

REGIONAL AUDIT OF XANTHOCHROMIA ANALYSIS

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Background

Recent publications have questioned the value of performing analysis of cerebrospinal fluid (CSF) by spectrophotometry for the investigation of suspected aneurysmal subarachnoid haemorrhage (SAH) in computed tomography (CT) negative patients. Data from Ditta *et al* suggest that secondary imaging with CT angiography may have a higher diagnostic yield than CSF analysis (1). However, guidelines from the college of emergency medicine still state that in patients with suspected SAH and a negative CT scan, lumbar puncture (LP) and CSF spectrophotometry is necessary to exclude the diagnosis of SAH (2). The diagnostic sensitivity of head CT is 98% for patients presenting within 12 hours, but decreases over time. National guidelines for the analysis of CSF for bilirubin define the laboratory protocols for CSF spectrophotometry which is most useful in detecting SAH in those patients who present late to secondary care (3). Some publications have called for a change in guidance, removing the requirement for LP if the CT is performed within 6 hours (4). Delayed diagnosis of SAH is associated with high morbidity, related to the incidence of aneurysmal re-bleed which is highest in the first week (1). A timely diagnosis of SAH is therefore important to ensure favourable patient outcomes.

Aim

To determine the frequency of SAH detected by CSF analysis in patients with a negative CT scan across 3 NHS Trusts in the North 1 region (Newcastle upon Tyne Hospitals (NUTH) NHS Foundation Trust, North Cumbria Integrated Care (NCIC) NHS Trust and South of Tyne and Wear (SoTW) Clinical Pathology Services).

Standards / Guidelines

Compliance with the revised national guidelines for analysis of CSF fluid for bilirubin in suspected SAH (2008) was investigated.

Audit method

A retrospective study over a 2 year period (1st January 2018-31st Dec 2019) was undertaken. All CSF bilirubin requests were extracted from the laboratory information management systems and the patient records examined to determine if a CT had been requested prior to lumbar puncture (LP). Clinical indications for requests were determined, results obtained and the patients' final diagnosis recorded.

Results

A total of 1471 CSF requests were received for CSF bilirubin analysis across the 3 NHS Trusts. Some were excluded due to incomplete data sets; 1344 requests were included in the audit.

The rate of compliance with CT scanning prior to LP was high (89% for NUTH, 98% for SoTW and 94% for NCIC).

CSF bilirubin results can be summarised as follows:

- 1270 (94.5%) of scans were negative
 - 40 (3%) of scans were equivocal or inconclusive
 - 34 (2.5%) of scans were positive: 7 patients were subsequently diagnosed with acute aneurysmal SAH and 6 with non-aneurysmal SAH.
- The false-positive results and equivocal results may have led to increased patient stays.

Clinical details provided	Number of samples
Headache / rule out SAH	730
No clinical details	353
?Meningitis, infection	74
? Encephalitis	46
?SAH / meningitis / encephalitis	38
Confusion, behavioural change, neurological change	25
Other	17
Seizures	16
Low GCS	10
Previous SAH, known aneurysm	9
Infection, fever	7
Unwell	6
Weakness	5
Routine, review, monitoring	5
Intracranial hypertension	3

Table 1: Clinical details provided for the xanthochromia analysis request

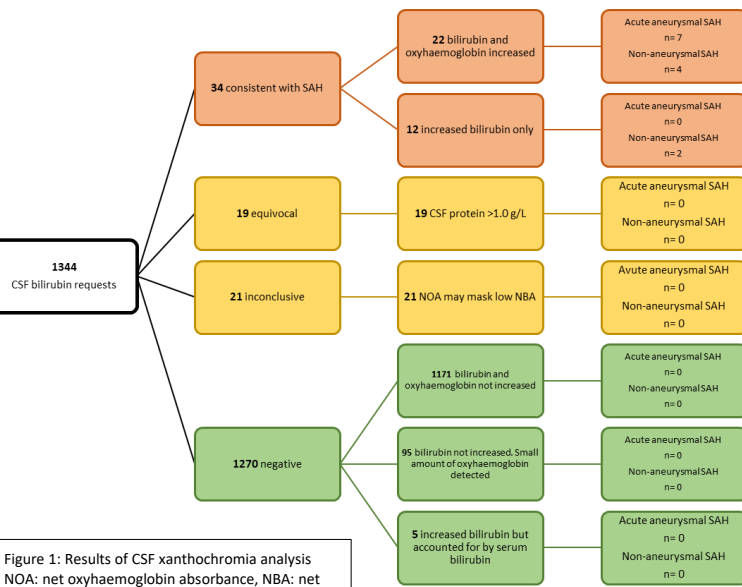


Figure 1: Results of CSF xanthochromia analysis
NOA: net oxyhaemoglobin absorbance, NBA: net bilirubin absorbance

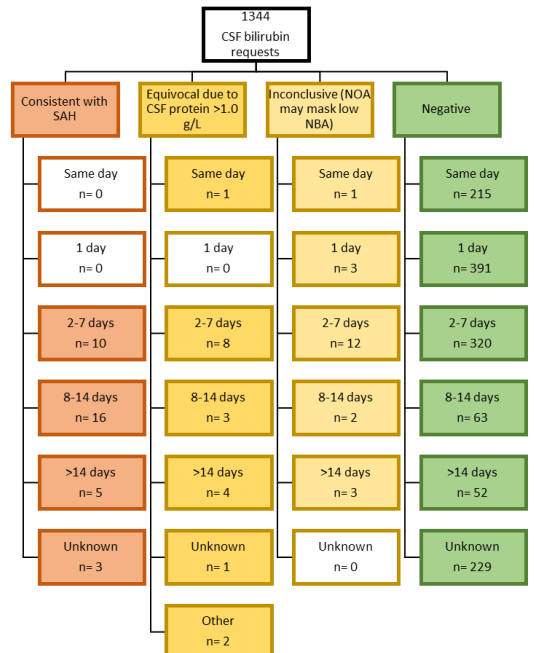


Figure 2: A summary of length of stay in each patient cohort
Other: patients died during admission

Discussion

Of the 1344 samples included in the audit, 7 (0.5%) and 6 (0.2%) patients were diagnosed with acute aneurysmal SAH and non-aneurysmal SAH respectively. Data from the region is consistent with published studies and confirms that in patients with clinically suspected SAH who have a negative CT, CSF analysis is highly likely to be negative. Given the low diagnostic yield for aneurysmal SAH evidenced in this audit we support the draft NICE guidance which suggests if the CT head is performed within 6 hours of the onset of symptoms and shows no evidence of SAH then LP should not be routinely offered.

The audit also demonstrated that a relatively high proportion of requests were not clinically justified; CSF spectrophotometry is not indicated in the investigation of encephalitis, meningitis or possible CSF infection.

References

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2. Ferguson C. Guideline for the management of lone acute severe headache. *The College of Emergency Medicine* 2009 www.rcem.ac.uk
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4. Edlow JA, Fisher J. Diagnosis of subarachnoid hemorrhage: time to change the guidelines? *Stroke* 2012;43:2031-2032.