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CSF analysis in subarachnoid haemorrhage

Recommendations for CSF analysis in subarachnoid haemorrhage

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Spectrophotometry of CSF involving bilirubin quantitation is the recommended method of analysis

In this journal in the late 1980s, two papers presented contrasting advice about the appropriate investigation of cerebrospinal fluid (CSF) in suspected subarachnoid haemorrhage when computed tomography (CT) of the head revealed no evidence of blood. The first concluded that it was the detection of red blood cells that was important in supporting a decision to proceed to cerebral angiography and not that of the red cell breakdown products, oxyhaemoglobin and bilirubin.¹ This was a conclusion based on the use of visual inspection to detect the colour (xanthochromia) imparted by oxyhaemoglobin and bilirubin. The second, based on a series of 111 patients in whom blood was found on CT, concluded that it was the presence of oxyhaemoglobin and bilirubin, as detected spectrophotometrically, that was important.² An editorial in *The Lancet* picked on the difference in examination principle (visual inspection versus spectrophotometry) as being fundamental to the contrasting conclusions.³ The editorial concluded that spectrophotometry was the appropriate way in which to examine CSF when the occurrence of subarachnoid haemorrhage was in doubt. As was subsequently pointed out, the criteria recommended to determine a

positive finding were ambiguous on two counts, and it was not clear that the conclusions reached from a study of patients where blood was detected could be extrapolated to those where blood was not visualised on imaging.⁴ Moreover, although the subjectivity involved in visual inspection of CSF had been replaced by spectrophotometry, this still involved a subjective interpretation of the spectrophotometric scan without any guidance on what quantitative amounts of oxyhaemoglobin or bilirubin constituted a positive finding.

Against this background it was clear that even in the late 1990s there was much confusion about how CSF should be analysed and the results interpreted in CT negative suspected subarachnoid haemorrhage. Consequently, a working group convened to produce guidelines on CSF sampling, transport, handling, analysis, and interpretation. Central to this process was a retrospective multicentre review of over 700 cases where spectrophotometry had been undertaken, haem pigments identified, and bilirubin quantitated, and where the angiographic outcome was known in 87 cases. While recognising the limitations of such a process, which inevitably would have resulted in some patient selection and population bias, this was a significant improvement on the knowledge that existed at this time.

These guidelines have now been published.⁵ The key recommendations are as follows:

- Spectrophotometry of CSF involving bilirubin quantitation is the recommended method of analysis.
- This should be done on the final bottle of CSF to be collected.
- An increased CSF bilirubin is the key finding which supports the need for further investigation. Bilirubin will usually be accompanied by oxyhaemoglobin.
- The occurrence of oxyhaemoglobin alone is most often artefactual, but occasionally may occur with subarachnoid haemorrhage.
- Absence of oxyhaemoglobin and bilirubin on spectrophotometry is not supportive of subarachnoid haemorrhage.

In addition, the group has worked closely with UK NEQAS for Immunochemistry to produce a robust external quality assurance (EQA) scheme through which laboratories can maintain appropriate analytical and interpretative standards.

We believe that the production of the guidelines and the introduction of the EQA scheme represent a significant step forward in ensuring an appropriate standard of CSF analysis. We urge all clinicians and laboratories to adopt these practices.

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