



X-Plain Concussions

Reference Summary

Introduction

A concussion is a mild injury to the brain. It is usually caused by a blow to the head or a sudden violent movement of the head. Every year about 300,000 concussions are reported among football players alone. Many others are unreported.

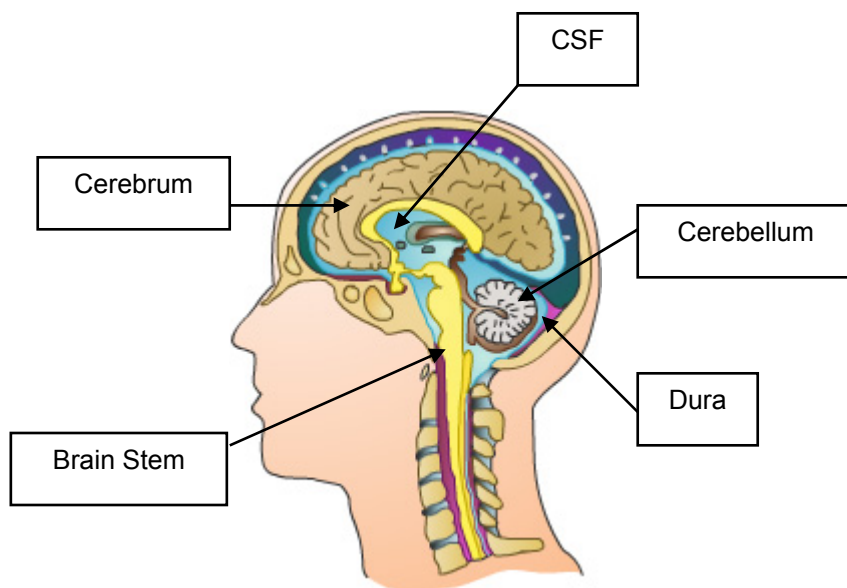
Most people recover from concussions. However, a brain injury that looks like it's mild with no or little scratches to the face, may hide a severe brain injury. Severe brain injuries can be fatal if not treated.

If you or your loved one had a concussion, this reference summary will explain what to watch for and when to seek help. This summary talks about the causes of concussions, their complications, types, and treatment. Tips for athletes are also presented.

The Brain and TBI

The brain is the control center of the body. It controls movements, actions, thoughts and sensations. This section explains some of the parts of the brain and how they may be affected after a traumatic brain injury (TBI). Fortunately, most concussions do not have the complications discussed in this section.

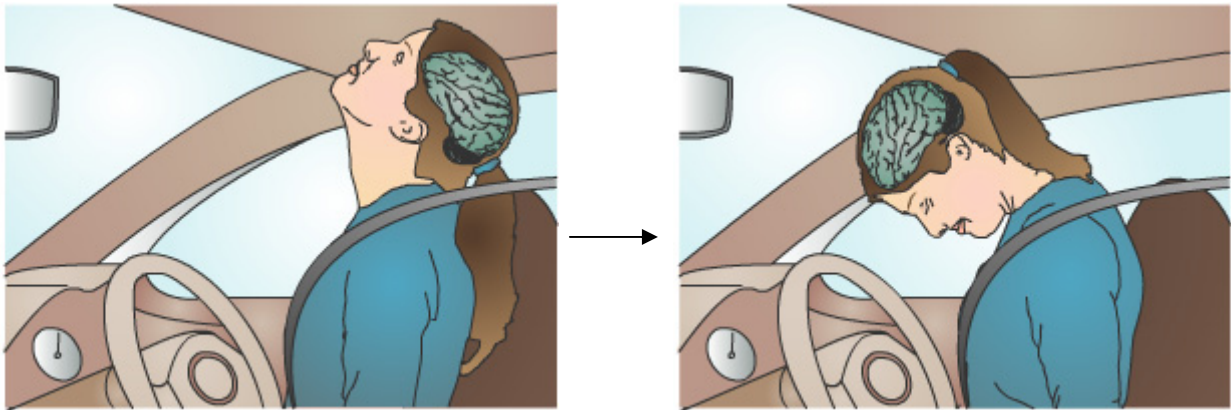
The brain has the consistency of gelatin. It floats inside the skull in a special fluid called cerebrospinal fluid also known as spinal fluid or CSF. This fluid acts as a shock absorber protecting the brain from blows to the skull.



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In accidents where the head is suddenly and violently shaken, the brain may push the cerebrospinal fluid and hit the skull. Even if the brain does not hit the skull, the sudden acceleration/deceleration of the brain can cause injury. This may cause bruising and swelling known as contusion.

Acceleration and deceleration is when the brain suddenly moves fast then suddenly stops. For instance, during a car crash when the neck flexes forward then extends backward very fast, the brain, inside the skull, moves very fast forward, stops suddenly, then moves very fast backward, and then again stops very suddenly. In this example the brain accelerates, decelerates, accelerates again and decelerates again before it hits the head rest!



Acceleration and deceleration

When injured brain tissue swells up, it puts pressure on the rest of the brain. The hard and rigid skull does not expand. This makes brain swelling more dangerous. It causes more pressure on the brain itself, which results in more damage to the brain cells.

Usually, brain swelling starts at the time of the injury and is worse three days later before it starts going back to its normal condition. If the swelling and pressure is severe and is not treated, it can lead to death.

Brain cells need oxygen and nutrients to survive. These are delivered by blood vessels. The blood vessels of the brain could get hurt easily during a head injury.

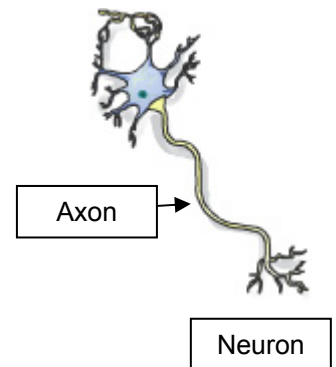
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During a head injury they can burst. This causes bleeding in or around the brain. This bleeding is also known as a hematoma.

Bleeding, swelling, and pressure inside the brain can also cause less blood to flow to the brain. This can cause problems with how well oxygen, blood, sugar and certain minerals are delivered to the brain cells. If a balance is not kept, too little or too much of different substances can become toxic to the brain cells, causing their death. Minerals are substances such as calcium and sodium.

Brain tissue is made up of small cells called neurons. Neurons have long fibers called axons. Axons can only be seen with microscopes. Axons work a lot like cables. They transfer information between brain cells.

A sudden and violent trauma to the head can cause injury to the axons. This type of tearing is known as diffuse axonal injury or DAI. This microscopic injury of axons can lead to long lasting mental problems, coma, and possibly death.



The brain has two parts, the left and the right hemispheres. Each hemisphere has specialized areas for movement, thinking, sensations, and feelings. Which functions are affected depends on which area of the brain is damaged. For example, if a hematoma injures the area of the brain that controls vision, the person may not be able to register and understand what they are seeing, even if the eyes are working perfectly.

The brain is a very complex organ and scientists do not fully understand how the brain thinks, feels emotions, and coordinates body functions. Because uncontrolled increase in the pressure of the brain can injure different areas inside the brain, it is not always possible for doctors to tell what will happen with a brain injury. The effects could be long-term mental, physical, emotional, and psychological effects.

Causes

Concussions result from a sudden blow to the head, or sudden acceleration and deceleration of the brain. Common causes of concussions include contact sports, vehicle and biking accidents, and falls at home.

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Falling at home is the most common cause of brain injury for toddlers and people over the age of 70. People older than 75 have the highest rate of hospitalization and death resulting from brain injury.

Types of TBI

Doctors view mild, moderate, and severe brain injuries differently. Concussions are considered mild brain injuries. Many concussions do not result in a loss of consciousness. Consciousness or being conscious means being awake and aware of what is going on around you.

Doctors grade concussions to help treat them. The type and grade of a concussion depends on:

1. If a person has or has not had a loss of consciousness,
2. How long a person had a loss of consciousness for,
3. How long memory loss after the injury or post traumatic amnesia lasts, and
4. How long the symptoms of confusion, headache, and dizziness last.



Grade I Patients suffering a grade I concussion have not lost consciousness and have little (less than 30 minutes) or no loss of memory after the trauma. This type of memory loss is called post traumatic amnesia and is the loss of memory of what happened for a period of time AFTER the incident.

For example, a football player, who has suffered a grade I concussion during which he has not lost consciousness, may not be able to remember, a day later, the incident and what happened for up to half an hour after the injury, even though he may look like he is acting normal right after the accident.

Grade II Patients with a grade II concussion lose consciousness for less than five minutes and/or have post traumatic amnesia that lasts between 30 minutes and 24 hours.

Grade III Patients with grade III concussions lose consciousness for more than five minutes and/or have post traumatic amnesia that lasts for more than 24 hours.

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Symptoms

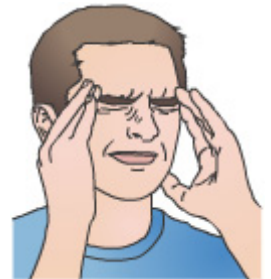
After a concussion, the person may or may not lose consciousness. If consciousness is lost, it lasts from a few seconds to minutes. The person is dazed and confused. It is normal for someone who had a concussion not to remember the events right before, during, and right after the accident.

Signs of confusion include:

- A person not being able to think and communicate clearly.
- A person not being able to remember where he or she is.
- A person not being able to do a sequence of goal-directed movements when asked. For example a patient may not be able to follow commands such as “touch your left ear with your right hand”.
- A person shows perseveration, which is when patients repeatedly either ask the same question or say the same thing over and over.

Paramedics and sport trainers who suspect a concussion may ask the injured person what year it is, who the president is, or ask them to count backwards from 10 to try and find any changed brain functions.

Other symptoms of a concussion include headache, lightheadedness, dizziness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue, and sleep disturbances. The injured person may have trouble with memory, concentration, attention, or thinking.



If a person has a more severe brain injury than a mild concussion, he or she may have the same symptoms as those of a concussion but with more severity. Also, he or she may have repeated vomiting or nausea, convulsions or seizures, not be able to wake up from sleep, expansion of one or both pupils of the eyes, slurred speech, and weakness or numbness in the extremities.

When to See a Doctor

If you or your loved one had a concussion, you should always get checked by a doctor if the signs include:

- A headache that lasts more than an hour or two
- Vision problems
- Dizziness
- Nausea or vomiting



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- Difficulty with balance
- Confusion
- Memory loss
- Ringing in the ears
- Difficulty concentrating

You should seek emergency medical care if your symptoms or those of your loved ones include:

- Convulsions, which are involuntary muscle contractions and rigidity, usually along with a loss of consciousness
- Not being able to hear, taste, or see
- Difficulty understanding information
- Weakness or numbness in the hands or legs
- Slurred speech or difficulty finding the “right” word
- Repeated vomiting



It is important to realize that rarely, but possibly, a patient with a head injury may act very normal for a few hours while a blood clot forms on top of the brain. As the clot gets bigger, symptoms start to show up. Because of this, it is very important, even in head injuries that seem minor, to check on the patient every hour or two.

As you check with the patient:

- ask them questions to make sure they know where they are,
- ask them to move their arms and legs to make sure there is no early weakness and
- check their pupils to make sure that they are not becoming unequal in size, with one becoming much bigger.

If the patient has done fine over 12 hours then they do not need to be checked anymore.

Minor head injury, especially in older people, can lead to a different type of bleeding, a bleeding that may not show up on a CT scan done immediately after the injury. This type of bleeding is known as a subdural hematoma. Symptoms usually show up weeks later in the form of headaches, weakness, loss of balance, and speech problems.

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This is why it is always very important to be on the lookout for such symptoms right away after a head injury, in the day or so after, and even a few weeks after.

Complications

People who suffer a head injury may suffer from side effects that continue to happen for weeks or months. This is known as post concussive syndrome.

Post concussive symptoms include memory and concentration problems, mood swings, personality changes, headache, fatigue, dizziness, insomnia, and excessive drowsiness.

If the brain injury is severe it can lead to serious complications such as bleeding, blood clot, and cell death resulting from decreased blood flow to the brain. If not treated, these complications could lead to more damage to the brain and even death.



If the concussion is not severe, but the person has another concussion before recovering from the previous one, the second concussion is much more likely to be severe. This is known as “second impact syndrome”, which can be fatal.

This is why athletes who have suffered a concussion, even a mild one, may be asked not to play for the rest of the season to avoid a much more dangerous second concussion.

Some complications respond well to treatment. However, the brain may take a long time to fix the damage or may never be able to fully recover. Some of these long-term effects include:

- **Cognitive disabilities:** Most people who have had a significant TBI will experience some problems in their cognitive skills. This may include problems with reasoning, problem solving, memory, speed of thinking, focusing, multitasking, and communicating.
- **Personality changes:** People who had a significant TBI may become more impulsive, irritable, agitated, and depressed. They may also develop post traumatic stress disorder. These damaged social skills and unstable emotions may become one of the greatest challenges for families and friends of the recovering patient.
- **Sensory problems:** Sensory problems. A person recovering from TBI may sense ringing in the ears, which may last months or years. This is known as tinnitus. Vision may be changed causing blind spots, double vision or difficulty

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recognizing objects. The person may have less muscle coordination, which makes him or her look clumsy. In some cases, the person may feel a bitter taste or a bad smell.

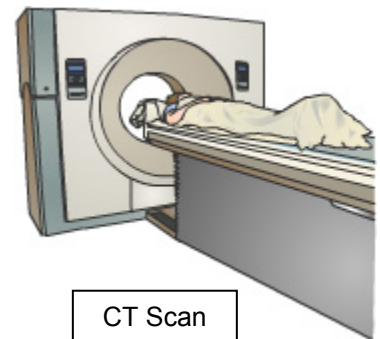
- Headaches: Some people who have had a traumatic brain injury develop chronic headaches. Tension-type headaches are the most common form but migraine-like headaches are also common.
- Seizures: Some people who have had a traumatic brain injury may have one or more seizures. A seizure is caused by abnormal electrical activity in the brain, and usually comes with convulsions or sudden movement of the body.
- Post-traumatic stress disorder

Diagnosis

Whether the concussion looks severe or mild, the doctor usually needs to assess the situation quickly to treat complications if any exist. Often, but not always, physicians rely on images of inside the brain called CT scans.

CAT or CT scan is an advanced x-ray machine that allows doctors to see images of organs inside the body. The machine takes many x-ray images as it rotates around the body and a powerful computer creates the final images.

CT scans of the brain may be done to make sure that there are no fractures in the skull and no blood clots or bruising in or around the brain. Depending on the patient's condition and the first CT scan, the patient may need to stay at the hospital and be watched closely. If the injury is severe and needs surgical treatment, the patient may go to surgery right away.



CT Scan

Most concussions are mild brain injuries that do not appear on the CT scan. The doctor will then rely on the symptoms of the patient to figure out the grade of the concussion.

Treatment

The standard treatment for a concussion is rest. If you have a headache you can usually take some over the counter painkillers like acetaminophen. Ask your doctor which medication is best for you.

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If the doctor requests a CT scan and the test shows bleeding or severe injury, the brain injury may require hospitalization, close monitoring, and treatment. If there is a fracture or a big blood clot, surgery may be needed to fix the skull and take the blood clot out.

For Athletes

Patients with post concussive syndrome should avoid activities that put them at risk for repeated concussions. Athletes should not return to play while experiencing these symptoms.

Depending on the severity of the concussion, an athlete may return to play the same season. It is very common that an athlete may sit out for the rest of the season to avoid a second concussion. Athletes who get repeated concussions should consider ending participation in the sport.

Athletes should wear the appropriate sports safety gear, such as helmets or head gear at all times.

People who bike or skateboard should avoid uneven or unpaved surfaces, obey all traffic signs, and be aware of drivers.

Repeated concussions can lead to significant problems. Some of the symptoms may not show up for years. These include memory problems or dementia, forgetfulness, tremors, inability to walk or to use the arms and legs. This is a big problem for boxers.



Conclusion

A concussion is an injury to the brain that is usually caused by a blow to the head. It results in temporary loss of normal brain functions such as consciousness, awareness, and thinking.

People with concussions often cannot remember what happened right before or after the injury, and they may act confused. A concussion can affect memory, judgment, reflexes, speech, balance, and muscle coordination.

Some concussions are mild and some are more severe. Most people recover from their concussion and a single concussion does not usually cause permanent damage. However, a second concussion soon after the first one can have serious complications, which can be disabling and even deadly.

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- Vision problems
- Dizziness
- Nausea or vomiting
- Difficulty with balance
- Confusion
- Memory loss
- Ringing in the ears
- Difficulty concentrating

You should seek emergency medical care if your symptoms or those of your loved ones include:

- Convulsions
- Not able to hear, taste, or see
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