

# Subarachnoid haemorrhage

## Characteristics

- Subarachnoid haemorrhage accounts for 10% of CVAs.
- *Causes*
  - Spontaneous – ruptured aneurysm (72%), AVM (10%) and hypertensive haemorrhage.
  - Trauma.
- Blood enters the subarachnoid space onto the surface of the brain, between the pia and arachnoid, and may lead to raised intracranial pressure by obstructing the ventricular outflow of CSF.
- Incidence increases with age and peaks at age 50 years. Approximately 80% of cases of SAH occur in people aged 40–65 years, with 15% occurring in people aged 20–40 years.
- 40–50% of patients with aneurysmal SAH have symptoms from a ‘sentinel’ bleed, 10–20 days prior to rupture.
- Morbidity can be severe and is increased by rebleeding, which often occurs in the first few days, and cerebral vasospasm 7 to 14 days after the initial event. 45% mortality within 8 weeks.
- Berry aneurysms are associated with hypertension, polycystic kidney disease, SLE, connective tissue disorders, AVMs and long term analgesic use.
- In 20% of non-traumatic SAH’s, no lesion is found at post-mortem.

## Clinical features

- SAH classically presents with a sudden onset of a severe ‘thunderclap’ occipital headache, often described as the ‘worst headache in their life’.
- Associated with physical or emotional stress, coitus or head trauma.
- 30–40% occur at rest.
- A leading cause of maternal mortality, accounting for 6–25% of maternal deaths during pregnancy.
- Meningeal irritation generates symptoms of neck stiffness, photophobia and low back pain, with a positive Kernig’s sign.
- Focal neurological signs include third nerve palsy from compression by an expanding berry aneurysm of the posterior communicating artery of the Circle of Willis.
- Consider SAH in the comatosed or fitting patient.
- Fundoscopy may reveal papilloedema and subhyaloid retinal haemorrhages.
- Lumbar puncture (LP) is performed 12 hours after the onset of symptoms to evaluate xanthochromia. 15% of LPs are falsely negative.

## Radiological features

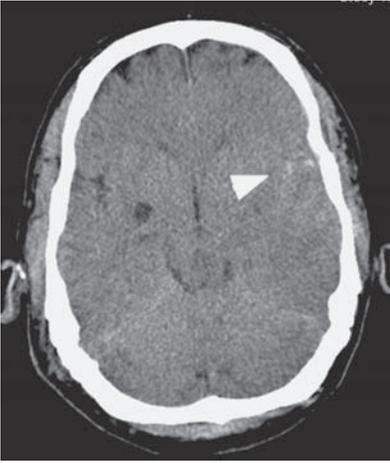
### Location of aneurysm rupture

Approximately 85% of saccular aneurysms occur in the anterior circulation. The most common sites of rupture are as follows:

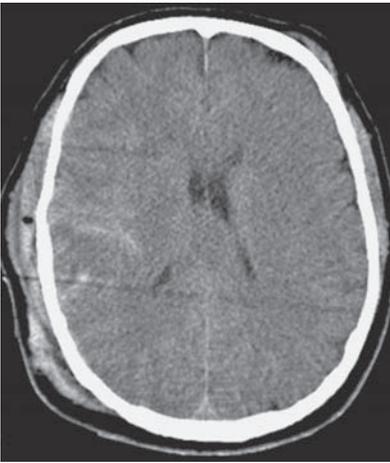
- The internal carotid artery, including the posterior communicating (PCom) junction (41%).
- The anterior communicating (ACom) artery/ anterior cerebral artery (34%).
- The middle cerebral artery (MCA) (20%).
- The vertebrobasilar and other arteries (5%).

### CT features

- *CT scan without contrast.*
- CT scan findings are positive in approximately 92% of patients who have SAH.
- Sensitivity decreases with time from onset of ictus.
  - $\approx 98\%$  within the first 12 hours and 93% within 24 hours.
  - Decreases to  $\approx 80\%$  at 72 hours and 50% at 1 week.
  - May be falsely negative in patients with small hemorrhages and in those with severe anaemia.
- The location of blood within the subarachnoid space correlates directly with the location of the aneurysm rupture in 70% of cases.
  - Blood localised to the basal cisterns, the Sylvian or intrahemispheric fissures suggests rupture of a saccular aneurysm.
  - Blood found lying over the cerebral convexities or within the superficial brain parenchyma suggests rupture of an AVM or mycotic aneurysm.
- ACom artery aneurysms are often associated with interhemispheric and intraventricular haemorrhages.
- MCA and PCom artery aneurysms are associated with intraparenchymal haemorrhages.
- Serial CT allows for surveillance of developing mass effect and hydrocephalus; up to 20% of patients develop some degree of obstructive hydrocephalus in the first 2 weeks post-ictus.
- *A contrast-enhanced CT scan* may reveal an underlying AVM; however, a non-contrast study should always be performed before considering a contrast study, so as not to interfere with the visualisation of subarachnoid blood.



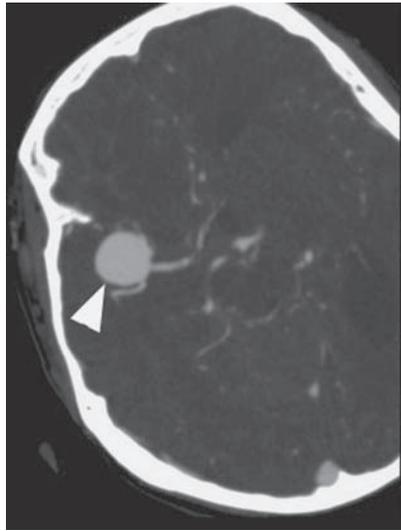
Two examples of subtle subarachnoid haemorrhage. Faint hyperdense subarachnoid blood is seen outlining cerebral sulci (arrowheads).



Subarachnoid blood seen predominantly within the right cerebral hemisphere with overlying soft tissue contusion.



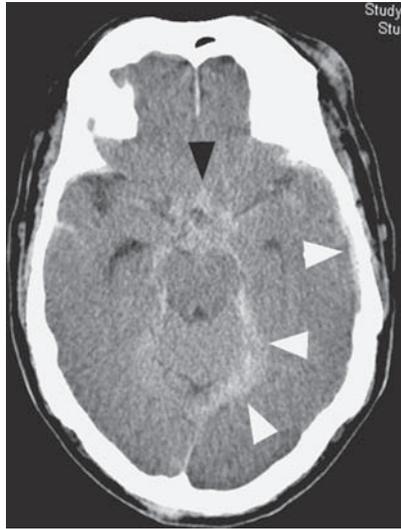
Hyperdense subarachnoid blood outlining several sulci within the left cerebral hemisphere.



Unenhanced scan and a CT angiogram. Extensive subarachnoid haemorrhage secondary to a ruptured MCA aneurysm (arrowheads).



Extensive hyperdense subarachnoid haemorrhage outlining the basal cisterns.



Subarachnoid blood within the suprasellar cistern (black arrowhead). Additional acute subdural haemorrhage along the tentorium and over the left temporal lobe (white arrowheads).