



Neurology Department  
Faculty of Medicine  
Andalas University

# CERTIFICATE

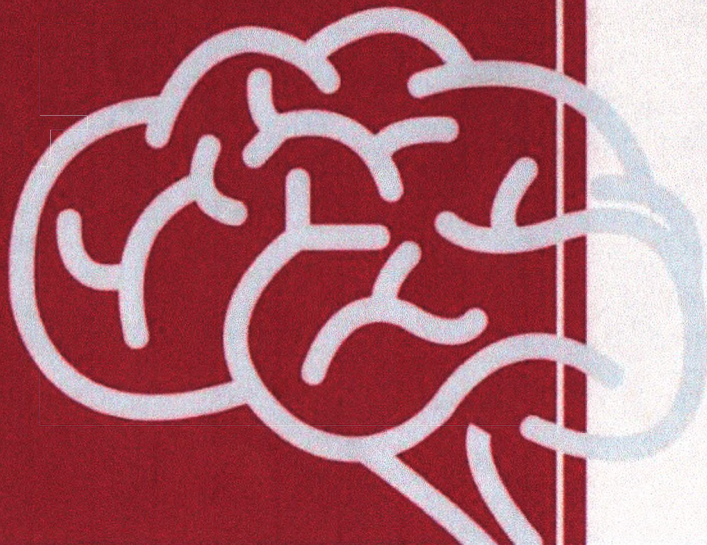
of appreciation to

dr. Restu Susanti, Sp. S (K), M. Biomed

as speaker of *One Day Seminar In*

*World Stroke Day*

October 29th 2020



Dr. dr. Yuliarni Syafrita, Sp. S (K)  
Head of Neurology Department

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Head of Committee

# Headache As Symptom Of Stroke (Thunderclap Headache)



dr. Restu Susanti, Sp.S, M.Biomed

Padang, October 29th 2020



1 in 4 of us will have a stroke.  
**DON'T BE THE ONE**  
World Stroke Day: October 29th

World Stroke Day

#DontBeTheOne  
#ESOWS02020

## Pain-sensitive structures in the head

### Intracranial Structures

- Venous sinuses (Sagittalis sinuses)
- Arteries of duramater ( anterior and median meningen arteries)
- Duramatter base
- N. V, N. IX, N. X
- arteries of willisi circulus and their branches
- Talamus sensories nuclei

### Extracranial Structures

- Skin
- Subcutaneous tissue
- Muscles
- Periosteum of the skull
- Mucosa
- Extracranial arteries
- Delicate structures of the eye, ear, nasal cavities and sinuses

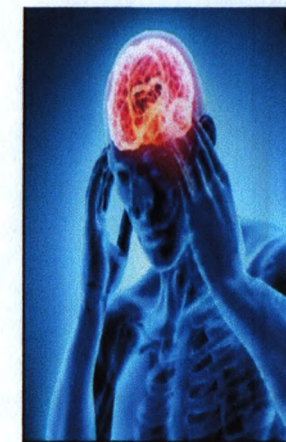
### Pain not sensitive structures :

- Skull
- Pia-arachnoid and dura over the convexity of the brain
- Brain parenchyma
- Ependyma
- Choroid plexuses

Disorder Of The Nervous System-  
Reeves & Swenson  
Chapter 18- Headaches

## Headache

- Headache ?
- The most common reason for seeking medical help (policlinic / ED)
- Headache affects about 90% of the general population
- Primary and secondary headache
- mechanism : **traction, inflamation, distension**, displacement, **vascular spasme**
- Headache is symptoms or diagnose?
- Headache and stroke



PubMed 2020 , <https://doi.org/10.1136/svn-2020-000333>  
BMJ 2013;345:e8557, doi: 10.1136/bmj.e8557

## DIAGNOSING HEADACHE

### H.SOCRATESS

**H**istory, history, history (Diary)

**S**ite

**O**nset

**C**haracter

**R**adiation

**A**ssociated symptoms

**T**iming

**E**xacerbating and relieving

**S**everity

**S**tate of health between attacks

- Neurologic Examination
- Laboratory investigation
- **CT SCAN OR MRI**
- EEG
- **LUMBAR PUNCTURE**



## Red Flags for Headache NMEMONIC SNNOOP10

1	Systemic symptoms including fever	9	Papilledema
2	Neoplasm in history	10	Progressive headache and atypical presentations
3	Neurologic deficit or dysfunction (including decreased consciousness)	11	Pregnancy or puerperium
4	Onset of headache is sudden or abrupt	12	Painful eye with autonomic features
5	Older age (after 50 years)	13	Posttraumatic onset of headache
6	Pattern change or recent onset of headache	14	Pathology of the immune system such as HIV
7	Positional headache	15	Painkiller overuse or new drug at onset of headache
8	Precipitated by sneezing, coughing, or exercise		

4 Onset of headache is sudden or abrupt Subarachnoid hemorrhage and other headaches attributed to cranial or cervical vascular disorders Red

American Academy of Neurology; Neurology® 2019;92:1-11.  
doi:10.1212/WNL.0000000000006697

## Pathophysiology

- Multifactorial, poorly understood
- The sympathetic nervous system --> regulates the vascular tone
- Pain occurs due to acute vasoconstriction and changes in the vascular tone
- Vasospasm : smooth muscle constriction --> narrowing of the blood vessel --> leading to abrupt onset severe headache

## Thunderclap Headache

ICHD 3 BETA VERSION 2018 → 4. Other primary headache disorders

### 4.4 Primary thunderclap headache :

High-intensity headache of abrupt onset, mimicking that of ruptured cerebral aneurysm, in the absence of any intracranial pathology.

Usually, thunderclap headache is the expression of intracranial vascular disorders (SECONDARY thunderclap headache)

- A thunderclap headache is defined as a severe form of headache that occurs abruptly, like a 'clap of thunder' as suggested by the name, peaks within 30 seconds to 1 minute of the onset, and usually fades in next few hours (last at least for 5 minutes)
- It is often defined by the sufferers as the worst headache of their life.
- Estimated incidence Thunderclap headache is about 43 per 100 000 adults per year in the world

Headache: The Journal of Head and Face Pain  
doi: 10.1111/head.12950

## Etiology

### Vascular Causes:

- Subarachnoid haemorrhage
- Carotid and vertebral artery dissection
- Cerebral venous sinus thrombosis
- Reversible cerebral vasoconstriction syndrome
- Ischaemic stroke

### Nonvascular causes :

- Meningoencephalitis
- Intermittent hydrocephalus
- Spontaneous intracranial hypotension
- Pituitary apoplexy

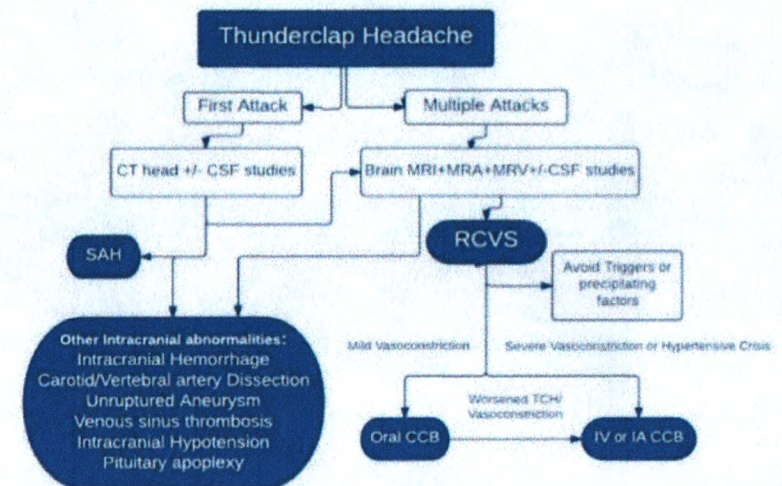
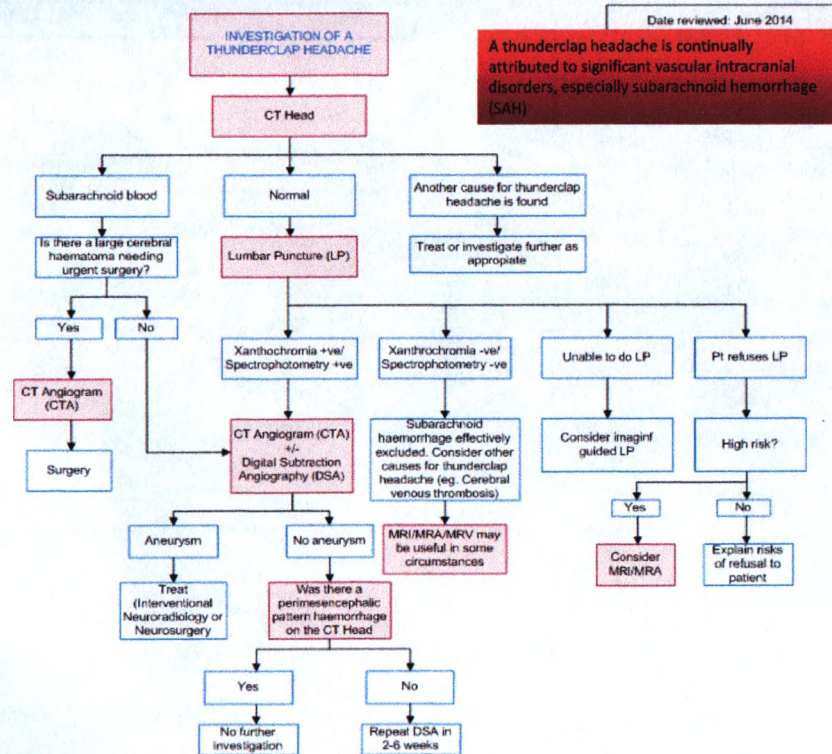
## Diagnosis Thunderclap Headache cause of Vascular etiology

Cause	Clinical Features	Brain CT	Lumbar Puncture	Angiography	Brain MRI
Aneurysmal subarachnoid hemorrhage	Altered consciousness, seizures, meningismus	Subarachnoid blood in basilar cisterns and sylvian fissures	Elevated red blood cells, xanthochromia	Ruptured aneurysm, vasospasm	Subarachnoid blood in basilar cisterns and sylvian fissures
Reversible cerebral vasoconstriction syndrome	Recurrent thunderclap headaches	Normal, subarachnoid blood along cortical surface/sulci	Normal, mild white blood cell elevation, mild protein elevation	Multifocal multivessel vasoconstriction	Normal, subarachnoid blood along cortical surface/sulci, ischemic stroke, cerebral edema, intracerebral hemorrhage
Carotid and vertebral artery dissection	Neck pain, symptoms related to cerebral ischemia, Horner syndrome (carotid dissection)	Normal, ischemic stroke	Normal	Dissected artery, multifocal, segmental vasoconstriction if associated with reversible cerebral vasoconstriction syndrome	Normal, ischemic stroke
Cerebral venous sinus thrombosis	Focal neurologic deficits, altered mental status, visual changes	Dense triangle sign (clot inside the sinus), cord sign (thrombosed cortical or deep vein), venous hemorrhages	Elevated opening pressure, high protein	Venous sinus thrombosis	Normal, venous infarctions with hemorrhage; MRI evidence of intraluminal thrombus on T1, T2, and

Diagnostic Findings for the More Common Causes of Thunderclap Headache  
<https://www.semanticscholar.org/>

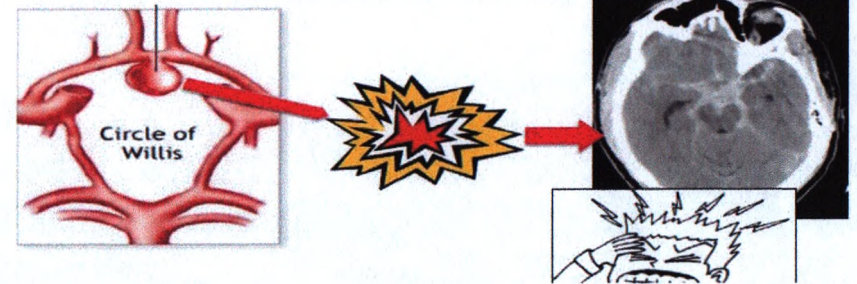
## Sign and symptoms that provide clues to a possible cause of TCH

Sign or Symptom	Conditions
Photophobia	SAH, infection
Neck stiffness	Infection, SAH
Neck pain	CeAD
Visual disturbance	PRES
Horner's syndrome	CAD
Papilloedema	Intracranial hypertension
Fever	Infection and sometimes haemorrhage (SAH, CVST, haemorrhagic stroke, pituitary apoplexy)
Hypertension	PRES, RCVS,
Third nerve palsy	Aneurysmal SAH
Postural headache worse on sitting up or standing	SIH



Recurrent thunderclap headaches can be suggestive for RCVS, a thorough examination including a detailed neurological assessment is required to formulate the correct diagnosis and treatment.

## Aneurysmal Subarachnoid Hemorrhage



It is found to be the most common cause of TCH

Presentation :

- “worst headache in life” or “unexpected clap of thunder”
- Neck stiffness, photophobia, nausea/vomiting, seizure, diplopia, eye pain, visual loss
- Most common location is “occipitonal”

West J Emerg Medical journal

<https://doi.org/10.5811/westjem.2019.1.37352>

### RCVS SAH

*No evidence* of ruptured aneurysm or vascular malformation

*Diffuse and disproportionate* extent of cerebral vasoconstriction relative to amount of SAH

*Sausage on string appearance* of alternating areas of segmental vasoconstriction preferentially involving distal 2nd- and 3rd-order cerebral branches

Development of vasoconstriction in first 4–5 days after symptom onset, or **persistence past 3 weeks**

### Aneurysmal SAH

Plausible *target lesion* identified

Severity of *vasospasm correlates* with amount of hemorrhage

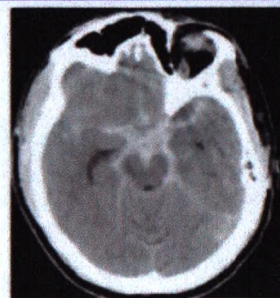
*Smooth, long segmental narrowing* for proximal arteries at circle of Willis

Development of vasospasm peaking between **4 and 14 days** after hemorrhage

## Aneurysmal Subarachnoid Hemorrhage

Physical examination findings :

- Decreased level of consciousness
- Sign of increased ICP
- Ptosis, dilated pupil from CN 3 stunning



Diagnosis: CT Scan, LP

Treatment:

- Seizure precaution
- Nimodipine 60 mg
- Monitor BP
- Neurosurgical evaluation



West J Emerg Medicine journal

<https://doi.org/10.5811/westjem.2019.1.37352>

## Reversible Cerebral Vasoconstriction Syndrome (RCVS)

- Group of conditions that show **reversible vasoconstriction with clinical manifestations that typically include thunderclap headache and less commonly focal neurological deficits related to brain edema, stroke and seizure**
- The disease is more common in women, typically in their 40s-50s with a history of migraine.
- **Occur as the result of a sudden constriction of the vessel that support blood to the brain “Transient disturbance of cerebral arterial vascular tone”**
- Headache (secondary)- “thunderclap variety”, peaks within one minute and very intense
  - Only symptom in 75% cases
  - Multiple over 1-4 weeks period is almost pathognomonic
  - Usually posterior and bilateral
  - Nausea/vomiting, photophobia, phonophobia

AHA/ASA Journal

<https://doi.org/10.1161/STROKEAHA.119.024416>

## Reversible Cerebral Vasoconstriction Syndrome (RCVS)

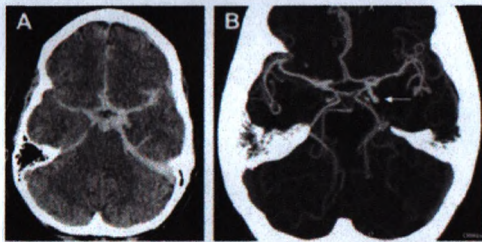
### Diagnosis :

- Imaging plays a vital role as the condition is defined in part by the **reversibility of cerebral vasoconstriction**
- Catheter cerebral angiography is consider the “gold standard”

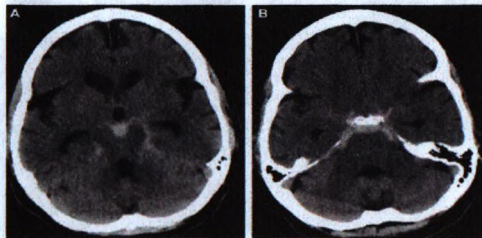
### Treatment :

- Symptomatic (pain, seizure, Blood pressure control)
- Trigger avoidance (either activity or vasoactive substance)
- Calcium channel blocker

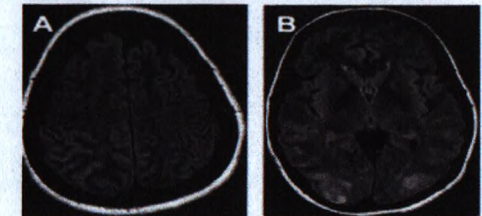
BMJ. Medicine (Baltimore). 2019  
doi: 10.1097/MD.00000000000018254.



**Diffuse SAH** in the basal cisterns, sylvian fissures and interhemispheric fissure on axial noncontrast CT



**Perimesencephalic haemorrhage** axial CT. Perimesencephalic SAH has been defined as SAH, which on CT within **three days** of symptom onset, is centered anteriorly to the **pons and midbrain**. may extend into the **basal and suprasellar cisterns and into the proximal/basal Sylvian fissure and interhemispheric fissure**.



**RCVS MR imaging flair.** RCVS is a **group of disorders characterized by severe headaches and a narrowing of the blood vessels in the brain**.

## Treatment of TCH

### Calcium channel blockers:

- Nimodipine is most commonly used for the treatment of a thunderclap headache. **It crosses the blood-brain barrier easily and inhibits activation of glial cells and TNF alpha production.**
- TNF alpha is a cytokine involved in the pathogenesis of thunderclap headache. It produces CNS inflammation and vasoconstriction thus precipitates a thunderclap headache onset.
- Nimodipine **also has a blocking effect on certain neurotransmitters like serotonin, histamine, etc, thus it can prevent the vasospasm.** It has also been found that **treatment with nimodipine decreases the recurrence rate of thunderclap headaches to many folds.**
- Commonly found side effects of nimodipine are dizziness and flushing.

## CONCLUSION

- Thunderclap headache can have multiple causes, but aneurysmal rupture causing subarachnoid haemorrhage is the primary concern.
- Diagnostic assessment should be done on an urgent basis to rule out the possibility of harmful etiologies : non contrast CT, LP, CTA, MRA and MRV
- Patients should be educated about the early warning signs of the headache : a recent change in the pattern of the headache, diurnal variation, new headache in old age, associated nuchal rigidity.