Practice Guideline for Diagnosis and Management of Migraine Headaches in Children and Adolescents: Part One

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This article is part one of a two-part practice guideline for the diagnosis and management of headaches (with an emphasis on migraine headaches) in children and adolescents. Part one includes the epidemiology, headache classification and diagnostic criteria, history and physical examination, and differential diagnosis of headaches. Part two will focus on the pathophysiology and management of migraines in children and adolescents.

INTRODUCTION

Headaches, including migraines, are a common reason children and their families seek care from their primary care provider, go to an emergency department, or visit a subspecialist (Kabbouche & Linder, 2005; Rosenblum & Fisher, 2001). When headaches are recurrent, the child and his or her parents may be frightened and interested in identifying the etiology of the headache, obtaining relief, and receiving remedies for the headache and reassurance that a life-threatening illness is not present (Powers & Andraski, 2005; Rosenblum & Fisher).

EPIDEMIOLOGY

Headaches in infancy and early childhood are rare, and in children younger than 3 years are more likely to have an organic cause (Abu-Arafeh, 2002). However, by age 15 years, about 75% of children will have had at least one headache (Rubin, Suecoff, & Knupp, 2006). The prevalence of migraine headaches is 1% to 3% in preschoolers, 4% to 11% in school-aged children, and 8% to 23% in adolescents. Boys with migraine outnumber girls with migraine before 7 years of age; however, boys are equally as likely as girls to have...
**BOX 1. Differential diagnosis for headaches in children and adolescents**

**Acute**
- Systemic or central nervous system infection (viral illness, pharyngitis, sinusitis, otitis media, dental infection, brain abscess, meningitis, encephalitis)
- Vascular (aneurysm/arterial venous malformation, thrombosis, subarachnoid hemorrhage due to ruptured aneurysm, hematoma, intraparenchymal hemorrhage)
- Toxins (prescription medications, analgesia rebound, cocaine, amphetamines, carbon monoxide, lead)
- Hypertension
- Trauma (with or without hematoma or hemorrhage)
- Congenital malformations (Dandy-Walker, arachnoid cysts, hygromas)
- Neoplasm
- Hydrocephalus
- Ventriculo-peritoneal shunt malfunction
- Pseudotumor cerebri
- Postictal
- Post-lumbar puncture
- Hypoxia
- Exertion

**Acute recurrent**
- Migraines
  - Migraines with aura
  - Migraines without aura
  - Complicated
    - Basilar artery
    - Hemiplegic
    - Confusional
    - Ophthalmoplegic
- Chronic progressive
  - Neoplasm
  - Pseudotumor cerebri
  - Hydrocephalus
  - Brain abscess
  - Congenital malformations (Chiari/Dandy Walker)
  - Vascular (subdural hematoma, aneurysm, malformation)
  - Hypertension
  - Medications (e.g., oral contraceptive pills)

**Chronic nonprogressive**
- Tension-type

**Mixed**
- Acute recurrent + chronic nonprogressive

Data from Kondev & Minster, 2003.

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migraines between ages 7 to 11 years, and girls in incidence beginning in adolescence (Lewis, Yonker, Winner, & Sowell, 2005).

### EVALUATION

**Headache Classification and Differential Diagnosis**

The differential diagnosis for headaches in children is vast (Box 1). Diagnostic criteria have been developed (Box 2) and have been adapted for children and adolescents (International Headache Society [IHS], 2004).

**Acute headaches** occur as a single generalized or localized event in a patient without a previous history of this type of headache. **Acute recurrent headaches** are periodic and with pain-free intervals; various forms of migraines fall into this category. The terms “classic” and “common” with reference to migraines have been replaced with the terms “with aura” and “without aura.” Complicated migraines have some form of transient, neurologic changes, and include basilar artery migraines (occurring in adolescents and presenting with blurred or tunnel vision, an occipital headache, and some form of vertigo); hemiplegic migraines (presenting with hemiparesis); confusional migraines (seen in adolescents with headaches followed by altered mental status); and ophthalmoplegic migraine (retro-orbital pain and a third cranial nerve palsy).

**Chronic progressive headaches** increase in severity and frequency. When combined with an abnormal neurologic examination, evaluation for an organic cause should be undertaken. **Chronic nonprogressive headaches** usually refer to “tension-type” headaches (previously called tension or stress headaches); they usually are frequent, daily, or constant and are mild to moderate in severity. This headache type is most often seen in adolescent girls. **Mixed headaches** have characteristics of tension-type and migraine headaches. Drug-rebound headaches are seen with the overuse of over the counter analgesics in patients with recurrent or chronic headaches.

### HISTORY

A thorough history, incorporating the IHS classification system and diagnostic criteria as a key history component, should enable the provider to establish a tentative diagnosis, focus the physical examination, and initiate a management plan. History is gathered from the child and parent, and an opportunity for a private interview of adolescents is appropriate. The following data should be gathered.

#### History of Present Illness

- Age of onset
- Presence or absence of prodrome or aura
- Presence or absence of nausea and vomiting
- Frequency: number per month, time interval between headaches
- Duration: number of minutes, hours, or days. Pain may be continual in cases of chronic daily headaches
- Time of onset: specific time of day, night-time waking, relationship to particular activity/menses
- Location: frontal, temporal, occipital, unilateral, bilateral
- Quality: worse headache ever had, or cannot describe pain, pain or other symptoms worsening, staying the same
- Throbbing, pulsating, tightness, pressure, squeezing, sharp, stabbing, dull
- Precipitating factors: foods, odors/perfumes, stressors
- Ameliorating factors: sleep, exercise, quiet, dark room
- Associated factors: photophobia, phonophobia
- Lifestyle factors: sleep pattern, exercise; diet: caffeine intake, chocolate, aged cheeses, processed meats, monosodium glutamate, nuts, and pickles
- Personality change: crying, rocking, holding head, decreased ac-
BOX 2. International Headache Society diagnostic criteria for migraine headaches

I. Migraine without aura
   At least five attacks fulfilling criteria A-D:
   A. Headache attacks lasting 4 to 72 hours*
   B. Headache has at least two of the following characteristics:
      1. Unilateral location*
      2. Pulsating quality
      3. Moderate or severe pain intensity
      4. Aggravated by or causes avoidance of routine physical activity (e.g., walking or climbing stairs)
   C. During headache at least one of the following:
      1. Nausea and/or vomiting
      2. Photophobia and phonophobia*
   D. Not attributable to another disorder

II. Migraine with aura
   There are 6 subforms of migraine with aura, each of which have specific criteria. The criteria for the most common subform, typical aura with migraine headache, will be listed here. The other subforms may be found in the reference listed below.

   Subform: Typical aura with migraine headache
   At least 2 attacks fulfilling the criteria A-D:
   A. Aura consisting of at least one of the following but no motor weakness:
      a. Fully reversible visual symptoms including positive (e.g., flickering lights, spots, lines) and/or negative features (i.e., loss of vision)
      b. Fully reversible sensory symptoms including positive (i.e., pins and needles) and/or negative features (i.e., numbness)
      c. Fully reversible dysphasic speech disturbance
   B. At least two of the following:
      a. Homonymous visual and/or unilateral sensory symptoms
      b. At least one aura symptom develops gradually over ≥5 minutes and or different aura symptoms occur in succession over ≥5 minutes
      c. Each symptom lasts ≥5 minutes and ≤60 minutes
   C. Headache fulfilling criteria A-D for migraine without aura begins during the aura or follows aura within 60 minutes
   D. Not attributable to another disorder

* Variations of migraines without aura in children:
   • Attacks may last 1 to 72 hours
   • The pain is commonly bilateral in young children; adult pattern of unilateral pain usually begins in late adolescence or early adult life
   • The pain is usually frontotemporal; occipital headache in children, either unilateral or bilateral, is rare, and structural lesions should be suspected
   • Photophobia and phonophobia may be inferred in young non-verbal children through observation of their behavior, such as covering their eyes or ears, or seeking a quiet and/or dark room.

Adapted from International Headache Society, Headache Classification Subcommittee, 2004.

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PHYSICAL EXAMINATION

A systematic examination, including a detailed neurologic examination, is essential to determining the etiology of the headache. Inclusion of the IHS classification system and diagnostic criteria further increases the likelihood that a serious etiology will not be missed. Specific components of examination of a child or adolescent with a headache and abnormal findings that warrant further investigation are listed in the Table.

Radiography/Laboratory

Neuroimaging. The decision to perform neuroimaging on a child with headache is made based on the history and physical. For a variety of reasons (ease of obtainable computed tomography [CT] scans and magnetic resonance imaging [MRI], increased patient demand, and practicing “defensive” medicine), imaging has become commonplace as part of an evaluation of a patient with recurrent or chronic headaches (Frishberg, 1994). In general, adults with stable headaches, a normal examination, and an ab-

### TABLE. Abnormal findings present on the physical examination and related differential diagnosis

<table>
<thead>
<tr>
<th>Components of examination</th>
<th>Abnormal physical findings</th>
<th>Differential diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth parameters</td>
<td>Change in velocity: below the 5th or above the 95th percentile</td>
<td>Obesity/pseudotumor cerebri; tumor; chronic illness</td>
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<tr>
<td>Vital signs</td>
<td>Temperature &gt;101°</td>
<td>Infection; inflammation</td>
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<tr>
<td></td>
<td>Blood pressure &gt;95th percentile for height and sex (measure both arms)</td>
<td>Hypertension; pheochromocytoma</td>
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<td></td>
<td>Unequal pulses in extremities (measure in all four extremities)</td>
<td>Coarctation of aorta</td>
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<td></td>
<td>Abnormally large head circumference (measure in all age groups; in older children, slow progressive increase in intracranial pressure can result in macrocrania)</td>
<td>Increased intracranial pressure: ventriculo-peritoneal shunt malfunction; tumor; trauma; infection</td>
</tr>
<tr>
<td>General</td>
<td>Impaired/abnormal cognitive, emotional, social functioning of patient and family</td>
<td>Stressors; family problems; depression, anxiety of patient and/or family</td>
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<tr>
<td>Skin</td>
<td>Bruises; abrasions</td>
<td>Trauma</td>
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<td></td>
<td>Neurocutaneous stigmata</td>
<td>Neurofibromatosis; tubular sclerosis (tumor)</td>
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<tr>
<td>Head and neck</td>
<td>Asymmetrical, indented, depressed cranial bones, overriding of sutures noted on palpation of head</td>
<td>Increased intracranial pressure: infection; ventriculo-peritoneal shunt malfunction, trauma, tumor</td>
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<td></td>
<td>Temporal, orbital (eye), carotid artery bruits</td>
<td>Arterial venous malformations</td>
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<td>Tenderness over frontal and/or maxillary sinuses</td>
<td>Sinusitis</td>
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<td>Asymmetrical, enlarged, and/or visual thyroid. (palpable thyroid is normal variant in children up to age 5 years)</td>
<td>Thyromegaly</td>
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<tr>
<td>Eyes</td>
<td>Visual acuity &lt;20/50 in 3-year-old; &lt;20/40 in 4-year-old; &lt;20/30 in 5-year-old; &lt;20/20 in child &gt;6 years</td>
<td>Eye strain</td>
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<tr>
<td></td>
<td>Blurred vision</td>
<td>Poor visual acuity; basilar artery migraine; increased intracranial pressure: see head circumference</td>
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<td></td>
<td>Unequal pupil size shape and/or reaction to light</td>
<td>Increased intracranial pressure</td>
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<tr>
<td></td>
<td>Papilledema</td>
<td>Pseudotumor cerebi; other causes of increased intracranial pressure</td>
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<tr>
<td>Jaws and mouth</td>
<td>Nystagmus; inability of eyes to move in six cardinal fields of gaze</td>
<td>Pressure on cranial nerves III-IV</td>
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<td></td>
<td>Tenderness, clicking, popping and/or limited mobility of temporomandibular joint</td>
<td>Referred pain</td>
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<td></td>
<td>Dental caries, abscesses</td>
<td>Referred pain</td>
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<tr>
<td>Ears</td>
<td>Otorrhea, pain with movement of tragus, edema of auditory canal, crusty debris</td>
<td>Otitis externa</td>
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<td></td>
<td>Opaque, retracted tympanic membrane with/without fluid; growth on tympanic membrane</td>
<td>Chronic otitis media with effusion; cholesteatoma</td>
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<tr>
<td>Cervical spine</td>
<td>Limited vertical range of motion</td>
<td>Meningitis; subarachnoid hemorrhage</td>
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<tr>
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<td>Limited lateral range of motion</td>
<td>Soft tissue problems and anomalies of the posterior fossa</td>
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<td>Neurologic system</td>
<td>Positive Kernig/Brudzinski’s signs</td>
<td>Meningitis</td>
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<td>Nuchal rigidity</td>
<td>Meningitis; intracranial hemorrhage</td>
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<td></td>
<td>Altered level of consciousness, mental status; abnormal cranial nerves (especially eye movements), deep tendon reflexes; ataxia; motor or sensory asymmetry</td>
<td>High index of suspicion for tumor; other causes of increased intracranial pressure</td>
</tr>
</tbody>
</table>

BOX 3. Danger signs and symptoms of life-threatening conditions that can present with a headache

History
- No family history, especially in presence of other signs and symptoms
- Lack of response to medical therapy
- Early morning pain, with/without vomiting
- Night-time awakening with pain
- Persistent vomiting
- Increased pain with coughing, voiding, or bowel movements
- Chronic progressive headaches
- Description of “worst headache has ever had”
- Inability to describe pain
- Recurrent localized headache
- Personality change (depression and migraine could indicate temporal lobe tumor)

Physical examination
- <3 years of age
- Known risk for intracranial pathology
  - Ventrículo-peritoneal shunt malfunction
  - Neurofibromatosis
  - Tubular sclerosis
- Abnormal neurologic examination
  - Seizures
  - Lethargy
  - Ataxia
  - Abnormal reflexes
  - Hemiparesis
  - Diplopia
  - Papilledema
  - Meningeal signs
  - Complex migraines

Data from Brazis & Lee, 2005.

Presence of seizures do not require neuroimaging (Lewis, 2002b). Similarly, neuroimaging in children with recurrent headache but a normal examination routinely is not recommended (Lewis, 2002b). Neuroimaging should be considered for children with headaches with abnormal neurologic examinations and/or seizures, and possibly for children with recently occurring severe headaches, change in headaches, or associated neurologic dysfunction (Lewis, 2002b).

Emergent CT versus non-emergent MRI. An MRI scan is more sensitive than a CT scan, and both are more sensitive with intravenous contrast (Sandrini, et al., 2004). However, an emergent, noncontrast CT scan of the head should be obtained when the history suggests that the headache is “the worst headache ever” or when focal neurologic findings, nuchal rigidity, or an altered mental status on physical examination are found. Diagnostic possibilities to be considered in these instances include trauma (subdural, epidural hematoma, intracranial hemorrhage); large subarachnoid hemorrhage; large brain abscess or tumor; history of VP shunt; or hydrocephalus. In other instances, a nonemergent MRI scan should be obtained, especially if an aneurysm, small vascular malformations, posterior fossa lesions, or brain stem lesion is in the differential (Kondev & Minster, 2003).

Lumbar puncture. Lumbar puncture (LP) often is indicated in the pediatric patient with headache. A CT scan of the head to rule out increased intracranial pressure may be indicated prior to LP if the child has altered mental status or focal findings. Otherwise, an LP should be conducted when there is a concern for an inflammatory (Guillain-Barré), an infiltrative (acute lymphocytic leukemia), or an infectious (meningitis, encephalitis) process. An LP also is indicated when pseudotumor cerebri is suspected to obtain an opening pressure (Kondev & Minster, 2003). If a child has a VP shunt and fever, the shunt should be tapped.

REFERENCES


