

## The Diagnosis and Treatment of Pediatric Migraine Headaches



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### OBJECTIVES

At the end of this activity, the participant should be able to:

1. Explain how migraine headaches occur
2. Describe the differences in types of migraine headaches
3. Discuss how pediatricians and care-givers may treat migraine headaches

### INTRODUCTION

Migraine is the most common primary headache disorder in childhood. It is a chronic pain condition that cannot be cured, but can be effectively managed. The goal for pediatricians seeing children with headache complaints is to properly classify the cause of the headache and, just as importantly, to develop an appropriate treatment plan.

The prevalence of headaches in general and migraine headaches in particular increases with age. Migraine is found in about 3% of children aged three to seven years, 4% to 11% of those aged seven to 11 years, and anywhere from 8% to 23% in those 11 years to 15 years of age. Prior to puberty, there is an equivalent male-to-female ratio for migraine. After puberty, migraine is twice as common in females as it is in males.

### DIFFERENTIATING PRIMARY HEADACHE FROM SECONDARY HEADACHE DISORDERS

It is important to realize that the brain parenchyma itself is not a pain-sensitive structure. Cranial pain-sensitive structures include the dura mater, large proximal arteries, dural venous sinuses, as well as bone, sinuses, teeth and soft tissues of the head and neck. Traction or displacement of any of these structures can result in pain mediated through the trigeminal nervous system. Likewise, migraine headache pain is also mediated through the trigeminal nerve afferents and the

trigeminal nucleus in the brainstem. Hence, localized or systemic inflammatory, infectious, traumatic or neoplastic processes may be perceived as a headache by children.

One way to help differentiate migraine from secondary headaches is to look at the time course of the headache. Migraines follow an acute intermittent pattern with clear headache-free intervals. Headaches due to raised intracranial pressure, on the other hand, are daily and progressive, usually over a period of days to weeks. Chronic tension-type headache is daily and non-progressive. Acute localized headaches are more likely to be caused by inflammatory or infectious processes of the head. Acute generalized headaches may be indicative of systemic illness.

### CLASSIFICATION OF MIGRAINE

Migraine headaches can be further sub-classified based on associated neurological symptoms. Classical migraine is a migraine with a preceding sensory aura. It accounts for less than 20% of Juvenile Migraine and is extremely uncommon in pre-pubescent children. Auras are most commonly visual and are associated with a combination of negative visual phenomenon (such as central scotomas) and positive phenomenon (such as phosphenes, lightning bolts, or fortification spectra). Another common aura is somatosensory in which the patient experiences slowly moving distal paresthesias in one or both hands that migrate proximally to the shoulders over 5 to 10 minutes. Auras should never last longer than 60 minutes or occur more than one hour before the head pain begins.

Common migraine is a migraine headache without transient neurological deficits. The International Headache Society has proposed diagnostic criteria for childhood migraine (fig.1). Complicated migraine is a migraine associated with transient neurological deficit. Hemiplegic migraine, ophthalmoplegic migraine and basilar migraine are examples of complicated migraine. Children with neurological deficits associated with migraine headaches should generally be worked up for TIAs or stroke with neuroimaging before coming to a complicated migraine diagnosis by exclusion.

### THE CLINICAL EVALUATION OF A CHILD WITH HEADACHES

The diagnosis of all headache disorders begins with a detailed history that should be directly obtained from the child as much as possible. The first set of questions should be devoted to classifying the etiology of the headache.

## Figure 1. Proposed Revised IHS Classification for Pediatric Migraine

At least 5 attacks fulfilling the following:

- a. Headache lasting 30 minutes to 48 hours
- b. Headache has at least 2 of the following:
  1. Bilateral (fronto-temporal) or unilateral location
  2. Pulsating quality
  3. Moderate to severe intensity
  4. Aggravated by routine physical activity
- c. During the headache, at least one of the following:
  1. Nausea or vomiting
  2. Photophobia or phonophobia

### QUESTIONS RELATED TO HEADACHE CLASSIFICATION

Start with assuming the child has migraine and asking questions to see if the headaches meet the IHS criteria (see fig. 1). Some key features of migraine include their acute intermittent nature with clear headache-free intervals, as well as improvement of the headache with rest or sleep. A positive family history for migraines is also found in up to 80% of patients. Many people assume that they have headaches due to other causes such as stress headaches, so ask if any other family members have headaches initially, and then try to clarify if anybody has migraine headaches.

### QUESTIONS RELATED TO MANAGEMENT OF MIGRAINE

**Frequency:** “How often do the headaches occur? Every day, almost every day, three to four times a week, two to three times a week, one to two times a week, one to two times per month, or less?”

**Severity:** “What percentage of all your headaches are severe, meaning you have to leave school or extracurricular activities and go to sleep – all of them, most of them, half of them, or a few of them?” A functional definition of severity may also be useful. “How many days or partial days of school or extracurricular activities have been missed in the past three months?”

**Duration:** “How long do the headaches tend to last?” Get a range of durations.

**Triggering Factors:** Ask about stress, menses, lack of sleep, skipping meals, hot weather and exercise. Food triggers are very uncommon in children.

**Relieving Factors:** It is important to ask about what has been tried to date to treat the headaches. It is necessary to get specific information here (what medication, what dose, and are they taking it at the onset of the headache?) This information is useful even with over-the-counter medications. I find that parents are often either under-dosing their children or waiting until their headaches are well established before treating. Also, some treatments work well for most of a child’s headaches but perhaps not for the most severe ones; this information can help with management.

### THE PHYSICAL AND NEUROLOGICAL EXAMINATION

In any patient with headaches, a detailed head and neck exam is necessary to exclude inflammatory, infectious, neoplastic or structural causes for the headaches. Make sure the child is not hypertensive. On the neurological examination, focus on looking for any evidence of raised intracranial pressure. Specifically, a Fundoscopic exam is essential to look for papilledema. Extraocular movements should be full to exclude Abducens nerve palsy (another sign of

raised intracranial pressure). The rest of the exam is performed in a “screening” fashion to look for any focality. Be sure to evaluate tandem gait to exclude a small midline cerebellar mass causing CSF obstruction at the level of the fourth ventricle resulting in hydrocephalus and raised ICP headaches.

### DIAGNOSTIC STUDIES

No diagnostic studies are necessary to diagnose migraine headaches in children. The diagnosis is a clinical one based on historical features and supported by the lack of focal neurological deficits or evidence of raised ICP on the neurological examination. Recent evidence-based reviews concerning the diagnostic study on childhood headaches have concluded that less than 3% of all children with headaches will have an intracranial lesion requiring specific neurosurgical or medical intervention based on neuroimaging studies. The routine use of neuroimaging also has certain drawbacks. The most significant is the occurrence of incidental findings not related to the cause of the headache. The most common incidental findings include non-significant Chiari I malformations, arachnoid cysts, pineal gland cysts, sinus mucosal thickening, and unexplained small white matter lesions.

These findings often create a lot of parental anxiety and usually require a trip to a subspecialist or repeated neuroimaging studies to resolve the issue. In addition, neuroimaging is expensive and has certain risks associated with it (complications from sedation in younger children and/or radiation exposure from CT imaging). Because of this, neuroimaging has been recommended only for those children with headaches who also have:

- a. Evidence of focal neurological signs or increased intracranial pressure on examination or
- b. The co-existence of seizures or
- c. Historical features to suggest recent onset of severe headache, change in type of headache, or historical features that suggest a change in neurological function.

### DEVELOPING A TREATMENT PLAN FOR MIGRAINE HEADACHES

#### Acute symptomatic treatment

Each child with migraine headaches needs timely access to their acute symptomatic treatment plan, including when they are at school. A good starting point is with over the counter NSAIDs. Ibuprofen or Naproxen are commonly used and generally well tolerated. To prevent the onset of medication overuse headache, any acute symptomatic treatment should not be used on average more than one dose per day or four doses per week. A second line approach may include aspirin or aspirin/caffeine combinations. If neither of the above are effective for most headaches, consider adding a triptan to whatever NSAID worked the best. Most triptans can be dosed once at the onset of the headache with a repeat dose given two hours later if necessary. The triptans have not been FDA approved for children, mostly because of lack of efficacy over placebo based on early studies. Their main contraindication is vasoconstriction, which can cause adverse events for many diseases that generally do not affect children (myocardial infarction, hypertension, stroke, pregnancy, etc.). Successful treatment with any acute symptomatic treatment regimen may be defined as significant relief for most headaches within one to two hours to the point where the child is functional without needing to sleep and without emesis. (See Table 1 for acute symptomatic treatment medication dosing).

Table 1. Medications used for Acute Symptomatic Treatment of Migraines

<b>Ibuprofen</b>	10 mg/kg. Max dose 1,000 mg
<b>Naproxen Sodium</b>	10 – 15 mg/kg. Max dose 440 mg
<b>Aspirin</b>	10 – 15 mg/kg. Max dose 650 mg
<b>Excedrin Migraine</b>	Aspirin 250 mg, Acetaminophen 250 mg, Caffeine 65 mg. One to two tabs at onset
<b>Zolmitriptan (Zomig)</b>	2.5 mg & 5 mg regular tabs as well as orally disintegrating tabs. Also in a 5 mg nasal spray preparation.
<b>Rizatriptan (Maxalt)</b>	5 mg & 10 mg tablets as well as 5 mg & 10 mg orally disintegrating tablets
<b>Eletriptan (Relpax)</b>	20 mg & 40 mg tablets
<b>Almotriptan (Axert)</b>	6.25 mg & 12.5 mg tablets
<b>Sumatriptan (Imitrex)</b>	4 mg & a 6 mg subcutaneous auto-injectable form, 5 mg & 20 mg nasal spray, or 25, 50 & 100 mg tablets. A new preparation of Sumatriptan 85 mg combined with 500 mg of Naproxen Sodium (Treximet) has shown superior efficacy over Sumatriptan alone.

Table 2. Medications used for Daily Preventative Treatment of Migraines

<b>Cyproheptadine (Periactin)</b>	2 – 4 mg po qHS or 2 mg BID
<b>Amitriptyline (Elavil)</b>	Start 10 mg po qHS, increase to 20-25 mg po qHS
<b>Topiramate (Topamax)</b>	50 mg po qHS to 50 mg po BID. Build up over 2 to 4 weeks
<b>Verapamil</b>	40 mg po TID for younger kids, 80 mg po TID for teenagers
<b>Magnesium Oxide</b>	400 mg po BID
<b>Propranolol (Inderal)</b>	20 to 80 mg po TID (Side effects make Inderal less attractive)
<b>Valproic Acid (Depakote ER)</b>	250 to 1000 mg po qHS (Side effects make Depakote less attractive)

### Daily Preventative Treatment

While each child with migraine headaches needs acute symptomatic treatment, some will also require daily headache preventative treatment. Considerations may include having greater than one disabling headache per week or headaches not responding adequately to optimized acute symptomatic treatment. Evidence-based medicine leaves us hanging here, and it is dealer's choice based on experience and side effects when determining which medication to use. Regardless of what one uses, a few principles guide usage. First, more is not necessarily better. If the child is not responding well to low dosages, then higher dosing probably won't add much benefit. Give any tolerated medication at least a three-month trial before deciding efficacy. Efficacy here means a significant reduction in headache frequency, severity and/or duration and not necessarily the elimination of all headaches. Finally, a responsive patient should stay on medication for at least one year. Try to taper kids off their medication over the summer when there is less stress and you are more likely to be successful. Most children who respond to preventative treatment continue to do just as well when the medication is withdrawn.

Choices for preventative treatment include Cyproheptadine for pre-pubescent children and Amitriptyline, Topiramate, or Verapamil for teenagers. (See Table 2 for daily preventative treatment medication dosing).

### Lifestyle Choices

Just as important as choosing an optimal medication treatment plan for children with migraine headaches is encouraging healthy life choices. Migraines are a chronic disorder that are often more disabling and frequent when the body is stressed. Encouraging healthy meals, regular exercise and getting plenty of sleep are all important and may work as well if not better than daily headache preventative medication.

### REFERENCES

- 1) Lipton RB, Silberstein SD, Stewart WF. An update on the epidemiology of migraine. *Headache* 1994;34:319-328.
- 2) Lewis DW, Ashwal S, Dahl BS, et al. Practice Parameter: Evaluation of children and adolescents with recurrent headaches. *Neurology* 2002;58:1589-1596.



## State-of-the-art Pediatric Intensive Care Unit keeps Children's Hospital at the forefront of critical care medicine

When the children of Louisiana and the northern Gulf Coast face life-threatening injuries and illnesses, they can count on Children's Hospital's state-of-the-art Pediatric Intensive Care Unit to meet their critical care needs. Located on the top floor of the hospital's west tower, the 9,456-square-foot PICU opened in May 2009. The unit features 18 private patient rooms outfitted with cutting-edge technology that assists the staff of four specialists and more than 30 nurses and residents in instantly providing the best available critical care for the children of the Gulf South

and an avant-garde medical philosophy including stunning panoramic views of Greater New Orleans that will assist in each child's recovery.

### **Garnering National Attention**

Each patient room is designed to allow medical staff to perform almost any procedure bedside. Ceiling-mounted surgical lights and boom arms that provide patients oxygen and medical gas have been upgraded from the previously standard wall-mounted design, allowing medical professionals 360-degree access to the child.



*Children’s Hospital emergency transport helicopter*



*Dr. Costa Dimitriades*

Patients receive care for a full spectrum of diseases and therapies, as well as postoperative heart and renal surgeries. The unit can also provide all ventilatory support, including ECMO.

In addition to the latest medical advances, the unit includes design elements to lift the spirits of children and families in hopes that healing will be easier.

“It brings together the latest technology – monitors, computer systems, beds – to help us take care of the kids the best we can,” said PICU Medical Director Costa Dimitriades, MD. “Parents should expect that their child will get the same type of care here as they would at PICUs in Houston, Boston, Chicago and Baltimore. But more important, the unit is set up to provide care for the patient with the family being there.”

### **Stress & Solace**

The unit’s design gives recovering children and their families a less “helter-skelter” environment to get well in while medical staff performs their duties.

Dr. Dimitriades said there can be a very chaotic situation in one room and the rest of the unit can stay relatively calm. That is important for the rest of the families in the unit because it reduces stress and minimizes other traumatic experiences for other patients, families and visitors. “We can operate in one room with doors closed and curtains drawn and keep the unit open to other families to visit their child,” he said.

The unit has a policy of allowing one parent to stay in their child’s room at all times except during twice daily rounds. Each room has an oversized club chair that converts into a twin bed so a parent can stay overnight to calm their child when needed. “That will help reduce anxiety and related stress for the kids and adults that will have a very positive impact on them and the staff,” he said.

### **Healing Environment**

Hospital staff worked with architects to design a modern unit that features the latest medical advances in a soothing environment conducive to healing. The rectangular-shaped unit features glass walls which offer almost 270-degree, panoramic views overlooking Audubon Park to the west, Lake Pontchartrain to the north and downtown New Orleans and the Mississippi River to the east. Waiting and family consultation rooms are situated on the southwest corner of the unit, overlooking the river and Audubon Zoo. Soft colors were selected for the unit’s walls, decorative glass, desks and cabinetry to create a light, serene setting that encourages tranquility.

“The new PICU gives an amazing first impression,” said critical care nurse Jeanie Graves. “Natural light permeates the whole unit, so it’s bright and cheerful. The kids love having an area that feels bright and open. It helps them heal physically and psychologically. It’s beautiful ... just amazing.”

## **Children’s Hospital’s PICU**

**For Information:** (504) 896-9430  
1-800-299-9511, extension 4230

### **Physicians:**

**Costa Dimitriades, MD**, Medical Director  
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**Bonnie C. Desselle, MD**  
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In addition to Children's Hospital Main Campus, some physicians also hold clinics at other centers.

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