes.[22] The onset of cerebral ischemic events is usually sudden with an equal distribution in the relevant vascular territory, although the affected area can expand stepwise if blood flow drops in additional vessels.[23] The progression in partial seizures is generally much more rapid. The return of function in areas first affected while symptoms begin in newly affected areas occurs in migraine aura but not in ischemia or seizures. As noted earlier, when more than one type of aura occurs, they almost always do so one after the other; in contrast, multiple neurological symptoms typically occur at the same time in cerebral ischemia. Finally, migraine aura often begins with positive phenomena such as shimmering lights, zigzags in vision, or tingling. It is then frequently followed minutes later by negative symptoms such as scotoma, numbness, or a loss of sensation, which can also occur during seizures but usually with a faster progression of symptoms. This cycle from positive to negative symptoms is not typical of cerebral ischemia.

Late-Life Migraine Accompaniments and Migraine Aura Without Headache

Fisher reported new-onset "late life migrainous accompaniments" in 85 patients aged 40 to 73 years.[24] The

CRITERIA FOR MIGRAINE WITH BRAINSTEM AURA[1]

A. At least two attacks fulfilling criteria B-D
B. Aura consisting of visual, sensory, and/or speech/language symptoms, each fully reversible, but no motor or retinal symptoms (note: when motor symptoms are present, code as 1.2.3 hemiplegic migraine)
C. At least two of the following brainstem symptoms
   1. dysarthria
   2. vertigo
   3. tinnitus
   4. hypacusis
   5. diplopia
   6. ataxia
   7. decreased level of consciousness
D. At least two of the following four characteristics
   1. At least one aura symptom spreads gradually over 5 minutes, and/or two or more symptoms occur in succession.
   2. Each individual aura symptom lasts 5 to 60 minutes. (Note: when three symptoms occur during an aura, for example, the acceptable maximal duration is 3 x 60 minutes.)
   3. At least one aura symptom is unilateral. (Note: aphasia is always regarded as a unilateral symptom; dysarthria may or may not be.)
   4. The aura is accompanied, or followed within 60 minutes, by headache.
E. Not better accounted for by another diagnosis from The International Classification of Headache Disorders, third edition, and transient ischemic attack has been excluded.

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episodes resembled transient ischemic attacks[25] similar to those of the 120 patients he had previously described. Most had visual symptoms occurring alone (44/205) or combined with other aura symptoms. Headache was associated with the episodes in 40% of cases. In the Framingham study, visual migrainous symptoms were reported by 1.23% of subjects (1.33% of women and 1.08% of men) who had an onset after age 50 in 77% with the following characteristics: stereotyped in 65%, never accompanied by headaches in 58%, ranging in number of episodes from one to 500 with 10 or more in 69% of subjects, and lasting 15 to 60 minutes in 50%.[26] Of 1,000 patients presenting for a comprehensive eye examination in Alabama,[27] 6.5% reported visual symptoms consistent with migraine aura without headache, 8.6% women and 2.9% men with risk factors such as a history of migraine headaches and a history of childhood motion sickness.

CRITERIA FOR RETINAL MIGRAINE[1]

A. At least two attacks fulfilling criteria B and C
B. Aura consisting of fully reversible monocular positive and/or negative visual phenomena (eg, scintillations, scotomata, or blindness) confirmed during an attack by either or both of the following
   1. Clinical visual field examination
   2. The patient's drawing (made after clear instruction) of a monocular field defect
C. At least two of the following three characteristics
   1. The aura spreads gradually over 5 minutes.
   2. Aura symptoms last 5 to 60 minutes.
   3. The aura is accompanied, or followed within 60 minutes, by headache.
D. Not better accounted for by another diagnosis from The International Classification of Headache Disorders, third edition, and other causes of amaurosis fugax have been excluded.

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A retrospective study of 100 aura patients compared those whose age at onset was 45 years or older versus younger than 45 years.[28] The investigators found no difference in gender distribution, family or personal history of migraine without aura, type of aura symptoms, or imaging findings. Aura symptoms were mostly visual. The duration of the auras was similar in both groups, breaking out as follows in the late-onset group: less than 20 minutes, 47.8%; 20 to 60 minutes, 39.1%; and longer than 60 minutes, 13%. Headache was associated with auras less often in patients who were older at onset. The patients whose age at onset was 65 or older were similar to those with an onset age of 45 or older.

"Alice in Wonderland" Syndrome

"Alice in Wonderland" syndrome, a term coined by Todd in 1955,[29] is a rare migraine aura. Usually, affected patients experience a distortion in body image that they know is unreal (ie, enlargement, diminution, or distortion of part of or the whole body). The syndrome can occur at any age but is more common in children. The cause may be migrainous ischemia of the nondominant posterior parietal lobule. Other causes include medication (topiramate,[30] cough syrup with dihydrocodeine phosphate and DL-Methylephredrine hydrochloride), Epstein-

Barr virus and other infections,[31] depression, seizures, and a right medial temporal lobe stroke.

Persistent Visual Aura

Rarely (35 cases reported), migraineurs may have persistent visual aura.[32,33] This aura usually consists of simple, unformed hallucinations in the entire visual field of both eyes, including innumerable dots, television static, clouds, heat waves, flashing or flickering lights, lines of ants, a rain-like or snow-like pattern, squiggles, bubbles, and grainy vision. Occasionally, palinopsia (the persistence of visual images), micropsia, or formed hallucinations occur. The ICHD-III describes persistent aura without infarction as aura symptoms persisting for 1 week or more without evidence of infarction on neuroimaging.

Migraine With Brainstem Aura

Brainstem aura was formerly termed *basilar-type migraine*, a label no longer used because involvement of the basilar artery is unlikely (see *Criteria for Migraine With Brainstem Aura*). Migraine with brainstem aura is a rare disorder that usually affects patients aged 7 to 20 years and rarely presents in individuals older than 50 years.[34] One study reported the following aura symptoms: vertigo, 61%; dysarthria, 53%; tinnitus, 45%; diplopia, 45%; bilateral visual symptoms, 40%; bilateral paresthesias, 24%; decreased level of consciousness, 24%; and hypoacusis, 21%. Visual symptoms—usually blurred vision, shimmering colored lights accompanied by blank spots in the visual field, scintillating scotoma, and graying of vision—may start in one visual field and then spread to become bilateral. The median duration of aura was 60 minutes (range, 2 minutes-72 hours), with two or more aura symptoms always occurring.

Retinal Migraine

Retinal migraine is rare.[35] The mean age at onset is 25 years. Patients present with fully reversible, monocular, positive and/or negative visual phenomena lasting less than 2 hours (see *Criteria for Retinal Migraine*). Typically, patients report flashing rays of light and zigzag lightning and, less often, brightly colored streaks, halos, or diagonal lines. Negative phenomena may be blurring, "gray-outs," and "blackouts" causing partial or complete blindness. Elementary forms of scotoma are perceived as blank areas, black dots, or spots in the field of vision. Visual field defects can be altitudinal, quadrantic, central, or arcuate. The headache is usually ipsilateral to the visual loss. Almost 50% of those affected have a history of migraine with visual aura. Some patients who report monocular visual disturbance have hemianopsia of which they are not aware, because they do not perform a cover/uncover test. Diagnosis is one of exclusion of other causes of transient monocular blindness. Retinal migraine can lead to permanent monocular visual loss. ■

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