OBJECTIVES

- Discuss types, etiology, and characteristics of headaches
- Define red flags
- Discuss evaluation methods
- Treatment methods

HISTORY OF HEADACHE

- First documented headache 1200 BC
- Most common presenting symptom for medical treatment
- $14 Billion cost per year
- $1 Billion each year on unnecessary brain imaging of primary headache disorders

SUBTYPES OF HEADACHE

PRIMARY HEADACHES

TENSION TYPE (TTH)

- Pathophysiology: Precise mechanisms are uncertain
  - Likely environmental factors
    - Hunger
    - Lack of sleep
    - Stress
    - Overexertion
    - Depression and anxiety
    - Dehydration
    - Possible genetic elements
    - Consider medication overuse
- Most prevalent headache in the general population
- Bilateral, dull, pressing quality
- Infrequent episodes TTH
  - < one day per month
  - Frequent TTH
  - 1-14 episodes per month
  - Chronic TTH
  - >15 episodes per month

(Rizzoli & Mullally, 2018)

(Bajway & Wootton, 2019)
MIGRAINE

Pathophysiology:
- Cortical spreading depression
- Self-propagating wave of neuronal and glial depolarization across the cerebral cortex

Epidemiology:
- Affects 12% of the general population
- 7th leading cause of disability worldwide
- Gender: Women > Men
- Association with PFO and migraine with aura

Precipitating Factors
- Stress
- Menses
- Weather changes
- Diet changes
- Odor/Smoke
- Sleep changes

Prodrome
- 77% of people experience
- E.g.: Yawning, euphoria, depression, food cravings, constipation
- Positive or negative aura (25% of migraines)
  - Visual (negative or positive)
  - Somatic
  - Motor
  - Language

Characteristics
- Unilateral, pulsatile
- Nausea, vomiting
- Photophobia, phonophobia
- Cutaneous allodynia

Postdrome
- Drained, exhausted
- Mild elation or euphoria

Diagnostic criteria (must have 5 attacks involving)
- Headache lasting 4-72 hours
- Headache with:
  - Unilateral
  - Pulsating
  - Moderate-severe pain
  - Aggravated by routine physical activity

- Headache with:
  - Nausea, vomiting, both
  - Photophobia, phonophobia

- Not better accounted by another diagnosis (e.g., trauma, SAH, etc.)

CLUSTER

Pathophysiology
- Hypothalamic elevation with secondary activation of trigeminal-autonomic reflex

Epidemiology
- Lifetime prevalence (25 per 100,000)
- Males > Females
- 15% have previous head injury (not causative)
- Possible inherited disorder
- 65% of affected smokers exposed to smoke

Characteristics
- Severe orbital, supraorbital, or temporal pain with restlessness/agitation (contrast to migraineurs)
- Strictly unilateral (but can shift sides with different attacks)
- Up to 8 times daily
- Attacks last 15-180 minutes with a cluster period of 4-12 weeks
TRIGEMINAL NEURALGIA

- Pathophysiology
  - Compression of the trigeminal nerve root, usually within a few millimeters of entry into the pons
  - Epileptology
    - Female > Males
    - 4-12 per 100,000
- Precipitating Factors
  - Cotonaua syndrome
  - Characteristics
    - Paroxysms seconds to minutes
    - Unilateral shock like pain
    - V2/V3 pattern

SECONDARY HEADACHES

- Medication Overuse
  - Simple analgesics (15 or more days/month)
  - NSAIDs
  - Combination pain relievers (10 or more days/month)
  - Caffeine, ASA, acetaminophen (Excedrin, Mido)
  - Prescriptions medications (10 or more days/month)
  - Triptans/Ergotamines
  - Opioids (10 or more days/month)

TRAUMATIC (MILD TBI)

- 2.5 million ER visits annually in the US
- Three TBIs occur every minute
- Highest rates 0-4yrs, 15-24, >75
- Males > Females
- Falls most common cause
- GCS 13-15

MILD TBI PATHOPHYSIOLOGY

- Induces a neurologic alteration
- Neurochemical changes occur
- Reduction of blood flow and diminished glucose utilization occurs
- Axonal injury can occur
- Average recovery 7-10 days

MILD TBI SYMPTOMS

- Somatic
  - Headache
  - Nausea
  - Photophobia
  - Tinnitus
  - Difficulty focusing vision
  - Postural lightheadedness
  - Anosmia
  - Fatigue
- Cognitive
  - “Brain fog”
  - Difficulty concentrating
  - Word finding difficulty
  - Behavioral
  - Mood liability
  - Irritability
  - Hypersomnia
  - Insomnia
  - Anxiety/Depression
  - Personality changes
OMINOUS – SPONTANEOUS SUBARACHNOID HEMORRHAGE

- Pathophysiology
  - Aneurysmal vs non-aneurysmal
- Epidemiology
  - Increase with age, peaks seventh decade (mean 55yrs)
  - 6-8% of all strokes
  - Overall mortality 25%; 10-15% pre-hospital
  - Women > Men
  - 20-25% of DCAs will be negative

OMINOUS – MASS LESION

- Brain mass
  - Subdural hematoma
  - Epidural hematoma
  - Intracranial hemorrhage

RED FLAGS

- S: systemic symptoms; secondary risk factors
- N: Neurologic symptoms/signs
- O: Onset
  - Older
  - Positional
- P: Positional, Prior headache, Papilledema

NOW WHAT?

HOW TO EVALUATE THE ACUTE HEADACHE

- History and Physical
  - Onset
  - Aura/Prodrome
  - Headaches per month
  - Quality, site, radiation of pain
  - Precipitating and relieving factors
  - Current medications
  - Changes in vision
  - Trauma
  - Changes in weight, sleep, exercise, diet
  - Birth control
  - Vitals
  - Palpate the head, neck, shoulder regions
  - Examine neck and spine muscles
  - Lines of bruit at neck, eyes, and head
  - GCS
  - Cranial nerve exam
  - Symmetrical motor, reflex, cerebellar, and sensory tests

IMAGING NON TRAUMATIC HEADACHES

- CT or MRI
  - Not warranted for patients with a stable migraine pattern and normal neurologic exam
  - Consider for atypical migraine symptoms
LUMBAR PUNCTURE

- Indicated with suspicion of subarachnoid hemorrhage in the setting of a negative CTH
- Suspect infectious/inflammatory/neoplastic etiology

<table>
<thead>
<tr>
<th>CSF Fluid</th>
<th>Normal</th>
<th>Viral</th>
<th>Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Clear</td>
<td>Clear</td>
<td>Turbid/Cloudy</td>
</tr>
<tr>
<td>Opening Pressure</td>
<td>5-20 mm Hg</td>
<td>Normal or 25-30 mm Hg</td>
<td>&gt;30 mm Hg</td>
</tr>
<tr>
<td>WBCs</td>
<td>&lt;5 (lymphocytes)</td>
<td>&lt;1000</td>
<td>Normal</td>
</tr>
<tr>
<td>Glucose</td>
<td>2.5-4.4 mmol/L</td>
<td>Normal</td>
<td>&lt;2 mmol/L</td>
</tr>
<tr>
<td>Protein</td>
<td>0.15-0.45 g/L</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Gram Stain</td>
<td>Negative</td>
<td>Negative</td>
<td>60-80% positive</td>
</tr>
</tbody>
</table>

(Mild Puncture Golden Rules, 2014; Rizzoli & Mullally, 2018)

MILD TBI EVALUATION

- Cervical spine must be cleared
- TBI with + LOC must be seen in ER
- TBI with seizure must be seen in ER
- Observe in ER for several hours, if exam WNL and no worrisome symptoms may discharge with a responsible person and adequate instructions of when to return and follow up with PCP
- No data to support waking patient up frequently at night
- Imaging is controversial

(Mild TBI Golden Rules, 2014)

INDICATIONS FOR CTH IN MILD TBI

- Abnormal neuro exam
- Progressively worsening headache
- More than one episode of vomiting
- Loss of consciousness over one minute
- Prolonged retrograde amnesia
- Seizure
- Skull fracture
- Age > 60
- Intoxication
- Coagulopathy
- GCS of < 12 2 hours after injury

(Mild TBI Evaluation, 2014)

MILD TBI WORKUP - SAC

- Orientation (month, date, day of week, year, time)
- Immediate memory (recall of 3 words in 2 separate trials)
- Neurologic:
  - Loss of consciousness (duration, duration)
  - Amnesia (either retrograde or anterograde) (recollection of events pre- and post-injury)
  - Sensation
  - Coordination
  - Strength
  - Gait
  - Sensation
  - Exertional maneuvers (jumping jacks, sit-ups)
  - Delayed recall (5 words)

(Mild TBI Evaluation, 2014)

PHARMACOTHERAPY TREATMENT
TENSION HEADACHE TREATMENT

- Acetaminophen
- Ibuprofen
- Naproxen
- Chloral Hydrate
- IM ketorolac, parenteral chlorpromazine +/- diphenhydramine
- Meperidine +/- diphenhydramine

(Peters, 2018)

MIGRAINE TREATMENT

- NSAIDs
- Ketorolac IV or IM
- Antidiopaminergics
  - Provide headache relief PLUS nausea/vomiting
- Tricyclics
- Sumatriptan SC and IN
- Zolmitriptan IN
- Dexamethasone single dose 10mg IV or 25mg PO
- Other agents: magnesium, ergotamines

(Peters, 2018)

TRIPTANS

- Serotonin 5-HT receptor agonists
- Leads to vasoconstriction, decrease nociceptive transmission in the trigeminal pathway, and inhibit vasoactive peptide release
- Contraindicated in pregnancy, history of MI, ischemic stroke, Prinzmetal angina, and ergotamine use within 24hrs
- Side effects: non-cardiac chest pain, flushing, paresthesias, worsening headache
- Up to 2/3 will report headache recurrence within 24hrs

(Peters, 2018)

BUT WHAT ABOUT OPIOIDS

- The role of opioids in headache is limited
- Can lead to rebound headaches, chronic migraine
- Increased length of stay
- Increased return ER visits
- Increased use of abortive agents

(Young, Sherman, Bradford, & Finkelstein, 2017)

CLUSTER HEADACHE TREATMENT

- First line:
  - Inhaled oxygen 100% x 15 minutes
  - Sumatriptan SC or IN
  - Zolmitriptan IN
- Preventive:
  - Suboccipital steroid injection
  - Melatonin
  - Verapamil

(Chambers, Becker & Pringsheim, 2018; Peters, 2018)

TRIGEMINAL NEURALGIA TREATMENT

- Pharmacological treatment:
  - Carbamazepine/OXC, oxcarbazepine – first line
  - Dibucaine
  - Baclofen
- Surgical options
  - Percutaneous procedures at the Gasserian ganglion, percutaneous neurolysis
  - Microvascular decompression
MILD TBI TREATMENT

- **Medical Management**
  - Early physical activity
  - 1-2 days of rest then activity as tolerated
  - 3-5 days of scaled down cognitive activity then activity as tolerated

- **Pharmaceutical Management**
  - Use a stepwise approach
  - 1st choice: simple analgesics such as NSAIDs/Acetaminophen
  - If failure, use Triptans for headaches with migraine features
  - Metoclopramide and Prochlorperazine for HA with nausea
  - Avoid narcotics and butalbital compounds
  - If HA last >2 weeks, try TCA
  - If TCA's fail, try Propranolol
  - Topiramate can be used
  - For refractory HA's, botulinum toxin-A injections

(West & Marion, 2014; Mittenberg, Canyock, Condit, & Patton, 2001)

MILD TBI RETURN TO ACTIVITY

- **Grade I**
  - First concussion return when asymptomatic
  - Second concussion: Return 2 weeks, if asymptomatic
  - Third concussion: terminate season

- **Grade II**
  - First concussion: Return 1 week if asymptomatic
  - Second concussion: Wait 1 month, return if asymptomatic; consider terminating season
  - Third concussion: Terminate season, considering return next year

- **Grade III**
  - First concussion: Wait 1 month, return if asymptomatic
  - Second concussion: Terminate season, consider returning next year

(West & Marion, 2014)

MILD TBI EDUCATION

- Provide written, clear instructions for the patient and family
- What about school?
- Provide time for cognitive rest
- Avoid provocation of symptoms
  - Cell phones, computer, TV

- Return to ER with:
  - Repeated vomiting
  - Worsening headache
  - Memory loss
  - Confusion
  - Focal neurological deficits
  - Abnormal behavior
  - Seizures

(Special Populations: Pregnancy and Pediatrics)

SPECIAL POPULATIONS

- **Pregnancy and Pediatrics**

PREGNANCY

- Most primary headaches improve during pregnancy
- Migraine is associated with increased risk of hypertensive disorders of pregnancy (not preeclampsia)
- Frequent pregnancy headaches should be evaluated for depressive disorders

(MacGregor, 2012)

PREGNANCY

- Postpartum Headache
  - Common in the first week after delivery
  - Affects 30-40% women
  - Risk factors:
    - 1st pregnancy
    - Previous headache history
    - Multiparity
    - Shorter pushing period
    - Irregular menstrual cycle

- Lactation Headache
  - Protective effect
  - Stable low levels of estrogen

(MacGregor, 2012)
PREGNANCY

- Pregnancy and 6 weeks postpartum are prothrombotic states
- Pre-eclampsia must be ruled in or out in EVERY pregnant woman over 20 weeks gestation with new onset migraine
- MRI without contrast is recommended (MacGregor, 2012; Rizzoli & Mullally, 2018)

PREGNANCY MANAGEMENT - MIGRAINE

- Non-pharmacologic
  - Avoid triggers
    - Preventive
      - CoQ10 300mg daily
      - Magnesium supplements
      - ASA 81mg
- Pharmacologic
  - Abortive
    - Acetaminophen (analgesic of choice during pregnancy)
    - Sumatriptan
    - Antiemetics – Prochlorperazine 10mg IV
    - Magnesium 1g IV over 15 minutes
    - Prednisolone (60mg/d x2 days, 40mg/d x2 days, 20mg/d x2 days)
  - Prophylaxis
    - Propranolol – lowest effective dose
    - Amitriptyline
(MacGregor, 2012)

PREGNANCY HEADACHE MANAGEMENT

- Tension type
  - Acetaminophen (analgesic of choice during pregnancy)
  - ASA and NSAIDs in first and second trimesters; avoid late term
- Cluster
  - Oxygen
  - Sumatriptan SC or IN
  - Verapamil
  - Prednisone
  - Gabapentin – second line option
(MacGregor, 2012)

PEDIATRIC HEADACHE

- More than 90 percent of adolescents report having had a headache
- Before 12 years of age, the prevalence of headaches is similar among boys and girls (approximately 10 percent)
- After age 12 years, the prevalence is higher in girls than boys (36% vs 20% respectively)
(Bonthius, et al., 2018)

PEDIATRIC HEADACHE

- Presentation
  - Younger children may react by crying, rocking, or hiding
  - Chronic pain in older children may be associated with anxiety, depression, and behavioral problems
  - Pain may affect the child’s ability to eat, sleep, or play
  - Older children are better able to perceive, localize, and remember pain
(Bonthius, et al., 2018)

PEDIATRIC HEADACHE

- H&P
  - Obtain history from child, then confirm with adult
  - Exam (SNOOP)
    - TTH
    - Migraine
    - Infection
    - Tumor
    - Intracranial hemorrhage
    - Carotid revascularization
    - Hypertension
    - Thyrotoxicosis
    - Tension-type
    - Diagnosis: Acute episodic headache (Cluster headache)
(Bonthius, et al., 2018)
**PEDIATRIC MIGRAINE TREATMENT**

- Ibuprofen 10 mg/kg per dose
- Acetaminophen 15 mg/kg per dose
- Promethazine 0.31-0.36 mg/kg per dose
- Propranolol 15 mg/kg to 30 mg/kg
- Ketanserin 0.05 mg/kg IV
- Metoprolol
- Dihydroergotamine (DHE) 1 mg over 3 minutes
- Ibuprofen 25 mg (≤30-50 kg)
- Promethazine 25 mg (<30-50 kg)

(Fromhau et al., 2018)

**PEDIATRIC TTH TREATMENT**

- Abstinence
- Amitriptyline
- NSAIDs
- Avoid: ergotamine, caffeine, butalbital, and codeine

(O’Brien, Patterson, & Swanson, 2018)

**QUESTIONS**

- Katie Archer – katherly@ulh.org
- Michelle Bailey – michelgi@ulh.org

**REFERENCES**