CONDITION

Brain abscess

Learn about brain abscess symptoms, causes, diagnosis, hospital treatment, possible complications, and the follow-up needed during recovery.

WHAT IT IS
Pocket of infected material inside the brain

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
Headache, nausea and vomiting, confusion, weakness

WHAT CAUSES IT
Bacterial, fungal, or parasitic infection

HOW IT IS DIAGNOSED
Contrast MRI or CT, abscess fluid testing

MAIN TREATMENT
Antimicrobial medicines and surgical drainage

CAN IT BE CURED?
Sometimes, prompt treatment can control infection

IS IT AN EMERGENCY?
Yes, urgent hospital care required

LONG-TERM OUTLOOK
Some recover, but lasting effects or recurrence possible

Overview

A brain abscess is a pocket of infected material, immune cells, and damaged tissue inside the brain. It usually develops when bacteria or, less often, fungi or parasites reach the brain. The infection causes inflammation and swelling around the affected area.

A brain abscess is uncommon, but it requires urgent hospital care. The skull cannot expand, so swelling or a growing abscess can increase pressure on the brain. The abscess may also interfere with areas that control speech, movement, vision, thinking, or other functions.

Prompt treatment can control the infection and reduce pressure on the brain. Care usually includes antimicrobial medicines, such as antibiotics like amoxicillin or doxycycline , and often a procedure to drain or remove the abscess. Specialists in infectious diseases, neurology, neurosurgery, and radiology may work together on treatment.

Symptoms may develop over several days or weeks. They can sometimes appear more quickly. A person does not need to have every typical symptom, and fever may be absent.

Symptoms

Headache is a common symptom. It may be persistent, become gradually worse, or feel different from a person's usual headaches. Nausea and vomiting can occur when swelling raises pressure inside the skull.

Other possible symptoms include:

Symptoms depend partly on where the abscess is located. For example, an abscess near an area that controls movement may cause weakness. One near language centers may cause difficulty speaking.

A brain abscess is a medical emergency. Call emergency services for a first seizure, loss of consciousness, severe confusion, sudden weakness, new trouble speaking, or a severe headache with repeated vomiting. A rapidly worsening headache or increasing difficulty staying awake also needs emergency attention.

People with a weakened immune system may have less obvious signs of infection. New neurological symptoms-symptoms involving the brain, spinal cord, or nerves-still require urgent assessment even without fever.

- Fever or chills
- New confusion, unusual sleepiness, or a change in behavior
- Weakness or numbness, often affecting one side of the body
- Trouble speaking or understanding speech
- Problems with balance, coordination, or walking
- Blurred vision, double vision, or other vision changes
- A seizure in someone with or without a history of seizures
- Neck stiffness, particularly if infection involves tissues around the brain

Causes and risk factors

An abscess can form when an infection spreads directly from nearby tissue. Possible sources include severe infections of the middle ear, the bone behind the ear, the sinuses, or the teeth and surrounding tissues. Modern treatment of these infections has reduced this route, but it

can still occur.

Germs can also travel through the bloodstream from another part of the body. Possible starting points include an infection of a heart valve, a lung infection, a deep skin infection, or an infection elsewhere in the body. In some people, abnormal connections between arteries and veins in the lungs allow germs to bypass the lungs' usual filtering system.

A penetrating head injury can carry germs directly into brain tissue. Brain or skull surgery can also create a route for infection, although hospitals use several measures to reduce this risk.

Conditions and treatments that weaken immune defenses increase the chance of unusual infections. These include advanced HIV infection, certain cancers, organ or stem cell transplantation, and medicines that suppress the immune system. In these situations, fungi, parasites, or less common bacteria may be responsible.

Other risk factors can include congenital heart disease that affects blood oxygen levels, infection of a heart valve, and injection drug use. The exact risk depends on a person's health and the type of exposure.

More than one type of bacterium may be present, especially when infection spreads from the teeth, ears, or sinuses. In some cases, testing does not identify the original source or a specific organism.

A routine sinus infection, dental problem, or ear infection does not usually lead to a brain abscess. People being treated for one of these conditions should seek prompt medical advice if they develop a worsening headache, confusion, a seizure, weakness, or another new neurological symptom.

Diagnosis

Doctors begin by reviewing symptoms, recent infections, medical conditions, medicines, dental history, and any history of head surgery or injury. A neurological examination checks alertness, speech, vision, strength, sensation, reflexes, balance, and coordination.

Brain imaging is central to diagnosis. Magnetic resonance imaging, or MRI, uses a magnetic field to create detailed images. MRI with an injected contrast agent is often the preferred test because it can show the abscess and surrounding inflammation clearly.

Computed tomography, or CT, uses X-rays to create images of the brain. A contrast-enhanced CT scan may be used when MRI is not immediately available, cannot be performed safely, or would take too long in an emergency. Imaging may show a ring-shaped area around the infected center, but other conditions can sometimes have a similar appearance.

Blood tests can look for signs of inflammation and problems affecting treatment. Blood cultures may identify bacteria or fungi circulating in the bloodstream. Doctors may also investigate possible sources with heart imaging, chest imaging, dental assessment, or tests of the ears and sinuses.

A neurosurgeon may use image guidance to place a needle into the abscess. Removing fluid can lower pressure and provide a sample for laboratory testing. Cultures, microscopic examination, and molecular tests may help identify the organism and guide treatment.

A lumbar puncture, also called a spinal tap, is generally not a routine test for a suspected brain abscess. It often does not identify the cause, and removing spinal fluid can be dangerous when pressure inside the skull is elevated. The medical team decides whether it is appropriate in an unusual situation.

Treatment and management

Treatment begins in the hospital. If a brain abscess is strongly suspected, doctors may start antimicrobial medicine before every test result is available. Initial treatment is chosen to cover the organisms most likely to be involved based on the suspected source, immune status, and any recent surgery or injury.

Once laboratory results are available, the medical team may narrow or change treatment. Bacterial abscesses are generally treated with antibiotics given into a vein for an extended period. Fungal or parasitic infections require different medicines. The exact medicine and length of treatment depend on the organism, abscess size and location, drainage results, immune health, and response on follow-up imaging.

Many brain abscesses are drained with a needle through a small opening in the skull. This is often called stereotactic aspiration because imaging helps the surgeon guide the needle precisely. Some abscesses require open surgery to remove infected material and its surrounding capsule.

Surgery may be especially important when an abscess is large, causing substantial pressure, not responding to medicine, or at risk of rupturing. Its location and the person's overall condition also affect the decision. Small abscesses in selected patients may sometimes be managed with medicine and close imaging rather than immediate drainage.

Corticosteroids like prednisone or hydrocortisone reduce inflammation and swelling. They are not automatically needed for every brain abscess, but doctors may use them when swelling is causing dangerous pressure or threatening important brain structures. Their benefits must be balanced against effects on infection and imaging.

A person who has a seizure may receive an antiseizure medicine. Decisions about starting or continuing this treatment depend on the abscess location, seizure history, brain imaging, and specialist assessment.

Hospital care also addresses pain, nausea, hydration, nutrition, blood-clot prevention, and the original source of infection. Dental treatment, heart-valve treatment, or management of an ear or sinus infection may be needed to prevent the infection from continuing or returning.

Complications

Swelling around an abscess can increase pressure inside the skull. Severe pressure can shift or compress brain tissue and interfere with consciousness, breathing, or circulation. This is why changes in alertness and rapidly worsening symptoms need immediate attention.

An abscess can rupture into the fluid-filled spaces within the brain. This can spread infection and cause sudden deterioration. Infection may also affect the tissues around the brain or nearby blood vessels.

Possible longer-term effects include:

Some effects improve as infection and swelling resolve. Others may require rehabilitation or ongoing treatment. The outcome is influenced by how quickly treatment begins, the infection's cause and location, whether it has ruptured, and the person's underlying health.

- Seizures or epilepsy
- Weakness, numbness, or problems with coordination
- Difficulty speaking, understanding language, or swallowing
- Changes in memory, concentration, mood, or behavior
- Vision or hearing problems
- Recurrence of the abscess

Follow up

Follow-up is an essential part of treatment. Repeat MRI or CT scans allow the medical team to check whether the abscess and surrounding swelling are shrinking. Imaging findings may improve more slowly than symptoms, so doctors consider both when making decisions.

People receiving long courses of antimicrobial medicine may need regular blood tests. These tests can monitor kidney function, liver function, blood cell counts, inflammation, and possible

medicine side effects. If treatment continues at home through an intravenous line, the care team will explain how to protect the line and recognize infection or blockage.

Rehabilitation may begin in the hospital and continue after discharge. Physical therapy can help with strength, balance, and walking. Occupational therapy supports daily activities, while speech-language therapy can address communication, thinking, or swallowing problems.

Keep routine appointments even when symptoms are improving. Do not stop antimicrobial or antiseizure medicine without speaking with the treating team. Ask when it is safe to drive, work, exercise, travel, or drink alcohol, as restrictions depend on recovery and seizure risk.

Contact the treating team promptly for a returning or worsening headache, fever, vomiting, increasing fatigue, new medicine side effects, or redness, drainage, or pain around an intravenous line or surgical wound.

Call emergency services for a seizure, loss of consciousness, severe confusion, sudden weakness, new speech difficulty, repeated vomiting, or rapidly increasing sleepiness. These are emergency symptoms rather than issues to wait to discuss at a routine visit.

Sources

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