TURN IT UP TO 11: LP IN THE DIAGNOSIS OF SAH

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IN CASE YOU MISSED THE REFERENCE
HEADACHES IN THE ED

• Account for approximately 2% of ED visits
• 1% of these are due to SAH
• Approximately 14% get imaging
  • Only 5% of these show pathology
SUBARACHNOID HEMORRHAGE

• Incidence: 6-10 per 100,000 in general population
• 10% die prior to arrival
• Mean age 40-60
• 1.6 X more likely in women
• Risk factors: Smoking, females, binge EtOH, previous hx, family hx, connective tissue d/o
PRESENTATION

• 33% have headache as only symptom
• 8% have classic “thunderclap” headache
• 50% are neurologically intact
• Thunderclap h/a and normal neuro exam
  • 12% chance it’s SAH
IMPORTANT

• Type of pain / location of pain has no predictability

• Resolution of pain with or without treatment has no predictability
CAUSES (NON-TRAUMATIC)

- 80% are aneurysmal (these are the ones we are most interested in)
- Perimesencephalic (most common non-aneurysmal)
  - These generally do very well without intervention
- AVM, dural AV fistula, cavernous angioma, vasculitis, amyloid angiopathy, cerebral venous sinus thrombosis… there are more
• Current recommendations from AHA and ACEP

• Unenhanced CT, followed by lumbar puncture if initial CT is negative for SAH

• But CTs are getting better… do we still need the LP?

• This debate has been ongoing in the literature since at least 1995
CHARACTERISTICS OF MOST STUDIES

Dr. Atkinson??
INCLUSION CRITERIA

• >15 years of age
• Headache or syncope with associated headache
• Non-traumatic (within last 7 days)
• Acute h/a (peak intensity within 1 hour of onset)
• GCS 15
EXCLUSION CRITERIA

• > 14 days since onset of headache
• 3 or more headaches of similar character in last 6 months
• Focal neurologic deficit
• Papilledema
• Hx of SAH or aneurysm
• Ventricular shunt
• Intracranial neoplasm
+ SAH IN STUDIES

- Subarachoid blood on CT
- Xanthochromia in CSF
- > 5 X 10^6 RBCs in 4th tube with aneurysm on CTA or catheter angiography
CT AND LP APPROACH

• We know a few things:
  • CT sensitivity decreases with time from onset
    • ? Best < 6 hrs from onset
  • LP sensitivity increases with time
    • Best >12 hrs after onset
    • Some suggest even better a few days later…
IS THIS APPROACH GOOD ENOUGH?

• Perry et al. 2008
• Prospective cohort over 3 years
• 592 patients with sudden onset h/a who had CT, then LP if CT negative
• 61 diagnosed with SAH
• Sensitivity of 100% (94-100)
• Specificity 67% (63-71)
WHY ARE WE TALKING ABOUT THIS THEN?

- There were limitations to the study
  - Lost to follow up of 19% (although checked for further visits/deaths in their region)
  - Traumatic taps were considered SAH if \( > 5 \times 10^6 \) RBCs on last tube AND positive CTA
- LPs have risks/morbidity associated
  - Post LP headaches
  - Infections, epidural hematomas, pain, etc
- LPs can be difficult to interpret
  - No well agreed upon way to determine traumatic tap
CT FOR SAH

- Perry et al 2011 – Prospective cohort study
  - 3132 patients, 240 with SAH
  - Sensitivity all comers = 92.9% (89.0 – 95.5)
  - < 6 hours (953 patients) = 100%
  - > 6 hours – 17 of 119 SAH were missed! = sens 85.7%
  - New generation CT scanner (3rd generation??)
  - Qualified radiologist (neuro or one who reads head CTs routinely)
CT FOR SAH

• Backes et al. 2012

• Prospective cohort of 250 patients (consecutive)

• Sensitivity was 98.5% if CT < 6 hours
  • But was 100% if pt presented with h/a (1 was missed as was a cervical AVM with acute neck pain)

• > 6 hours – 92% sensitivity

• CT read by neuroradiologists only, xanthochromia by spectrophotometry
LUMBAR PUNCTURE

• These can be technically difficult
• Can be difficult to interpret
  • What is a positive result?
• Can be painful for patients
• Often causes a more intense headache!
• Risk of infection, bleeding, need for blood patch, etc.
CSF ANALYSIS

- Most sensitive for SAH > 12 hours, < 2 weeks from onset of h/a
- Xanthochromia is considered a positive result
  - But how is xanthochromia determined?
XANTHOCHROMIA

• When RBCs are lysed, they release oxyhemoglobin
• This is then broken down by macrophages → bilirubin
• Visual xanthochromia can be caused by either of the above
• If just oxyhgb – could be from traumatic tap
• If just bilirubin – can be caused by elevated serum bilirubin
• If both – likely SAH
• Can also be caused by drugs like rifampin
XANTHOCHROMIA

- Arora et al. 2010 – retrospective chart review of patients with imaging confirmed SAH
  - 47% had positive xanthochromia, 53% negative by visual inspection

- Chu et al. 2014 – systematic review of spectrophotometry vs visual analysis for xanthocchromia in SAH
  - Spec – 87% sensitive, 86% specific
  - Visual – 83% sensitive, 96% specific
  - Lots of problems with review, heterogeneity, defining the outcome, etc.
WHAT ABOUT TRAUMATIC TAPS?

• Decreasing RBC count from 1st to 4th tube… HOW MUCH OF DECREASE?

• Heasley et al. 2005 – Looked at 25% reduction in RBCs
  • Small numbers, not a great study
  • 2 of 8 patients with 25% reduction were found to have an aneurysm on CTA
HOW ABOUT JUST DOING A CTA?

- 2-5% of people have aneurysm in population
- CTA does not tell you if the aneurysm is leaking
- How do you (neurosurgery) decide which to treat?
- Asymptomatic aneurysms have a low bleed rate (~6% annually)
WHAT DO WE DO?!?!?!?!
I'm not convinced we've wasted enough time on this.
CONCLUSIONS

• No great answers yet, though imaging appears to be where this is headed

• Evidence suggests CT within 6 hours is good enough, as long as:
  • Qualified radiologist
  • Modern scanner (ours is a 64 slice, we also have a 16)
  • Normal neuro exam
  • Acute headache (not isolated neck pain)

• The rest need some combination of LP/CTA if initial CT negative
OTTAWA SAH RULE

• Investigate if 1 or more of:
  • Age 40 or older
  • Neck pain/stiffness
  • Witnessed LOC
  • Onset during exertion
  • Thunderclap headache (instantly peaking pain)
  • Limited neck flexion on exam (chin to chest, or lift head > 8cm off bed)
• Sensitivity of 100% (97.2% - 100%)
• Specificity of 15.3% (13.8 – 16.9)

• One external validation study showed sensitivity of 100% (62.9 – 100) and specificity of 7.6% (5.4 – 10.6)
  • This was a medical record review of 454 applicable charts (only 9% of headaches could be included)

• This rule is probably not quite ready for prime time yet…
REFERENCES


