CONDITION

Subarachnoid hemorrhage

Subarachnoid hemorrhage is sudden bleeding into the space surrounding the brain.

WHAT IT IS
Bleeding into the fluid-filled space surrounding the brain

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
Sudden severe headache, vomiting, stiff neck, loss of consciousness

WHAT CAUSES IT
Usually a ruptured brain aneurysm or head injury

HOW IT IS DIAGNOSED
Brain CT, sometimes lumbar puncture and blood-vessel imaging

MAIN TREATMENT
Emergency care and control of the bleeding source

CAN IT BE CURED?
Sometimes - bleeding source can be secured

IS IT AN EMERGENCY?
Yes - suspected bleeding needs immediate hospital care

LONG-TERM OUTLOOK
Full recovery, lasting disability, or death are possible

Overview

A subarachnoid hemorrhage is bleeding into the space between the brain and one of the thin membranes covering it. This space contains cerebrospinal fluid, the clear fluid that cushions the brain.

The bleeding often begins when a brain aneurysm ruptures. An aneurysm is a weak, bulging area in the wall of an artery. Subarachnoid bleeding can also follow a head injury or, less often, come from another blood-vessel problem.

A subarachnoid hemorrhage is a type of stroke and a medical emergency. Blood around the brain can raise pressure inside the skull, irritate brain tissue, and reduce blood flow. Some people remain awake and able to speak, so the absence of collapse does not make a sudden, extreme headache safe to monitor at home.

Prompt treatment can stop further bleeding and reduce complications. However, the outcome is different for each person. It is influenced by the amount and location of bleeding, the underlying cause, early complications, and the person's health before it happened.

Symptoms

The classic symptom is a sudden, extremely severe headache. It may reach maximum intensity within seconds or a few minutes. People often describe it as a "thunderclap headache" or the worst headache they have experienced.

Other possible symptoms include:

Symptoms do not always follow the classic pattern. Some people have a less intense sudden headache, and symptoms may briefly improve before getting worse. A small leak from an aneurysm can sometimes cause a warning headache in the days or weeks before a larger bleed, but this cannot be identified safely without urgent assessment.

Bleeding caused by an injury may occur with other signs of head trauma. A worsening headache, repeated vomiting, confusion, weakness, seizure, or increasing sleepiness after a head injury needs emergency assessment.

- Neck pain or stiffness
- Nausea and vomiting
- Sensitivity to light
- Fainting, severe drowsiness, or confusion
- A seizure
- Weakness or numbness, often on one side
- Difficulty speaking, seeing, walking, or keeping balance
- A drooping eyelid or unequal pupils

Causes and risk factors

The most common cause of a spontaneous, meaning non-injury-related, subarachnoid hemorrhage is a ruptured brain aneurysm. Many aneurysms never rupture or cause symptoms. It is not usually possible to predict rupture from symptoms alone.

Other causes include an abnormal tangle of blood vessels called an arteriovenous malformation, inflammation or damage affecting blood vessels, and certain bleeding disorders.

In some cases, testing does not find a source. This may be called a non-aneurysmal subarachnoid hemorrhage and can have a different outlook from bleeding caused by a ruptured aneurysm.

Head trauma is another important cause. Traumatic subarachnoid hemorrhage is managed according to the overall brain injury as well as the bleeding itself.

Factors linked with aneurysm formation or rupture include smoking and high blood pressure. Risk may also be higher with increasing age, a close family history of brain aneurysm or aneurysmal subarachnoid hemorrhage, and certain inherited conditions, including autosomal dominant polycystic kidney disease.

Having a risk factor does not mean that you have an aneurysm or will have a hemorrhage. Many people who experience one had no previous warning.

Diagnosis

Assessment begins immediately with questions about how the symptoms started and an examination of alertness, movement, speech, pupils, and other nervous-system functions. Blood tests help check clotting, blood count, salts, kidney function, and other issues that may affect treatment.

A non-contrast CT scan of the head is usually the first imaging test. It can show fresh blood around the brain. CT is especially sensitive soon after symptoms begin, although its ability to detect bleeding can fall over time.

If the CT scan does not show blood but suspicion remains, further testing may be needed. A lumbar puncture uses a needle in the lower back to collect cerebrospinal fluid and look for evidence of bleeding. Whether this is needed depends partly on when the scan was performed, its quality, and the overall clinical findings.

CT angiography uses contrast dye and CT imaging to examine the brain's blood vessels. It may identify an aneurysm or another source. Catheter angiography, also called digital subtraction angiography, involves passing a thin tube through an artery and injecting contrast dye. It gives detailed images and may be used when other imaging is unclear or when planning treatment.

Treatment and management

Treatment takes place in hospital, usually in a specialist stroke, neuroscience, or critical care unit. Early care focuses on breathing, circulation, pain and nausea control, and careful management of blood pressure and fluids. Medicines that affect blood clotting may need to be

reversed when medically appropriate.

When a ruptured aneurysm is responsible, the aim is to secure it as soon as safely possible and prevent another bleed. The main procedures are:

The choice depends on the aneurysm's shape and location, the pattern of bleeding, the person's condition, and the expertise available. Neither procedure can reverse brain injury that has already occurred, but both can reduce the chance of the treated aneurysm bleeding again.

Nimodipine, a medicine that affects blood vessels, is commonly used after aneurysmal subarachnoid hemorrhage to reduce the risk of poor neurological outcomes from delayed loss of blood flow. Treatment also includes close monitoring for changes in alertness, strength, blood pressure, heart rhythm, and blood chemistry.

If cerebrospinal fluid builds up and raises pressure, a temporary drain may be placed into the brain's fluid spaces. Seizures and other complications are treated when they occur. Rehabilitation may begin in hospital and can include physiotherapy, occupational therapy, speech and language therapy, and support for memory, mood, and fatigue.

- Endovascular coiling: A specialist guides a catheter through an artery and places tiny coils, sometimes with other devices, inside the aneurysm
- Surgical clipping: A neurosurgeon opens the skull and places a small clip across the aneurysm's neck

Complications

Rebleeding is an early concern, especially before a ruptured aneurysm has been secured. It can cause further brain injury.

Several days after the hemorrhage, narrowed or poorly regulated brain arteries can reduce blood flow. This is called delayed cerebral ischemia and may cause new weakness, speech difficulty, confusion, or reduced alertness. Hospital teams monitor closely for these changes.

Hydrocephalus occurs when cerebrospinal fluid cannot circulate or drain normally. It can increase pressure and cause headache, vomiting, drowsiness, walking problems, or cognitive changes. Some people need temporary drainage; a smaller number need a permanent drainage tube called a shunt.

Other possible complications include seizures, abnormal sodium levels, infections, blood clots, and heart or lung problems. These are not inevitable.

Longer-term effects may be less visible. Even someone who appears physically well can experience severe fatigue, headaches, poor concentration, slower thinking, memory problems,

sleep disturbance, irritability, anxiety, depression, or reduced tolerance for noise. These effects can affect work, driving, relationships, and daily routines.

Prevention

Not every subarachnoid hemorrhage can be prevented. Some aneurysms arise without a clear avoidable cause, and inherited risks cannot be removed. Traumatic bleeding may also occur despite reasonable precautions.

Not smoking and managing high blood pressure can reduce important modifiable risks. This means following an agreed blood-pressure plan rather than making sudden medication changes yourself. Limiting exposure to tobacco smoke and avoiding stimulant drugs such as cocaine are also relevant to blood-vessel health.

Routine screening for brain aneurysms is not offered to everyone because screening can find small aneurysms that may never rupture, while follow-up tests and procedures have their own risks. Screening may be considered for some people with a strong family history or an inherited condition linked with aneurysms. This requires an individual discussion of likely benefits and drawbacks.

If an unruptured aneurysm is found, prevention may involve monitoring it or treating it. The decision considers its size, shape, location, evidence of growth, family history, overall health, and the risks of a procedure.

Living with it and what to expect

Recovery can take months or longer. Some people return to independent life with few lasting effects. Others need ongoing support with movement, speech, memory, personal care, or emotional health. Severe hemorrhage can cause profound disability or death.

Progress is often uneven. Fatigue and headaches may continue even when scans are stable, and doing too much can temporarily worsen symptoms. A gradual return to household tasks, social activity, exercise, study, or work may be more manageable than trying to resume everything at once.

Follow-up may involve neurosurgery, neurology, stroke services, rehabilitation, or primary care. Imaging may be arranged to check a treated aneurysm or monitor another aneurysm. The type and timing of follow-up are based on the procedure and imaging findings.

Memory, attention, mood, and personality changes deserve the same attention as physical problems. Neuropsychology or cognitive rehabilitation may help clarify difficulties and develop

practical strategies. Emotional reactions can also affect partners and family members.

Driving, work involving machinery or heights, air travel, and strenuous activity may need temporary restrictions. These are influenced by seizures, vision, physical or cognitive effects, treatment, and local licensing rules. Follow the specific discharge and follow-up advice you receive.

When to get medical help

Call emergency services immediately for a headache that becomes extremely severe within seconds or minutes, especially if it is new or accompanied by vomiting, neck stiffness, fainting, confusion, seizure, weakness, speech difficulty, or vision loss. Do not drive yourself to hospital.

After a known subarachnoid hemorrhage, seek emergency help for:

Routine follow-up is appropriate for persistent fatigue, mild ongoing headaches without sudden worsening, sleep problems, memory or concentration changes, low mood, or difficulty returning to normal activities. Mention these symptoms rather than assuming they are an unavoidable part of recovery.

- Another sudden, severe headache
- A new seizure or loss of consciousness
- New weakness, numbness, facial drooping, or speech difficulty
- Rapidly increasing confusion or difficulty waking
- Repeated vomiting with worsening headache

Common questions

Is a subarachnoid hemorrhage the same as a stroke?

Yes. It is a hemorrhagic stroke, meaning a stroke caused by bleeding. It differs from an ischemic stroke, which is caused by a blocked blood vessel.

Can you survive a subarachnoid hemorrhage?

Yes, many people survive, but it is a serious condition. Outcome is shaped by the initial bleed, how quickly treatment begins, complications, and the person's previous health. Early symptoms cannot reliably predict the final recovery.

Can the brain heal completely after a subarachnoid hemorrhage?

A full or near-full recovery is possible, particularly after a smaller bleed without major

complications. Other people have lasting physical, cognitive, or emotional effects. Improvement may continue for many months, but complete recovery cannot be guaranteed.

Can a subarachnoid hemorrhage happen again?

A ruptured aneurysm can bleed again until it is secured. Coiling or clipping greatly reduces that risk, although follow-up imaging may still be needed. Risk can also remain if another aneurysm is present or the original one is not fully closed.

How long does recovery take?

There is no single timetable. Hospital recovery may be followed by weeks or months of rehabilitation and gradual return to daily activities. Fatigue, concentration problems, and reduced stamina can last longer than visible physical symptoms.

Is every thunderclap headache a brain hemorrhage?

No, but a first or unexplained thunderclap headache needs emergency assessment because subarachnoid hemorrhage and other serious blood-vessel conditions must be ruled out. Symptoms alone cannot safely identify the cause.

Sources

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