Management of Acute Headache

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Classification of Headaches ICHD3

Primary headaches
1. Migraine
2. Tension-type headache
3. Trigeminal autonomic cephalalgias
4. Other primary headache disorders

Secondary headaches attributed to
5. Trauma or injury to the head and/or neck
6. Cranial or cervical vascular disorder
7. Non-vascular intracranial disorder
8. Substance or its withdrawal
9. Infection
10. Disorder of homoeostasis
11. Disorder of cranium/neck/eyes/ears/nose/sinuses/teeth/mouth/cervical
12. Psychiatric disorder

Painful cranial neuropathies \textit{classical} / \textit{secondary}
Headache in the Emergency Department

Main complaint in 1-16% of all visits
   Mostly young adults, female preponderance
   Mostly primary headaches, serious conditions in 5-15%

Top priority = precise etiologic diagnosis

Crucial part = interview

Diagnosis determines management of the patient

Symptomatic treatment may be needed but a good response should not be a reason for postponing etiologic investigations
<table>
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<tr>
<th>Have you ever had this type of headache before? When did your actual headache start?</th>
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<tr>
<td><strong>Patient able to say that he has already suffered from several similar headaches for months or years</strong> and that he is recognizing a usual headache attack</td>
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<td><strong>A primary headache disorder is most likely</strong></td>
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<td><strong>Diagnosis = detailed interview</strong></td>
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<td><strong>Treatment relies on specific acute headache treatments as in/out patient</strong></td>
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| **Patient reports having headaches for the first time in his life for hours/days/weeks/months** |
| **A secondary headache disorder has always to be excluded** |
| **Diagnosis = emergent investigations** |
| **Treatment of the underlying cause** |
Have you ever had this same type of headache before?
When did your actual headache start?

Patient has *already suffered* from several *similar* headaches for *months or years* and is recognizing his usual headache attacks.

A primary headache disorder is most likely

Diagnosis = detailed interview

Do you have headache attacks or do you have headaches all the time?
Migraine > tension type > cluster headache

Patient says he has already suffered from several similar headaches for months or years

Make a precise diagnosis (duration of attacks)

Interview about characteristics of headache attacks
Age of onset, duration, localisation, intensity, type, associated signs and symptoms, triggers
Normal neurologic or physical examination
Investigations not necessary, normal if done

Specific acute headache treatments
Primary Headache Attacks: Diagnosis

**Migraine without aura**
- 4-72 hours, irregular frequency of attacks all over the year
- Moderate or severe, possibly by physical activity, unilateral, pulsating (2/4)
- Nausea/vomiting and/or photophobia
- Migraine with aura: aura is characteristic

**Cluster headache**
- 15-180 minutes; 1-8 attacks/day; periodicity; night, regular
- Severe to very severe, unilateral, always same side, agitation
- Autonomic signs: eyelid edema, miosis/ptosis, tearing, nasal congestion
- Mostly episodic, rarely chronic

**Tension type headache**
- 30 minutes to 7 days, limits not clear
- Mostly bilateral, pressing or tightening, not affected by physical activity
- Setting of stress, anxiety or depression or “can no longer cope”

**Classical trigeminal neuralgia**
- Severe, electric shock like or stab, seconds to 2 minutes, trigger zone
Primary Headache Attacks: Treatment

**Migraine:** treatment varies according to local protocols
- Specific drugs: subcutaneous sumatriptan or infusion of DHE
- Nonspecific drugs: IV paracetamol or NSAIDs
- Add antiemetics and/or tranquilizers (clorazepate 20-50 mg)
- IV fluids (vomiting), ice packs, calm/quite room, deep relaxation
- Intractable migraine: IV amitriptyline, IV sodium valproate
- Status migrainosus: hospitalisation may be requested

**Cluster headache**
- Attack: subcutaneous sumatriptan and/or high flow oxygen 15L/min
- Initiate prophylaxis: verapamil 120 mg
- Consider transitional treatment with steroids: oral or GON injections

**Tension type headache**
- If needed IV paracetamol or NSAIDs often with tranquilizers

**Classical trigeminal neuralgia:** carbamazepine
Chronic Daily Headache
« I have headache all the time since years »

Mostly primary headaches
- Chronic migraine
- Chronic tension-type headache
- Chronic post-traumatic headache
- Medication overuse

Can present to an emergency department in the setting of stress, anxiety, depression or “can no longer cope”

Investigations mandatory if never done before to exclude a secondary headache disorder

Management by headache specialist
Have you ever had this type of headache before?
When did your actual headache start?

Patient reports having headaches for the **first time in his life** for hours/days/weeks/months

Patient reports history of definite primary headaches but states that his acute headache is **different** from his usual headaches attacks

A **secondary headache disorder** has always to be excluded

How did the headache begin?
How long the headache took to peak?
How has the pain changed since its onset?

Sudden Vascular Disorders
Nonvascular disorders

Progressive Nonvascular Disorders
Vascular disorders
Unusual Acute Headache: Interview
Headache Characteristics?

Mode of onset: time to peak

Maximum severity
11-point scale (0-no pain to 10-worst ever pain)
Headache can be mild in a serious condition

Type and location of pain: not specific

Spontaneous or triggered: Valsalva, exertion, sexual activity...

Avoids standing up: intracranial hypotension, cerebellar stroke

Avoids lying flat: SAH, intracranial hypertension, cerebral venous thrombosis, sinusitis
Unusual Acute Headache: Interview
Circumstances? Medical history?

Mild trauma: subdural hematoma, cervical arterial dissection, intracranial hypotension

Intake of vasoactive substances: serotoninergic and sympathomimetic medications, illicit drugs: reversible cerebral vasoconstriction syndrome (RCVS)

Dural puncture: intracranial hypotension

Fever: infectious disorders

Postpartum: RCVS, cerebral venous thrombosis, eclampsia, post dural puncture intracranial hypotension

Ear, nose, and throat symptoms: complicated sinusitis

Cardiovascular disease and hypertension: stroke

Cancer: cranial metastases
Unusual Acute Headache: Interview
Associated Symptoms?

**Any central neurological symptoms:** consciousness impairment, seizures, focal deficits: intracranial disorder

**Visual symptoms:** eclipses, visual loss, diplopia: intracranial hypertension

**Any headache in a >50 years old:** giant cell arteritis

**Fever:** infectious disorders

**Nausea and vomiting:** non specific
Unusual Acute Headache
Clinical Examination

Any abnormality in the clinical examination increases the need for rapid evaluation

**General:** blood pressure, temperature, skin

**Consciousness and neck**

**Always check eyelids, pupils, visual field, and cerebellar function for subtle signs**

- Cerebellar ataxia (stroke)
- Hemianopia (stroke)
- Unilateral mydriasis (aneurysm)
- Complete third nerve palsy complet (aneurysm)
- Myosis and ptosis (carotid artery dissection)
- Sixth nerve palsy (intracranial hypertension or hypotension)

**Fundoscopy**
All these 3 males have an acute, recent, unusual right sided headache.
The absence of any associated symptoms and a strictly normal examination do not exclude a serious cause
Urgent diagnostic work-up is still needed

Investigations are guided by the list of all possible underlying causes
Thunderclap Headache

High intensity headache of abrupt onset mimicking that of a ruptured cerebral aneurysm
Peaking in < 1 minute, no limits for duration
Often reveal serious causes
Investigations should be expedient and exhaustive
The absence of any associated symptoms and a strictly normal examination do not exclude a serious cause
Diagnosis is based on plain brain CT and, if tomogram is normal, on lumbar puncture but these first line investigations can be normal in several serious conditions
Subarachnoid hemorrhage

- 11-25% of patients with thunderclap headache
- 70% present with headaches, 50% thunderclap
- CT: sensitivity decreases with time
- MRI (FLAIR, T2*): superior to CT after day 1
- CSF analysis after normal imaging
- Ruptured aneurysm 85% => angiography
Other intracranial hemorrhages

Intracerebral hemorrhage ICH

Headache >50% but often overshadowed by focal deficit and/or coma

Isolated (thunderclap) headache: cerebellar ICH, frontal, temporal or occipital ICH (non dominant hemisphere)

Intraventricular hemorrhage and acute subdural hematoma

Isolated headache

Plain CT, IRM T2*

*Note: IRM T2 refers to Magnetic Resonance Imaging with T2 weighting, which provides high contrast for fluid and indicates the presence of hemorrhage.
**Ischemic stroke**

Headache in 17-34% of all ischemic stroke

Often overshadowed by focal deficit and/or coma

**Isolated (thunderclap) headache possible:** cerebellar, temporal or occipital regions

**Headache in ischemic stroke points to certain etiologies** cervical artery dissection, RCVS, SAH followed by vasospasm, angiitis

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**MRI diffusion weighted images**

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Other causes detected by CT and LP 10-12%

Other intracranial hemorrhages 5-10%

Ischemic stroke (rare)

Hydrocephalus and tumours

Sinusitis

Meningitis 2%
Misdiagnosis of SAH 30%
50% aneurysmal SAH report previous thunderclap H
Painful third nerve palsy revealing aneurysm

=> Fear of warning leaks

Prospective series of sudden onset headache (CT and LP)
11-25% SAH, 10-12% stroke/tumour/meningitis
70% no cause and good outcome

=> Concept of « benign thunderclap headache »

=> Suggestion that cerebral angiography is not necessary in cases with thunderclap headache with normal CT and normal LP
34 yo female
Normal delivery 25/09/2007
Day 0, 26/09 first TCH
Day 1 normal CT scan
Day 3 2nd TCH + aphasia
Day 4 CT bilateral frontal ICH + cSAH, normal MRA and conventional angiogram
Day 6 partial seizure
Day 10 third TCH
Reversible Cerebral Vasoconstriction Syndrome (RCVS) => Clinico-radiological syndrome
Calabrese LH, Dodick DW, Schwedt TJ, Singhal AB. Ann Intern Med. 2007; 146: 34-44

Acute severe headaches (often thunderclap) ± focal deficits or seizures
Segmental vasoconstriction of cerebral arteries on angio (CT, MR or IA)
Uniphasic course: no new symptoms >1 month
No evidence of aneurysmal SAH
Normalisation of arteries <12 weeks of onset
Isolated TCH in 75% of cases: RCVS accounts for most « benign thunderclap headache »
All ages, female preponderance
Stroke rare but often severe and sometimes lethal
Multiple causes (postpartum, vasoactive medications/drugs)
RCVS Clinical Presentations

Purely cephalalgic 55-75%
- Recurrent thunderclap headaches over 1-4 weeks 94%
- 80% TCH triggered: sexual activity, leaning down, exertion, singing, emotion, defecation, cough, sneezing, shower, urination, laughing... ...

=> RCVS, the most frequent cause of recurrent TCH

Headaches + other symptoms: 25-45%
- Seizures 5-17%
- Focal deficits 20-43%: transient (TIAs/aura like)
  persistent (stroke)

Catastrophic, sometimes lethal < 2%
- Multiple strokes and intractable vasoconstriction

Stroke in RCVS: a Dynamic Process

Intracranial hemorrhage 33%
  Any variety of hemorrhage
  Convexity subarachnoid hemorrhage, intracerebral or subdural (associations)
  Early event 1st week
  17% with normal initial CT

PRES 8-40%
  Early event 1st week

Infarcts 6-39%
  Later on 2nd week

ICH 1.7 ± 2
cSAH 5 ± 5
Last TCH 7.4 ± 5.6
Infarct 12 ± 3
TIA 11.6 ± 4.9
Sensitivity of investigations is incomplete but increases with time

Repeat brain imaging: Normal initial imaging in hemorrhagic RCVS 17%

Image cerebral vasoconstriction

  Initial normal angiogram 20-40% (MRA/CTA, transfemoral rarely)
  MRA maximal at D16±10, close to headache resolution (Chen, Ann Neurol 2010)
  Intracranial velocities TCD maximal at D18-25 (Chen, Ann Neurol 2008)

Image cervical arteries: 12% cervical artery dissection (Mawet, Neurology 2013)

Prove reversibility of vasoconstriction < 3 months

Rest, removing vasoactive substances, nimodipine
Mostly good outcome, few permanent deficit, Case fatality < 1%
What are the Less Common Causes of Thunderclap and Sudden Headaches?

Causes detected by plain CT or lumbar puncture

RCVS is possibly missed by plain CT and lumbar puncture

Several case series showed that some etiologies of thunderclap headache cannot be ruled out clinically and can present with normal plain CT and normal cerebrospinal fluid.
Cervical Artery Dissection
Isolated pain 8%
TCH 20%
Pain precedes stroke
Image cervical and cerebral arteries
CT or MR angio
Fat sat T1WI
Antithrombotics

Cerebral venous thrombosis
Inaugural TCH 2-16%
Elevated CSF pressure
Pain precedes stroke
Image cerebral veins to visualize thrombus
IRM T1 T2, T2*
Sinus manquant
Heparine

Intracranial hypotension
Inaugural TCH 15%
Orthostatic headache
Low CSF pressure
Complic= SDH and CVT
MRI signs PMGE, cranio-caudal descent, subduralcollections
Epidural blood patch

Causes of TCH which can present with normal CT/LP
Other causes of sudden headache which can present with normal CT and normal LP

- Posterior reversible encephalopathy syndrome
- Pituitary apoplexy
- Spontaneous retroclival hematoma
- Aortic arch dissection
- Giant cell arteritis
- Myocardial ischemia
Etiologies of recent headache with progressive subacute onset

Causes diagnosed by physical examination followed by plain CT, and when CT is normal, by LP

Intracranial hypertension with abnormal CT
- Space occupying lesion (tumour/abcess/subdural hematoma)
- Hydrocephalus

Meningitis and meningoencephalitis

ENT and eye disorders: sinusitis, glaucoma...

Any causes of TCH can also present with progressive headache !!!
Other etiologies of acute headache with progressive onset which can present with normal CT

Any causes of TCH can present with progressive headache !!!

Causes of intracranial hypertension with normal CT
- Chronic meningitis
- Cerebral venous thrombosis
- Dural fistula
- Hyperproteinorachia (horse tail tumour, PRN)
- Idiopathic intracranial hypertension

Intracranial hypotension (post dural puncture or with spontaneous CSF leak)

Giant cell arterities

CO poisoning
Idiopathic intracranial hypertension

Rare disorder
Female predominance, obesity
**Normal imaging** (CT, MRI + gado, MRV, MRA) + no hormonal or toxic causes

Headache 75-99% progressive or rapidly increasing

Visual symptoms 80%
- Eclipses, bilateral decrease of VA
- Diplopia with VIth nerve palsy
- Bilateral papilloedema 95-100%

Tinnitus, nausea

CSF pressure > 25 cm

Tt: diet + LP + acetazolamide

Surgery if intractable headaches/papilledema/visual loss
Diagnosis of Acute Headache

Rapid interview distinguishes a primary headache attack from a suspected secondary headache disorders

Characterise primary headache attack and provide a specific treatment, discharge the patient with a treatment plan to avoid early readmission to the emergency department

When a secondary headache disorder is suspected, the absence of any associated symptom and strictly normal examination do NOT exclude a serious cause, and investigations should always be performed
18 years-old male without past medical history

Sudden headache at 3:30 PM while working on his computer
Headache peaked in 10 seconds reaching 9 on the 11-point verbal scale
Bilateral and diffuse headache, pulsating, phono and photophobia

Clinical examination at 5:20 PM
- Painful but calm
- Supple neck
- Body temperature 36.8°C
- Blood pressure 130/75 mmHg
A strictly normal clinical examination does not exclude a subarachnoid hemorrhage.

SAH is initially misdiagnosed in 1 of 3 patients.
Investigations in Acute Headaches

Blood tests, ESR and CRP, electrocardiogram

Plain head CT followed by LP if CT is normal

Timing of LP

12 hours after headache onset (spectrophotometry)

Risks: meningitis, early rebleeding of ruptured aneurysm (15%)

Further investigations after normal CT and LP

Cervical and cerebral angiography: alternate diagnosis

Normal CT/LP/angiogram: brain MRI may show cortical CVT, pituitary apoplexy, PRES, intracranial hypotension

Four vessel angiography nowadays rarely necessary
Conclusions

Acute headache, either of the thunderclap type, or sudden, or rapidly progressive is a **warning symptom** pointing to numerous underlying causes.

Plain CT and LP whenever the CT is normal diagnose several causes.

Several *vascular disorders* can present with isolated acute headaches, and, except intracranial haemorrhages, **may be missed by plain CT and lumbar puncture**.

Large prospective series to establish the respective frequencies of underlying causes and to evaluate the diagnostic yield of angiography and brain MRI after normal CT and LP.

**Systematic cervical and cerebral CT or MR angiography**