Cerebrospinal fluid in subarachnoid hemorrhage

If non-contrast head CT is not definitive (time to study, patient elements [i.e., severe anemia], interpretation limitations [i.e., trainee radiologist, motion artifact], etc) the next recommended diagnostic tool is the lumbar puncture LP. In these instances the LP is looking for two elements that raise the concern for SAH: 1) RBCs; and 2) xanthochromia (bilirubin in cerebrospinal fluid [CSF]).

Given the sensitivity of the CT discussed above, shared decision-making should be conducted with regard to LP. In particular, with a sensitivity of nearly 99% for an adequate study, if completed within six hours, and meeting the criteria outlined above (Dubosh), patients should be made aware of the low diagnostic utility of LP if completed after a CT [1].

Despite improved computed tomography scanning technology, cerebrospinal fluid xanthochromia interpretation aids in the definitive diagnosis of subarachnoid haemorrhage. When requested appropriately cerebrospinal fluid xanthochromia analysis remains a vital service as results impact on clinical decision making, especially when computed tomography scan results are equivocal and is also important in later presenting patients when computed tomography accuracy decreases [2].

A guide to define a subpopulation of patients who would benefit from a lumbar puncture after an NHCT would be desirable [3].

No xanthochromia and red blood cell count <2000 × 10(6)/L reasonably excludes the diagnosis of aneurysmal subarachnoid hemorrhage. Most patients with acute headache who meet this cut off will need no further investigations and aneurysmal subarachnoid hemorrhage can be excluded as a cause of their headache [4]. Patients without a subarachnoid hemorrhage (SAH) on brain CT scan (CT-negative), but a lumbar puncture (LP)-proven SAH, are a challenging patient category. The optimal diagnostic approach is still a matter of debate. Also, there is little knowledge on the probability of finding an underlying vascular lesion.

A guide to define a subpopulation of patients who would benefit from a lumbar puncture after an negative CT would be desirable [5].

The decision to follow a negative CT with an LP in all cases needs careful consideration, as CSF results may only rarely confer therapeutic benefit to patients suspected of SAH [6].

Results support a change of practice wherein a lumbar puncture can be withheld in patients with a head CT scan performed <6 hours after headache onset and reported negative for the presence of SAH by a staff radiologist in the described nonacademic setting [7].

For Martin et al. LP has a high diagnostic yield, eliminating the need for neurosurgical opinion or investigation in almost 90% of cases. The test is both cost and time efficient and subjects only a small number of patients to the radiation and contrast risks of angiography [8].

Findings in cerebrospinal fluid

↑ opening pressure (OP) (cm H2O).

Appearance bloody; supernatant xanthochromic.

Cells (per mm3) early: ↑RBCs.

Protein (mg%) 50–400

Glucose (% serum) nl or ↓

Miscellaneous RBCs disappear in 2 wks, xanthochromia may persist for weeks.

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All patients in a case series with aSAH had either a CSF RBC count greater than 2000 × 10(6)/L or visible CSF xanthochromia, increasing the likelihood that this proposed cutoff strategy may safely identify patients who warrant further investigation for an aneurysmal cause of subarachnoid hemorrhage [10)].

Case series

2015

In patients presenting to the emergency department with acute severe headache, LP to diagnose or exclude SAH after negative head CT has a very low diagnostic yield, due to low prevalence of the disease and uninterpretable or inconclusive samples. A clinical decision rule may improve diagnostic yield by selecting patients requiring further evaluation with LP following nondiagnostic or normal noncontrast CT brain imaging [11)].

A study included 302 patients, including 2 (0.66%) who were diagnosed with SAH based on LP (number needed to diagnose, 151); both of these patients had a known intracranial aneurysm. Eighteen (5.96%) patients experienced an LP-related complication (P < .01 compared with number with SAH diagnosed; number needed to harm, 17). Complications included 12 patients with low-pressure headaches, 4 with pain at the LP site, and 2 with contaminated CSF cultures.

The yield of LP for diagnosing SAH in adults with nontraumatic headache after a normal head CT was very low. The severity of LP-related complications was low, but complications were more common than SAH diagnoses. Lumbar puncture may not be advisable after a normal head CT to evaluate for SAH, particularly in patients with low-risk clinical features for SAH [12)].

Visual inspection for xanthochromia is used to diagnose subarachnoid hemorrhage (SAH), to validate computed tomography subarachnoid hemorrhage diagnosis and was used to determine the Walton rule. No study has assessed the reliability of xanthochromia.

This simple laboratory study would be expected to maximize agreement relative to clinical practice. Although non-color-blind female observers significantly outperformed non-color-blind male observers, both intraobserver agreement and interobserver agreement for xanthochromia were prohibitively poor regardless of sex or illumination. Yellow was most frequently misclassified, 88% as clear (ie, true positives were commuted to false negatives). Xanthochromia is therefore highly unreliable for subarachnoid hemorrhage diagnosis and computed tomography validation. The Walton rule requires urgent clinical revalidation [13].

2013

The chance of finding a vascular lesion in a patient with CT-negative, LP-positive SAH was 43%, underlining the need for an adequate diagnostic workup. In general, the patient outcome was favourable. Female gender was found to be predictive for detecting a vascular lesion. In contrast with previous reports, the interval between ictus and LP was not associated with the presence of an aneurysm [14].

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