Subarachnoid Haemorrhage and Thunderclap Headache

Tom Heaps
Consultant Acute Physician
Lesson Outline

Clinical Case

Why is this topic important?

Thunderclap Headache (TCH): definition

SAH: diagnosis, management and pitfalls

Clinical Case

Other Causes of TCH

New SAH/TCH Clinical Guidelines

Summary
Secondary Survey

<table>
<thead>
<tr>
<th>Time</th>
<th>16:30</th>
<th>16:59</th>
<th>17:03</th>
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<tr>
<td>Reaps</td>
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<tr>
<td>Pulse</td>
<td>74</td>
<td>80</td>
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<tr>
<td>Temp</td>
<td>3.8</td>
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<tr>
<td>BP Sys</td>
<td>184</td>
<td>103</td>
<td>101</td>
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<tr>
<td>BP Dia</td>
<td>63</td>
<td>67</td>
<td>64</td>
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<tr>
<td>Sp O2</td>
<td>7.8%</td>
<td>19.5%</td>
<td>100%</td>
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<tr>
<td>MMWS</td>
<td></td>
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<tr>
<td>CO2</td>
<td></td>
<td></td>
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<tr>
<td>Blood Sugar</td>
<td>7.6</td>
<td>7.6</td>
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</tr>
<tr>
<td>Peak Flow</td>
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Stroke (FAST)

Facial Weakness L R None
Arm Weakness L R None
Speech Impairment Y N None
Referred to Stroke Unit

Mental Capacity and Consent

History of preventing complaint

PT EXPERIENCING HEADACHE
MILD TO MILD
PHOTOPHOBIA, AT APPROX LIGHT
14.30 HRS. SUDDEN ONSET
WITH NECK STIFFNESS
AND VOMITING.
PT TOOK SELF TO BED. MOANED
1 PREVIOUS EPISODE
APRIL 13. WIFE REPORTS
PT TOOK 3/52 TO RECOVER FULLY

Recent Goals

On examination 9A CAW N/G BY WIFE. PT IN BED UPHOARS
EXPERIENCING PHOTOPHOBIA, EYES COVERED WITH HANDS.
CNs: Pt had vomited x 3. BAV ATHLETIC RES.

Spinal Immobilisation

Selective immobilisation

No Altered Mental Status
No Cervical Tenderness
No Evidence of Intoxication
No Disturbing Injury
No Neurological Deficit

Cardiac Monitoring

SINUS RHYTHM

Airway Breathing Management

Venturi 28% O2 Nasal Cannula
Ventilation 100% O2 Nebuliser
NPA ET NCD Size
Achieved Y/N Attempts
Position checked by Auscultation ECG

Cannulation

Size 1 Y/N Size 1 Y/N Size 2 Y/N

Hospital Details

Hospital Alert Pt handed over to Dr.
Dear Doctor,

The patient had a cold over 1-2 days. No fever or sweating.

Headache: yes (migraine)

Migraine: yes

No pain

No pressure

Light, photophobia (mild), no rest after

Sleep: 11h, 00 pm - 08 am / 05 am / 05:35

Gadcidle S.A.H

Yours sincerely

Dr. Sylvester
<table>
<thead>
<tr>
<th>T</th>
<th>35.4</th>
<th>HR</th>
<th>72</th>
<th>BP(lying)</th>
<th>121/76</th>
<th>BP(standing)</th>
<th>Pain score (Time)</th>
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<tr>
<td>RR</td>
<td>16</td>
<td>O2sat (Air)</td>
<td>100</td>
<td>Sats</td>
<td>1/min</td>
<td>BM</td>
<td>Pain score (Time)</td>
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<tr>
<td>Pre PEFR</td>
<td>Pre-Neb PEFR</td>
<td>Post-Neb PEFR</td>
<td>GCS</td>
<td>15</td>
<td>AMT</td>
<td></td>
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<tr>
<td>VA (R)</td>
<td>VA(L)</td>
<td>Urine</td>
<td>Urine Beta HCG</td>
<td>MEWS</td>
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Has the patient or a household member had diarrhoea and / or vomiting in the last 48 hours?

Yes No

Has the patient or a household member had symptoms suggestive of influenza. Fever >38°C, muscle ache & dry cough (during winter months) over the last 48 hours?

Yes No

Has the patient or a household member had an infectious rash. Measles, scarlet fever on an exposed area?

Yes No

Signed __________ Print Name __________ Date ________

-- Sough onset of frontal headaches, Photophobia, Neck stiffness and 2 episodes of vomiting today. Also felt quite lethargic. Suspected SAH. GCS 15. No pyrexia or rash. CT booked.

Approx 14:20 today pt was watching TV and noticed a "fuzzy feeling" in his head. Then suddenly developed a frontal 9/10 headache. Developed nausea and vomiting. Dialled 999, BIBA.

Vomited approx 4 times. No haematuria.

Prev 7 migraine 12/12 ago

Pain

4/10 frontal and neck pain

Photophobia constant. Improving coming in waves

No nausea - improving

Lives with partner + daughter, non-smoker

7 units/week. NOT teetotaller.
Pt is alert and oriented. In a bright room, no photophobia.

CNS: Cranial nerves I-XII intact.
9CS 15. Full power to arms and legs.
PERLA 3+2+
No photophobia
Pt is warm and emotional, feels out of control.

CV: I-II+O
Normotensive
Normothermic
Good colour and turgor
S SVP

ABDO: Abdomen soft and non-tender
Splenomegaly
Guarding
B.O.D today - NAD

Skin: Warm and intact
Very mild non-blanching rash to sternum and mandible
Acne to temples - Rx cortisone

Stress induced migraine

Plan: Observe for alleviation of symptoms, repeat paracetamol TO dopamine

Cannula insertion record

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<th>Date &amp; Time</th>
<th>Insertion Site (left hand)</th>
<th>Name (Print)</th>
<th>Signature</th>
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</table>

Blood cultures record

<table>
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<th>Date/Time</th>
<th>Site Taken</th>
<th>Name</th>
<th>Signature</th>
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</table>

Cannula removal record

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>Name (Print)</th>
<th>Signature</th>
<th>Comments (ie, clean, dry, red, pus, swabs)</th>
</tr>
</thead>
<tbody>
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</table>

Blood cultures must be taken according to Trust Policy

Diagnosis
Stress induced migraine

Outcome
Sx alleviated
ECG

Time: 1910
### Attendance Summary

<table>
<thead>
<tr>
<th>Site</th>
<th>BHH</th>
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<tbody>
<tr>
<td>Arrival</td>
<td>30 Jun 2014</td>
</tr>
<tr>
<td>Presenting complaint</td>
<td>HEADACHE/VOMITING</td>
</tr>
<tr>
<td>Place of incident</td>
<td>Home</td>
</tr>
<tr>
<td>Source of referral</td>
<td>Emergency services</td>
</tr>
<tr>
<td>Mode of arrival</td>
<td>Ambulance</td>
</tr>
<tr>
<td>Triage nurse</td>
<td>ARIDA OLATAYO</td>
</tr>
<tr>
<td>Triage time</td>
<td>30 Jun 2014 17:27</td>
</tr>
<tr>
<td>Clinician(s)</td>
<td>Joanna Fellowes, Mark Anderton</td>
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<tr>
<td>Time seen</td>
<td>30 Jun 2014 17:46</td>
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<tr>
<td>Outcome</td>
<td>DISCHARGED (PATIENT TO SEE GP)</td>
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<tr>
<td>Departure</td>
<td>30 Jun 2014 19:12</td>
</tr>
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</table>

**Comments**

BIBA with severe headache, SAH ruled through Hx of Sx, Sx resolving rapidly with tramadol and sumatriptan. Red flags discussed, pt happy to be discharged with tto sumatriptan, will see GP to discuss migraine control. Also discussed stress management with patient. Pt happy to be discharged home with partner, to reattend if Sx return.

Sudden onset of frontal headaches, Photophobia, Neckstiffness and 2 episodes of vomiting today. Also felt quite lethargic. Suspected SAH.

GCS 15. No pyrexia or rash. CT Booked.

### Details

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>G43.9: Neuro - Migraine</th>
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<tr>
<td>Investigation</td>
<td>None</td>
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<tr>
<td>Treatment</td>
<td>Advice/ Guidance - verbal</td>
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<tr>
<td></td>
<td>Med administered - oral</td>
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<tr>
<td>Allergy</td>
<td>None</td>
</tr>
<tr>
<td>Drug</td>
<td>OTHER DRUGS</td>
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<td>TRAMADOL HYDROCHLORIDE</td>
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</table>
Readmitted to ED 03/07/14 with collapse/seizures and GCS 10/15
**3/7/14**

**1700**

**WRITTEN IN RETROSPECT**

Mr. F. Legerski 110794

Attendance 30.6.14 - 7.10

**PC** Headache

Patient examined, reported no headache. Pt. describes watching T.V., felt a 'fuzzy' feeling, then developed a headache. States he has had similar headache 2 years ago which pt. knife tried to 'stop' for a 'couple of weeks' to get better - states that previous headache was not 'worse' but not like today's in severity.

- Denied today's headache having worsening of 'being hit around the head' or 'Thunderclap'.
- Headache NOT induced by exercise or made worse when sitting forwards.

**DE** As documented previously

- Patient stated to feel 'tremendously better'.
- Very keen to go home.
- Pain free

**Plan**

- Had flags discussed at length, written down advice given.
- Advised to return to ED/GP with any concerns.
Why is this topic important?

3x Serious Untowards Incidents (SUIs) at HEFT in the last 5 years

NCEPOD *Managing The Flow 2013* (national audit of 427 SAH cases)

• ‘room for improvement’ or ‘unsatisfactory’ care in 42% of cases
• 32% of hospitals had no policy for Ix/Rx of acute onset headache
• 18% of patients had no documented neurological examination
• diagnosis initially overlooked in 32/75 (may have affected outcome in 23)
• 49/383 did not have a timely diagnosis of SAH (affected outcome in 10)
• 68% of patients did not receive CT within 1h of admission
• 46% of patients with confirmed diagnosis of SAH did not receive nimodipine
Acute Medicine Audit July 2014 (n=54)

- no current guideline/pathway for the assessment and management of thunderclap headache/SAH at HEFT
- nearly 1/3 of patients did not have a full neurological examination documented in the medical notes
- only 28% of patients had CT within 1h of presentation
- 1/3 of patients with normal CT did not have LP for xanthochromia
- 39% of patients waited >12h (unnecessarily) for LP following –ve CT report
- no confirmed case had a WFNS grade documented in the notes
- nimodipine was only commenced in 52% of confirmed cases
- hourly obs not performed in 30% of cases accepted for neurosurgical transfer
- delays in transfer >12h in 38% of patients accepted by UHB
Thunderclap headache

Any **severe headache** (usually >7/10) with **sudden onset** (reaches maximal intensity within seconds to minutes, usually <1 minute)

Often (but not necessarily) described as the ‘worst headache of my life’

SAH in 11-25%

Other serious pathology in 10-12% which may be missed by CT/LP
Subarachnoid Haemorrhage

- 5-10% of all strokes
- peak age 35-65
- female > male
- 85% due to ruptured saccular aneurysm
- headache is primary symptom in 70% (thunderclap in 50%)
- headache is the ONLY symptom in ~1/3 of cases
- often occipital but may be frontal/generalized and lateralizes in 30%
- sentinel headache (‘warning leak’) recalled in 10-43% 6-20 days prior
Other clinical features of SAH

- precipitated by exertion (including intercourse) or valsalva in 50%
- vomiting at headache onset (75% but not specific)
- syncope/dizziness at headache onset (53%)
- meningism ≥6h after onset (35%)
- paucity of lateralizing neurological signs (absent in >85% of cases)
- seizure at headache onset (7%)
- reduced conscious level (67%) and/or confusion
- hypertension
- history of smoking
- retinal or subhyaloid haemorrhage
- ECG changes mimicking ACS (ST elevation)
Utility of clinical features of SAH

- Features highlighted in bold increase the odds of SAH in patient with TCH

  **HOWEVER**

- NO clinical features are sensitive or specific enough to allow the diagnosis of SAH to be made clinically

  **AND**

- The absence of these clinical features, improvement in headache with simple analgesia/triptans or prior history of headaches (including migraine) CAN NOT BE USED TO EXCLUDE SAH CLINICALLY

- Patients may appear deceptively ‘well’ at time of first presentation

**CT FOLLOWED BY LP (if CT negative) IS MANDATORY IN ALL PATIENTS PRESENTING WITH TCH (as defined previously)**
Investigation of TCH

CT head is MANDATORY in all patients with TCH (ideally within 1h of presentation)

• sensitivity for SAH declines with time: 98% at 12h from headache onset, 93% at 24h, 74% at 72h, 50% at 1 week

• sensitivity ~100% ≤6h using modern CT scanners removing need for LP

• not accepted practice currently in UK

LP is MANDATORY in all cases of TCH where CT is negative (and does not show CI to LP)

• spectrophotometry for xanthochromia ~100% sensitive between 12h and 2w of headache onset

• additional pick-up rate for SAH very low in practice

• may detect other pathologies: MEASURE OPENING PRESSURE

➢ Inform patient at presentation of the need/rationale for the above diagnostic pathway

➢ Reasons for declining CT/LP need to be fully explored and risks carefully explained

➢ Discussions need to be fully documented (together with assessment of patient capacity)

CONSIDER NEED FOR ADDITIONAL Ix (e.g. MRI/MRA, CTA) in CT/LP –ve cases
Initial misdiagnosis of SAH is common

- 12% in one case series (20% in patients with normal mental status at time of presentation)
- initial diagnosis overlooked in 32/75 patients in NCEPOD audit (may have affected outcome in 23)
- failure to obtain CT head at initial contact most common error (>70%)
- failure to appreciate spectrum of clinical presentation of SAH (false reassurance provided by absence of associated symptoms/signs etc.)

Delays in diagnosis are common

- 25% in one case series
- 13% of patients in NCEPOD audit did not have a timely diagnosis of SAH
- outcome adversely affected in 10/49 of these patients
- 51/383 patients experienced delay in obtaining CT scan (outcome affected in 4)
Management of SAH

- REFER IMMEDIATELY TO NEUROSURGEONS @ UHB (NORSe or via phone)
- airway protection
- bed-rest, analgesia, stool softeners, TEDS
- reverse anticoagulation, stop antiplatelets +/- transfuse platelets
- cardiac monitor, hourly BP/neo-obs
- IV fluids (0.9% NaCl), correct hypotension
- cautious control of hypertension (IV labetalol) aiming sBP <160mmHg
- control fever and hyperglycaemia
- PO nimodipine 60mg/4h (monitor for hypotension)
- ? high-dose statin (may reduce vasospasm/mortality)
- no evidence for routine AEDs, steroids, anti-fibrinolytics
Case 1

- 41-year-old male
- PMHx of migraine with aura during adolescence
- Admitted 14/7 ago with severe post-coital headache
  - CT and LP normal (xanthochromia negative)
  - Discharged with PRN indomethacin
- Presents to AEC with recurrent post coital headache
- 10/10 severity, ‘like being hit around the head with a baseball bat’
- Associated numbness of left face/arm for 2h
- No fever/meningism
- MEWS = 0
- Neurological examination (including funduscropy) NAD
- Routine bloods and ECG normal
Case 1 cont.
Further investigations?
Repeat CT/LP??
Possible Diagnoses?
Coital Headache/Cephalalgia

30% pre-orgasmic (dull, bilateral, gradually increases)
• excessive contraction of neck/jaw muscles
• usually benign

70% orgasmic (sudden onset ‘thunderclap’ headache at point of orgasm)
• may be benign but can be associated with underlying pathology
  • SAH (4-12%)
  • haemorrhage into cerebral tumour
  • ischaemic stroke/cervical arterial dissection
  • spontaneous intracranial hypotension
  • phaeochromocytoma
  • reversible cerebral vasoconstriction syndrome (RCVS) may account for up to 60%
Benign Sex (Primary Coital) Headache

Diagnosis of exclusion

Pathophysiology unclear
- rapid increases in blood pressure and heart rate during orgasm?
- possible migraine variant?

Preventative management
- Indomethacin 25-150mg 30-60min prior to intercourse
- Propanolol 40-200mg OD (first line if history of migraine)

Acute management
- Sumatriptan or zolmitriptan 5mg intranasal spray

Prognosis
- Single attack or single bout of attacks in 75%
- More chronic course in 25% (69% remission at 3 years)
Case 1 cont.

- CT angiography requested
Reversible cerebral vasoconstriction syndrome (RCVS)

- Benign angiopathy of the CNS (BACNS), Call-Fleming syndrome, primary/benign thunderclap headache, ‘crash’ migraine
- Recurrent thunderclap headaches +/- transient focal neurological deficits, seizures, altered conscious level, vomiting, ataxia, dysarthria
- May be triggered by sexual activity, exertion, coughing, straining/Valsalva, emotion, bathing/showering
- Pathophysiology unclear – transient disturbances in regulation of cerebral arterial tone and/or endothelial dysfunction?
- Associated with:
  - Migraine
  - Pregnancy, pre-/eclampsia, postpartum angiopathy
  - Vaso-constrictive medications (nasal decongestants, triptans, SSRIs, SNRIs, cocaine, amphetamines, ecstasy, cannabis, nicotine)
  - Cervical arterial dissection, CEA, CVST, PRES/RPLS
Reversible cerebral vasoconstriction syndrome (RCVS)

- CT and LP usually normal
- Diagnosis made by CTA/MRA – arterial ‘beading’
- Occasionally may result in infarction (posterior/watershed), convexity SAH, lobar ICH, PRES, SDH
- Symptoms and angiographic vasoconstriction resolve <12w (often <4w)
- Stop vasoactive drugs
- Avoid other triggers
- Some evidence for nimodipine 60mg/4h (avoid hypotension)
# Thunderclap headache: is CT/LP sufficient?

<table>
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<tr>
<th>Vascular</th>
<th>Non-Vascular</th>
<th>Primary Headaches</th>
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<tbody>
<tr>
<td>SAH/sentinel headache</td>
<td>Spontaneous intracranial hypotension</td>
<td>Thunderclap migraine</td>
</tr>
<tr>
<td>Symptomatic aneurysms</td>
<td>PDPH</td>
<td>Cluster headache</td>
</tr>
<tr>
<td>CVST</td>
<td>Pituitary apoplexy</td>
<td>Primary cough headache</td>
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<tr>
<td>Cervical carotid/vertebral arterial dissection</td>
<td>Arnold-Chiari type 1 / aqueductal stenosis / acute hydrocephalus</td>
<td>Primary exertional headache</td>
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<tr>
<td>Ischaemic stroke</td>
<td>Intracranial infection</td>
<td>Primary coital headache</td>
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<td>ICH/SDH/EDH</td>
<td>Acute sinusitis</td>
<td>Primary thunderclap headache</td>
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<td>Vasculitis/angiitis/GCA</td>
<td>Colloid cysts of 3\textsuperscript{rd} ventricle</td>
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<td>Hypertensive encephalopathy/PRES</td>
<td>HaNDL syndrome</td>
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<td>MI</td>
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<td>Aortic dissection</td>
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CTA/MRA after negative CT/LP?

- Unrealistic for all cases of thunderclap headache in the NHS

- Consider in selected cases:
  - persistent severe unexplained headache
  - recurrent admissions with thunderclap headache
  - abnormal neurology/GCS/confusion/seizures
  - raised CSF opening pressure at LP
  - neck pain (?dissection)
  - strong clinical suspicion for cerebral aneurysm
  - risk factors for CVST e.g. post-partum (CTV/MRV)
New SAH/TCH Guideline Coming soon....
TCH/SAH: Key messages

Misdiagnosis and delays in diagnosis of SAH common
  • often with catastrophic results

History and examination CANNOT be relied upon to rule out SAH

URGENT CT +/- LP MANDATORY IN ALL PATIENTS WITH ACUTE SEVERE HEADACHE (TCH) IRRESPECTIVE OF:
  • presence/absence of associated symptoms/neurological signs
  • previous headache/migraine history
  • improvement in headache with simple analgesia

Medical management often suboptimal pending neurosurgical transfer

Negative CT/LP does not necessarily rule out other serious pathology in TCH
Any Other Questions?