To determine sensitivity of modern CT brain (CTB) in detecting SAH in our hospital 126 no lumbar puncture positive 1/187 (0.5%) (figure 4) Specificity is 100% (CI 98-100%).

Adult patients undergoing CTB with clinical query of acute non-traumatic SAH: time from onset of symptoms when available, scan result from verified report, if comment on limitation of CTB, whether LP performed, xanthochromia result and relevant further imaging results were recorded

**Figure 1.**

In 313 negative scans

Lumbar puncture
Successful lumbar puncture was carried out in 187 patients (60%)

Xanthochromia result
- negative 166/187
- high bilirubin only 6/187**
- positive 1/187 (0.5%) (figure 4)
- unhelpful/not done 14/187 (table 1)

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Unhelpful xanthochromia result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not requested or not done on specimen</td>
<td>6</td>
</tr>
<tr>
<td>Too much oxyhaemoglobin to detect bilirubin and SAH not excluded</td>
<td>5</td>
</tr>
<tr>
<td>Insufficient or clotted specimen</td>
<td>2</td>
</tr>
<tr>
<td>Negative but at time frame (4 weeks) cannot exclude</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

Further Imaging
Of those with no LP (126) or unhelpful xanthochromia result (14), 21 and 5 patients respectively (18.5%) had some form of further relevant neuroimaging (table 2) with no occult SAH cases found.

Reported Limitations
Limitations of CT and/or recommendation for subsequent LP were mentioned in 145/313 cases (46%). No statistical correlation with LP uptake.

**Figure 3.** True positive. 42 year old male with sudden onset headache. Time interval unrecorded. Subtle right Sylvian fissure SAH and rounded hyperdensity in region of right PCOM with aneurysm demonstrated here on CT-A.

**Figure 4.** False negative. 71 year old man presenting 5 days following onset of thunderclap headache. Reported as no acute findings but positive xanthochromia in cerebrospinal fluid (CSF) and retrospect subtle extra-axial hyperdensities bilaterally on CT. Subsequent MRI demonstrates some subtle FLAIR hyperintensity in a left parietal sulcus with several foci of subarachnoid hypointensity bilaterally on gradient echo images. No aetiology found for SAH on subsequent CT-A, MRI, MRA or DSA.

**Figure 5. Summary**

1. **True positive.** 37 year old female presenting at least 5 days following sudden onset of headache with superimposed exacerbation and associated hypertension. CT shows right convexity SAH with corresponding FLAIR hyperintensity. Further drug history and neuroimaging work-up suggested a diagnosis of reversible cerebral vasoconstriction syndrome.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Further neuroimaging in patients with negative CTB and no LP or useful xanthochromia result</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>11</td>
</tr>
<tr>
<td>CT-A:Angiogram (CT-A)</td>
<td>3</td>
</tr>
<tr>
<td>MRI and MR angiogram (MRA)</td>
<td>4</td>
</tr>
<tr>
<td>CT-A and MRI</td>
<td>2</td>
</tr>
<tr>
<td>CT-V and MRI</td>
<td>1</td>
</tr>
<tr>
<td>CT-A, CT-V and MRI</td>
<td>1</td>
</tr>
<tr>
<td>MRI and MRA</td>
<td>1</td>
</tr>
<tr>
<td>MR Venogram and CT-V</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
</tr>
</tbody>
</table>

*Threshold headache pain would not normally be seen within the first week of SAH and there are other well known causes. 5/6 were accounted for by significantly high LP protein or high serum bilirubin with 3 having negative MRI or CT-A while the 6th patient was known to be scanned within 1 day of symptoms.

**Figure 4.**

Diagnostic Test Evaluation
- Sensitivity of CTB for SAH in our cohort, encompassing the 15 positive cases and the 199 negative scans with either definitive xanthochromia result or further negative vascular imaging/ MRI, is 94% (CI 70-100%).
- Specificity is 100% (CI 98-100%).
- Negative predictive value is 99.5% (CI 97-100%).
- If the initially false negative case with positive xanthochromia but positive imaging on review of image was found to have SAH, sensitivity is 100% (CI 78-100%).

**Figure 5. Summary**

343 Scans
313 negative CTB
15 positive SAH
15 other pathology
187 lumbar puncture
166 no lumbar puncture
173 definitive xanthochromia result
16 no useful xanthochromia result
164 negative
6 high bilirubin only**
1 positive
2 subsequent negative relevant neuroimaging
21 subsequent negative relevant neuroimaging

**Figure 5. Summary**

**Conclusion**

Modern CT is a highly sensitive tool for detecting SAH. Sensitivity was between 94-100% in our relatively small cohort with one false negative on initial reporting. In cases with negative CTB, LP uptake was 60% while a moderate number with no LP or xanthochromia result had further relevant negative imaging (18.5%). Limitations of CT was mentioned in 46%.

The role of lumbar puncture in patients with suspected non-traumatic SAH remains in question.