**CLINICAL SCENARIO**

A normally fit and well 26-year-old man presents to the emergency department with a sudden onset headache. It came on 2 h ago, and is the worst he has ever had. He has taken paracetamol without success. His headache made him feel very unwell, but he has no neurological symptoms. His Glasgow Coma Scale (GCS) is 15 and his blood pressure is 120/80 mm Hg.

**THREE PART QUESTION**

In (patients presenting with a history of sudden onset headache) is a (CT scan within 6 h) sufficient to rule out (subarachnoid haemorrhage).

**CLINICAL SCENARIO**

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**ABSTRACT**

A short cut review was carried out to establish whether a normal CT scan within 6 h of onset of a severe, sudden onset headache can be used to rule out a subarachnoid haemorrhage. Four studies were directly relevant to the question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these papers are tabulated.

The clinical bottom line is that a CT scan performed on a third generation scanner with thin slices, reported by a radiologist experienced in reporting CT brain scans, within 6 h of onset of the headache can be used to rule out a subarachnoid haemorrhage.

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<table>
<thead>
<tr>
<th>Table 2</th>
<th>Relevant papers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author, date, and country</strong></td>
<td><strong>Patient group</strong></td>
</tr>
<tr>
<td>Perry et al.⁰, 2011, Canada</td>
<td>Patients over 15 years of age presenting with acute non-traumatic headache (maximum intensity within 1 h of onset), who had a CT scan as part of their evaluation. 953 patients, neurologically intact, GCS 15, had a CT scan within 6 h</td>
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<tr>
<td>Backes et al., 2012, the Netherlands</td>
<td>136 patients presenting with acute headache, no neurology, GCS 15, CT scan within 6 h and who underwent subsequent CSF analysis.</td>
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<tr>
<td>Mark et al., 2013, USA</td>
<td>55 patients with a diagnosis of subarachnoid haemorrhage on lumbar puncture after a negative CT scan within 6 h</td>
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<tr>
<td>Blok et al., 2015, the Netherlands</td>
<td>760 patients presenting with acute headache, no neurology, GCS 15, CT scan within 6 h of onset of headache and who underwent subsequent CSF analysis</td>
</tr>
</tbody>
</table>

CSF, cerebrospinal fluid; GCS, Glasgow Coma Scale; SAH, subarachnoid haemorrhage.
clinical examination is normal. You are concerned that he may have had a subarachnoid haemorrhage (SAH) and want to rule this out. He has a CT scan within 6 h of the onset of the headache. It is reported as normal. You wonder if this excludes a diagnosis of SAH.

SEARCH STRATEGY
(subarachnoid.mp. OR sub-arachnoid.mp.) AND (haemorrhage.mp. OR hemorrhage.mp. OR six hours.mp.) AND (csf.mp. OR xanthochromia.mp. OR Bilirubin.mp. OR exp Hemorrhage/) AND (6 hours.mp.) AND (haemorrhage.mp. OR hemorrhage. mp. or exp Cerebrospinal Fluid/ OR lumbar puncture.mp. or exp Spinal Puncture/ OR xanthochromia.mp. OR Bilirubin.mp. or exp Bilirubin/) AND (exp Tomography, X-Ray Computed/ or ct scan.mp.)

SEARCH OUTCOME
Ovid Medline (1946 to August week 2 2015): 13 papers, 4 of which were relevant to this question. These are presented in table 2.

A search of the Cochrane Central Register of Controlled Trials and the Cochrane Database of Systematic Reviews found no further papers relevant to the question.

COMMENTS
Headache is a common presentation to the emergency department, comprising approximately 2% of all attendances. Of these, 7% will have a SAH. Cerebrospinal fluid analysis has been regarded as essential to successfully exclude a SAH if the CT scan is normal. This dogma has not gone unchallenged, especially when the scan is performed within 12 h.

Being able to rule out SAH in the emergency department using CT scan would be beneficial to patients. It would reduce inpatient admissions to carry out and await results from a lumbar puncture, which is an invasive procedure carrying risks of infection, pain, bleeding and dural puncture headache.

The evidence reviewed, with one exception, supports the use of a CT scan without lumbar puncture if patients present with an acute severe headache, no neurological deficit, and a normal level of consciousness. The exception was the study by Mark et al which found that 11 patients had missed SAHs despite an early negative CT brain scan. Vergouwen and Rinkel challenged the diagnostic criteria for these haemorrhages. For the scan to be diagnostic it must be done within 6 h of the onset of headache and must be reported by an experienced radiologist who regularly reports CT brain scans. In patients presenting with an absence of headache or with atypical features such as neck pain or stiffness, back pain or loss of consciousness, lumbar puncture is still indicated in the event of a negative CT scan. All patients with a negative scan more than 6 h after the onset of their headache should have a lumbar puncture after 12 h.

Major international guidelines continue to recommend a lumbar puncture after negative CT brain scans irrespective of their timing. Clinical decision rules, which may give physicians the confidence to discharge more patients with a negative CT brain scan, are currently undergoing validation.

CT scan alone is sensitive enough to rule out subarachnoid haemorrhage in patients presenting with lone acute severe headache, normal level of consciousness, and no neurological features, if performed within 6 h of onset with a third generation CT scanner with thin slices, and reported by a radiologist experienced in reporting CT brain scans.

Clinical bottom line
CT scan alone is sensitive enough to rule out subarachnoid haemorrhage in patients presenting with lone acute severe headache, normal level of consciousness, and no neurological features, if performed within 6 h of onset with a third generation CT scanner with thin slices, and reported by a radiologist experienced in reporting CT brain scans.

REFERENCES
BET 2: does a normal CT scan within 6 h rule out subarachnoid haemorrhage?

Chris Gray and Bernard A Foëx

doi: 10.1136/emermed-2015-205330.2

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- Clinical diagnostic tests (1034)
- Radiology (980)
- Radiology (diagnostics) (885)

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