

The Patient with Thunderclap Headache

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KEYWORDS

• Thunderclap headache • Subarachnoid hemorrhage • Lumbar puncture • Intracranial aneurysm

KEY POINTS

- Thunderclap headache (sudden onset of severe headache reaching maximal intensity within seconds to a minute) can have multiple causes, but aneurysmal rupture causing subarachnoid hemorrhage is the primary concern.
- Noncontrast CT performed within 6 hours of onset is very sensitive for subarachnoid hemorrhage, but the sensitivity decreases with time.
- Further work-up for subarachnoid hemorrhage should be guided by the pattern of blood on non-contrast CT head.

Headache is an extremely common symptom and annually more than 70% of the United States population may have a headache.¹ Headache accounts for approximately 2% of all emergency department (ED) visits.² Most episodes of headache are benign and do not require emergent imaging.³ Clinical decision rules have been proposed to identify patients with acute nontraumatic headache who need further investigation.⁴ Despite high sensitivity for subarachnoid hemorrhage (SAH), they suffer from poor specificity and are applicable to only a minority of ED patients with headache.⁵ In a 2006 study, 14% of patients presenting with headache underwent neuroimaging, and only 5.5% of the imaged patients received a pathologic diagnosis.²

Thunderclap headache (TCH) is defined as sudden-onset unruptured intracranial aneurysm (UIA) of severe headache reaching maximal intensity within seconds to a minute.⁶ The term TCH was initially used in reference to pain associated with a UIA, but multiple causes have since been described (**Boxes 1 and 2, Table 1**).^{6,7} Aneurysmal rupture resulting in SAH is the primary concern, given the high morbidity and mortality associated with this condition.⁸ It accounts, however, for only 4% to 12% of acute, severe headaches.^{9–12} Primary TCH is a diagnosis of exclusion when all other underlying causes have been eliminated. Primary TCH can recur intermittently but is generally associated with a benign outcome.⁶ This review discusses the differential diagnosis of TCH and details the

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Box 1**Etiology of spontaneous convexity/sulcal subarachnoid hemorrhage**

- Cerebral amyloid angiopathy
- RCVS
- AVMs, dural fistulae
- Cavernomas
- CVT
- Moyamoya disease
- Arterial dissection/stenosis
- Nonvascular causes—such as brain tumors and abscesses
- Coagulation disorders

diagnostic assessment of patients presenting with TCH.

DETECTION OF SUBARACHNOID HEMORRHAGE

SAH results most commonly from rupture of an intracranial aneurysm.¹³ Headache associated with SAH typically lasts a few days; it is atypical for the headache to resolve in less than 2 hours.¹⁴ Loss of consciousness can occur in a third of patients with SAH.¹⁰ Other symptoms may include nausea, vomiting, dizziness, photophobia, neck stiffness, delirium, and seizures.¹⁵ Prompt

Box 2**Other names for reversible cerebral vasoconstriction syndrome**

- Isolated benign cerebral vasculitis
- Acute benign cerebral angiopathy
- Reversible cerebral segmental vasoconstriction
- Call or Call-Fleming syndrome
- CNS pseudovasculitis
- Benign angiopathy of the CNS
- Postpartum angiopathy
- Migraine angiitis
- Migrainous vasospasm
- Primary TCH
- Drug-induced vasospasm
- Cerebral vasculopathy
- Vasospasm in fatal migrainous infarction

Table 1**Causes of thunderclap headache**

Findings on CT and Cerebrospinal Fluid	Causes of Thunderclap Headache
Usually detected by noncontrast CT	<ul style="list-style-type: none"> • SAH (most cases detected by noncontrast CT done within 24 h of symptom onset) • Intracerebral hematoma • Intraventricular hemorrhage • Acute subdural hematoma • Cerebral infarcts (after 3 h) • Tumors (eg, third-ventricle colloid cyst)
Usually detected by analysis of CSF after normal CT	<ul style="list-style-type: none"> • SAH • Meningitis
Possibly presenting with normal CT results and normal or near-normal results of analysis of CSF	<ul style="list-style-type: none"> • Intracranial venous thrombosis • Dissection of cervical arteries (extracranial or intracranial—carotid or vertebral) • Pituitary apoplexy • RCVS with or without posterior reversible encephalopathy syndrome • Symptomatic aneurysm without evidence of subarachnoid haemorrhage (painful third nerve paralysis) • Intracranial hypotension • Cardiac cephalgia due to myocardial ischaemia (very rare)

Data from Kumar S, Goddeau RP Jr, Selim MH, et al. Atraumatic convexal subarachnoid hemorrhage: clinical presentation, imaging patterns, and etiologies. Neurology 2010;74(11):893–9.

diagnosis of acute SAH is critical because initial misdiagnosis and subsequent rebleeding correspond with a poor prognosis and up to 70% mortality.¹⁶ SAH may go undiagnosed in 5% of patients during ED visits, with lower acuity patients at higher risk.¹⁷

Physical examination is of limited utility for assessment of patients with suspected SAH.¹¹ Noncontrast CT is the initial diagnostic test for

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