

**LP vs CTA for diagnosis of SAH**  
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UT Medical Center  
@emboardbombs

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**Objectives**

- THE LEARNER WILL APPRECIATE THE PRESENTATION OF SUBARACHNOID HEMORRHAGE.
- THE LEARNER WILL UNDERSTAND THE APPLICATION AND USES OF THE SIX-STEP SUBARACHNOID HEMORRHAGE RULE.
- THE LEARNER WILL REACH THEIR OWN CONCLUSION OF PRACTICE AFTER WEIGHING RISKS AND BENEFITS OF LUMBAR PUNCTURE VERSUS CTA.

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**Disclosures**

- No funding to disclose
- I own a medical education podcast platform, EM Board Bombs, LLC

**Board Bombs**

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10 %

Headaches are 2% of all ED visits.  
Of these, 1-3% turn out to be a SAH.

Shaw AM, Reed SO, Curtis US, et al. Characteristics of nontraumatic subarachnoid hemorrhage in the United States in 2003. Neurosurgery 2007; 61: 1131.

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<b>Background</b>	• Aneurysmal vs non-aneurysmal
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Sudden, severe headache = 97% of cases.

Unilateral headache = 30% of patients.

Nausea and vomiting = 77% of patients.

Loss of consciousness = about 50% of patients.

Seizures = ~10% of patients. Arguably the most concerning symptom if present early on.

Sudden death = ~10-15% of patients. These rarely reach the hospital.

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**Ottawa Subarachnoid Hemorrhage Rule**

**MUST** have the following to undergo this assessment

- neurologically intact patients
- ≥15 years old
- nontraumatic headaches that reach max intensity within one hour

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**Ottawa Subarachnoid Hemorrhage Rule**

Do NOT use in the following:

- New neurologic deficits
- Prior aneurysm
- Prior SAH
- Known brain tumors
- Chronic recurrent headaches (≥3 headaches of same character for >6 months)

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**Ottawa Subarachnoid Hemorrhage Rule**

Age ≥40	No 0	Yes +1
Neck pain or stiffness	No 0	Yes +1
Witnessed loss of consciousness	No 0	Yes +1
Onset during exertion	No 0	Yes +1
Thunderclap headache (peaking pain within 1 second)	No 0	Yes +1
Limited neck flexion on examination	No 0	Yes +1

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**Summary of Ottawa SAH Decision Rule Study Results**

Study	Patients	Prevalence of SAH	Missed SAH	Sensitivity (95% CI)	Specificity (95% CI)
JAMA 2003	2131	6.2%	0	100% (97.2 - 100.0%)	15.3% (13.8 - 16.9%)
AJEM 2004	454	2.0%	0	100% (62.9% - 100.0%)	7.6% (5.4% - 10.6%)
BMJ 2006	156	17.7%	0	100% (98.6% - 100%)	8.6% (7.2% - 10.7%)
GMAJ 2007	153	5.8%	0	100% (94.6% - 100%)	13.6% (13.1 - 15.8%)

How it holds up

- 100% sensitive, but very limited use
- 8-15% specificity

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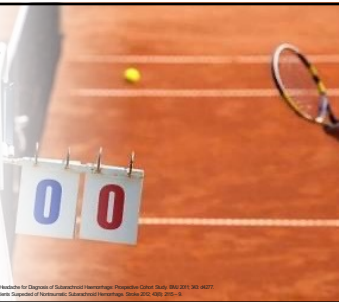
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### CT head alone?

- 92% if <24 hours
- 100% if <6 hours



Hsieh JJ et al. Sensitivity of Computed Tomography Performed Within Six Hours of Onset of Headache for Diagnosis of Subarachnoid Hemorrhage. *Protophila Color Study*. *May 2011*; 36(10):1477.  
Baskin DM et al. Time-Dependent Test Characteristics of Head Computed Tomography in Patients Suspected of Intracerebral Subarachnoid Hemorrhage. *Stroke*. 2012; 43(3):391-5.

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### Critical Caveats

- 1) reviewed by "expert" radiologist
- 2) no significant anemia (Hgb <10)
- 3) CT scanner is a modern model
- 4) "typical" presentation



Of course, I'm a Terminator.

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### Lumbar puncture

<2000 RBCs/microL in addition to no xanthochromia excludes SAH with a sensitivity of 100%



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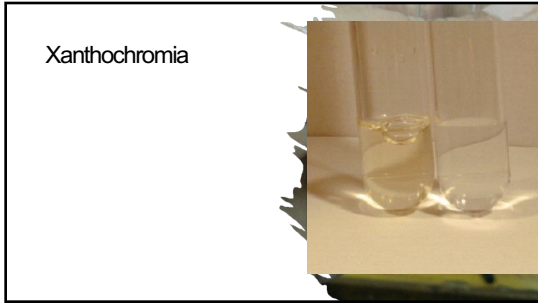
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**Complications**

- post-LP headache (10-30%)
- spinal epidural hematoma
- infection

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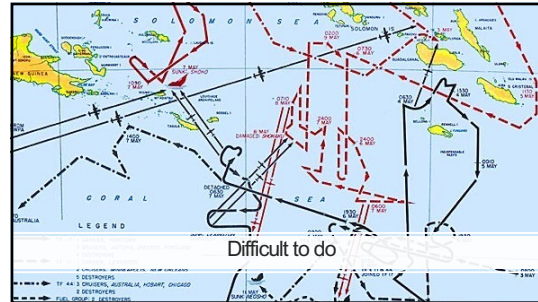
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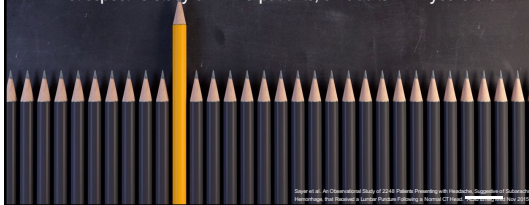
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**Number needed to treat**

- LP has a low diagnostic yield
- Retrospective study of 2248 patients, all adults >17 years old



Report et al. An Observational Study of 2248 Patients Presenting with Headache. Stroke and Neurology. 2019; 20(1): 1-7.

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CTA  
>98% accurate for SAH

Palumbo MA, Hoffmann JRC. Computed Tomography Angiography of the Head in a Resource-limited Unit After a Negative Noncontrast Head Computed Tomography Scan in the Emergency Department Evaluation of Spontaneous Intracerebral Hemorrhage. *Ann Emerg Med.* 2016;67(5):773-774. doi:10.1016/j.annemergmed.2016.03.020

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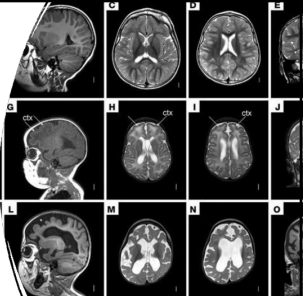
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Drawbacks of CTA

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Incidentalomas



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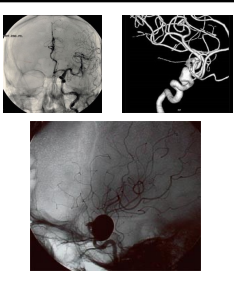
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Incidentalomas

- "Normal" aneurysms?
- Most are in anterior circulation
- 20-30% have multiple.



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<b>LP</b>	<b>CTA</b>
<ul style="list-style-type: none"><li>• Poor specificity</li><li>• Painful</li><li>• Time-consuming/difficult to do</li><li>• Complications/harm to patient</li></ul>	<ul style="list-style-type: none"><li>• Incidental findings</li><li>• IV contrast, radiation exposure</li><li>• More expensive?</li></ul>



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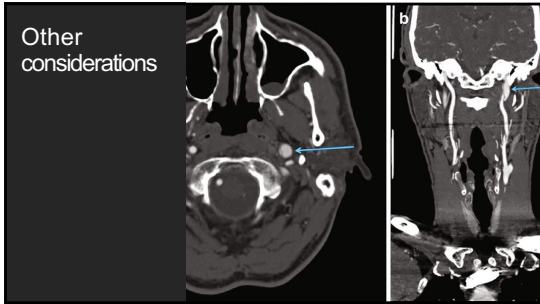
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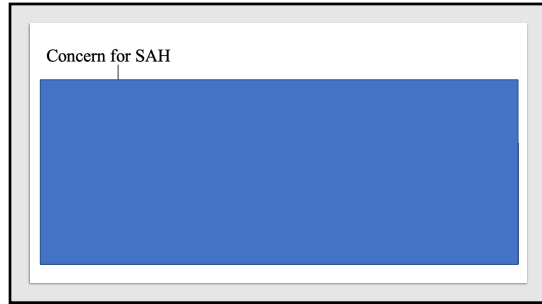
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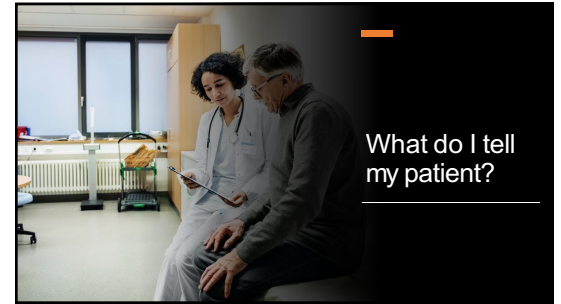
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### Conclusions

- The Ottawa SAH Rule is 100% sensitive at ruling out patients who need a SAH workup, *but* the criteria are very strict.
- CT head has ~100% sensitivity for ruling out SAH < 6 hours.
- Lumbar punctures are not benign procedures, and the NNT is very high in most cases.
- CTA is very good and likely equivalent to LP for ruling out subarachnoid hemorrhage.

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Questions?

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