

Department of Clinical Neuropsychology

Understanding Moderate-to-Severe Traumatic Brain Injury



Traumatic brain injury (TBI) is an injury to the brain that causes a temporary or permanent change in brain function. TBI is classified as mild, moderate, or severe. Mild TBI, also known as concussion, is not covered here because the causes and treatments of concussion differ from more serious injuries.

Two factors help determine whether TBI is moderate or severe. The first factor is how long someone is unconscious after the injury. Brief periods of unconsciousness are associated with mild brain injuries. Longer periods of unconsciousness are associated with more serious injuries. The second factor is the duration of posttraumatic amnesia (PTA), or how long a person has poor memory for events before and after the injury. PTA that lasts more than 24 hours is a sign of severe brain injury.

Moderate TBI is a brain injury that results in unconsciousness lasting more than 30 minutes but less than 24 hours. Confusion about the event can last from a day to one week. Trouble performing day-to-day living activities can last for months or can be permanent.

Severe TBI is a brain injury that results in unconsciousness lasting more than 24 hours and long-term confusion about what happened. Severe TBI can cause long-term problems with thinking, language, and behavior. It can reduce a person's ability to perform basic tasks, such as toileting, dressing, and walking.

Types

- **Penetrating or Open Head Injury** is caused by something entering the skull, such as a bullet, shrapnel, or a knife. Puncturing the skull can force bone fragments, skin, and hair into the brain, along with fragments of the object that punctured the skull.
- **Bruises and Hematomas** can happen when the head is hit hard with something or when the head hits something that is hard (like a floor) when a person falls. One common type of bruise is known as a "coup-contrecoup" (pronounced "koo contra-koo") contusion. With this injury, the original strike (coup) on the head causes a bruise on the brain. Then, the brain bounces across the skull and strikes the opposite inside wall of the skull (contrecoup). Therefore, the brain is bruised on both sides. Bleeding between the skull and the surface of the brain is called a hematoma. This type of bleeding can be very serious.
- **Diffuse Axonal Injury** refers to wide-spread (diffuse) nerve cell (axonal) injury. This can happen when there is such strong, fast rotation of the head that the brain remains stationary inside while the skull twists around it. This type of injury causes tearing of the nerves (called shearing) in many parts of the brain, which can result in severe damage.

Symptoms

- Headache that gets worse or does not go away
- Nausea or repeated vomiting
- Convulsions or seizures
- Inability to awaken from sleep
- Dilation of one or both pupils
- Slurred speech
- Weakness or numbness in the extremities
- Loss of coordination
- Increased confusion, restlessness, or agitation
- Loss of consciousness

Causes

- Falls
- Car, motorcycle, and bike accidents
- Sports accidents
- Violence, including shaken baby syndrome, bullets, knives, and more

Risk Factors

Although a brain injury can happen to people of any age, children, young adults, and adults over 75 are at a high risk of having a moderate-to-severe TBI. Boys and men between the ages of 14 and 24 are at the highest risk.

Common Diagnostic Tests

- The Glasgow Coma Scale (GCS) is used to rate a person's ability to open their eyes, speak, and move on command after suspected brain injury. Scores range from 3-15 points. Lower scores can mean a more severe injury.
- CT or MRI can detect physical changes in the brain, such as bleeding, fracture, or swelling. An abnormal CT or MRI can indicate more serious brain injuries.
- Neuropsychological evaluation using pencil-and-paper tests may be used to find changes in thinking ability. These tests can show whether changes in a person's thinking are typical for the severity of their TBI or if they may have other causes. The tests also give a benchmark so the doctor can compare changes in thinking ability over time. A neuropsychologist can also recommend care specific to the individual, including resources to improve overall quality of life.

Treatment

- Some brain bleeds require surgery, depending on their size and location.
- Moderate TBI is usually treated with rest and rehabilitation therapy. People with a moderate TBI can make a full

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recovery or learn to make up for lasting problems.

- People with a severe TBI often require a long hospital stay and extensive rehabilitation for recovery.
- Physical, occupational, and speech therapy are often prescribed to improve functioning in people with TBI. Rehabilitation usually begins when a person is still in the hospital and may continue on an outpatient basis.
- Rehabilitation psychologists may also work as part of a TBI treatment team to help the TBI survivor and their family adjust to changes in functioning that may accompany TBI. Emotional changes are also common after TBI, and a rehabilitation psychologist may recommend ways to improve mood and cope better.
- Sometimes a person with TBI requires long-term rehabilitation, including training for caregivers. Outpatient rehabilitation programs may focus on a particular aspect of a person's recovery, such as their ability to return to driving or work (vocational rehabilitation).
- For example, the BNI Center for Transitional Neurorehabilitation (CTN) offers intensive outpatient treatment programs for individuals with brain and spinal cord injuries. CTN has specialized tracks for returning to work or school, as well as a fast track for people with less severe injuries. Family members are included in the process and educated about how to best assist their loved one. Another option, the Barrow Bridge Program, delivers customized therapy to help individuals with TBI reach maximum independence.

Suggestions for Patients

- Healing can take up to a year or more. Participating in physical, occupational, and speech rehabilitation therapies greatly helps the healing process.
- A brain injury can make it hard to notice changes in higher-order thinking, such as problem-solving and decision-making. Therefore, have a trusted friend or family member help with decision-making in important areas, such as finances and medical decisions, or with other tasks where the possibility of error could have a bad effect.
- Do not do activities that increase your chances of harm, such as shooting firearms, biking without a helmet, climbing ladders, or drinking alcohol.
- Brain injury can make depression more likely due to changes in brain function, so keep an eye on your mood. Let your doctor know if it is getting harder to manage your mood. Psychotherapy, support groups, and medication can be helpful.
- Routine and structure can be very helpful as you recover. Use calendars, cell phones, white-boards, notebooks, and other visual reminders as memory aids.
- Use a pillbox to keep medications organized.
- Ask for written information from your medical providers.
- Have a friend or family member attend appointments with you to assist with understanding and recall of instructions.
- Get plenty of rest during the healing process. You may feel more tired than usual, and it is important to allow the brain to rest between stimulating activities.
- Consider participating in a support group for survivors of TBI.

Suggestions for Caregivers

- Be available to help your loved one with important decision-making.
- Hold important conversations with your loved one in a quiet or distraction-free room.
- Speak slowly and clearly.
- Begin by briefly explaining your intention as you begin an activity.
- Use gentle physical contact to provide reassurance.
- Redirect attention if your loved one becomes frustrated or distressed.
- Create a predictable environment to minimize frustration and confusion. For example, arrange items in a particular place and always put them there to assist with recall. Minimize clutter around the home to reduce distraction and improve concentration.
- Adhere to routine as much as possible.
- Break large tasks down into small steps to help your loved one complete them successfully.
- Avoid saying “no” when your loved one asks if they can do something that is currently outside of their ability. Find workarounds for previously enjoyed tasks, such as sitting while chopping vegetables instead of standing.
- Manage behavioral problems by managing your response to the behavior. Remember that behavioral problems are neurological, not a personal issue. Aim to minimize, not eliminate, inappropriate behavior.
- Take breaks and ask others for help when you feel overwhelmed. Caregiver burden is real, and caregivers need support. Ask for help when you need it, and manage your stress level by participating in relaxing and enjoyable activities daily.
- Consider participating in a support group for caregivers.

Resources

Additional resources for patients and caregivers, such as educational materials, support groups, and more, can be found below.

Brain Injury Alliance of Arizona

www.biaaz.org

We're Moving Forward

www.wmforward.org

Ability 360

www.ability360.org | (602) 386-4566

BNI Center for Transitional Neurorehabilitation

www.barrowneuro.org/get-to-know-barrow/centers-programs/center-for-transitional-neurorehabilitation

Recommended Books

- *Living with Brain Injury: A Guide for Families, Second Edition* by Richard C. Senelick and Karla Dougherty
- *Where is the Mango Princess?* by Cathy Crimmins