Objectives

• Understand pediatric chronic headache presentations
• Review evidence for the treatment of chronic pain, including behavioral approaches, injections and neurostimulation
• Consider a multidisciplinary approach that includes lifestyle interventions, preventive treatments, physical therapy, psychological support, sleep and anxiety interventions

Statement of Problem:
Migraine Headaches Are Common

• Affects 2-5% preschool age children
• Affects 1 in 10 school age children
• Affects 16-30% young women

• Typical migraine patient will have 2 attacks/month
• No totally effective treatment
Chronic Daily Headaches Are Common

- CDH defined as >15 HA days/month for > 3 months
- In Adults
  - 4% of women, 2% of men
- Wang et al (Neurology 2006)
  - 7900 middle school children age 12-14
    - 2.4% of middle school girls
    - 0.8% of middle school boys
  - 67% had migraine
  - 5% consulted neurologist
  - 5671 children aged 5-12 in Brazil
    - 2.2% of girls, 1.1 % of boys daily headache
    - 0.6% had chronic migraine

Chronic Daily Headache Prognosis

- Wang et al, Neurology 2009
  - Community based study of adolescents
    - 50% improved after 1 year
    - 75% improved after 2 years
    - 12% had chronic daily headaches 8 years latter
    - Some vacillated between chronic and episodic
  - 17% sought treatment with a physician
  - 5 % sought treatment with a neurologist

Types of Chronic Daily Headache

- Chronic Migraine
- New Daily Persistent Headache
  - No prior HA history
  - Sudden Onset
  - Often associated with infection
- Chronic Tension Type Headache
- Hemicrania continua
  - One-sided
  - Responsive to indomethacin
What is Chronic Migraine?

- International Headache Society (IHS) Criteria
- Headaches > 15 days/month > 3 months
- > 8 days/month has features of a migraine
- Unilateral (Bilateral in children)
- Pulsating
- Moderate or severe intensity
- Worse with activity
- Nausea and/or vomiting
- Photo- or phonophobia
- Relief by sleep

Chronic Migraine: Multiple Headache Types

- Ask patient to first describe their worse headache
  - Severe intermittent headache (migraine)
  - ? more responsive to preventives
- Then ask patient to describe what the headache is like on other days
  - Low grade daily, continuous headache
    - Pain is continuous, lower grade
    - Will often have migraineous features
    - Bothering but not debilitating
    - Similar to Intense headaches, but less severe
    - ? More responsive to lifestyle changes, Behavior
- Are both headaches a form of migraine?

Chronic Migraine: Multiple Headache Types

- Idiopathic stabbing headaches are a third headache type, occurring in 2% of adolescents seen at Mayo Clinic with CM.
  - Often occurs every day.
  - The headaches are severe, stabbing or ice pick.
  - Will occur in multiple spots on their head, and will last for seconds to minutes.
  - May occur once to multiple times each day.
  - Responsive to Indomethacin
Does Medication Overuse Cause CM?

- Bigal, Lipton et al (Neurology 2008)
- American Migraine Prevalence and Prevention Study
- Identified 24,000 headache sufferers in the general population. This sample has been followed up with annual surveys for the diagnosis of episodic migraine and chronic migraine. As a part of the survey, subjects were asked to report the specific medications used for their most severe headaches, as well as level of satisfaction with treatment.
- This study asked if frequent medication use led to chronic headaches.

**Table 3**

<table>
<thead>
<tr>
<th>Medication Class</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine-non-specific</td>
<td></td>
</tr>
<tr>
<td>Anticonvulsant</td>
<td>1.22 (0.98, 1.51)</td>
</tr>
<tr>
<td>Combination OTCs</td>
<td>0.76 (0.49, 0.94)</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>0.76 (0.49, 0.94)</td>
</tr>
<tr>
<td>Ergot analgesics</td>
<td></td>
</tr>
<tr>
<td>Topiramate</td>
<td>1.02 (0.76, 1.51)</td>
</tr>
<tr>
<td>S ergot</td>
<td>0.54 (0.35, 0.87)</td>
</tr>
</tbody>
</table>

Cross-sectional data from the American Migraine Prevalence and Prevention study.

OTC = over the counter; NSAID = nonsteroidal anti-inflammatory drugs.

AMPP Study and Medication Overuse Headache

- Important findings are as follows:
  - 1) Opiates are associated with migraine progression; critical dose of exposure is around 8 days per month, and the effect is more pronounced in men.
  - 2) Barbiturates are also associated with migraine progression. Critical dose of exposure is around 5 days per month and the effect is more pronounced in women.
  - 3) Triptans induced migraine progression in those with high frequency of migraine at baseline (10-14 days per month), but not overall.

Migraine Prophylaxis

- Prophylaxis medications are given on a daily basis to reduce the headache burden
- Will sometimes improve frequency
- Will sometimes improve severity
- Goals
  - Reduce headache frequency by 50%
  - Rare to get to zero headaches
  - 1-2 headaches per month is great control
  - 6 months of good headache control

Randomized Controlled Trials

- Amitriptyline
- Hershey et al, (Headache 2000)
  - Amitriptyline (up to 1 mg/kg/day) was used in an uncontrolled retrospective study looking at 192 children with migraine. 84% of children reported feeling better, with a reduction in mean headache days from 17 to 9 days per month. Severity of headaches was also decreased.
Randomized Controlled Trials In Adults

- Topiramate
- Silberstein et al, (Headache, 2009)
  - In adults, topiramate showed a reduction in headache days, the worst daily severity of migraine, and improvement in quality of life. Still the effect was mild, with only 37% of topiramate treated patients (versus 28% of placebo treated) showing a greater than 50% reduction in the number of headache days.
- Lewis et al, (Pediatrics, 2009)
  - In adolescents with episodic migraine, it was shown that 100 mg/day of topiramate was effective in reducing monthly migraine days (72% vs 44%), whereas 50 mg/day was no different than placebo.

Randomized Controlled Trials In Children

- Child and Adolescent Migraine Prevention Study
- Powers et al, 2017 NEJM
- Amitriptyline vs Topiramate vs Placebo
  - Prospective, randomized controlled trial
  - >400 patients, NIH funded
  - Efficacy (p=0.49) >50% reduction in HA days
    - Placebo 61%
    - Topiramate 55%
    - Amitriptyline 52%
  - Side Effects
    - 30% in active med groups

Chronic Migraine Rx Strategy

- At the simplest level
  - Limit analgesic use
  - Find appropriate preventive medication
  - Set appropriate expectations
Chronic Migraine Rx Strategy

• Limit analgesic use
  • Certainly treat severe headaches
  • Continuous headaches poorly responsive to analgesics
  • Unfortunately, once chronic pain develops, often the acute pain relievers are ineffective
• Find appropriate preventive medication
• Set appropriate expectations

• Amitriptyline, topiramate, propanolol (atenolol)
  • 50-70% response rate
  • 20% “home run”
  • 60% “singles, doubles or triples”
  • 20% “striking out”
  • High side effects (30% from CHAMPS)
  • May be more effective against severe headaches
  • Use that as an initial metric
• OnabotulinumtoxinA
• Set appropriate expectations

• Sleep needs to improve
  • Typical adolescent needs 9.5 hours/night
• Preventives helpful to decrease the number of severe migraine attacks
• Functioning is a target symptom. Improve functioning with use of CBT, biobehavioral, 504 plan (late start, access to nurses office)
What to do when nothing else works

• Question Diagnosis of Chronic Migraine
• Onabotulinumtoxin A
• Treat Co-Morbidities
• Trigger Point Injections
• Neurostimulation
• Behavioral Programs

1. Question Diagnosis of Chronic Migraine

• Idiopathic Intracranial Hypertension
  • Most (not all) have papilledema, >28 cm H2O
  • Eye pain, visual obscurations, pulsatile tinnitus
• Hemicrania Continua
  • Unilateral Headache, autonomic features
  • Responsive to Indomethacin
• Occipital/Supraorbital Neuralgia
  • Positive Tinel’s sign
  • Responsive to nerve blocks, gabapentin
• Nummular Headache
  • Coin shaped, silver dollar size
  • Responsive to Botox

2. Onabotulinumtoxin A for CM

• Onabotulinumtoxin A
• Aurora, Diener, Dodick et al (Cephalalgia 2010)
  • Double-blind placebo-controlled trials of 155 IU onabotulinumtoxin A has shown a decreased number of headache days (-7.8 versus -6.4 days/28) in adults with chronic migraine. Started at 20 HA days/28 at baseline.
  • $3500 per treatment, which is effective for 3 months.
  • Typically insurance preapproval needs
    • Dx of Chronic Migraine
    • Trial of > 3 Preventives
    • Wearing off effect 10-12 weeks
2. Onabotulinumtoxin A: Peds Studies

- Ahmed et al., (Pediatric Neurology, 2010)
  - Retrospective chart review of 100 IU protocol
  - Positive response in 50% patients who have failed multiple (>8) previous preventative medications.
  - Effective in other HA types, such as NDPH, nummular headache
- Other retrospective studies
  - Toronto Sick Kids
  - Cincinnati Children’s
  - Germany
- Prospective RCT funded by Allergan
  - Single dose 75 IU vs 150 vs placebo
  - Results Pending

3. Treat Co-Morbidities

- Sleep (67%)
- Anxiety (85%)
- Fibromyalgia and muscle pain (40%)
- Chronic abdominal pain (40%)
- Dizziness and lightheadedness (60%)

3. Comorbidities: Sleep, School

- Two most common triggers are Stress and Sleep
  - Migraines frequent during school year
    - Sept is most common month to see onset of NDPH
    - Use the term “busy” rather than stress
  - Lack of sleep
    - Teenagers tend to be “night owls”
    - Challenged by early school start time
    - Bidirectional effect (more HA, worse sleep)
    - 9.5 hours per night
    - “do you feel rested in the morning”
- Rx: melatonin, CBT, turn off electronics
3. Comorbidities: Anxiety

- 50% in Adults with Episodic Migraine
- 85% in Teens with Chronic Headache
- Generalized anxiety
- Social anxiety  
  - Can interfere with school attendance
- Panic attacks
- Anticipatory anxiety of getting HA
- Rx: CBT can be very effective  
  - SSRI if needed

3. Comorbidities: Dizzy and Lightheaded

- Migrainous Vertigo  
  - Worse during migraine attack
- Orthostatic Intolerance  
  - Position dependent
  - Responds to fluids, salt, exercise
- Chronic Subjective Dizziness  
  - Position independent
  - Feeling “like on a boat”  
  - Responds to CBT, SSRIs or SNRIs

Other Therapy Options

- Nerve Blocks
- Cefaly Antimigraine Device
- eNeura TMS
- Behavioral Treatment Programs
4. Nerve Blocks-Post Traumatic Headache

- Pediatric post-traumatic headaches and peripheral nerve blocks of the scalp. Dubrowski AS, Friedman D, Kociłowicz H. Headache 2014 54:878
  - Retrospective case series of 28 patients with PTH. The therapeutic effect was good (>24 pain relief or ask for a repeat block) in 93% of patients with 71% reporting immediate complete relief of their headaches.

  - 15 patients received occipital nerve block for CPTH. Follow-up in 14 patients at 5 months postinjury, 64% reported long-term response to the occipital nerve blocks.

5. Stimulation-Cefaly Anti-Migraine Device

- CEFALY MIGRAINE MIGRAINE PREVENTION
  - Cefaly is the perfect solution for more than 500,000 suffers worldwide, improving quality of life to be markedly improved.
  - Clinical studies have demonstrated its excellent complete safety. Cefaly has been approved under prescription.
  - Cefaly is positioned on the forehead using a precise intensity, which acts in order to prevent migraine attacks.

- eNeura Transcranial Magnetic Stimulator
6. Behavioral Approaches

Cognitive Behavioral Therapy

- Amitriptyline plus Cognitive Behavioral Therapy (CBT).
- Powers et al, JAMA 2013
  - Aged 10 to 17 with chronic migraine with a baseline of 21 headache days/month.
  - Amitriptyline plus CBT reduced by 12 headache days per month.
  - Amitriptyline plus headache education reduced 7 headache days per month.

Pain Rehab Programs - 3 weeks

- Involves coordinated intervention among at least 3 disciplines usually pediatrics, anesthesia, psychology, physical medicine working in an integrated way
- An inpatient or day hospital setting
- 1-3 weeks in duration
  - Goals:
    - Improve functional status
    - Improve physical conditioning, strength, flexibility
    - Improve psychological well-being
    - Return to school full-time at the end of the 3-week program
    - Taper and discontinue the use of opioids
    - Educate the patient's parent(s) in how to effectively parent a chronically ill child
Therapies that don’t work- Daith Piercing

• From the Hebrew word Daath (or Daith), meaning "intelligence," or "knowledge," and was co-invented by famous piercer Erik Dakota and a female client, who drew a connection between a conduit placed in the ear and the filtering of wisdom.
Therapies that don’t work (?): Surgery

• Migraine Trigger Site Surgery
  • Plastic surgeon Guyuron
• Decompressive surgery of greater occipital nerve, supraorbital nerve
• Single retrospective study of 14 adolescents, after a 3 year followup, then reduction of monthly migraine days from 25 days to 5 days per month Plast Reconstr Surg 135:1700, 2015

Future Therapies: CGRP

• 37 amino acid peptide/Neurotransmitter associated with pain
• Initial studies used small molecule (talcagepant)
• Anti-CGRP antibodies being developed
• Positive early study in adults
  • Not 100% effective
  • $$$$

Conclusion

• Chronic headache cause significant pain and functional disability
• There is a not a single treatment to help everyone
• Pharmacology helps, but often a more holistic approach is needed