

# Chapter 18

## Treatment of Pediatric and Adolescent Headaches

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### Introduction: A Model for Pediatric Headache Treatment

The treatment of headaches in children and adolescents is a combination of art and science. Take into consideration both the diagnosis and the temperament of the family, as well as the personality of the child.

A model or overall paradigm for treatment of headaches in children and adolescents is outlined in Table 18.1.

The above approach varies somewhat when dealing with chronic pediatric headache as opposed to an acute headache syndrome. The patient's headache frequency, its severity, its duration, and its temporal pattern must be taken into consideration. In addition, take into account the degree of disability when considering treatment.

Making a diagnosis is key. Do not begin treatment of a child's headache without a diagnosis. Either a tentative or a definite diagnosis is necessary for initiation of therapy, as different therapies are available depending on the specific diagnosis.

Therapy can still be initiated if the treating physician has only a tentative diagnosis. The patient and parent should be informed that the treatment may change if the diagnosis changes.

This chapter reviews the treatment paradigm for pediatric patients with either recurrent or chronic headaches. The approach to children and adolescents with a variety of other headaches is also presented.

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**Table 18.1** Overall model for pediatric headache treatment

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1. Confirm the diagnosis
  2. Provide confident reassurance
  3. Patient education
  4. Discuss the role of stress
  5. Review lifestyle issues
  6. Dietary considerations
  7. Rescue medication
  8. Preventive medications
  9. Alternative approaches
  10. Follow-up
- 

## Confident Reassurance

When the treating healthcare provider is confident that no life-threatening or serious problem is present, the patient and parent should be so reassured. Emphasize that since no neurological symptoms are present, that the neurological exam is normal, that the course of the headache is not progressive, and the scans and other tests are normal, there is no serious underlying problem!

At this point, it is useful to explain any abnormalities on tests or scans that are present but not relevant. These include arachnoid cysts, pineal cysts, Chiari I malformation, white matter changes, developmental venous abnormalities, and abnormalities of the sinuses. Still, acknowledge the patients' and parents' concerns and tailor therapy accordingly.

Parents know their children best and should be given the opportunity to verbalize concerns. The same principle applies to children themselves. It is useful at times, especially with adolescents, to obtain separate interviews so that they are provided with an opportunity to open up to the health-care provider and take part in the decisions made regarding their own treatment.

## Patient Education

Both verbal and written information should be provided to the patient and parent. This will allow them to study the brochures over time and in a less anxiety-provoking situation. Lists of additional readings, organizational contacts, and reputable websites are valuable (See Chap. 23).

## Stress

“Stress” is an all-encompassing term for psychosocial issues that may precipitate or aggravate headache. This includes depression and anxiety. Emphasize that all patients experience stress. The most frequent sources of stress in pediatrics include

family and school related issues, difficulty with friends, and excessive extracurricular activities.

Problems regarding divorce, blended families, joint custody, substance abuse, and physical and sexual abuse, frequently play important roles as headache triggers and should be addressed. Otherwise, treatment failure will occur. In patients with chronic daily headache (CDH), stress regarding overachievement is often unrecognized.

Frequent school absences are a barometer of stress. Measures to return patients to full attendance are important; even partial attendance is critical in care. Home schooling should be discouraged. "Normalization" should be the rule.

Isolation from peers and exclusion from family activities will only exacerbate anxiety and depression. Patients with academic struggles are also more prone to headache, and tutoring or providing additional resources can be useful in this setting.

Relationships with fellow students and physical and emotional bullying are being recognized with increased frequency as bringing on or aggravating headache. In addition, many of our patients are overcommitted. Sports, cheerleading, band, debating clubs, and a part-time job not only cause stress but also, when combined with excessive homework, adversely impact sleep. Many adolescents are also now responsible for looking after siblings or ill parents, leaving them in overwhelming situations.

If stressful issues are identified, refer the patient for psychological evaluation. Use adolescent behavioral specialists trained in pain management. Recommendations regarding counseling, biofeedback, or other behavioral methodologies are often very helpful.

Emphasize that these factors require their own treatment, and pharmacological treatment alone is not enough. Adolescents in particular are searching for independence during this important stage of development. A non-pharmacological approach will be more appealing knowing that these techniques empower them to take control over their symptoms and assume a more active role in their own treatment.

## Lifestyle

Improving aspects of a patient's lifestyle choices may significantly decrease headache frequency. A regular schedule is needed.

Patients often experience poor sleep quality which contributes to ongoing headache. Many have difficulty falling asleep and experience multiple awakenings. Offer suggestions to improve the quality of sleep (see Table 18.2).

A regular bedtime must be established. Restorative sleep is needed.

The use of melatonin can be helpful. In an adolescent, begin with 3 mg of melatonin 2 h before bedtime. If after 2 weeks there is no improvement, the patient can be instructed to increase the dose to 6 mg. If after 2 weeks, there is still no improvement, increase the dose to 9 mg.

If difficulty persists, a sleep consultation may be indicated. Loud snoring or apneic pauses during sleep must be further investigated.

**Table 18.2** Clinical pearls and suggestions for improved sleep

- 
- No TV, computers, or cell phones in the bedroom, no texting!
  - Establish a routine (same time to bed/awaken)
  - Relax 30–60 min before bedtime
  - Your room should be quiet, dark, and cool
  - Exercise earlier in the day, not before bedtime
  - Do not eat heavily before bedtime
  - Avoid caffeine
  - Avoid afternoon and evening naps
  - Do not take sleep aids without discussing them with your parents and doctor
  - Discuss problems falling asleep and awakening at night with your physician or healthcare provider
- 

The treating physician should question the patient about analgesic use, barbiturates, narcotics, aspirin, and caffeine, both by prescription and over-the-counter (OTC) medications. We inform patients and parents that using these medications more than 2 days per week may cause rebound or medication overuse headache and may interfere with the effectiveness of preventive medications. Narcotics and combination products containing barbiturates, aspirin, and caffeine have no place in the treatment of pediatric headache.

The adolescent should be questioned about smoking and alcohol use. In addition to health related issues, they may actually increase headache frequency.

Regular, vigorous exercise decreases headache frequency. Many patients with CDH are deconditioned. In these patients, a stepwise approach using strategies beginning with physical therapy will provide structure in a more controlled setting. Patients with chronic pain who are deconditioned are often afraid that exercise will lead to more pain. Physical therapy can provide a safe reconditioning regimen in a less threatening environment.

Current recommendations include 30 min of vigorous exercise per day or 1 h of vigorous exercise three times weekly. Explain the role of the body mass index (BMI). It is likely that a BMI > 25 and definitely > 30 is associated with an increased frequency of headache. Structured exercise and weight reduction efforts help increase self-esteem and decrease disability due to headache.

## Diet

The role of diet in a comprehensive headache treatment program is controversial. We feel that eliminating certain foods and additives can be helpful. Use an 8-week period during which there is elimination of a variety of substances (see Table 18.3).

Foods that the patient or family feels adversely impact the patient's headaches should also be eliminated. At the 8-week follow-up visit, the patient and parents are queried about their experiences with the diet. Foods not implicated are put back into the diet one by one every 2 weeks. Implicated foods should continue to be restricted or offered in limited amounts.

**Table 18.3** Dietary considerations: elimination for treating pediatric headache

- 
- No caffeine
  - No chocolate
  - No luncheon meats
  - No aged cheese
  - No monosodium glutamate (MSG)
  - No foods implicated by the patient/family
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**Table 18.4** Pediatric acute and rescue medications*Sedatives*

Diphenhydramine

*Antiemetics*

Metoclopramide (0.1 mg/kg, max single dose 10 mg)

Prochlorperazine (0.1–0.15 mg/kg/dose; max. single dose: 10 mg)

Ondansetron (4–8 mg)

*Analgesics*

NSAIDs: Ibuprofen or Naproxen (10 mg/kg)

Acetaminophen (15 mg/kg)

*Abortives/Migraine Specific/Triptans*

Sumatriptan (Nasal spray approved for adolescents in Europe)

Rizatriptan (FDA-approved in patients 7 years and older)

Zolmitriptan (Nasal spray approved for adolescents in Europe)

Almotriptan (FDA-approved for adolescent migraine)

Eletriptan

Naratriptan

Frovatriptan

## Rescue or Acute Medications

Rescue medication should be limited to 2 days of use per week. When possible, acute medications should be combined with nonpharmacologic measures.

As soon as the headache begins, the patient should retire to a cool, quiet, dark environment. Previously learned relaxation skills should be initiated. A cold compress with a headband is useful for some patients.

It is useful to divide pediatric acute and rescue medications into four categories. (see Table 18.4). The patient and healthcare provider together can decide in what combinations they should be used. Sedation should not be used at school.

Sleep frequently relieves pediatric headache and can even abort it completely. A preferred pediatric sedative is diphenhydramine. Side effects are infrequent.

If nausea and vomiting are prominent and antiemetics are indicated, the orally dissolvable form of ondansetron is effective and very well tolerated. Neuroleptics, such as metoclopramide or prochlorperazine, must be used with caution as they can result in dystonic reactions.

Nonsteroidal anti-inflammatory medications are more effective than acetaminophen. A dose of 10 mg per kilogram that does not exceed 660 mg per dose of naproxen sodium is suggested.

Triptans have been studied in adolescents and to a lesser extent in children. They are available as orally dissolvable tablets (rizatriptan and zolmitriptan), nasal sprays (sumatriptan and zolmitriptan), tablets, and by injection with and without a needle (sumatriptan). Most are not approved for pediatric use by the Food and Drug Administration (FDA). Parents should be informed that, with the exception of almotriptan for adolescents, and rizatriptan now approved for ages 7 and older, they are not FDA approved but have been well studied and are safe. Many of the other triptans are approved for pediatric use in Europe.

Start with a combination of anti-emetics (if needed), sedation, and analgesics. If in 2 h the patient is no better, the sedation is repeated, and acetaminophen is substituted for the nonsteroidal anti-inflammatory drug (NSAID). However, sedatives should be avoided in the school setting as they may impair function even if the headache has resolved.

If these medicines are unsuccessful after 2–3 migraine attacks, a triptan is added. In most episodic migraine attacks, these measures combined with stress management, lifestyle change, and diet restrictions are effective. However, if the diagnosis is not clear and the patient has CDH with superimposed acute worsening, rescue medications are less effective.

The route of administration should also be taken into account. For example, in patients with significant nausea or vomiting, a nasal spray or injectable rescue medication should be considered.

## Preventive Medications

When the patient presents with more than three attacks of migraine per week or more than 3–4 headache days per week and has failed to respond to lifestyle changes, diet, stress management, and rescue measures, daily preventive medications should be considered. This decision must be made together with the patient and parents.

Other considerations for the use of preventive medications include excessive school absences and analgesic medication overuse. If the attacks are few but extremely severe and/or prolonged, as is often the case in cyclical vomiting, consideration can also be given to the use of preventive medications.

A list of frequently used pediatric preventive headache medications is contained in Table 18.5. None of these medications is FDA-approved for pediatric prophylaxis. Valproate, topiramate, and propranolol are FDA-approved for adults.

Comorbidities are important and play a major role in the selection of prophylactic medication. When possible, choose prevention that treats a comorbid condition, and avoid those that worsen existing problems (see Tables 18.6, and 18.7).

**Table 18.5** Pediatric preventive headache medication*Antihistamines*

- Cyproheptadine

*Antidepressants*

- Amitriptyline (1 mg/kg/day)

*Anticonvulsants*

- Topiramate (50–150 mg/day)
- Gabapentin (600–2,400 mg/day)
- Valproic acid (avoid in girls due to teratogenicity, and other adverse side effects)

*Others*

- Beta blockers
  - Propranolol
- Calcium channel blockers

**Table 18.6** Pediatric headache comorbidities for consideration in choosing prophylaxis

- School absences
- Medication overuse
- Sleep disorders
- Obesity
- Anxiety
- Depression
- Epilepsy

**Table 18.7** Clinical pearls on use of comorbidities in choosing prophylaxis

- In a very thin patient, even if that patient is an adolescent, a medication that increases appetite, such as cyproheptadine or amitriptyline, may be desirable
- In patients with problems falling asleep and/or staying asleep, a medication that aids sleep is desirable, such as cyproheptadine and amitriptyline
- If the patient is obese, giving them a medication that increases weight is inappropriate (e.g., tricyclics, [TCAs] or cyproheptadine), but a medication that aids weight loss such as topiramate is desirable
- If the patient is depressed, a preventive such as amitriptyline which has antidepressant properties is desirable
- If the patient is suicidal, or depressed, extreme caution is indicated. The medication must be supervised closely, optimally with a psychiatrist, and administered by the parents. At the first sign of a change in personality or worsening depression, psychiatric consultation is mandatory
- If the patient has comorbid epilepsy, a preventive medication that has antiepileptic properties, such as topiramate, or valproic acid (not in girls), should be considered

## How to Administer Preventive Medication

Initiate these medications in sub-therapeutic dosages and increase them slowly every 2 weeks in 2 divided doses. By going slow and limiting daytime dosing, side effects are minimized or recognized early. Beneficial effects are recognized at lower dosages, and excessive medication dosages can be avoided with this approach.

Patients and their parents are encouraged to contact the physician or provider between the initial visit and the 8-week follow-up visit if problems occur. Parents are told not to simply stop medication without talking to the provider's office. Preventive medications are always used in conjunction with lifestyle and dietary changes, as well as stress management as described above.

Set realistic expectations! Most preventive medications may take several weeks to months for clinical benefit to be achieved.

If one medication used in therapeutic dosages is unsuccessful, a second medication with a different mode of action should be added slowly. When the patient has been responsive to these medications, maintain them for approximately 4 months. Never discontinue medication at the start of the school year, as that seems to be a time when headaches exacerbate.

As noted above, all preventive medication should be withdrawn slowly. Other measures, such as lifestyle changes, diet, and counseling, should be continued after preventive medications are tapered. Clinical pearls in administering pediatric prevention are summarized in Table 18.8.

**Table 18.8** Clinical pearls in administering pediatric prevention

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- Initiate these medications at night in subtherapeutic dosages and increase them slowly every 1–2 weeks
  - Certain preventive medications (e.g., TCAs) are given at night only; others are given in two divided doses (e.g., topiramate). Topiramate may be given either nightly or twice per day
  - By going slow and limiting daytime dosing, side effects are minimized or recognized early. Beneficial effects are recognized at lower dosages, and excessive medication dosages can be avoided
  - Patients and their parents are encouraged to contact the healthcare provider between the initial visit and the 8-week follow-up visit if problems occur
  - Tell parents not to simply stop medication first without talking to provider
  - Preventive medications are always used in conjunction with lifestyle and dietary changes, as well as stress management
  - If one medication used in therapeutic dosages is unsuccessful, a second medication with a different mode of action should be added slowly
  - When the patient has been responsive to these medications, maintain them for at least 4 months
  - Never discontinue medication at the start of the school year, as that seems to be a time when headaches exacerbate
  - All preventive medication should be withdrawn slowly
  - Other measures such as lifestyle changes, diet, and counseling should be continued after preventive medications are tapered
  - It is important to address overuse of rescue medications, as patients who are experiencing analgesic rebound may be more refractory to preventive medications unless the offending agent is discontinued
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**Table 18.9** Alternative approaches for pediatric headache

A	B
Magnesium	Acupuncture
Riboflavin (vitamin B2)	Yoga
Coenzyme Q10	Massage
Butterbur root	Hypnosis
Feverfew	
Physical therapy	
Biofeedback	
OnabotulinumtoxinA	

## Alternative Approaches in the Treatment of Pediatric Headache

Many patients and families wish to avoid medication and explore nonpharmacologic measures to treat their headaches. Table 18.9 lists some of these approaches. Column A includes those with data support for use, although not always in pediatrics. Column B lists those with less data but potential usefulness. Any of these approaches should be combined with lifestyle changes, diet, and stress management.

The use of onabotulinumtoxinA (Botox) has recently been approved in adults for treatment of chronic migraine, defined in the prescribing information as headaches that occur at least 15 days per month, for at least 4 h per day. Data concerning Botox onabotulinumtoxinA in pediatric CDH are sparse. At the time of this writing, it should be used only if the standard measures of medication, lifestyle changes, diet, and counseling for CDH have been unsuccessful. It is not a first-line pediatric therapy.

## Multidisciplinary Rehabilitation Treatment of Refractory Pediatric Headache

A mixed inpatient and outpatient rehabilitation program for the treatment of refractory pain in pediatrics can be very useful. At the Cleveland Clinic, four forms of chronic pediatric pain are treated using a rehabilitation model in the Pediatric Pain Rehabilitation Program (also referred to as the Shaker Pain Program). They are complex regional pain syndrome, fibromyalgia, chronic recurrent abdominal pain, and CDH, especially those associated with frequent school absences and medication overuse.

A limited medication/true rehabilitation model is used, stressing psychological and physical rehabilitation modalities. Follow-up data over a period of 3 years indicate a decrease in headache severity, school absences, and work time lost by the parents due to their children's headaches.

When considering participation in this type of intensive approach, take the time to review the diagnosis with family and patient and reassure both. Again, discuss the

need for stress evaluation, and rediscuss the roles of lifestyle, diet, rescue medication, preventive medication, and alternative medication.

A treatment plan should be presented to the patient and parents in writing, along with educational materials. The patient is then asked if they have questions, comments, or criticisms. Once they feel they understand the program and are willing to participate, compliance is discussed. Emphasis is placed on the importance of 8 weeks of strict adherence to the regimen.

## **Follow-up**

Emphasize the opportunity for the patient and/or parent to call with questions and/or comments between the first visit and the 8-week follow-up. Adherence is increased by encouraging communication.

The follow-up visit is the time to revisit the diagnosis and modify it based on new information, new symptoms, or new findings on the examination, and lack of response or side effects to the treatment program. Additional testing may be indicated. This is the ideal time to reassess disability, medication-related side effects, adherence, and the patient's and parents' feelings concerning progress.

Often, in patients with CDH, there is no change in the headache frequency and severity, but the patient is noted to be more involved, with more social contacts, less medication overuse, and less missed school. These are definite signs of progress.

Consideration can be given, in the absence of side effects, to increasing the dose of medication or, if necessary, to starting a second medication. Dietary restrictions can be modified if they are not helpful. Weight loss can be noted and encouraged. At the end of the visit, another visit should be scheduled. Follow-up is crucial for progress and to prevent recidivism.

## **Special Circumstances**

A variety of special circumstances may need to be addressed. These are listed in Table 18.10, and will be covered below.

## **Acute Pediatric Headache**

Children and adolescents are often seen in the emergency room and in their primary care physician's office for the evaluation of an acute headache with no previous history of recurrent headache. The overwhelming majority of patients with acute headache do not have any underlying structural or neurological abnormalities.

**Table 18.10** Special situations in treating pediatric headache

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1. Acute pediatric headache
2. Migraine: acute, urgent treatment
3. Migraine with neurologic features
4. Menstrual Migraine
5. Cyclical Vomiting
6. CDH
7. Posttraumatic HA (PTH)
8. New daily persistent headache (NDPH)
9. Exertional HA
10. Trigeminal autonomic cephalalgias (TACs)

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Often, the patients have a headache related to fever or upper respiratory infection. Some are seen for a primary headache, such as a migraine or tension-type headache. The most important aspect in the evaluation of these patients is to rule out a major secondary cause and to treat the associated illness when present.

If the healthcare provider feels that this is a primary headache, sedation and analgesia should be effective. If the patient has any neurologic symptoms and/or any abnormality on the neurologic examination, immediate, more complete evaluation is necessary prior to treatment. Imaging may be necessary.

Until a diagnosis is secure, children and adolescents should not be given highly sedating medications, which may mask neurological symptoms or signs. The routine use of narcotics is not in the best interest of the patient. Follow-up after office or emergency room discharge is strongly recommended.

## Pediatric Migraine Headache: Acute/Urgent Treatment

Migraine headaches are among the most common headaches seen in pediatrics, and healthcare providers are often called upon to treat urgently in the office or ER.

Principles of treatment, acutely, as noted above, include sedation, antiemetics, analgesics, and abortives (see Table 18.11). For the average-size teenager, begin with 25 mg of diphenhydramine and 10 mg per kilogram of naproxen sodium. If they are not better 2 h later, repeat the diphenhydramine and use 15 mg per kilogram of acetaminophen. If the IV route is preferred, ketorolac may be used. If this is unsuccessful, triptans can be used in future attacks.

In younger children aged 7–12, use the 5 mg sumatriptan nasal spray or 2.5 mg zolmitriptan orally dissolvable tablet. Rizatriptan (5 mg in patients <40 kg and 10 mg in patients >40 kg) is also available. If nausea and vomiting are important components of a patient's migraine syndrome, use 4–8 mg of ondansetron orally dissolvable tablet prior to initiating the diphenhydramine and analgesic abortive combination (see Table 18.12).

**Table 18.11** Clinical pearl: the principles of treatment of an acute pediatric migraine

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- Principles of treatment of acute pediatric migraine: sedation, antiemetics, analgesics, and triptans
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**Table 18.12** Treatment of an acute pediatric migraine

- 
- Begin with 25 mg of diphenhydramine and 10 mg per kilogram of naproxen sodium
  - If not better in 2 h, repeat diphenhydramine and use 15 mg per kilogram of acetaminophen
  - If unsuccessful, triptans can be used in future attacks
  - 5 mg sumatriptan nasal spray or 2.5 mg of zolmitriptan orally dissolvable tablet
  - Rizatriptan mg in patients less than 40 kg and 10 mg in patients >40 kg
  - For nausea and vomiting
    - Use ondansetron orally dissolvable tablet prior to diphenhydramine and analgesic abortive combination
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## Tension-type Headache

Many children and adolescents will have an occasional headache of mild to moderate severity without associated nausea and vomiting. These patients can be treated with 10 mg per kilogram of naproxen sodium, and the problem will usually resolve. If the parents find them using these medications more than 2 times per week on a regular basis, further evaluation and use of other treatment options, lifestyle changes, stress reduction, and diet are indicated.

## Migraine with Neurologic Features

At times, patients presenting with migraine will have associated neurological features. This can be seen in migraine without aura, migraine with aura (including brainstem aura), and hemiplegic migraine. If symptoms or signs of increased intracranial pressure are present, a workup for underlying structural abnormality is indicated. Migraine with neurologic features requires close follow-up. Specialized testing for hemiplegic migraine may be needed. Triptans should be avoided in patients with brainstem aura and hemiplegic attacks.

## Menstrual Migraine

Some adolescent girls experience increased numbers of migraine attacks during their menstrual periods. Most begin their headache the night before the menstrual flow begins.

The patient should keep calendars of both their headaches and their menstrual periods. If there appears to be a predictable pattern, the patient can be started on a course of nonsteroidals, given every 6–8 h for 3–4 days prior to menstrual cycle. This frequently modifies the attacks.

Other considerations, if the attacks are unresponsive to nonsteroidals, would include the use of twice-daily long-acting triptans, such as frovatriptan or naratriptan. The routine use of birth control pills as the first option in the treatment of this disorder is discouraged.

## Cyclic Vomiting

Cyclic vomiting is considered a migraine precursor (see Chap. 9). Many patients have a positive family history of migraine and go on to develop typical migraine. The usual patient is a preschool child who periodically begins to vomit repeatedly, averaging 5–8 emeses per hour for several hours every 20–40 days, usually early in the morning. Many have these recurrent episodes with a predictable pattern. Patients should be evaluated to rule out underlying intracranial, abdominal, or metabolic disorders.

Acute treatment includes sedation and antiemetics, and in some cases judicious use of triptans while keeping in mind the patient's age and weight. Some require intravenous therapy. If spells are severe and recurrent, prophylaxis with cyproheptadine or amitriptyline can be useful.

## Chronic Daily Headache

CDH in adolescents is very difficult to treat. It may in fact be the most difficult pediatric headache type to treat, and it causes the greatest family disruption. If CDH is complicated by excessive school absences and medication overuse, it is even more difficult to remediate.

The medical model for the treatment of pediatric headache is followed. We emphasize patient education, stress management, lifestyle changes especially sleep, hydration, and exercise, diet modification, and prophylactic medication. The latter is chosen bearing in mind the patient's comorbidities.

If depression or anxiety is present, psychiatric consultation and ongoing counseling are needed. This group of patients is most appropriate for a multidisciplinary rehabilitation program.

## **New Daily Persistent Headache**

New daily persistent headache (NDPH) begins acutely. The patient often has no significant past history of migraine or frequent daily headache. In 40% of patients, NDPH is preceded by a viral illness, injury, or an emotional event. From that day on, the patient has daily, continuous headache. NDPH is a variant of CDH and should be treated in the same way.

## **Posttraumatic Headache**

Many patients are seen with daily or almost daily headache following a head injury or concussion, usually in the absence of serious intracranial pathology. Patients frequently have associated symptoms such as lethargy, personality change, irritability, and dizziness.

Once secondary causes have been excluded (infections such as meningitis, structural lesions, or IIH), these patients should be treated as if they have CDH. This, too, is a difficult group of patients to treat, and often stress management is indicated. Chapter 24 is entirely devoted to traumatic brain injury and concussion.

## **Exertional Headache**

Many adolescents, but fewer younger children, experience headache during intense exertion. The story one generally hears is that the patient starts an activity without headache, and when they exert themselves, develops either a severe generalized headache or a true migraine with associated phonophobia, photophobia, nausea, and vomiting.

If these attacks are predictable and occur less than 2–3 times per week, treatment with 10 mg per kilogram of naproxen sodium 2 h before the event can be helpful. Indomethacin has been recommended but given the availability and safety of naproxen, try naproxen first.

## **Pediatric Trigeminal Autonomic Cephalalgias**

The trigeminal autonomic cephalalgias (TACs) are a group of disorders which are very uncommon in children and adolescents. TACs generally present with multiple short headaches on a daily basis with autonomic symptoms, except for the continuous hemicrania continua (HC).

The short paroxysmal TACs are cluster, paroxysmal hemicrania (PH), and short-lasting unilateral neuralgiform headache attacks (SUNHA). As noted, HC is classified as a TAC in ICHD-3, but it is continuous with exacerbations that can include autonomic features.

Cluster headache is the most common TAC. PH and HC are indomethacin responsive. TACs are reviewed in detail in Chaps. 2 and 12.

TACs frequently go unrecognized for months to years, but should be suspected if the patient presents with multiple headaches per day. After a thorough evaluation, the use of indomethacin can be very helpful, therapeutically and diagnostically. Cluster and SUNHA, not indomethacin responsive, have more specialized treatments (see Chap. 12).

Healthcare providers not familiar with pediatric TACs may require consultation from a headache medicine specialist. Given their rarity in pediatrics, a careful search for secondary causes is in order when a TAC is suspected.

## Conclusions

- The treatment of pediatric headache requires the correct diagnosis and making sure underlying medical or neurological issues have been ruled out
- Provide patients and parents with background information and a treatment plan
- Stress management, lifestyle changes, and diet are the mainstays of pediatric headache management
- Judicious use of rescue and preventive medications in moderation is also of great importance
- Continued communication and follow-up is necessary
- Consultation with a pediatric headache medicine specialist can be sought if initial approaches are not successful

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