Introduction to the Emergency Department Evaluation of Headache

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Disclosures

• No financial disclosures
Objectives

1. Introduction of HA in the ED: Description of the patient population who presents to the ED
   – Epidemiology, comorbidities, discharge statistics

2. Evaluation of HA patient in the ED
ED use for headache

• In the ED:
  – Headache is fifth most common complaint
  – Third most common in women 15-64

• Migraine accounts for the majority of the five million HA visits/yr to US EDs
  Mean cost of an ED visit for migraine was $775 in the US.

• Total national annual costs for ED visits was $700 million.

Loder et al 2013, Headache, Lucado J et al 2011 HCUP statistical briefs

Source: Headache: The Journal of Head & Face Pain, Jan 2015, Vol. 55 Issue 1, p21-34, 14p
American Migraine Prevalence and Prevention (AMPP) Study

• A small proportion of the migraine patient population accounts for almost half of ED visits for migraine.

• Patients who visited the ED were more likely to have depression and to be of lower socio-economic status.

Friedman B. Frequency of emergency department or urgent care use: Results from the American migraine prevalence and prevention study. *Headache*. 2007;47:745-6
In addition, we know the following...

- Up to 50% of migraine patients who use the ED have taken no medication before coming to the ED, including acetaminophen. ¹
- A French study found that patients went to the ED for treatment because of a severe attack (49%) or because of ineffective treatment (20%). ²

Study of the Characteristics of Patients Presenting to the ED

- Study by Minen, Loder and Friedman
- Prospectively interviewed 309 consecutive patients presenting to urban ED for HA
- 100 closed-ended questions re sociodemographics, headache history, and current HA attack
- We performed descriptive analyses on patients fulfilling ICHD2 migraine criteria.
- 186 patients met migraine criteria

Results of the Study=Missed Opportunities!

- 77% (95%CI: 71, 83%) had a primary care provider (PCP)
- Approximately 90% had medical insurance
- 83% had drug coverage
- 55% (95% CI: 48, 63%) took abortive medication for migraine on the day of the ED visit
- 49% (95%CI: 42, 57%) screened positive for depression
Conclusions of Study

• Most migraineurs presenting to the ED have a PCP and healthcare insurance.
• ED visits result from an inability to access care elsewhere and because patients consider pain to be an emergent condition.
• Missed opportunities for diagnosis and treatment likely contribute to ED visits.
Influence of Psychiatric Comorbidities in Migraineurs in the Emergency Department

- Cross sectional analysis of 2,872 pts who visited the MGH ED over a 10-years + principal dx of migraine, data on healthcare utilization+psychiatric comorbidities assessed

Influence of Psychiatric Comorbidities in Migraineurs in the Emergency Department

• Migraineurs w/ psychiatric comorbidity:
  – 3x more ED visits, 6x more inpatient hospital stays and 4x more outpatient visits
  – More likely to have a CT of the head [RR 1.42 (95% CI=1.28, 1.56, P<0.001)] or a MRI of the brain [RR 1.53 (95% CI=1.33, 1.76, P<0.001)]
  – Received narcotics in the ED more than migraineurs without psychiatric comorbidities (p<0.0001)

Discharge from the ED

• The d/c stats reveal that quality of care in ED=suboptimal
• One study (N=219) found that on d/c from the ED:
  – Only 21.8% were pain free
  – Only 40.6% were asked to f/u with a physician
  – ~2/3 were discharged w/o any medication
  – Only 1 pt was given a script for preventive medication
  – In 64% of pts, HA returned w/in 24 hours of ED d/c

Discharge from the ED

• Few studies to assess what would improve the d/c stats

• Friedman et al. comprehensive migraine intervention prior to ED D/C
  – Intervention: explanation of the diagnosis, migraine education, prescription for sumatriptan and naproxen + referral to a specialty HA clinic
  – Intervention was NOT associated w/ improvement in HIT scores one month after hospital d/c

Discharge from the ED

-->Study may have failed because of poor understanding of who these pts are + their motivation for seeking care in the ED (Prompted study above)
When discharging a patient from the ED, consider the abortive treatment PITFALLS

1. Not actively treating
2. Fear of using multiple medications
3. Fear of using certain classes of medications
4. Not warning against medication overuse headache
Objectives

1. Introduction of HA in the ED: Description of the patient population who presents to the ED
   – Epidemiology, comorbidities, discharge statistics

2. Evaluation of HA patient in the ED
Major Categories of Headache Disorders

- Migraine (Twenty eight million Americans have migraines a year)
- Tension Type
- Cluster and other trigeminal autonomic cephalgias
- Other primary headaches
- Primary stabbing, cough, exertional, thunderclap, associated with sexual activity, hypnic, hemicrania continua, new daily persistent
- Headache attributed to head and/or neck trauma
- Headache attributed to cranial or cervical vascular disorder-stroke, TIA, hemorrhage, unruptured vascular malformation, arteritis, carotid or carotid artery pain, venous thrombosis
- Headache attributed to non vascular intracranial disorder-high or low CSF, non infectious inflammatory disease, intracranial neoplasm, intrathecal injection, epileptic seizure, Chiari I malformation
- Headache attributed to a substance or its withdrawal
- Headache attributed to infection
- Headache attributed to disorder of hemostasis-hypoxia/hypercapnea, dialysis, arterial hypertension, hypothyroidism, fasting, cardiac cephalgia
- Headache or facial pain
- Headache attributed to psychiatric disorder
- Cranial neuralgias and central causes of facial pain
HPI for headache

• Temporal Profile
  – Age of onset, time to maximum intensity, frequency, time of day, duration, recurrence

• Headache Features
  – Location, quality and severity of the pain

• Associated signs and symptoms
  – Before HA, During HA, After HA

• Aggravating or precipitating factors
  – Trauma, medical conditions, triggers, activity, meds
Focus on taking a complete headache history

• Evaluation and treatment history (Physicians/other providers)
• Psychosocial history
  – Substance use and occupational and personal life
• Psychological History
  – Sleep history and impact of the headache
• Patient’s own diagnosis
• Family History
• Complete medical and surgical history
The physical exam is important:

Vital signs
Body habitus and comfort
Meningismus
Eye exam including pupillary light response and funduscropy
Head and neck exam – sinuses, temporomandibular region, submandibular areas, carotid arteries, superficial nerves
Neurologic exam
Vestibular signs, Dix-Hallpike maneuver
Lab Testing

- Routine testing is low yield
- Some experts state that serum glucose, electrolytes, cbc and pregnancy tests are generally recommended (Levin) but other reviews state otherwise (Minen)
Do you perform imaging?
Discussion of Best Practices
Imaging

There are no clear guidelines on when to obtain imaging.

- American College of Emergency Physicians (ACER) issued recommendations on when head imaging is necessary in patients who present with acute onset headache.

Level B recs: “recommendations for management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty.”

- **Highlight red flags:**
  - New onset severe headache
  - New abnormal findings in a neurologic examination
  - Immunosuppression/HIV-positivity

Level C recs: “other strategies for patient management that are based on preliminary, inconclusive or conflicting evidence, or in the absence of any published literature, based on panel recommendations.”

- Non-urgent imaging in patients over 50 with a new type of headache and a normal neurologic examination.
Acute Head Imaging in the ED

American Academy of Neurology’s 11 Finalist Recommendations for the Choosing Wisely Campaign was do not perform brain imaging for patients presenting to the ED with recurrence of their baseline primary headache disorder.

Imaging continued...

- Use of CT is increasing despite awareness of radiation risk.
- A study published in 2006 revealed that 14% of ED visits for headache included CT head scans.
- However, a 2008 retrospective chart review of 100 patients who presented to ED for HA found that CT head was done for 51% of the pts.

Need to have low threshold for

- MRV or CTV for venous sinus thrombosis
- MRA or CTA of the head for RCVS
- MRA or CTA of the neck for carotid or vertebral arterial dissection
Spinal Tap

- Traditionally, for spontaneous thunderclap headache, LP is indicated because up to 7% of CTs are false negatives for thunderclap headache
Do we still need to do spinal taps to r/o SAH?

- An observational study of 302 adult ED patients at a single hospital was done to determine yield of LP in patients who p/w with HA and underwent LP after a normal head CT to evaluate for SAH.
  
  - Lumbar puncture results classified as indicating a SAH included xanthochromia in cerebrospinal fluid (CSF) or red blood cells in the final tube of CSF with an aneurysm or arteriovenous malformation on cerebral angiography.

- 2 (0.66%) diagnosed with SAH based on LP (number needed to diagnose= 151)- both of these patients had a known intracranial aneurysm

- 18 (5.96%) patients had a LP-related complication (P < .01 compared with number with SAH diagnosed) (number needed to harm, 17). Complications: 12 patients w/ low-pressure HAs, 4 w/ pain at the LP site, and 2 w/ contaminated CSF cultures.

Do we still need to do spinal taps to r/o SAH?

• Study using a mathematical probability model to determine whether CT/CTA instead of CT/LP can be done in the diagnostic w/u of acute-onset HA
  – SAH prevalence in ED HA patients was conservatively estimated at 15%.
  – Representative studies reported CT sensitivity for SAH to be 91% (95% confidence interval [CI] = 82% to 97%) and sensitivity of CTA for aneurysm to be 97.9% (95% CI = 88.9% to 99.9%).
  – Based on these data, the posttest probability of excluding aneurysmal SAH after a negative CT/CTA was 99.43% (95% CI = 98.86% to 99.81%).
• CT and then CTA can exclude SAH with a greater than 99% posttest probability
• ED patients w/ acute-onset HA without significant SAH RFs, CT/CTA may offer a less invasive and more specific diagnostic paradigm
  – If one chooses to offer LP after CT/CTA, informed consent for LP should put the pretest risk of a missed aneurysmal SAH at less than 1%.

McCormack RF1, Hutson A. Can computed tomography angiography of the brain replace lumbar puncture in the evaluation of acute-onset headache after a negative noncontrast cranial computed tomography scan? Acad Emerg Med. 2010 Apr;17(4):444-51.
Framework for the Evaluation of HA in ED

- ICHD still not being widely used in the ED
- Friedman study questions:
  1. Can a structured interview and adherence to the ICHD allow ED headache pts to be classified in a reproducible manner?
  2. With the ICHD, how often can one specific diagnosis be assigned to each ED HA presentation?
If it can be applied → ICHD can be used to improve pain and functional outcomes. Otherwise, new schema need to be developed.
Using the ICHD in the ED

- Prospective observational cohort study for non traumatic headache
- 480 participants, EM reviewers agreed on presence of secondary headaches in 94% of cases, type or absence of primary HA in 91% of cases
  - 10% had both a primary and secondary HA
  - 20% had neither a secondary cause of HA/primary HA d/o not identified (b/c ICHD relies on h/o similar HAs)
  - 26% of those with primary HA d/o could not be given specific ICHD-2 diagnosis

# Table 3. Specific secondary headaches identified by the emergency medicine

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>No. (%)</th>
<th>n=122</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhinosinusitis (ICHD-2: 11.5)</td>
<td>30 (25)</td>
<td></td>
</tr>
<tr>
<td>Intracranial infection (ICHD-2: 9.1)</td>
<td>12 (10)</td>
<td></td>
</tr>
<tr>
<td>Postdural puncture (ICHD-2: 7.2.1)</td>
<td>11 (9)</td>
<td></td>
</tr>
<tr>
<td>Systemic viral infection (ICHD-2: 9.2.2)</td>
<td>10 (8)</td>
<td></td>
</tr>
<tr>
<td>Hypertensive crises without encephalopathy (ICHD-2: 10.3.2)</td>
<td>9 (7)</td>
<td></td>
</tr>
<tr>
<td>Systemic bacterial infection (ICHD-2: 9.2.1)</td>
<td>6 (5)</td>
<td></td>
</tr>
<tr>
<td>Disorder of neck (ICHD-2: 11.2)</td>
<td>6 (5)</td>
<td></td>
</tr>
<tr>
<td>Disorder of ears (ICHD-2: 11.4)</td>
<td>6 (5)</td>
<td></td>
</tr>
<tr>
<td>Other cranial, facial, cervical structure (ICHD-2: 11.8)</td>
<td>5 (4)</td>
<td></td>
</tr>
<tr>
<td>Idiopathic intracranial hypertension (ICHD-2: 7.1.1)</td>
<td>4 (3)</td>
<td></td>
</tr>
<tr>
<td>Adverse reaction to medication (ICHD-2: 8.1.10)</td>
<td>3 (2)</td>
<td></td>
</tr>
<tr>
<td>Ischemic stroke or transient ischemic attack (ICHD-2: 6.1)</td>
<td>2 (2)</td>
<td></td>
</tr>
<tr>
<td>Medication overuse headache (ICHD-2: 8.2)</td>
<td>2 (2)</td>
<td></td>
</tr>
<tr>
<td>Intracranial hypertension secondary to hydrocephalus (ICHD-2: 7.1.3)</td>
<td>2 (2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>14 (11)</td>
<td></td>
</tr>
</tbody>
</table>

Secondary Headache

• More common in the ED than in the outpatient setting, especially for kids and the elderly
Secondary Headache Types

• Differential is long but will discuss as it pertains to the ED Evaluation of Headache:
  – The thunderclap causes (on next slide)
  – Spontaneous Intracranial Hypotension
  – Post traumatic headache

• Other important ones to consider:
  – Other forms of nonvascular headache in the ED e.g. causes of elevated ICP such as Intracranial Neoplasm and SUNCT/SUNA (Dr. Marmura’s talk)
  – Vascular causes of Headache in the ED (Dr. Sheik’s talk)
Causes of Sudden or Thunderclap Headache

Table 4 Secondary causes of acute headache (Levin, M Seminars in Neurology 2015)

- Intracranial hemorrhage (subarachnoid, parenchymal)
- Cerebral venous thrombosis
- Reversible cerebral vasoconstriction syndrome (RCVS)
- Carotid or vertebral artery dissection
- Acute posttraumatic (postconcussive) headache
- Hydrocephalus
- Meningitis
- Encephalitis
- Acute angle closure glaucoma
- Acute sinusitis
- Systemic infection
- Medication-induced headache
- Intracranial mass
Spontaneous Intracranial Hypotension

- Orthostatic headache
- MRI is frequently the imaging modality of choice: subdural collections, engorgement of venous structures, pituitary hyperemia + brain sag
- However, if CT is done in the ED, there may be signs of SIH that can be seen e.g. tentorial subdural hygroma

Figure 1. Normal noncontrast brain computed tomography (CT) (A1–4). Noncontrast brain CT findings of spontaneous intracranial hypotension: (B1) Tentorial subdural hygroma; (B2,3) Subdural hygroma and hematoma; (B4) Cervical spinal venous engorgement.
Acute Post-Traumatic HA

-~1.7 million Americans/yr have a traumatic brain injury (TBI)
-1.365 million Americans are treated and released from ED
-Rate of ED visits, marker of quality of ED care influenced by diagnostic accuracy, education at time of d/c and effective care at 1st visit, for TBI in the US has been rising
-70-90% of the cases are considered mild
-Currently little data describing ED patients with concussion
Acute Post-Traumatic HA

- Case series by Minen et al of 19 patients with concussion who had 72 hour ED revisits:
  - 63% (12) presented to the ED w/in 24 hours of concussion
  - 63% (12) male, mean age 41.8±23.0 (19, 89)
  - fall=most common cause of injury
  at 1st visit (N=8, 47%) followed by assault (N=4, 24%)
  - 95% (18) had medical insurance
  - 32% (6/19)+LOC
  - Time between d/c + revisit: 31.9±20.6 (0.6, 67.7) hours
Acute Post-Traumatic HA

-Case series by Minen et al of 19 patients with concussion who had 72 hour ED revisits:
  -Concussion characteristics at initial visit: headache 68% (13), dizziness 47% (9), n/v 26% (5), cognitive changes 21%; at revisit, 58% (11) reported head pain, 42% (8) reported n/v, 37% (7) reported dizziness, 5% (1) reported cognitive changes
  -84% (16/19) had documented pain, with 74% (14/19) reporting moderate (4-6) to severe (7-10) pain on a 1-10 scale
Acute post-traumatic headache attributed to mild traumatic injury to the head

Headache < 3 months’ duration caused by traumatic injury to the head

Headache developed within 7 days after one of the following:

1. the injury to the head
2. regaining of consciousness following the injury to the head
3. discontinuation of medication(s) that impair ability to sense or report headache following the injury to the head

Either of the following:

1. Headache resolved within 3 months after the injury to the head
2. Headache has not yet resolved but 3 months have not yet passed since the injury to the head

Not better accounted for by another ICHD-3 diagnosis.
Acute post-traumatic headache attributed to mild traumatic injury to the head

Headache with Injury to the head fulfilling both of the following:

1. Associated with none of the following:
   a) loss of consciousness for > 30 minutes
   b) Glasgow Coma Scale (GCS) score <13
   c) post-traumatic amnesia lasting > 24 hours
   d) altered level of awareness for >24 hours
   e) imaging evidence of a traumatic head injury ie. hemorrhage

2. Associated right after the head injury with 1+ of the following symptoms and/or signs:
   a) transient confusion, disorientation or impaired consciousness
   b) loss of memory for events just before/after head injury
   c) 2+ other sx suggestive of mild TBI: n/v, visual disturbances, dizziness +/- vertigo, impaired memory and/or concentration
Headache must be reported to have developed within 7 days- somewhat arbitrary- compared with longer intervals,- a 7-day interval yields diagnostic criteria with higher specificity

Appendix criteria-
Delayed-onset persistent headache attributed to moderate or severe traumatic injury to the head
+ Delayed-onset persistent headache attributed to mild traumatic injury to the head

May be used when the interval between injury+ HA onset> than 7 days.
Post-Traumatic Headache can present with different phenotypes
Headache in noncephalic acute illness

- 194 consecutive patients in ED due to noncephalic illness were prospectively surveyed to determine HA prevalence and characteristics

- HA
  - Reported in 42.7%
  - More common in febrile illness (77.5% vs. 22.5%, P<0.001), younger age (58 vs. 69, P<0.001), decreased platelet count, “Active HA disorder”-def of prior HA episodes in the past year (48.2% vs. 10.8%, P<0.001)
  - No gender association

Primary Headache Disorders

Migraine
Cluster
Hemicrania Continua
Exertional and sex related
Primary thunderclap
The ED is a **BAD** place for migraineurs

- Bright lights
- Long waits for treatment
- Loud
- “Treated like a drug addict!”
- Danger of unnecessary tests (CT)
- At risk of receiving nonspecific treatments
Thank You!