

## Optimizing Headache Management in the ED: *A Focus on Subarachnoid Hemorrhage*

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## Objectives

- Improve screening of patients for SAH
- Learn key points in diagnosis, treatment disposition, documentation
- Improve outcome of patients with SAH
- Further Emergency Medicine practice as it relates to SAH

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## A Clinical Case

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## Patient Clinical History

- 47 yo female
- Shopping with her husband
- Severe, sudden onset of headache
- Sat down → passed out for 3-5 minutes
- Hx of HTN on diuretic

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## ED Presentation

- Vitals: 99.5F, 105, 16, 190/95, 98% RA
- Lying still on stretcher with eyes closed
- NCAT, Heart, lungs, abdomen normal
- “Sore” neck, no clear meningismus
- Alert, mild confusion
- CN intact, strength 5/5 all 4 ext, sensory intact, DTRs normal, FTN normal

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## Critical Questions

- Who is at risk for SAH?
- What symptoms suggest SAH?
- How can we best diagnose SAH?
- Who requires CT? LP? Angiography?
- When should an LP be deferred?
- When is "traumatic tap" the likely diagnosis?
- When does symptom resolution suggest a benign headache etiology?

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## Headache in the ED: Evidence-based Recommendations

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## Grading of Recommendations

**Level A recommendations.** Generally accepted principles for patient management that reflect a high degree of clinical certainty (ie, based on "strength of evidence class I" or overwhelming evidence from "strength of evidence class II" studies that directly address all the issues).

**Level B recommendations.** Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty (ie, based on "strength of evidence class II" studies that directly address the issue, decision analysis that directly addresses the issue, or strong consensus of "strength of evidence class III" studies).

**Level C recommendations.** 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 consensus.

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## ACEP Policy: Acute Headache

- Does a response to therapy predict the etiology of an acute headache?
  - Level C:
    - Pain response to therapy should not be used as the sole diagnostic criteria in determining the underlying etiology of an acute headache.

Ann Emerg Med, Jan 2002; 39:108-122

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## ACEP Policy: Acute Headache

- In which adults with a headache can an LP be safely performed without neuroimaging?
  - Level C:
    - Those pts without signs of increased intracranial pressure (ICP)
      - Papilledema, absent venous pulses
      - Altered mental status
      - Focal neurologic deficits

Ann Emerg Med, Jan 2002; 39:108-122

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## ACEP Policy: Acute Headache

- Which patients with an acute headache require neuroimaging?
  - Level B:
    - Headache and focal neurologic deficit
    - Headache of sudden, rapid onset (e.g SAH)
    - HIV and new headache
  - Level C:
    - > 50 years old, new or different headache

Ann Emerg Med, Jan 2002; 39:108-122

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## ACEP Policy: Acute Headache

- Do patients with “thunderclap” headache need an angiogram after a negative CT and LP?
  - Level C:
    - No, outpatient follow-up if:  
Negative CT, normal opening pressure, and “negative” CSF analysis

Ann Emerg Med, Jan 2002; 39:108-122

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## Sentinel Headache in SAH

- Present in 10-43% of SAH patients
- Typically occurs 2 weeks prior to SAH
- Unusual, severe, abrupt, thunderclap
- Xanthochromia after first 12 hours

Neuro Sci (2004) 25:S 215-217

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## Sentinel Headache: Symptoms

- 77% Nausea/Vomiting
- 74% Severe, sudden onset
- 64% Focal neuro deficit
- 53% Syncope
- 33% Stiff neck

Neuro Sci (2004) 25:S 215-217

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## “Worst Headache of My Life”

- N = 107 patients “worst headache”
- 20 pts with SAH (19.5%)
- 18 of 20 diagnosed by CT (90%)
- Two diagnosed: + LP after - CT
- NPV of CT =  $87/89 = 98\%$   
(2% would have SAH)

Ann Emer Med, Sept 1998; 32: 297-304

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## “Worst Headache” LP Results

- Positive LP, Negative CT (n=2)
  - Tube 1 RBCs: 163,000 median
  - Tube 4 RBCs: 221,000 median
- Negative LP, Negative CT (N = 77)
  - Tube 1 RBCs: 19 median
  - Tube 4 RBCs: 0 median

Ann Emer Med, Sept 1998; 32: 297-304

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## Fifth Generation CT and SAH

- 2002 Retrospective study
- N = 177 with possible SAH
- All pts had both CT and LP
- “Fifth generation” CT scanner
- “Negative LP” = Tube 1 <400 RBCs and 10-fold drop by tube 4

JEM, 2005; 29: 23-27

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## Fifth Generation CT and SAH

- **Results:**
  - 6 CT scans positive for SAH
  - No CT neg pts had a positive LP
- **Conclusion:**
  - 5<sup>th</sup> gen CT detects SAH accurately
  - 100% sensitivity (61-100%)
  - 99.4% specificity (97-100%)

JEM, 2005; 29: 23-27

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## **SAH:** *The Evaluation*

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## SAH: The Evaluation

- Evaluate ABCs, altered mental status

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## SAH: The Evaluation

- Evaluate ABCs, altered mental status
- Know SAH risk factors:
  - Hypertension, DM, prior aneurysm/SAH
  - Thunderclap headache
  - Maximum severity in minutes
  - Focal neurological deficit

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## Non-contrast CT Head

- Inform radiologist to rule out SAH
- CT should be performed with sufficiently thin cuts (3 – 5 mm cuts)
- Unlikely to miss SAH on CT if performed and interpreted well

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## SAH: The Evaluation

- How do we evaluate a CT for SAH?

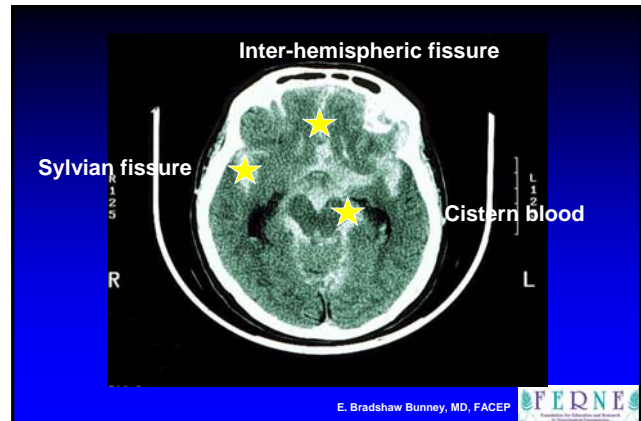
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## SAH: CT Interpretation

- CT evaluation for subarachnoid blood
  - 1) Inter-hemispheric fissure
  - 2) Inferior frontal sulci
  - 3) Third ventricle
  - 4) Ambient cistern
  - 5) Sylvian fissure

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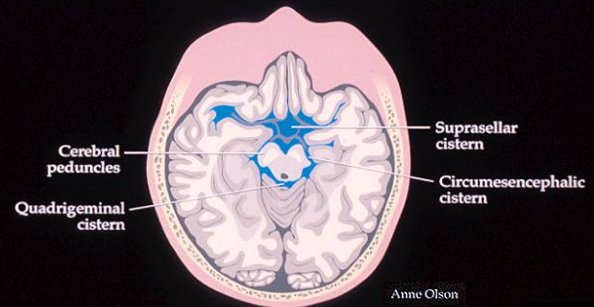
## CT Interpretation: Elevated ICP

- CT findings that exclude elevated ICP
  - Normal cisterns
  - No obliteration of cistern space
  - No edema, mass effect, or midline shift
  - No hydrocephalus

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## 2. Cisterns Viewed at Level of Cerebral Peduncles



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## Symptom Resolution

- Can headache resolution be used to exclude SAH?
- Brings to mind another question....  
In a patient who presents to the ED with a headache, can you rule out SAH by clinical evaluation alone?

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## Symptom Resolution

Consider headaches likely benign if:

- Low risk SAH patient
- No focal neurological findings
- Complete symptom resolution with meds that effectively treat migraine and muscle-tension headache (i.e. non-narcotic)

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## Lumbar Puncture Need

Which patients should have a lumbar puncture?

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## Lumbar Puncture Indications

- Moderate to high risk SAH patients following negative CT
- Severe, abrupt, thunderclap headache
- Focal neurological findings
- Unknown CT protocol / interpretive quality
- Minimal symptom resolution with meds that effectively treat migraine and muscle-tension headache

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## Deferred Lumbar Puncture

- Is it sometimes reasonable to not perform a lumbar puncture on patients suspected of SAH?

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## Deferred Lumbar Puncture

- Positive CT
  - Evidence of elevated ICP, edema, mass effect, midline shift, ICH, hydrocephalus
- Technically difficult procedure
- Critically ill or unstable patient
- Coagulopathy

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## Measuring Opening Pressure

- Is it necessary to measure opening pressure when performing an LP?

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## Measuring Opening Pressure

- Variable practice....
  - Measure if CSF flowing rapidly
  - Consider measuring with every LP

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## SAH: The Evaluation

- How should we interpret CSF results?

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## Interpreting CSF: RBCs

- Likely SAH with:
  - 10,000-100,000 RBCs or greater
  - No clearing of RBCs in tube 4
- Consider possible SAH with:
  - Intermediate RBC count (1,000 – 10,000)
  - Little RBC clearing by tube 4
- Traumatic tap
  - 75-90% drop in RBCs from tube 1 to 4

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## CSF Xanthochromia

- Xanthochromia characteristics
  - Typically > 12 hours from headache onset
  - Quantitative and qualitative measurements
  - “Read news print test” most often used
  - Clears after weeks

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## SAH: The Evaluation

- When is angiography indicated?

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## SAH: Cerebral Angiography

- Cerebral angiography indications:
  - High risk patients with uncertain diagnosis
  - Interventional radiology available for coiling
  - Preoperative neurosurgical planning
- MRI, MRA, CTA need less well established

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## Treating SAH

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## Treating SAH Patients

- SAH with increased ICP:
  - Head of the bed at 45 degrees
  - Mannitol 20% solution 0.25-1.0g per Kg
  - Hyperventilation to pCO<sub>2</sub> 30-35 mmHg, temporizing, only if other measures fail
  - Ventriculostomy
  - Consider seizure prophylaxis
  - Nimodopine (vasoconstriction prophylaxis)

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## ED Case Patient Outcome

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## ED Patient Management

- Pt had a generalized tonic-clonic seizure
- Responded to benzodiazapines
- Return to normal mental status

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## ED Diagnostic Evaluation

- Non-contrast CT negative
- Metabolic, toxicology tests normal
- CSF:
  - Tube 1 = 355,000 RBCs
  - Tube 4 = 298,000 RBCs
- Diagnosis: Subarachnoid Hemorrhage

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## Patient Outcome

- Cerebral angiogram performed
- Saccular aneurysm in the posterior communicating artery
- Neurosurgical aneurysm clipping
- Pt was discharged in one week
- No residual neurological deficit

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## Key Learning Points

- SAH needs to be thought of to be diagnosed
- Resolution of symptoms does not exclude SAH in all patients
- Know the CT technology where you work to be comfortable with the need for LP
- When in doubt do the LP

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Questions??

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