HEADACHES IN CHILDREN AND ADOLESCENTS

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Learning Objectives

At the end of this presentation the participant will be able to:

1. Define and diagnose most common headaches in children and adolescents.
2. Manage headaches in the pediatric population.

Introduction

• Headaches in children and adolescents are a common complaint in the outpatient office and the ER settings
• Prevalence of headache in the pediatric population varies widely from 17% to 90%
• Headaches are more common in young boys than girls before 7 years of age but around the time of puberty, the trend reverses and headaches are more common in young ladies
• Primary headache disorders (migraine, tension type and cluster headaches) are more common than secondary headache disorders (80%)

Headache Basic Patterns

Headache Can Be Divided in 4 Basic Patterns:

• Acute
• Acute recurrent
• Chronic non-progressive
• Chronic progressive

Disclosure

Jose Luis Aceves, M.D.
• has no relationships with commercial companies to disclose.

Headache Basic Patterns

• A thorough history and examination are essential to identify one of these 4 patterns
• In general terms, acute recurrent and chronic non-progressive are due to a primary headache disorder
• Chronic progressive headache is the most worrisome type of pattern
**Etiology of Acute Headache**

- Viral respiratory infection
- Meningitis/Encephalitis
- Migraine
- Intracranial hemorrhage
- Stroke

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**Etiology of Acute Headache**

- Vasculitis
- Malignant hypertension
- Trauma
- Toxins (alcohol, illicit drugs and medications)

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**Etiology Acute Recurrent Headache**

- **MIGRAINE**
- **TENSION TYPE**
- Trigeminal autonomic cephalalgias
- Recurrent toxic exposures
- Seizure associated headache

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**Etiology Chronic Non-progressive Headache**

- Chronic tension-type headache
- Chronic migraine
- New daily persistent headache
- Chronic trigeminal autonomic cephalalgias

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**Etiology Chronic Non-progressive Headache**

- Sleep apnea
- Chronic post-traumatic headache
- Chiari malformation
- Idiopathic intracranial hypertension

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**Etiology Chronic Progressive Headache**

- Tumor
- Idiopathic intracranial hypertension
- Sinus venous thrombosis
- Vascular malformations
**Etiology Chronic Progressive Headache**

- Chiari malformation
- Vasculitis

**CHILDHOOD PERIODIC SYNDROMES**

- Considered migraine variants in children
- Family history of migraine is common
- Well known tendency to transform into migraine

**CHILDHOOD PERIODIC SYNDROMES**

- Key clinical features: episodic, reversible and stereotyped nature of attacks.
- Therapy remains empirical rather than evidence based due to:
  a. Pathophysiology unknown
  b. Absence of controlled drug trails
  c. High placebo response (70%)

**BENIGN PAROXYSMAL TORTICOLLIS OF INFANCY**

- Female preponderance (70%)
- Onset: 2-8 months
- Resolution: 3-5 years
- Hour to days in duration
- Frequency: varies
- Some cases associated with (CACNA1A) and PRRT2 genes mutations

**BENIGN PAROXYSMAL TORTICOLLIS OF INFANCY**

- Tilting of the head to one side
- Ataxia
- Vomiting
- Pallor

**BENIGN PAROXYSMAL TORTICOLLIS OF INFANCY**

Differential diagnoses:

a. Sandifer syndrome
b. Idiopathic torsional dystonia
c. Complex partial seizures
d. Posterior fossa tumors
e. Craniocervical junction abnormalities
**BENIGN PAROXYSMAL TORTICOLLIS OF INFANCY**

Treatment: Cyproheptadine?

**BENIGN PAROXYSMAL VERTIGO OF CHILDHOOD**

- Onset: 2-4 years
- Resolution: 8 years to adolescence
- Sudden onset
- Duration: less than 5 minutes.
- Frequency: daily to once every month or 3 months

**BENIGN PAROXYSMAL VERTIGO OF CHILDHOOD**

- Expression of anxiety and fear
- Ataxia
- Nausea
- Vomiting (frequent)

**BENIGN PAROXYSMAL VERTIGO OF CHILDHOOD**

- Frequent positive family history of migraine
- Episodes resolve with sleep
- Some cases associated with **CACNA1A** mutations

**BENIGN PAROXYSMAL VERTIGO OF CHILDHOOD**

Differential diagnoses:
- Benign positional paroxysmal vertigo
- Episodic ataxias

Treatment:
May not be required or cyproheptadine.
**ABDOMINAL MIGRAINE**

- Onset: 7 years
- Resolution: May persist into adulthood
- Significant number will develop migraine headaches
- Female preponderance
- Duration: hours to 3 days

**ABDOMINAL MIGRAINE**

- Acute, recurrent, incapacitating, non-colicky midline abdominal pain
- Mostly dull in nature and periumbilical in location
- May be accompanied by pallor, nausea and vomiting
- May have a prodrome characterized by mood changes and anorexia

**ABDOMINAL MIGRAINE**

(Some cases may be preceded a visual, sensory or aphasic aura)

**Differential diagnoses:**

- a. Irritable bowel syndrome
- b. Crohn’s disease
- c. GERD
- d. Peptic ulcer
- e. Complex partial seizures

**Treatment:**
Same as for migraine headaches.

**CYCLIC VOMITING**

- Onset: 5 years to adulthood
- Resolution: 10 years to adulthood
- Duration 1 hour to 5 days
- Second most common cause of recurrent vomiting in children after GERD
- High frequency of developing migraine headaches

**CYCLIC VOMITING**

- Recurrent, self limited episodes of severe nausea and vomiting alternating with symptom free periods

**May have:**

- Prodromal phase (pallor, nausea, autonomic dysfunction and decrease muscle tone)
- Emetic phase (intense vomiting, at least four times per hour or more)
- Recovery phase

**DIFFERENTIAL DIAGNOSES:**

- Intermittent bowel obstruction
- Choledochal cysts
- Pancreatitis
- Hepatitis
- Metabolic disorder
- Ureteropelvic junction obstruction

**Treatment:**
Same as for migraine headaches
CYCLIC VOMITING

Cyclic Vomiting Syndrome Plus:
- Mitochondrial disorder
- Elevated lactic acid, abnormal OA and muscle biopsy
- Frequent feedings and early use of D10% IVF during episodes
- Same therapy as regular cyclic vomiting

MIGRAINE

- Common in childhood
- Prevalence 1 to 3% in children and 8 to 23% in adolescence
- Adults: 18% women and 6% men
- 28 million Americans have migraines per year

MIGRAINE

- Migraine is a syndrome of recurrent headaches with a wide variety of neurological and non-neurological manifestations.
- Exact pathophysiology unknown (complex interactions between vascular and neural systems with participation of cortical spreading depression, abnormal neuronal excitability, inflammatory response, serotonin activity and trigeminal neurovascular activation)

MIGRAINE

Trigger Factors:
- Dietary triggers (Alcohol, caffeine, nitrite laden meat, MSG, aspartame, chocolate, missing meal)
- Physical/environmental (Glare, flashing lights, odors, weather changes, high altitude)
- Psychological triggers (Stress, anxiety, depression)
- Sleep-related triggers (Lack of sleep, excessive sleep)

MIGRAINE

Trigger Factors:
- Hormonal triggers (menstruation, ovulation, oral contraceptives, hormonal replacement)
- Drugs (Nitroglycerin, histamine, reserpine, hydralazine, ranitidine, estrogens)
- Miscellaneous triggers (Head trauma, physical exertion, fatigue)
**MIGRAINE**

Two Major Subtypes:
- Migraine without aura (70 to 80% of cases)
- Migraine with aura (20 to 30% of cases)

**ICHD-3 DIAGNOSIS MIGRAINE WITHOUT AURA**

a. At least 5 attacks fulfilling criteria B-D
b. Headache attacks lasting 2-72 hours
c. Headache has at least two of the following four characteristics:
   - Unilateral location, although may be bilateral in children
   - Pulsating quality
   - Moderate or severe in intensity
   - Aggravation by or causing avoidance of physical activity

**MIGRAINE**

D. During headache at least one of the following:
   - Nausea and/or vomiting
   - Photophobia and phonophobia
   - Not better accounted for by another ICHD-3 diagnosis

**ICHD-3 DIAGNOSIS MIGRAINE WITH AURA**

A. At least two attacks fulfilling criteria B and C
B. Aura consisting of at least one of the following:
   1. Visual (flickering lights, spots, lines, loss of vision)
   2. Sensory (pins, needles, numbness)
   3. Speech and/or language (dyphasic speech)
   4. Motor (hemiparesis)
   5. Brainstem
   6. Retinal

C. At least two of the following four characteristics:
   - At least one aura symptom spreads gradually over 5 minutes or more, and/or two or more symptoms occur in succession
   - Each individual aura symptom lasts 5-60 minutes
   - At least one aura symptom is unilateral
   - The aura is accompanied, or followed within 60 minutes, by headache

D. Not better accounted for by another ICHD-3 diagnosis, and transient ischemic attack has been excluded

**RAPID CLINICAL SCREENING FOR MIGRAINE**

(I.D. Migraine, Lipton et al)

1. Nausea: Are you nauseated or sick to your stomach when you have a headache?
2. Disability: Has a headache limited your activities for a day or more in the last 3 months?
3. Photophobia: Does light bother you when you have a headache?
Rapid Clinical Screening for Migraine

- If 2 out of 3 questions are positive, there is a 93% positive predictive value
- If 3 out of 3 questions are positive, there is a 98% positive predictive value

Migraine

Phases of Migraine:

Prodrome (1 to 24 hrs)
- Irritability
- Depression
- Craving for certain foods
- Repetitive yawning
- Neck tightness

Aura (5 to 60 minutes)
- Visual (Flickering lights, dots, lines, loss of vision)
- Sensory (Pin and needles, numbness)
- Speech and/or language disturbances
- Motor
- Brainstem
- Retinal

Headache (2 to 72 hours)

Associated symptoms:
- Nausea 90%
- Vomiting 30%
- Photophobia and phonophobia 80%
- Allodynia 50%

Resolution Phase

- Fatigue
- Restless
- Scalp tenderness
- Mood changes
- Impaired concentration
Confusional Migraine

a. Altered mental status
b. Aphasia
c. Can be triggered by mild head trauma
d. Lasting 4 to 24 hours
e. Can be presenting feature for CADASIL and notch 3 mutations should be ruled out.

Migraine with Brainstem Aura

(Previously Known as Basilar Migraine)

a. Visual, sensory and/or speech disturbance symptoms (aura)
b. Brainstem symptoms: Dysarthria, diplopia, tinnitus, hyperacusis, vertigo, ataxia, decreased level of consciousness
c. No motor weakness
d. Headache occurs at the onset of an aura or within 60 minutes

Hemiplegic Migraine

a. Fully reversible motor weakness + visual, sensory and/or speech disturbance symptoms (aura)
b. Headache occurs at the onset of an aura or within 60 minutes
c. Familial or sporadic
d. Familial very often presents with brainstem symptoms in addition to the typical aura symptoms
e. Mutations in CACN1A, ATPA2 and SCN1A
f. Headache occurs at the onset of an aura or within 60 minutes

Retinal Migraine

a. Uncommon in children
b. Fully reversible monocular positive and/or negative visual phenomena
c. Confirmed by clinical visual field examination and/or patient’s drawing
d. Headache occurs at the onset of an aura or within 60 minutes

Migrainous infarction

b. Migraine aura-triggered seizure (occurring during or within 1 hour after)
c. Status migrainosus (lasting more than 72 hours)
d. Persistent aura without infraction

Most common type of headache in children but generally less disabling

Pathophysiology unkown
TENSION TYPE HEADACHE

- Episodic (<15 days)
- Chronic (15 or more days)
- Duration: 30 minutes to 7 days

TENSION TYPE HEADACHE

- Bilateral location
- Non-pulsating quality
- Mild or moderate in intensity
- Not aggravated by physical activity
- No nausea or vomiting
- Either photophobia or phonophobia

TRIGEMINAL AUTONOMIC CEPHALAGIAS

- Rare in children
- Includes cluster headaches, paroxysmal hemicranias and SUNCT
- Headache accompanied by autonomic symptoms: miosis, ipsilateral corneal redness, tearing, eyelid swelling, ptosis, forehead or facial sweating and flushing, nasal congestion and rhinorrhea

RED FLAGS FOR SECONDARY HEADACHES

- Progressive pattern
- New or different severe headache
- Sleep related headache (headache waking the patient or always present in the morning)
- Increased headache with straining, coughing or sneezing
- Systemic symptoms (fever, weight loss, rash and joint pain)

RED FLAGS FOR SECONDARY HEADACHES

- Neurologic symptoms (papilledema, abnormal ocular movement, cranial neuropathies, altered mental status)
- Secondary risk factors (immunosupression, cancer, hypercoagulable state, rheumatologic disorder, neurocutaneous disorder)

SECONDARY HEADACHES

**Headache Attributed to Trauma or Injury to the Head and/or Neck**

- Post traumatic headache develops within 1 week
- May have migraine or tension type qualities
- If associated with dizziness, fatigue, mild memory problems, insomnia, anxiety and irritability, the patient has a post-concussion syndrome
- Usually headaches resolves within 2 weeks
**SECONDARY HEADACHES**

**Headache Due to Abnormal Elevated Intracranial Pressure**

- Chronic Progressive
- Worse with Valsalva maneuver
- Nighttime waking
- Headache that may be accompanied by vomiting, papilledema, sixth nerve palsy and Cushing's triad

**SECONDARY HEADACHES**

**Headache Due to Decreased Intracranial Pressure**

- Headache present with a standing position, relieved by recumbent position
- Etiology: Lumbar puncture, spinal surgery, trauma connective disorder and spontaneous
- Meningeal enhancement and low lying tonsils

**SECONDARY HEADACHES**

**Systemic Diseases:**

a. Obstructive sleep apnea
b. Hypothyroidism
c. Epilepsy
d. Mitochondrial disorder

**SECONDARY HEADACHES**

**Systemic Diseases:**

e. Temporo-mandibular disorders
f. Sickle cell disease
g. Hypertension
h. Rheumatologic disease

**SECONDARY HEADACHES**

**Etiology:**

a. Tumors
b. Idiopathic intracranial hypertension
c. Cerebral sinus venous thrombosis
d. SLE
e. Medications; Growth hormone, tetracyclines, vitamin A, cis-retinoic acid, lithium, levothyroxine and corticosteroids.
f. Lyme's disease
g. Sarcoidosis
h. Sleep apnea

**SECONDARY HEADACHES**

**Structural Disorders:**

a. Chronic non-progressive or progressive
b. Etiology: arachnoid cysts, tumors, Chiari malformation type I, vascular malformations
**TREATMENT**

**Smart Headache Management**

a. Sleep (Lack of sleep or over sleep)
b. Meals (Regular meals, good hydration and avoiding certain foods or beverages like caffeine containing products, chocolate, monosodium glutamate, processed meats and aged cheese if they trigger headaches)
c. Activity: (Regular exercise)
d. Relaxation: (Relaxation and stress reduction)
e. Trigger avoidance (Stress, sleep deprivation, fasting, certain food)

**TREATMENT OF ACUTE MIGRAINE ATTACKS**

a. Make patient headache free as soon as possible
b. Reduce associated symptoms like nausea, vomiting, photophobia and phonophobia
c. Reduce disability therefore improving quality of life
d. Reduce the possibility of chronic migraines
e. Do not use acute treatment more than 2 to 3 days per week

**TREATMENT OF ACUTE MIGRAINE ATTACKS**

**Non-specific Medications:**

- Acetaminophen
- Prostaglandin inhibitors: NSAIDS, aspirin and COX inhibitors
- Combination analgesics: Isometheptene combinations, ASA/acetaminophen/caffeine and ASA/acetaminophen/caffeine/butalbital combinations.
- Promethazine
- Prochlorperazine
- Ondansetron
- Metoclopramide
- Methyprednisolone
- Valproic acid
- Opioids

**TREATMENT OF ACUTE MIGRAINE ATTACKS**

**Specific Medications:**
(Serotonin 5HT 1B/1D agonists)

**Mechanism of action:**

a. Reduction of neurogenic inflammation by reducing the release of vasocative peptides such as calcitonin related peptide (CGRP) at the perivascular space
b. Inhibitory effect on the central trigeminal system
c. Normalization of the dilated intracranial arteries

**Specific Medications:**
(Serotonin 5HT 1B/1D agonists)

**Selective:**

- Almotriptan (FDA approved for adolescents)
- Eletriptan
- Frovatriptan (main use for menstrual migraine)
- Naratriptan
- Rizatriptan (FDA approved for 6-17 years)
- Sumatriptan (nasal and SC available)
- Zolmitriptan (nasal available)
Specific Medications: (Serotonin 5HT 1B/1D agonists)

Non-selective:
- Ergotamine
- DHE

Indications:
- Migraine that substantially interferes with the patient's daily routine despite acute treatment
- High frequency of migraine attacks (4 or more headaches a month)
- Chronic Migraine
- Failure of acute medications
- Contraindications for acute medications
- Acute medications overuse
- Special circumstances such as hemiplegic or migraine with brainstem aura

Mechanism of Action:
- Regulation of voltage gated ion channels
- Modulation of central neurotransmitters (serotonin, norepinephrine, dopamine)
- Enhancement of GABA inhibition
- 5 HT2 antagonism
- Alteration in neuronal axonal metabolism
- None are specific for migraine and they are 60 to 65% effective

Drug Selection:
- Patient’s profile, age, frequency, severity of migraine attacks and disability
- Relative efficacy of the drug
- Comorbidity
- Side effect profile of the drug
- Risk to benefit ratio

Reason For Failure:
- Incorrect diagnosis
- Failure to recognize comorbidities
- Inadequate doses
- Inadequate treatment period
- Concomitant use of analgesic rebound-producing agents
- Unrealistic expectations

Practical Considerations:
- Start small and go slow
- Give adequate trail with optimum dose (3 months)
- Length of treatment at least 6 months
- Withdraw medication gradually (every 6 months if feasible)
**PROPHYLACTIC TREATMENT OF MIGRAINE**

**Medications:**
- Beta blockers: propranolol, nadolol, atenolol, timolol
- Tricyclic antidepressants: Amitriptyline and nortriptyline
- Antiepileptic agents: Topiramate, valproic acid, zonisamide, gabapentin
- Calcium channel blockers: verapamil and flunarizine
- 5HT2 antagonists: Cyproheptadine
- NSAID: Naproxen
- Angiotensin inhibitors: Lisinopril and candesartan

**PROPHYLACTIC TREATMENT OF TENSION TYPE HEADACHE**

- Tricyclic antidepressants: Amitriptyline and nortriptyline

**CONCLUSIONS**

a. Majority of headaches in children and adolescents are primary (80%)
b. Physicians should be able to detect secondary headaches based on the history, physical examination and if needed additional tests (lumbar puncture, CT and MRI of the brain, etc)
c. Treatment should be tailored according to the needs of the patient and family