

# Emergency Case

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## Diagnosing subarachnoid hemorrhage *Simple time-honoured test rivals computer technology*

### QUESTIONS

**A previously healthy 20-year-old man presents with a complaint of syncope while riding up a hill on his bicycle. He was able to stop and sit down in the seconds before he passed out. There was no trauma. He recalls waking with a severe headache and being taken to hospital where he was assessed. After feeling much improved, he was discharged with a diagnosis of vasovagal syncope. His family physician assessed him the next day and, concerned with his story, referred him to another emergency department. He looks well, results of his physical examination are entirely normal, and he is now asymptomatic.**

**What is worrying about this story? What tests, if any, are indicated?**

One of the axioms of emergency medicine has always been to rule out threat to life. In trying to do this, physicians might overlook a simple tool, the lumbar puncture.

Headache is a common complaint in both family and emergency medicine. Fortunately, most headaches are benign despite substantial associated morbidity. Headaches due to subarachnoid hemorrhage (SAH) represent the other side of the coin.

### Pathophysiology

Most spontaneous SAHs are due to saccular aneurysms. Other causes include arteriovenous malformations and extensions from other intracranial bleeding.<sup>1</sup> Rupture of an intracranial aneurysm occurs in 1% of the population; SAH is the cause of death in approximately 0.5% of the population. Rate of incidental intracranial aneurysm at autopsy is 2% to 3%.<sup>2</sup>

Most intracranial aneurysms are asymptomatic before they present with SAH. About 40% of patients do not survive their first SAH.<sup>2</sup> Others present with obvious intracranial events. The diagnostic challenge comes from more subtle presentations, such as a “sentinel” headache, sometimes referred to as a warning leak, that occurs about half the time before a major bleed. The mortality rate for patients with recurrent SAHs increases to 67%. The rate of repeat bleeding for untreated SAH is 5% in the first 24 hours, 20% in the first 2 weeks, 50% in the first 6 months, and 3% to 5% per year thereafter.<sup>2</sup> Microscopic clipping of an aneurysm prevents repeat bleeding in most patients.

### Presentation

Most (75%) SAHs present with sudden onset of severe headache.<sup>1</sup> This headache is often described as the worst headache of patients’ lives or a “thunder-clap” headache. Headaches often become severe in less than a minute. Other symptoms might accompany the headache or, less likely, present alone: 75% of patients have nausea and vomiting, 50% lose consciousness (usually briefly),<sup>1</sup> 5% have a seizure as the initial event,<sup>2</sup> and a few present with severe low back pain or bilateral radicular leg pain.

Physical examination can be even less helpful than history. About 75% of patients with SAH have signs of meningeal irritation (neck stiffness, fever, or photophobia). About 25% of patients have a focal neurologic deficit on examination or subhyaloid hemorrhages on retinal examination.<sup>1</sup> Other diagnoses not to miss undoubtedly come to mind when considering these signs and symptoms. According to one study, “lone acute sudden headache” with normal results of examination and no associated symptoms proves to be SAH about 10% of the time.<sup>3</sup>

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The main challenge is in deciding when to investigate beyond history and physical examination. Unfortunately for clinicians, patients with SAH might present with symptoms that have abated and no abnormal findings on physical examination. Headaches that resolve with your favourite treatment for presumed vascular or tension headaches must remain suspect for SAH. For patients with chronic headaches, any headache that occurs outside their normal pattern must also be considered for SAH.

### Investigation

Once you have decided you are suspicious enough to investigate further, a computed tomography scan is indicated. A noncontrast CT scan will pick up an SAH 90% to 95% of the time in the first 24 hours.<sup>2,4</sup> Sensitivity is probably lower in alert, neurologically intact patients. Blood becomes isodense over time, and sensitivity decreases to 85% at 5 days and to 30% by 2 weeks.<sup>5</sup>

### Lumbar puncture

When SAH is suspected and CT scan results are negative, a lumbar puncture (LP) is indicated. When performed between 12 hours and 2 weeks from headache onset, an LP has a sensitivity for acute SAH of almost 100%.<sup>6</sup> Blood will be present, and xanthochromia (a yellow supernatant present after centrifugation of cerebrospinal fluid, which is most reliably found with a spectrophotometer rather than visually) is diagnostic.

Results of LP might be falsely negative for blood in the first 2 hours or more and for xanthochromia in the first 12 hours.<sup>1</sup> Differentiation from a traumatic tap can be difficult in the absence of spectrophotometric xanthochromia. A decrease in the red cell count in successive tubes is unreliable.<sup>7</sup> For patients presenting early, some advocate delaying LP until 12 hours after symptom onset. This delay could adversely affect outcome for a few patients.<sup>8</sup>

In some locations, access to a CT scanner is a problem. Schull<sup>9</sup> has suggested a model of "LP first" to rule out SAH (only for patients with lone acute sudden headache) and to eliminate the need for CT scan if LP results are negative. This is probably safe, but has yet to be prospectively evaluated and cannot be endorsed at this time. Patients should be referred to centres with CT capability.

Patients with negative results of CT scan require an LP. For patients without contraindications, it is a safe and relatively simple procedure.<sup>10</sup> Physicians uncomfortable with performing LPs can refer patients to a colleague.

### Treatment

Once a diagnosis is made, or if diagnosis is still in question, prompt referral to a neurosurgeon is indicated. Urgent cerebral angiography is usually arranged. Emergency treatment should be discussed with a neurosurgeon and might include reducing blood pressure to pre-SAH levels and administering nimodipine to prevent vasospasm or anticonvulsants if seizures occur. Patients with nondevastating SAH due to a leaking aneurysm usually undergo surgery within 24 to 48 hours of symptom onset.

### Answers

Subarachnoid hemorrhage must be considered in the differential diagnosis of this patient. A CT scan was ordered and read as negative by a radiologist. An LP was grossly positive for blood and xanthochromia. A leaking saccular aneurysm of the anterior cerebral circulation was identified on angiography and subsequently clipped during surgery. The patient recovered uneventfully.

Sudden severe headaches (exertional or otherwise) in patients with no history of similar headaches should lead doctors to suspect SAH. Resolution of headache does not rule out SAH. A CT scan of the head is indicated. If scan results are negative, an LP must be done. ❖

### References

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