CONDITION

Traumatic brain injury

A traumatic brain injury is a change in brain function caused by a blow, jolt, or penetrating injury to the head.

WHAT IT IS
Brain injury caused by external physical force

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
Headache, confusion, dizziness, memory problems

WHAT CAUSES IT
Blow, jolt, or penetrating head injury

HOW IT IS DIAGNOSED
Clinical assessment, neurological examination, and sometimes brain imaging

MAIN TREATMENT
Symptom management, gradual rehabilitation, and emergency care when severe

CAN IT BE CURED?
Sometimes - mild injuries often heal fully

IS IT AN EMERGENCY?
Sometimes - worsening symptoms require emergency assessment

LONG-TERM OUTLOOK
Most mild injuries improve; severe injuries may cause disability

Overview

A traumatic brain injury, or TBI, happens when an outside force affects how the brain works. Common causes include a fall, vehicle crash, sports impact, assault, or object penetrating the skull.

A concussion is a mild traumatic brain injury. The terms are often used as if they mean the same thing, but TBI also includes moderate and severe injuries. A person can have a concussion without losing consciousness or having an abnormal brain scan.

TBI can briefly affect thinking, balance, mood, sleep, or physical comfort. More serious injuries can damage brain tissue and lead to lasting changes in movement, communication, memory, or behaviour.

Any suspected TBI deserves attention because symptoms can change after the injury. Most people with a mild injury improve, but bleeding or swelling inside the skull can sometimes develop and needs urgent treatment.

Symptoms

Symptoms may begin immediately or appear over the following hours or days. A person may not recognise their own confusion or memory problems, so observations from someone who witnessed the injury can be helpful.

Common physical symptoms include:

Thinking and memory symptoms can include feeling slowed down, having trouble concentrating, or not remembering events just before or after the injury. Some people feel mentally "foggy."

Mood symptoms may include irritability, anxiety, sadness, or being more emotional than usual. These changes can come from the injury itself, disrupted sleep, pain, stress, or a combination of factors.

Moderate or severe TBI may cause prolonged loss of consciousness, marked confusion, weakness, seizures, speech problems, or difficulty waking. These symptoms require emergency care.

Babies and young children may not be able to describe what they feel. Changes such as unusual crying, poor feeding, loss of balance, reduced interest in play, repeated vomiting, or being difficult to wake need medical assessment after a head injury.

- Headache or a feeling of pressure in the head
- Dizziness, poor balance, nausea, or vomiting
- Sensitivity to light or noise
- Blurred or double vision
- Tiredness or low energy
- Sleep changes

Causes and risk factors

TBI is caused by force applied to the head or body. The brain may move rapidly inside the skull, or an object may directly damage the skull and brain.

Common causes include falls, road crashes, sports injuries, workplace incidents, explosions, assaults, and penetrating injuries. Rapid acceleration and deceleration can injure the brain even when the head does not strike an object.

Anyone can have a TBI. The chance of injury is higher in situations involving unsafe driving, contact or collision sports, work at heights, violence, or activities with a risk of falling.

Older adults may be more likely to fall and may have a higher risk of bleeding after a head injury. Blood-thinning medicines and disorders that affect clotting can increase that bleeding risk. A seemingly minor head impact may therefore need prompt assessment.

Previous concussion is another risk factor. A second injury can happen more easily during recovery, particularly if balance, reaction time, or judgement is still affected. Repeated head impacts may also increase the chance of persistent symptoms, although individual outcomes cannot be predicted from the number of impacts alone.

Alcohol or drug use can raise the risk of injury and make symptoms harder to assess.

Diagnosis

TBI is diagnosed from the circumstances of the injury and a clinical assessment. A healthcare professional may ask about loss of consciousness, memory gaps, vomiting, seizures, medicines, previous injuries, and changes noticed by witnesses.

The examination may check alertness, memory, speech, pupil reactions, strength, sensation, coordination, and balance. One commonly used tool is the Glasgow Coma Scale, which scores eye opening, speech, and movement. It helps describe the person's level of consciousness but does not capture every effect of TBI.

A computed tomography, or CT, scan may be needed when there are signs of a skull fracture, bleeding, or a more serious injury. CT uses X-rays to make detailed images and is often the first brain scan used in an emergency.

A normal CT scan does not rule out concussion. Concussion usually causes changes in brain function that standard scans cannot see. Magnetic resonance imaging, or MRI, may be considered when symptoms or examination findings need further investigation, but it is not routinely required for every mild TBI.

There is no single symptom checklist, blood test, or scan that confirms every TBI. Diagnosis combines the history, examination, and any tests needed to check for structural injury.

Treatment and management

Treatment is based on the injury's severity, current symptoms, and whether there is bleeding, swelling, or another injury.

After a mild TBI, a short period of relative physical and mental rest may help. Relative rest means reducing activities that clearly worsen symptoms, not remaining in a dark room or in bed for days. Light daily activity can usually be restarted gradually as tolerated.

A return to work, school, exercise, driving, and screen use may need to happen in stages. Symptoms are used to guide the pace. Contact sports and activities with a risk of another head injury should wait until recovery has been assessed and an appropriate return plan has been completed. An athlete with suspected concussion should not return to play on the same day.

Headache, nausea, sleep problems, dizziness, mood changes, and neck pain can each be treated or managed. Care may involve suitable pain relief, sleep strategies, vestibular therapy for balance and dizziness, physical therapy, psychological support, or help with memory and concentration. Medicine choices should take account of bleeding risk, other conditions, and current medicines.

Moderate or severe TBI usually requires hospital care. Treatment may include breathing and blood-pressure support, repeated neurological checks, seizure management, monitoring of pressure inside the skull, or surgery to remove blood, repair damage, or reduce pressure.

Rehabilitation may begin in hospital and continue after discharge. Depending on the effects of the injury, it can involve physical, occupational, speech and language, cognitive, or psychological therapy.

Complications

Bleeding or swelling inside the skull is an early complication. Because the skull cannot expand, rising pressure may injure the brain. This is why increasing sleepiness, worsening headache, repeated vomiting, weakness, or seizures after a head injury need emergency assessment.

Some people have symptoms that continue beyond the expected early recovery period. These may include headache, dizziness, fatigue, sleep disturbance, mood changes, or problems with concentration and memory. Persistent symptoms are sometimes called post-concussion symptoms. They are real, but they do not necessarily mean that the brain is continuing to be damaged.

Moderate and severe injuries can cause longer-term problems with movement, speech, swallowing, vision, behaviour, emotions, or independent living. Other possible complications include seizures, blood clots caused by reduced mobility, infections after penetrating injury, or

changes in hormone production if the pituitary gland is affected.

Repeated head injuries are a concern, especially before recovery from an earlier injury. Research has linked repeated head impacts with later brain disease in some people, but the risk to any one person is difficult to predict.

Prevention

Not every TBI can be prevented, but practical safety measures can reduce the chance or severity of injury.

Useful measures include:

Helmets reduce the risk of some serious head injuries but cannot prevent every concussion. Safe technique, rule enforcement, and avoiding unnecessary head impacts also matter.

- Wearing an appropriate seat belt and using correctly fitted child restraints
- Wearing an approved helmet for cycling and activities where one is recommended
- Following workplace protections for heights, machinery, and falling objects
- Reducing fall hazards at home, especially for older adults
- Using handrails, suitable footwear, and prescribed vision aids
- Following sport rules and reporting possible concussion immediately
- Never driving while affected by alcohol, drugs, severe tiredness, or impairing medicines

Living with it and what to expect

Many people with mild TBI improve over days to a few weeks. Recovery is not always steady. Headache, tiredness, or concentration problems may become more noticeable after a busy day, poor sleep, stress, or increased activity.

A gradual return to ordinary routines is usually more helpful than prolonged inactivity. Temporary adjustments may include shorter work or school days, extra breaks, reduced screen brightness, a quieter environment, or more time for tasks.

If symptoms last for weeks, follow-up can look for factors that may be slowing recovery. These can include migraine, neck injury, balance problems, sleep disruption, anxiety, depression, medication effects, or another medical condition. Treating these specific problems can support recovery.

After moderate or severe TBI, improvement may continue for months or years. Rehabilitation

often focuses on practical goals such as walking safely, communicating, managing daily tasks, returning to education or employment, and adapting to changes that remain.

Some people recover their previous level of independence. Others need ongoing support or develop lasting disability. The early severity of the injury provides useful information, but it cannot predict every person's long-term outcome.

Family relationships may also be affected by changes in mood, behaviour, memory, or independence. Clear routines, written reminders, paced activity, and support for both the injured person and family can make daily life more manageable.

When to get medical help

Seek emergency help after a head injury if there is:

Emergency assessment is also important after a significant head injury in someone taking blood-thinning medicine or with a bleeding disorder, even if early symptoms seem mild.

Arrange prompt medical advice for ongoing headache, dizziness, memory problems, mood changes, or sleep disturbance after a head injury. Routine follow-up is appropriate when symptoms are stable but are not improving, interfere with daily life, or return as activity increases.

- Increasing difficulty waking or staying awake
- A worsening headache or repeated vomiting
- A seizure, collapse, or prolonged loss of consciousness
- New weakness, numbness, poor coordination, or slurred speech
- Increasing confusion, agitation, or unusual behaviour
- One pupil larger than the other or new double vision
- Clear fluid or blood coming from the nose or ears
- An open wound, dent in the skull, or penetrating injury

Common questions

Is a concussion the same as a traumatic brain injury?

A concussion is a type of mild traumatic brain injury. TBI is the broader term and also includes moderate and severe injuries that may involve visible damage, prolonged unconsciousness, or

major loss of function.

Can I have a concussion without being knocked out?

Yes. Most concussions do not require a loss of consciousness. Confusion, memory gaps, headache, dizziness, balance problems, or feeling mentally slowed can occur while the person remains awake.

Will a concussion show up on a CT scan?

Usually not. CT scans are mainly used to look for bleeding, fractures, or other structural damage. A normal scan does not exclude concussion because the functional changes of concussion are often too subtle for standard imaging.

How long does recovery take?

Many mild injuries improve within days or weeks, but some symptoms last longer. Recovery can be affected by the injury, previous concussions, migraine, sleep, mental health, neck or balance problems, and the demands of work, school, or sport.

Can I sleep after a concussion?

Sleep itself is not harmful after a mild TBI. However, a person with concerning symptoms should first be medically assessed. Being increasingly difficult to wake is an emergency sign, not normal sleep.

When can I return to sports or exercise?

Light activity can often restart gradually once it does not significantly worsen symptoms. Return to contact or collision sport should follow a stepwise plan and appropriate medical clearance. Another head impact during recovery should be avoided.

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