Headache

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I'm very brave generally, he went on in a low voice: only today I happen to have a headache.
—Lewis Carroll

Learning Objectives:
1. Understand the definition of key primary headache types including migraine and tension type headaches and how these definitions differ from adult definitions
2. Know the indications for imaging and referral in the evaluation of primary headache
3. Identify the key components in the management of pediatric headaches including the role for complementary and alternative medicines
4. Understand the key components in the management of chronic daily headaches

Primary Reference:
   http://pedsinreview.aappublications.org/content/33/12/562.full.pdf+html

CASE ONE:

Michael Graine, a 7-year-old child in your practice, is here for an evaluation of his headaches. His mother reports that Mike has been having migraines. She is concerned that these headaches represent a brain tumor and is requesting a brain and full body scan – she has seen on TV that these scans “can find all sorts of tumors.”

1. What else do you want to know about Michael’s headaches?

Questions should clarify the pattern and quality of pain of the headaches, as well as associated symptoms (nausea, photophobia, response to exertion, or aura). In addition, elicit the timing of headaches, severity, triggers, relievers, and location. Be aware that some children may suffer from more than one type of headache, and you must elicit this information about each type. Mood and affect are important to note, as depression or anxiety are commonly comorbid with headache. Family history should focus on other family members with headaches. Past medical history should elicit history of relevant conditions such as neurocutaneous syndromes, bleeding dyscrasias, cranial surgery or trauma, and social history should focus on stressors at school or home including physiologic stress such as heat, hunger or dehydration, recent life changes, and coping techniques.

Children may have a hard time localizing the pain of headaches, as well as describing the quality of the pain. If aspects of the history are initially unclear, as is often the case, a headache log or journal may help to elucidate the patterns, precipitating events, and quality of pain. Parents may not have realized previously which historical aspects are necessary for diagnosis and therefore may not recall the details during the initial visit.

Headache with fever, altered mental status, or neurologic signs requires urgent work up, including imaging and lumbar puncture as clinically indicated. Other red flags include headache after trauma, morning vomiting, and severe headache that wakes the child from sleep (in contrast to a headache that occurs when one wakes up from sleep). Occipital head pain can be associated with increased intracranial pressure. Change in pattern or severity of headaches is also concerning, as is a chronic progressive headache pattern (one of increasingly severe headaches) which would necessitate careful consideration of imaging and referral.

2. What are the key types of headaches in childhood? How do you differentiate between the most common types?

Primary headache disorders can be divided into several different types with migraine and tension-type being most common. Lewis identifies the prevalence of headache in general as 37-51% in children over
7 years of age and 57-82% by age 15. The actual incidence and prevalence of tension type headache has been difficult to capture secondary to variability in data collection and headache definitions but the largest series to include 13-15 year-old children found an 18% prevalence. Migraine prevalence increases with age and by adolescence it is 8-23%. The mean age of migraine onset is 7 years for boys and 11 years for girls.

Additional primary headache types include cluster (rare with prevalence estimated at 0.1%), paroxysmal hemicrania, short-lasting unilateral neuralgiform headache attacks with conjunctival injection and tearing (SUNCT), stabbing headache, cough headache, exertional headache, headache with sexual activity, thunderclap headache, trigeminal neuralgia, glossopharyngeal neuralgia, occipital neuralgia, neck-tongue syndrome, and cold-stimulus headache. For further discussion of all of these types of headache refer to Lewis’ article “The ‘other’ primary headaches in children and adolescents.” As these other types of headaches are relatively rare, we will confine our discussion to tension type and migraine headache.

The International Headache Society (IHS) has an International Classification of Headache Disorders which serves as a “gold standard” for defining types of headaches. The 2013 IHS definitions of migraine and tension type headaches for children are below:

**Migraine type headache**

<table>
<thead>
<tr>
<th>Without Aura</th>
<th>With aura</th>
</tr>
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<tbody>
<tr>
<td>At least 5 distinct attacks</td>
<td></td>
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<tr>
<td>Headache attack lasting 2-72 hours</td>
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<tr>
<td>Headache has at least two of the following:</td>
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<tr>
<td>Unilateral location</td>
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<tr>
<td>Pulsating quality</td>
<td></td>
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<tr>
<td>Moderate to severe intensity</td>
<td></td>
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<tr>
<td>Aggravation by or causing avoidance of routine physical activity</td>
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<tr>
<td>During headache, at least one of:</td>
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<tr>
<td>Nausea and/or vomiting</td>
<td></td>
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<tr>
<td>Photophobia and/or phonophobia</td>
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<tr>
<td>At least 2 attacks</td>
<td></td>
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<tr>
<td>One or more fully reversible aura symptoms (e.g., visual, sensory, speech, motor).</td>
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</tr>
<tr>
<td>At least two of the following:</td>
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<tr>
<td>At least one aura developing gradually over 5 or more minutes or 2 or more symptoms occurring in succession.</td>
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</tr>
<tr>
<td>Each individual aura lasting 5-60 minutes.</td>
<td></td>
</tr>
<tr>
<td>At least one aura is unilateral.</td>
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<tr>
<td>Headaches follow in less than 60 minutes.</td>
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</table>

**Tension Type Headache:**

| Headache lasting 30 minutes to 7 days. |
| Headache has at least two of the following: |
| Bilateral location |
| Pressing/tightening (nonpulsatile) quality |
| Mild to moderate intensity |
| Not aggravated by routine physical activity such as walking or climbing stairs. |
| Both of the following: |
| No nausea or vomiting |
| No more than one of photophobia or phonophobia |
| Not attributable to another disorder. |

The key components to differentiate migraine from tension headaches include intensity (severe vs. mild to moderate), quality (pulsating vs. pressing/tightening), and associated symptoms. While unilateral vs. bilateral headache can be an important distinguishing feature in adults, the IHS specifies that migraines in children and adolescents are frequently bilateral, unlike migraines in adults. As mentioned previously it may be difficult for younger children to articulate location (unilaterality vs. bilaterality).

IHS definitions of pediatric headache types are derived from adult criteria. The major difference between pediatric and adult version is the duration of headache; adult duration for migraine is four to 72 hours. This becomes important when designing/interpreting studies of abortive migraine therapy. For example, if the end point for a study is pain at 1 hour, 2 hours, etc., and pediatric patients have
shorter migraine duration, a larger placebo effect may be seen. The tension type headache definition is the same as the adult definition.

**CASE continued:**

On further questioning, Michael reports that he knows when the headaches are going to start because he sees shiny lights at the edges of his eyes. The headaches are so severe he has to stop what he is doing and go lie down. Once or twice he has thrown up because of the headaches. His mom reports that the headaches were better over the summer but are now worse. He has had 7 headaches in the last 6 months. On physical exam, Michael is a well appearing, talkative 7-year-old. He is afebrile, with age appropriate vital signs and normal blood pressure. His neurologic exam, including a fundoscopic exam, is normal.

3. **How would you classify Michael’s headaches? How do you treat them? What factors are important to consider for treatment?**

Michael has typical migraine headaches with aura. In pediatric patients, the aura does NOT need to resolve prior to the start of the headache, but should resolve prior to the end of the headache. Treatment of migraines in children and adolescents follows the same basic principles as migraine treatment in adults. Treatment should focus on lifestyle modification, identification and avoidance of triggers, abortive therapy, and, when necessary, prophylactic therapy. Known migraine triggers include disrupted sleep, skipping meals, stress, analgesic use (analgesia rebound headache), and caffeine withdrawal. Other dietary triggers are addressed below. Children and families should be counseled to maintain a standard bedtime allowing for at least 8 hours of sleep/night (including weekends), to eat regular meals including breakfast, to exercise routinely, and to avoid caffeine.

Frequency, duration, and impact on school and social function need to be considered in selecting between abortive therapy and prophylactic therapy. Prophylactic therapy should be considered if a child is experiencing headaches more than once per week or 4 times per month, or if there is significant impact on school performance.

Abortive therapy comes in 2 types - migraine nonspecific and migraine specific. Migraine-nonspecific therapies include acetaminophen, NSAIDs, caffeine, and anti-emetics, while migraine-specific abortive therapies include the triptans. Studies of abortive agents in children are made challenging by a placebo response rate of more than 50% in some trials. A 2016 Cochrane Review evaluated abortive migraine therapy in children and concluded that ibuprofen, triptans, and sumatriptan plus naprosyn were all effective in treating migraines. Acetaminophen was found to be no better than placebo in a single small study. There were no head to head comparisons, and most studies were small and of low to moderate quality.

The Pearlman article gives a thorough discussion of several triptan trials. The only triptans with FDA approval for use in children are rizatriptan, approved for children 6 years and older, and zolmitriptan nasal spray, almotriptan, and sumatriptan/naproxen combination treatment which are approved for children 12 and older. While still “off-label,” sumatriptan monotherapy has been widely studied and is well tolerated in children in nasal and subcutaneous forms.

Caffeine was not discussed in the Cochrane Review but has been shown to have efficacy in adult migraine, either by vasoconstricting cerebral vasculature or by addressing caffeine withdrawal. Adolescents can be instructed in a “migraine cocktail” of ibuprofen and 1 can of soda with caffeine. Finally, if a child’s headache is accompanied by nausea, various anti-emetics can be helpful adjuncts to therapy (e.g., promethazine, prochlorperazine, ondansetron), though these agents were not part of the Cochrane Review.

Migraine specific and migraine nonspecific abortive therapies can be combined in several manners: stepwise, graded, and combination approaches. It is imperative that the patient has access to medications when needed (e.g., they can get to the school nurse in a timely manner, and the nurse can dispense the medications). Early intervention with abortive therapy is more effective. Opiate pain medications, including codeine, are rarely effective in managing headaches and should be avoided.
Care should be taken to avoid analgesia overuse as the incidence of rebound analgesia headache increase when medications are used more than 2 times per week.

<table>
<thead>
<tr>
<th>Stepwise approach</th>
<th>Mild to moderate headache</th>
<th>Moderate to severe headache</th>
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</thead>
<tbody>
<tr>
<td>1. Migraine nonspecific medications</td>
<td>1. Migraine nonspecific medications</td>
<td></td>
</tr>
<tr>
<td>2. ADD migraine specific medication if headache does not resolve</td>
<td>2. ADD migraine specific if medication headache does not resolve</td>
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<tr>
<td>Graded approach</td>
<td>Migraine nonspecific medications</td>
<td>Migraine specific medications</td>
</tr>
<tr>
<td>Combination approach</td>
<td>Migraine nonspecific medications</td>
<td>Migraine nonspecific medications PLUS migraine specific medications</td>
</tr>
</tbody>
</table>

As mentioned above, children with frequent or severe migraine attacks that result in marked impact on school and social arenas may benefit from prophylactic therapy. Those children in whom abortive therapies have failed may see benefit as well. Like abortive therapy, data are sparse regarding prophylactic therapy. The CHAMP trial, published in 2017, found no differences between amitriptyline, topiramate, and placebo, though 61% of patients in the placebo group achieved the primary endpoint of a 50% relative reduction in headache days. Given the high response rate to placebo in this and other pediatric migraine trials, clinicians may offer a stance of empathy and reassurance to patients and families prior to consideration of prophylactic medications.

Though high quality evidence is lacking, a number of prophylactic treatment strategies are commonly employed. In young children cyproheptadine (Periactin) 0.25 to 1.5 mg/kg divided two to three times a day may be effective. In adolescents, amitriptyline 10-50 mg prior to sleep, particularly if sleep disruption is an issue, is frequently utilized. Beta-blockers can be used (propranolol 2 to 4 mg/kg divided three times a day), however the side effects of fatigue and exercise intolerance may limit their use. Calcium channel blockers can also be used. Divalproex sodium is effective but has a significant side-effect profile. Topiramate is FDA approved for use in these populations. Topiramate doses for migraine prevention are much smaller than for seizures, starting at 12.5 mg daily (1/2 tablet of 25 mg) and increasing to a maximum of 50 mg twice a day.

4. Should Michael follow a special diet? Are there complementary and alternative medications that might help him?

Michael does not need a special diet. However, children and parents should be alerted to the foods that may potentially trigger migraines: cheeses (particularly hard cheeses), processed meats (due to nitrites), chocolate, nuts, pickles, and MSG. If it becomes clear that a particular food is a trigger, then that food should be eliminated from the child’s diet.

Complementary and alternative therapies are widely used in the treatment of headaches, but data in children are limited. Vitamin B2 (riboflavin) has shown some promise in adult migraine prevention and is well tolerated other than causing yellow urine. Limited data suggest that magnesium and calcium supplementation may be useful for menstrual headaches and menstrual migraines. These supplements have few side effects though large doses of magnesium cause diarrhea. The evidence supporting essential fatty acids is less convincing. There are few herbal supplements that have a moderate amount of data supporting their use for migraine prophylaxis including butterbur and feverfew. Butterbur has positive data from studies in adults and small studies in children and is typically well tolerated. Feverfew also has had positive effects in studies but can result in rebound headaches, aphthous stomatitis and stomach upset. Coenzyme Q10 is being investigated with some initial positive data, however it is expensive. Recent studies suggest melatonin (3mg at bedtime) may have a positive effect on migraine control.

Headache and migraine control may benefit from massage therapy, acupuncture, and chiropractic. Case reports of adverse events with chiropractic cervical manipulation limit referrals. Further studies are needed to determine the risks and benefits of chiropractic care for migraines.
5. Does Michael need imaging?
Routine imaging for all headaches is not warranted. With a classic personal history, family history of migraine type headache, and a stable headache pattern, Michael does not need imaging at this time. If his headaches change, become more frequent and/or severe, or he develops neurologic symptoms, he should be imaged. The authors of the American Academy of Neurology practice parameter on childhood headache (endorsed by the American Academy of Pediatrics) reviewed six trials dealing specifically with neuroimaging. In collapsing the data, they found that of 605 pediatric patients who underwent neuroimaging for headache, only 14 (2.3%) had lesions that required surgical intervention, and all of these patients had neurologic abnormalities present on physical exam. Their full list of recommendations regarding imaging of children with headaches:
- Obtaining a neuroimaging study on a routine basis is not indicated in children with recurrent headache and a normal neurologic examination (Level B, class II and class III evidence).
- Neuroimaging should be considered in children with an abnormal neurologic examination (e.g., focal findings, signs of increased intracranial pressure, significant alteration of consciousness), the coexistence of seizures or both (Level B, class II and class III evidence).
- Neuroimaging should be considered in children in whom there are historical features to suggest recent onset of severe headache, change in type of headache, or if there are associated features that suggest neurologic dysfunction (Level B, class II and class III evidence).

CASE TWO:

Imin Kronin-Payne, a 15-year-old female adolescent, has a history of headaches and migraines. She comes today for a follow up visit; she is accompanied by her mother. Imin reports that although her summer went well, she has been having daily headaches since the second month of school.

6. What is the definition of chronic daily headaches?
Chronic daily headache is defined as headaches lasting longer than 4 hours per episode at least 15 times a month over a period of three consecutive months without an underlying organic cause. The prevalence of chronic daily headaches ranges from 2% to 4% of girls and 0.8% to 2% of boys. Most patients with chronic daily headache have a history of migraines.

7. How do you approach chronic daily headaches?
Patients and families dealing with chronic daily headache are frequently frustrated and concerned that a headache of long duration signals a severe underlying disease. A detailed history and physical can help identify common causes. Elicit a detailed medication history; in one study, 20-35% of teenagers with chronic daily headaches had analgesic overuse. Erratic sleep and meal schedules may contribute. Up to 2/3 of patients with chronic daily headache have sleep disturbances and a formal sleep study may help if there are symptoms suggestive of restless leg syndrome, sleep apnea, or other sleep disorders. Evaluate caffeine use, as caffeine withdrawal may be a headache trigger. Assess for changes in life stress and signs and symptoms of mood disorders, though chronic daily headaches should be considered a primary headache disorder rather than a primary mental health issue. Perform a detailed social history to identify substance use and emotional, physical, or sexual abuse. If no clear associations emerge from history, a headache log may be useful for patients to keep track of triggers and relievers, though some experts note that routine rating of headache intensity may exacerbate chronic daily headaches.

In the absence of findings suggesting intracranial pathology, neuroimaging is not absolutely necessary (see indications for imaging above). Some advocate neuroimaging as a tool to provide reassurance to the patient and family that there is no intracranial pathology, an intervention that may be therapeutic in and of itself.
Much like migraine, a consistent sleep pattern should be established with a set bedtime and morning wake time that is not altered over the weekends. Regular meals need to be instituted. Daily exercise for 20-30 minutes is often recommended, although this has not been rigorously studied. An exercise regimen should be started gradually with as little as 10 minutes of aerobic exercise daily and increased by 10% per week. Teens may benefit from counseling, stress management techniques, limitation of extracurricular activities, or biofeedback.

Pharmacologic therapy is instituted only if the measures listed above are unsuccessful. As a general rule, medication use should be limited to one rescue and one prophylactic agent. Because of the high frequency of analgesic overuse, limit acetaminophen, aspirin, and ibuprofen. Patients can keep a calendar to rate each day as 0 (no headache), 1 (mild headache), or 2 (severe headache). Instruct patients to limit the use of 2s to 2-3 times per week, and only use abortive medication on these days. Avoid opiates and barbiturates as these classes of medications often worsen chronic daily headaches and have abuse potential. Naproxen does not cause rebound headache, has no potential for abuse, and has been used successfully for patients with analgesic-induced headaches. Its longer half life means less frequent dosing, improved steady state and less withdrawal or rebound headache. However, there are no randomized trials proving its superiority.

Prophylactic medications similar to those used for migraine can be effective. Tricyclic antidepressants provide dual therapy for headache and sleep disturbance. SSRIs should be considered when headaches are complicated by depression or dysthymia. Topiramate, gabapentin, and valproate are also useful as primary headache therapies.

The provider must establish realistic goals and expectations. Since it may take months to achieve control, it is important to educate patients and families about what to expect. An explicit timeline for headache reduction and return to school should be negotiated. For example, the goal at one month of treatment may be decreased frequency of severe headache days, decreased intensity of the continuous headache, and a graduated return to school with 1 to 2 class periods per day to start. Like other chronic issues, chronic daily headaches require frequent follow up.

Additional References:

Resources: