Migraine Headache
adult/pediatric update

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Migraine objectives

• Approach to migraine with an emphasis on pediatrics
• Practical approach to diagnosis and treatment
• Use of medications both FDA and non-FDA approved
• A few sample cases
Migraine: pathophysiology 1

- Locus Ceruleus: 5 HT (serotonin).
  - Starts to malfunction
  - Topographically maps to cortex and starts “spreading depression”
- Change in cortex starts feedback pathway to meningeal vessels
  - Vessel inflammation
  - Vessel dilation
  - Trigeminal activation / sensitization

Migraine: pathophysiology 2

- The longer the HA, more activation of secondary and tertiary neurons in the trigeminal system
- Response to meds changes with longer lasting HA or status migrainoses
Migraine triggers

- Limbic: mood, hormone, sleep deprivation
- External: trigeminal stimulation in nasopharynx, etc: allergies, perfumes, sinusitis, etc
- Gut: foods, preservatives, neuropeptides?, vagal input?
- Dehydration, inadequate nutrition (kids that skip breakfast and do not drink fluids to avoid school bathrooms)

Migraine peds history 1

- Description of time course of events where possible
- HA spreads, moves, pounding like a heartbeat
- Aura, ask specifically about lights like fireflies
- Quantity and quality of sleep
- Meals, do they eat or skip, is urine clear or yellow
- Timing of HA in day and week, relation to classes/school
Migraine peds history 2

- School: friends, performance, bullying, social activities
- Mood: anxiety, OCD, depression
- Family life, stressors
- Consider gender preference / identity
- Menstrual / Pubertal status
- Family history of migraine

Migraine aura

- The aura is the cortical equivalent of the SLOW spreading depression.
  - Will not respect vascular territories
  - Can move from cortex to adjacent cortex
  - Will tend to build over 10 – 20 minutes then wane when HA starts
  - About 20% of migraineurs get an aura, the rest do not
  - Less common is aura without HA (peak at 30s and again at 65)
Migraine: hallmarks

- Normal development and exam
- Can be unilateral or bilateral, may shift
- Builds up over time, NOT abrupt onset
- When severe may have: photophobia, sonophobia, nausea, vomiting, throbbing
- Sleep tends to help

Migraine: Imaging

- If typical history, normal exam and response to meds then imaging is NOT INDICATED
- Explosive onset, abnormal exam then IMAGE.
Migraine: red flags

- Abrupt onset, “thunderclap HA”
- Increasing clumsiness (ataxia), diplopia, persistent neurologic findings (papilledema, myelopathy, focal abnormalities)
- Failure to respond to usual meds, atypical features
- Postural HA, HA waking up out of sleep (consider cluster)

Migraine complicators (adult > peds)

- Caffeine withdrawal HA
- Analgesic rebound HA
- Drug seeking behavior
- Mood disorders
- Sleep disorders
Migraine complicators (peds)

- Caffeine withdrawal HA
- Anxiety, bullying, school performance issues, OCD
- Malingering, conversion disorders
- Gender / sexual identity issues around puberty
- Abuse

Migraine: clues to other things

- Ptosis, lacrimation, rhinorrhea, HA are shorter, HA occur out of REM: Cluster of mixed cluster / migraine
- Pain is supraorbital on one side and radiates to back of head. Neck a little stiff. Focal pain at occipital notch. Percussing induces typical HA pain: Occipital neuralgia
- HA with exertion, occasional vertigo or diplopia: Chiari I
- HA waking out of sleep, clumsiness: PNET: primitive neuroectodermal tumors (posterior fossae)
- Thunderclap HA: aneurysm or AVM
Migraine: Peds – Cyclic vomiting

- Young child develops intractable vomiting, often for 2 -3 days, may be hospitalized for dehydration.
- Usually blamed on something viral the first time or two
- Tends to recur every 2 – 4 months
- Will subside as they get older and then will get more typical migraine
- Check ammonia once during an episode

Migraine: Peds – abdominal migraine

- Typically feeling of stomach moving up or down, may throw up
- May be followed by HA but often not at the onset of the spells
- Probably something related to cyclic vomiting
Migraine: Peds – Basilar migraine

- Aura will have vertigo, nausea, may be clumsy / ataxic?. Will then develop HA. Diplopia possible but not common at all.
- Tends to associate with menses
- Responds to usual migraine meds

Migraine: Peds – hemiplegic migraine

- Familial form is autosomal dominant mutation: 3 loci known
  - FHM1: 50% P/Q CACNA1A (calcium channel)
  - FHM2: < 25% Na/K – ATPase gene ATP 1A2
  - FHM3: rare SCN1A (sodium channel)
  - Other? PRRT2 protein associated with exocytosis complex, SLC4A4 (HaHCO3 cotransporter?)
- Presents age 10 - 25
Migraine: Peds – hemiplegic FHM1

- Attacks of hemiplegia can persist for days to weeks
- MRI normal
- May have seizures as part of this
- Alternating hemiplegia of childhood
- Association with episodic or progressive ataxia
- Minor head trauma can precipitate

Migraine: peds typical

- Young child with infrequent HA, often when ill but start to occur when not clearly sick with anything
- “looks droopy”, not as active, wants to sit or lay down rather than run around
- Resolves with sleep
- Starts to increase in frequency, some more severe, often escalates a few years before puberty
Migraine: peds HX

• Where does it hurt?
• Does it feel like your heart going thump thump when it is bad?
• Does it start small and get bigger?
• If you puke is it better?
• Do you ever see blinky lights like fireflies?

Migraine: teen case L.R.

• 15 y.o. male. Onset 4 months ago. Typ HA starts left supraorbital, builds up and spreads to entire head. Builds over 5 minutes, throbbing.
• Accompaniment: hears things like buzzing and truck horns when severe, pulsing in ipsilateral eye, no ptosis of lacrimation. No nausea. Often starts in vocal class when standing and gets light headed with it.
Migraine: teen case L.R., #2

- 3 per week, primarily on weekdays
- Bed 2200, fall asleep 2400 or later, OOB 0700, weekends sleep all day if allowed. Home from school and sleep 1600 to 2000
- School: not focusing, vyvanse not helping, likes school, people are an issue, likes girls. Gets breakfast 3 -4 x a week, drinks milk most days, eats at school, urine is clear. Increased fluids and salt and no better. Notices pulse speeds up when he gets up.

Migraine: teen case L.R. #3

- Neuro exam normal
- Not hypermobile (Ehler Danlos)
- Mood seems fine, not anxious, no OCD features
- 110/80 Pulse 96. 71.5 inches tall, 135 lb.
- WHAT DATA or TEST do you want?
Migraine: teen case L.R. #4

• Flat: 100/60 (40) 66
• Sit 110/80 (30) 96
• Stand 98/86 (12) 120
• Stand 3’ 108/98 (10) 132
• What is the possible Diagnosis?

Migraine: teen case L.R. #5  P.O.T.S.
Postural orthostatic tachyc. Synd.

• Excessive tachycardia in response to postural change with impaired ventricular filling and orthostasis. Should to tilt table to confirm
• Treated with fludrocortisone 0.1 mg 2 pills daily AND
• Metoprolol 12.5 mg daily
Migraine: teen case L.R. #6

- On treatment pulse changes now:
  - Flat: 48, Sit: 78, Stand: 90
  - Postural HA resolved. If forgets meds then gets palpitations and more rapid heart beat when standing in voice.
  - Still some tachycardia when on vyvanse with meds
  - Metoprolol bumped to 25 mg

Migraine approach to treatment

- HA frequency 0 – 2 per week
  - Fix sleep, fluids, nutrition.
  - Consider triggers
  - Trial of abortive meds: NSAIs + caffeine, triptans
  - Rest, ice, sleep
  - Zofran, Benadryl if needed
Migraine approach to treatment 2

- HA frequency 2 – 3 or more per week
  - Fix sleep, fluids, nutrition, consider triggers, e.t.c.
  - Consider prophylactic meds to reduce frequency of HA
  - Limit abortive meds to avoid rebound HA
  - If abortive meds fail, retry once HA frequency is reduced.
  - Pick med, start small, build it up until works, not tolerated or max dose

Migraine Treatment: prophylaxis

- Peds: FDA approved med is cyproheptadine
- Adults: FDA approved med: propranolol, valproate, topiramate, amitriptyline, riboflavin
- Non-approved meds: gabapentin, verapamil, zonisamide, venlafaxine, other tricyclics and beta blockers
- Same meds work for everyone. Start small and increase every 1 – 2 weeks until works, side effect or max dose then try the next one
Migraine treatment 2

• Cyproheptadine 4 mg or 2 mg/5 ml. 2 – 4 mg in PM. Sometimes up to 6 or 8 mg in PM
• Propranolol 10, 20, 40, 60, ER forms, 40mg/5 ml. Start 5 - 10 mg BID (kids) and titrate max 16 mg/kg/day. Adults ER 60 or 80 daily and titrate
• Others follow epocrates dosing guidelines

Migraine treatment 3

• Topiramate 15, 25 mg sprinkles, 25, 50, 100, 200 tabs
• Weight negative, tingling, word finding, loss of sweating, mood
  – <11 kg start 15 – 25 mg daily and increase weekly, consider levels if not responding as may metabolize or not be taking
  – Ex: 15 QD x 1 wk, 15 Bid x 1wk, 15/30 Bid x 1 wk then 30 BID
  – > 25 kg start 25 mg daily and increase weekly until responds, max 300 – 400/day, typically much less then that in migraine
Migraine treatment 4

- Amitriptyline 10, 25, 50, 100, 125 and 150 mg dose. Crush small pill in applesauce.
- Nortriptyline 10/5 ml, 10, 25, 50, 75 (use ½ dose of amitrip)
- Consider baseline ECG (QT prolonging) and repeat if > 50 mg
- Weight gain, constipation, dry mouth, mood, sedation

Migraine treatment 5

- Valproate (Depakote) 125 mg sprinkles, 250/5 ml, ER 250, 500
- < age 5 can bump ammonia and need Carnitine supplement
- 5% autism risk and neural tube defects in pregnancy, weight gain
- If teen girl should be on birth control
- Sprinkles better tolerated then liquid in children
Migraine treatment 6

- Riboflavin 100 mg 2 pills BID x 3 months. HAVE to take it for 3 months to see if works
- DATHE piercing?
- Acupuncture and Chiropractic
- BOTOX: need at least 15 days HA / month and 4 hrs per day of HA and fail multiple prophylactic agents at adequate dose. Adult only

Migraine treatment 7 - peds

- Must drink enough fluids to have to pee at school
- Urine should be relatively clear not dark yellow
- Must eat breakfast
- Ask if eating school lunch or throwing it out
- Protect sleep
Migraine treatment: Abortive meds

- DHE: where triptans come from. Is the most effective med in migraine status, lots of nausea
- Triptans
- Nonsteroidals
- Caffeine
- Steroids

Migraine treatment DHE protocol

- Reglan 10 mg or Zofran 4 iv with Benadryl 50 mg and ketorolac (Toradol) 30 mg i.v.
- DHE 0.5 mg iv. If no nausea and not better in 30 min give another 0.5 mg (or do 0.25 x 2 at 30 min) and subsequent doses will be 1.0 mg
- Repeat the reglan / DHE every 8 hours up to 5 days.
- When HA free for second dose stop.
Migraine treatment Kanecki cocktail

- Reglan 10 mg, Zofran 4 mg, Benadryl 50 mg and ketorolac (toraldol) 30 mg iv
- NS or ½ NS 1 liter i.v.
- Valproate (Depakon) 1000 mg iv (or 15 mg/kg if small/younger)
- May repeat NS 500 – 1000 ml iv
- If not better methylprednisolone 40 mg iv

Migraine treatment Rapid Reglan

- Reglan 20 mg with Benadryl 50 mg i.v. wait 30 min
- Reglan 20 mg with Benadryl 50 mg i.v. wait 30 min
- Reglan 20 mg with Benadryl 50 mg i.v. wait 30 min
- Reglan 20 mg with Benadryl 50 mg i.v. then home
- Can stop sooner if doing better
Migraine treatment triptans

- Dose at onset, repeat x 1 in 2 hours if not improving.
- If no response or worse can move to injectable sumatriptan
- Off label is to use triptan every 8 hours like DHE protocol up to 3 – 5 days
- Sumatriptan (IMITREX) and rizatriptan (Maxalt) are generic

Migraine treatment triptans 2

- Pill: all triptans
- Oral dissolving: Maxalt 5, 10 mg (mint), Zomig 2.5, 5 mg (orange)
- Nasal spray: Imitrex 5, 20 mg (sumatriptan), Zomig 2.5, 5 mg
- Injectable: Imitrex (sumatriptan). 4 and 6 mg
Migraine treatment triptans Peds

• US: age 12 adult 100 mg dose of sumatriptan. SC 3 – 6 mg approved age 6 and up in US. In Europe oral data to age 8
• Off label: if need to use, start with the smallest dose. If have to repeat each time, bump the size of the dose
• If it never works, might not be migraine.

Migraine: abortive in Peds

• Ibuprofen 10 mg/kg + caffeine (pop). Caffeine helps and helps prod the kid to remember to go ask for the med.
• If they puke with HA, ask them if they would rather not. Rehearse what they do in class if HA starts: Raise hand and go get meds
• Adding a triptan an option as an And/Or choice
Migraine Case #2  D.C.  HA and spells

- 14.5 y.o. male with HA since age 9. HA now about daily, sometimes is HA free. Forehead into temples, pressure that can be pounding. Can build up slowly or start and stay at the same level. No photophobia, sonophobia, some nausea with vomiting. May see dots during the HA. Ibuprofen tends to help. Coughing and sneezing intensifies HA.

Migraine Case #2  D.C.  HA and spells

- Spell: intense feeling about some memory that happened before then a very foul smell no one else smells. When severe he can move but difficult. Usually has to sit down or stop and stay still. If he moved the felings were stronger. Duration 1 – 2 minutes. Tired after the spell, is able to hear people but sometimes comprehension impaired. No automatisms. Started a few months ago. Unrelated to HA. EXAM normal. WHAT TEST DO YOU WANT?
Migraine Case #2  D.C.  HA and spells

- MRI: Giant aneurysm MCA with mass on temporal lobe.
- EEG: seizures.
- TREATMENT: Tx emergently to UIHC after imaging. Multiple endovascular procedures then surgical resection of aneurysm. Complicated by small stroke L basal ganglia (RUE). Seizure free on keppra since surgery. HA are less severe and shorter.
Migraine Case #3  R.T.  HA +

- 37 y.o. male had first spell with visual scotoma left field, Right sided numbness, difficulty with language / confusion followed by HA. Evolved over 90 minutes and HA persisted most of day then fine.
- Next event one year later, started with visual phenomena, weak on right side then impaired language. Became confused, restless and agitated if not allowed to wander. HA and vomiting. Presented to ER in Status Epilepticus. WHAT TESTS?
Migraine Case #3  R.T.  HA +

- MRI brain with and without normal
- EEG: diffuse slowing after status breaks with cerebyx, still confused
- CSF: WBC 55 lymphs, protein normal, no RBC, HSV, viral tests negative.
- Restraints for 10 days then slowly cleared.

Migraine Case #3  R.T.  HA +

- Maintained on DPH. If levels are good, spells tend to be shorter. Spells sometimes triggered by illness. At start of spell takes an oral load of DPH, Benadryl and Zofran and imitrex for HA. Wife has FMLA excuse and just watches him at home with the doors locked. He will be confused and wander a lot for 2 – 5 days then clear. If put in hospital gets agitated.
Migraine Case #3, R.T. - HANDL syndrome

- HA, neurologic deficits and CSF lymphocytosis
- Unknown etiology, in some ways similar to ADFHM
- Prolonged spell with confusion, restlessness, HA, impaired cognition, seizures (clinical and subclinical) takes 1 – 2 weeks to subside.