Initial Evaluation of Suspected Subarachnoid Hemorrhage

PURPOSE
Subarachnoid hemorrhage (SAH) is an acute life-threatening medical emergency associated with high mortality and morbidity. Outcome can be significantly improved with rapid diagnosis and triage to neurosurgical treatment.1 The clinical management goals of this guideline are to:

- Identify patients with clinical suspicion of subarachnoid hemorrhage;
- Proceed promptly with the appropriate evaluation of these patients;
- Arrange for speedy triage and referral of patients with SAH to a neurosurgical center.

BACKGROUND
There are many causes of SAH, including among others, aneurysm, arteriovenous malformation, and trauma. Rupture of a cerebral aneurysm is the most common, serious, and urgent etiology of SAH.2 Autopsy studies show the prevalence of aneurysms in the general population to be approximately two percent. Aneurysmal rupture is rarely seen in the first two decades of life and then gradually increases with a peak at 50 – 60 years of age.

Despite advances in medical technology, a ruptured cerebral aneurysm carries a very poor prognosis. A considerable proportion of patients die from a massive initial hemorrhage before reaching a hospital. Furthermore, a substantial number of patients who survive the initial hemorrhage have significant morbidity and mortality as a result of rebleeding and cerebral ischemia. The International Cooperative Study found that at six months after hemorrhage, 26% of hospitalized patients had died and 58% had made a good recovery. The remaining 16% were moderately to severely disabled.3,4

The risk of rebleeding is highest in the first 24 hours after SAH and remains high for six months. Vasospasm presents most often from four to 14 days after the hemorrhage. Early surgery followed by hypertensive, hypervolemic therapy has been recommended to avoid rebleeding and the ischemic complications of vasospasm.5,6 Prompt diagnosis and referral of these patients to a neurosurgical center is essential to perform this type of treatment.
Initial Presentation

The sudden onset of the "worst-ever" headache with transient impairment of consciousness followed by nausea, vomiting, nuchal rigidity, and focal neurological signs is the classic presentation of SAH. The headache can vary in character, being either gradual or step-wise in evolution and localized or holocranial in location. Disturbances in consciousness as a result of the hemorrhage, secondary seizures, or hydrocephalus may be manifested by confusion and transient or prolonged coma. Autonomic symptoms such as low-grade fever, diaphoresis, shivering, hypertension, and cardiac arrhythmia are also common. Signs and symptoms of meningeal irritation, as manifested by neck or back pain and stiffness, are occasionally more prominent than the headache itself. Neuroophthalmologic manifestations such as photophobia, blurred vision, eye pain, and limitations of extraocular movement may be present. Focal neurological symptoms can result from the mass effect of the aneurysm or hematomas and cerebral ischemia. Since the overall presentation is often not classic, a delay in diagnosis and referral for neurosurgical care often occurs. Even in large medical centers, misdiagnosis has occurred in up to 50% of patients.

A substantial proportion of patients with ruptured cerebral aneurysms have warning symptoms. The interval from the initial warning to a major aneurysm rupture is typically from six to 20 days. Although patients with a warning sign, e.g. a "sentinel leak," appear less ill than patients with a larger subarachnoid hemorrhage, their prognosis with treatment is better, making the need for correct diagnosis more urgent.

Thunderclap headache is a paroxysmal, excruciating headache which clinically resembles SAH. However, no evidence of subarachnoid hemorrhage is found on CT scan or lumbar puncture. The prognosis for these patients is extremely good and cerebral angiography is not indicated.

Diagnostic Tests

CT scan
A CT scan of the brain without contrast is the diagnostic procedure of choice for suspected SAH and should be obtained urgently. The study should be interpreted by an experienced physician. On the day of the hemorrhage the scan is abnormal in 95% of all cases, but this declines to about 75% after five days. In addition to the finding of subarachnoid blood, intracerebral hematoma or hydrocephalus may be seen on the scan.

Lumbar Puncture
When the CT scan is negative, lumbar puncture (LP) must be done in cases of suspected SAH. In this circumstance, the diagnosis of SAH is established by the presence of red cells and/or xanthochromia in the cerebrospinal fluid (CSF).
Red cells in the CSF are evidence of SAH, but can also be caused by a traumatic tap. Traumatic taps are hard to differentiate from SAH; even the "three-tube test" can be misleading unless the blood clears completely on later tubes. To minimize the chance of a traumatic tap, the procedure should be done by an experienced physician. Traumatic taps may be less frequent when the procedure is done at a higher lumbar level, e.g. L2-3, since distally the dural sac narrows and there is an increased incidence of degenerative changes lower toward the sacral level.

The presence of breakdown products of blood in the CSF, especially bilirubin, gives definitive evidence of SAH. The presence of bilirubin is indicated by a yellowish tinge (xanthochromia) of the supernatant of a centrifuged CSF sample. Xanthochromia may not appear until 12 hours after hemorrhage, and may last for up to one month. However, even at 12 hours, the xanthochromia may be too faint to be seen with the naked eye.

**Once the diagnosis is made**
The neurosurgeon on call at the regional center should be contacted immediately. The patient should be transported as soon as possible. Nothing should be given by mouth since an emergency cerebral angiogram is usually done followed by surgery if an aneurysm is found. The original CT scans should be sent with the patient since the quality of copies is often too poor to be of value.

Patients with SAH can present with very high blood pressures which gradually normalize over the next few days. Aggressive treatment of hypertension should be avoided to reduce the risk of cerebral ischemia.

All medications which may be considered for use prior to transfer should be discussed with the accepting neurosurgeon at the time of consultation.

**RECOMMENDATIONS**

1. A CT scan should be done urgently in all patients with suspected SAH. The scan should be interpreted immediately by an experienced physician. (Expert Opinion: Strong Consensus)

2. When the CT scan is negative, a lumbar puncture must be done by an experienced physician. (Expert Opinion: Strong Consensus)

3. The results of CT and/or LP must be obtained and interpreted as soon as possible, and a clinical diagnosis determined. If the diagnosis of SAH is made, the patient should be referred immediately to the regional neurosurgical center. (Expert Opinion: Strong Consensus)
REFERENCES


