

Headache with Negative CT: When could you not

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Question: In patients with a recent history of subarachnoid hemorrhage now presenting with headache, what is the utility of a lumbar puncture (LP) if a CT scan is negative?

Clinical Scenario: Recently, I had a unique case of a patient with a history of subarachnoid hemorrhage in for evaluation of recurrent headaches for “2-3 days” without any inciting trauma. Per the patient, the headaches were not as intense as those experienced during the SAH and were without any acute changes in neurological status or any loss of consciousness. The patient had a CT positive SAH at an outside facility approximately 3 weeks ago but was lost to follow-up. We pursued imaging on the patient which was negative for acute intracranial hemorrhage. At this point, a patient would normally undergo a lumbar puncture to assess the CSF for xanthochromia. However, given her recent confirmed SAH, I was curious if her recent SAH would alter the results of the LP and the associated risks versus the benefits of performing the procedure.

Background: In patients presenting with acute headaches, the likelihood of subarachnoid hemorrhage (SAH) is relatively infrequent, but the high morbidity and mortality necessitate a thorough screening examination. The presence of nontraumatic SAHs is even more difficult to detect. Their detection relies on careful use of the **history and physical, imaging studies, and lumbar puncture** to determine if the patient is, in fact, suffering from a headache caused by a SAH. A number of studies note that though the CT scan sensitivity approaches percentages in the **high 90s**, the high likelihood of adverse effects of misdiagnosis make sensitivities less than 100% unacceptable [1]. The sensitivity of the CT scan can also be modulated by the time since the onset of headaches, with a higher sensitivity if the scan is done **within 12 hours** of symptom onset. Scans outside of 12 hours have a lower likelihood of detecting SAH (100% vs 81.7%) [2].

To account for this difference, lumbar punctures serve as an adjunct to imaging in order to help determine if a patient is suffering from a bleeding event, especially if the headache occurred more than 12 hours after presentation. One of the key characteristics of the lumbar puncture is the presence (or absence) of xanthochromia, or a yellowing color to the drawn CSF. This color change is generated by the breakdown of heme in red blood cells to bilirubin. Xanthochromia is detected either by visual analysis or spectrophotometry, with visual analysis being more common in the United States. The presence of xanthochromia can help support the diagnosis of SAH if the CT is negative, but its diagnostic utility is limited, too. The presence of xanthochromia in CSF can persist for up to a month in patients with an intracranial hemorrhage. Studies done on patients with confirmed SAH showed xanthochromia on spectrophotometry (which, authors contend, is more accurate than simple visual inspection) in all patients who had an LP up to two weeks after admission (41/41 and 32/32 in weeks 1 and 2, respectively). Patients then continued to have a high likelihood of having xanthochromia during weeks 3 and 4 (20/22 and 10/14) [3].

Discussion: The findings and our discussion with our neurosurgery colleagues complicated what is normally a clear diagnosis process for patients with suspected SAH. The time course of these current symptoms, discounting the prior SAH, would make an LP the next step in diagnosing an acute head bleed [4]. However, given the prior history of SAH within the last month, the likelihood that an LP would show xanthochromia would be high, but the diagnostic value would

be questionable and it would not change the decision-making of either the ED staff or consulting neurosurgeons. Given this finding and the risks associated with the procedure, the decision was made not to perform the procedure on the patient and to continue to evaluate her clinically.

References / Further Reading:

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