# Headache in children

N. Kozeis, M. Triantafylla, S. Veliki, C. Basdekidou, S. Tyradellis, M. Balidis, P. Tranos

## SUMMARY

30-50% of children have a significant headache by the age of 7 years. Childhood migraine is an under-recognized condition and a different entity related to adult migraine. Headaches in children can be classified as primary and secondary. Sometimes are related to eye problems, however an ophthalmologist should know when to further investigate to diagnose if a significant pathology is covered behind a headache. This article reviews the warring symptoms / signs and the possible causes of headaches in childhood.

*Key words:* Headache, childhood, migraine, eye problems.

*''Ophthalmica'' Institute of Ophthalmology & Microsurgery*

*Corresponding author: N. Kozeis*
*e-mail: nkozeis@med.auth.gr*

An ophthalmologist rarely gets the chance to fully explore underlying causes for headaches in a child. But an ophthalmologist should know when to further investigate to diagnose any belying significant pathology. Childhood migraine is an under-recognized condition and a different entity related to adult migraine. Understanding the differences in symptoms and treatment between the pediatric and adult form of migraine is essential.

Headaches in children can be classified as primary and secondary. The two most common types of primary headaches are: migraine and chronic daily headaches (CDH). Other causes include: migraine without aura, migraine with aura, basilar-type migraine, hemiplegic migraine, "Alice in Wonderland" syndrome, tension-type headaches, cluster headaches, paroxysmal hemicranias, short-lasting unilateral neuralgiform headache with conjunctival injection and tearing, primary stabbing headache, primary cough headache, primary exertional headache, occipital neuralgia, neck–tongue syndrome, Cold-stimulus headache ("brain-freeze").[1,2]

30-50% of children have a significant headache by the age of 7 years.[3]

The prevalence of migraines is estimated between 2.6% and 6.9%, the ratio between girls and boys being 2:1, suffering from this condition.[4,5]

## Worrying symptoms and signs

In young children is not easy to get a reliable history. Parents usually offer explanations. Young children (2 to 4 years old) are usually honest and do not suffer from "functional" headache ("medically unexplained symptoms"). A child in this age group must be taken seriously. For instance, monocytic acute myeloid leukemia can be associated with severe

head pain. Children under the age of 6 years usually require MRI or CT scanning. A practical approach, to decide what to further investigate or not, is presented below.

### Worrying clinical picture:

- Reduced vision
- Seizures (focal or generalized)
- Focal neurological signs, e.g. cranial nerve palsy
- Alteration of consciousness
- Papilledema
- Systemic evidence of raised intracranial pressure
- Change or deterioration of personality/behavior
- Reduced growth rate
- Diabetes insipidus
- Age under 4 (especially with increasing head circumference)
- Headaches that are always unilateral (rare in pediatric migraine)
- Headaches that last several days and/or do not improve with treatment
- Headaches that wake from sleep, are early in the morning and associated with, or relieved by, vomiting
- Headaches associated with coughing, straining, or changing position (ask about number of pillows used)[3]

### Chronic daily headaches (CDH)

These children typically suffer from continuous diurnal headaches for more than 15 days per month. CDH can develop from episodic tension-type headaches, following a precipitating illness or associated stress (changing schools, parental break-up, etc.). Idiopathic intracranial hypertension (IIH) can rarely present without papilledema, but it can be presented in a similar way to CDH. Mild dehydration can exacerbate headaches. Over time, the frequency of headaches improves.

Treatment requires a multi-disciplinary approach involving careful use of medication (avoiding overuse) and preventative and bio-behavioral therapies.[6-8]

### Tension-type headaches

These can last from 30 minutes up to 7 days, not associated with nausea or vomiting, but they can be associated with photophobia or phonophobia.

They may be infrequent, frequent (more than one, but less than 15 per month), or chronic (more than 15 per month). Children describe these headaches as pressing rather than pulsating. 50% of children manifested teeth-grinding.[9] Bio-behavioral strategies using relaxation techniques and coping skills are a better treatment than medical management with amitriptyline.

### Cluster headache and paroxysmal hemicranias

Cluster headaches (CHs) are rare in children but significant. They can be associated with eyelid edema, conjunctival injection, and excess lacrimation, miosis, and ptosis. Paroxysmal hemicrania (PH) differs from CH in that it is exquisitely sensitive to indomethacin.

### Migraine

Adult classic migraine has a visual aura followed by unilateral headache. Childhood migraine often presents differently. Headaches are usually bilateral although they may start unilaterally. 20% of children have unilateral onset, 27% complaining of eye pain, 66% of frontal pain, and 12% of temporal pain. 10% of children with migraines miss 1 day of school in every 2 week period.

A predromal aura of a scintillating scotomata or other sensory or motor symptoms occur in only 30% of pediatric migraine sufferers, usually 20-40 minutes before the headache starts.[10] Non-specific symptoms may precede the headache. These include light-headedness, irritability, malaise, and hyperactivity. Precipitating factors include stress, poor sleep, poor or irregular diet, hot weather, menstruation, and significant exercise. Children who are obese, unfit, or cigarette smokers have a higher prevalence of headaches. Migraines are more common in children or adolescents taking adrenergic agonists (for ADHD or asthma) or oral contraceptives.[11]

Whilst headaches are the main feature of childhood migraine, there are some precursors, like cyclical vomiting syndrome, abdominal migraine, and benign paroxysmal vertigo (BPV) of childhood. Children with migraine often have a history of travel sickness.[12]

Childhood migraine can be subdivided into migraine with and without aura.

The diagnosis of migraine without aura is not always easy, and thus some diagnostic criteria are proposed below:

**A.** At least 5 attacks fulfilling criteria B through D

**B.** Headache attacks lasting 1 to 72 hours (untreated or unsuccessfully treated).

Sleep is also considered part of the headache duration.

**C.** Headache has at least two of the following characteristics:

- Bifrontal/bitemporal or unilateral location
- Pulsating/throbbing quality (which may need inferring from their behavior)
- Moderate or severe pain intensity (or a numerical or "faces" scale)
- Aggravation by or causing avoidance of routine physical activity

**D.** During headache at least one of the following:
- Nausea and/or vomiting
- Two of five symptoms (photophobia, phonophobia, difficulty thinking, light-headedness, or fatigue)

**E.** Not attributed to another disorder[1,2]

If there are more than 15 migrainous days per month, the diagnosis of chronic migraine is used. Migraine with an aura indicates focal cerebral or brainstem dysfunction. Auras do not last more than 60 minutes and may include visual, aural, or speech symptoms followed by headache. Aura without headaches is common in adults, but it is very rare in children and should raise concerns of an organic lesion.

***Basilar-type, hemiplegic migraine and "Alice in Wonderland" syndrome*** are variants of migraine with an aura. Basilar-type migraine is causing symptoms including vertigo (73%), nausea or vomiting (30-50%), ataxia (43-50%), visual field defects (43%), and diplopia (30%).[13] Hemiplegic migraine occurs both sporadically and as an inherited autosomal dominant trait.[14] Children with "Alice in Wonderland" syndrome describe bizarre visual illusions and spatial distortions preceding an otherwise nondescript headache.

## Etiology

Patients with migraine with aura have a higher prevalence of patent foramen ovale, of mitral valve prolapsed.[15,16] Disrupted sleep is associated with severe and chronic migraines.[9] Current knowledge about the pathophysiology and genetics of migraine comes from studies of a monogenic subgroup of migraine with aura called familial hemiplegic migraine (FHM). Three FHM genes have been identified that code for ion transporters suggesting that disturbances in ion and neurotransmitter balance could be the cause of not only FHM but other more common migraine variants.[17] It is well-accepted that the migraine aura is not caused by reactive vasoconstriction but is neurally driven. It is a short-lasting, slowly spreading wave of neuronal and glial cell depolarization which involves massive fluxes of key ions – Ca2+, Na+, and K+. This wave of depolarization is followed by a long-lasting (around 20 minutes) inhibition of spontaneous and evoked neuronal activity. Mutations in FHM genes have not yet been identified. It is likely that migraineurs have a hyperexcitable cerebral cortex, which may have a genetic basis and leads to a lower threshold for internal or external triggers to cause episodes of initial excitation followed by neuronal inhibition. The pain of migraine may have its origin in inflammation of meningeal vessels and "sensitization" of peripheral and central trigeminal afferents.

## Management

The treatment of migraine can include: bio-behavioral strategies, acute therapies, and preventative therapies.

## Bio-behavioral strategies

Children suffer less from migraines if they sleep well and eat healthy food regularly. Regular exercise also helps, as does losing weight. Caffeine, the over-the-counter medications may cause migraines. Stress therapy and relaxation techniques are as effective as propranolol in reducing the frequency of migraines.

## Acute therapies

Acute treatments (taken within 30 minutes of the onset of the migraine) remain the mainstay of treatment. Ibuprofen 10 mg/kg/dose and acetaminophen (paracetamol) 10-15 mg/kg/dose, nasal sumatriptan (20 mg) reduce the severity of the headache, photophobia, and phonophobia. Oral almotriptan maleate (25 mg) is the first triptan approved for use in adolescents 12-17 years old, it should not be used for hemiplegic migraine or where there is hypertension or cardiac disease.[18]

## Preventative therapies

In case a child or adolescent suffers more than three migraines per month, or if the acute measures are ineffective, preventative measures should be considered. Propranolol is consistently effective. It is contraindicated where there is a history of asthma or diabetes. Antidepressants are the mainstay of migraine prevention in children and adolescents, like amitriptyline (positive effect 89%).[13] There are also other promising medications for preventing migraines, but they are not frequently used yet.

## Secondary headaches

Children with headaches around or behind the eyes are often referred to pediatric ophthalmologists to "rule out anything serious."

Headaches in children are infrequent due to ophthalmic problems, even those centered on the orbits. Headaches can be caused by refractive errors and convergence insufficiency, glaucoma, dry eyes, and optic neuritis. There are also important secondary intracranial causes for headaches, like epilepsy (pre-, per- and postictal) (20-70%), raised intracranial pressure and idiopathic intracranial hypertension, brain tumors, infections, acute viral illness, meningitis, encephalitis, structural brain abnormalities, arachnoid cyst, Arnold-Chiari malformation, vascular abnormalities, intracranial hemorrhage and arteriovenous malformations, cerebral venous

sinus thrombosis, vasculitis, acute disseminated encephalomyelitis, multiple sclerosis and trauma.[19-21]

A careful history, ophthalmic and systemic neurologic examination can usually prevent unnecessary investigations in children with headaches. The clinical picture could identify the patient with serious pathology and lead to the appropriate treatment.

## REFERENCES


1. Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders. Cephalalgia 2004; 24(1):1-160.
2. Hershey AD, Winner P, Kabbouche MA, et al. Use of the ICHD-II criteria in the diagnosis of pediatric migraine. Headache 2005; 45:1288-1297.
3. Lewis DW, Ashwal S, Dahl G, et al. Practice parameter: evaluation of children and adolescents with recurrent headaches: Report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. Neurology 2002; 59:490-498.
4. Fendrich K, Vennemann M, Pfaffenrath V, et al. Headache prevalence among adolescents: the German DMKG headache survey. Cephalalgia 2007; 27:347-354.
5. Silberstein S, Loder E, Diamond S, et al. Probable migraine in the United States: results of the AMPP study. Cephalalgia 2007; 27:220-234.
6. Beri S, Gosalakkal JA, Hussain N, et al. Idiopathic intracranial hypertension without papilledema. Pediatr Neurol 2010; 42:56-58.
7. Hershey AD, Kabbouche MA, Powers SW. Chronic daily headaches in children. Curr Pain Headache Rep 2006; 10:370-376.
8. Wang SJ, Fuh JL, Lu SR. Chronic daily headaches in adolescents: an 8-year follow-up study. Neurology 2009; 73:416-422.
9. Vendrame M, Kaleyias J, Valencia I, et al. Polysomnographic findings in children with headaches. Pediatr Neurol 2008; 39:6-11.
10. Mortimer MJ, Kay J, Jaron A. Epidemiology of headache and childhood migraine in an urban practice using Ad Hoc, Vahlquist and HIS criteria. Dev Med Child Neurol 1992; 34:1095-1101.
11. Robberstad L, Dyb G, Hagen K, et al. An unfavourable lifestyle and recurrent headaches among adolescents: the HUNT study. Neurology 2010; 75:712-717.
12. Al-Twaijri WA, Shevell MI. Pediatric migraine equivalents: occurrence and clinical features in practice. Pediatr Neurol 2002; 26:365-368.
13. Lewis DW. Headaches in children and adolescents. Curr Probl Pediatr Adolesc Health Care 2007; 37:207-246.
14. Curtain RP, Smith RL, Ovcaric M, et al. Minor head trauma-induced sporadic hemiplegic migraine coma. Pediatr Neurol 2006; 34:329-332.
15. McCandless RT, Arrington CB, Nielsen DC, et al. Patent foramen ovale in children with migraine headaches. J Pediatr 2011; doi:10.1016/j.peds 2011.01.062.
16. Termine C, Trotti R, Ondei P, et al. Mitral valve prolapse and abnormalities of haemostasis in children and adolescents with migraine with aura and other idiopathic headaches: a pilot study. Acta Neurol Scand 2010; 122:91-96.
17. de Vries B, Frants RR, Ferrari MD, et al. Molecular genetics of migraine. Hum Genet 2009; 126:115-132.
18. Linder SL, Mathew NT, Cady RK, et al. Efficacy and tolerability of almotriptan in adolescents: a randomised, double-blind, placebocontrolled trial. Headache 2008; 48:1326-1336.
19. Ahad R, Kossoff EH. Secondary intracranial causes for headaches in children. Curr Pain Headache Rep 2008; 12:373-378.
20. Blume HK, Szperka CL. Secondary causes of headache in children: when it isn't a migraine. Pediatr Ann 2010; 39:431-439.
21. Lewis DW, Gozzo YF, Avner MT. The "other" primary headaches in children and adolescents. Pediatr Neurol 2005; 33:301-313.