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About Brain Injury

Understanding Brain Injury

Understanding the Injury

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Brain injuries may be classified as *traumatic* or *non-traumatic* to describe the cause of the injury. They may also be classified as mild, moderate, or severe to indicate the initial severity of the injury. Other terms, such as diffuse or penetrating, may be used to describe the type injury. The most commonly used terms are shown below:

Diffuse Axonal Injury

A diffuse axonal injury can be caused by shaking or strong rotation of the head, as with shaken baby syndrome, or by rotational forces, such as with a car accident.

- Injury occurs because the unmoving brain lags behind the movement of the skull, causing brain structures to tear.
- There is extensive tearing of nerve tissue throughout the brain. This can cause brain chemicals to be released, causing additional injury.
- The tearing of the nerve tissue disrupts the brain's regular communication and chemical processes.
- This disturbance in the brain can produce temporary or permanent widespread brain damage, coma, or death.
- A person with a diffuse axonal injury could present a variety of functional impairments depending on where the shearing (tears) occurred in the brain.

Concussion/Mild Traumatic Brain Injury (mTBI)

A concussion can be caused by direct blows to the head, gunshot wounds, violent shaking of the head, or force from a whiplash-type injury. Both closed and open head injuries can produce a concussion. A concussion is the most common type of traumatic brain injury.

- A concussion is caused when the brain receives trauma from an impact or a sudden momentum or movement change. The blood vessels in the brain may stretch and cranial nerves may be damaged.
- A person may or may not experience a brief loss of consciousness (not exceeding 20 minutes). A person may remain conscious, but feel “dazed” or “punch drunk”.
- A concussion may or may not show up on a diagnostic imaging test, such as a CAT scan.
- Skull fracture, brain bleeding, or swelling may or may not be present.
- A concussion can cause injury resulting in permanent or temporary damage.
- It may take a few months to a few years for a concussion to heal.

Contusion

A contusion is a bruise (bleeding) on the brain caused by a force (blow or jolt) to the head.

- A contusion can be the result of a direct impact to the head.
- Large contusions may need to be surgically removed.

Coup-Contrecoup Injury

Coup-contrecoup injury describes contusions that are both at the site of the impact and on the complete opposite side of the brain. This occurs when the force impacting the head is not only great enough to cause a contusion at the site of impact, but is also able to move the brain and cause it to slam into the opposite side of the skull.

Second Impact Syndrome

Second impact syndrome, also termed "recurrent traumatic brain injury," can occur when a person sustains a second traumatic brain injury before the symptoms of the first traumatic brain injury have healed. The second injury may occur from days to weeks following the first. Loss of consciousness is not required. The second impact is more likely to cause brain swelling and widespread damage.

Because death can occur rapidly, emergency medical treatment is needed as soon as possible. The long-term effects of recurrent brain injury can be muscle spasms, increased muscle tone, rapidly changing emotions, hallucinations, and difficulty thinking and learning.

Penetrating Injury

Penetrating injury to the brain occurs from the impact of a bullet, knife, or other sharp object that forces hair, skin, bone, and fragments from the object into the brain.

- Objects traveling at a low rate of speed through the skull and brain can ricochet within the skull, which widens the area of damage.
- A "through-and-through" injury occurs when an object enters the skull, goes through the brain, and exits the skull. Through-and-through traumatic brain injuries include the effects of penetration injuries, plus additional shearing, stretching, and rupture of brain tissue.
- Firearms are the single largest cause of death from traumatic brain injury.

Abusive Head Trauma (Shaken Baby Syndrome)

Abusive head trauma, also known as shaken baby syndrome, is a violent criminal act that causes traumatic brain injury. Abusive head trauma occurs when the perpetrator aggressively shakes a baby or young child. The forceful whiplash-like motion causes the brain to be injured.

- Blood vessels between the brain and skull rupture and bleed.
- The accumulation of blood causes the brain tissue to compress while the injury causes the brain to swell. This damages the brain cells.
- Abusive head trauma can cause seizures, lifelong disability, coma, and death.
- Irritability, changes in eating patterns, tiredness, difficulty breathing, dilated pupils, seizures, and vomiting are signs of abusive head trauma. A baby experiencing such symptoms needs immediate emergency medical attention.

Locked-in Syndrome

Locked-in syndrome is a rare neurological condition in which a person cannot physically move any part of their body aside from their eyes.

- The individual is conscious and able to think.
- Vertical eye movements and eye blinking can be used to communicate with others and operate environmental controls.

Open Head Injury

An open head injury, also known as a penetrating head injury, is a head injury in which the dura mater (the outer layer of the meninges) is breached. Penetrating injury can be caused by high-velocity projectiles or objects of lower velocity such as knives, or bone fragments from a skull fracture that are driven into the brain.

Closed Head Injury

A closed head injury is an injury to the brain caused by an outside force without any penetration of the skull. With a closed head injury, when the brain swells, it has no place to expand. This can cause an increase in intracranial pressure, which is the pressure within the skull.

As the brain swells, it may expand through any available opening in the skull, including the eye sockets. When the brain expands through the eye sockets, it can compress and impair the functions of the eye nerves. For instance, if an eye nerve, Cranial Nerve III, is compressed, a person's pupil (the dark center part of the eye) will appear dilated (big). This is one reason why medical personal may monitor a person's pupil size and intracranial pressure.

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[Bridgette Brown](#)

The Reality of TBI

"So September 17, 2017, was a day that I will never forget. They shot Michael in the left side of his head."

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The Reality of TBI

Bridgette Brown

"So September 17, 2017, was a day that I will never forget. They shot Michael in the left side of his head."

Bridgette Brown was traveling when she received a call from her mother. "They shot Michael," she heard. Michael, her 20 year old son, had called his grandmother to tell her he'd been shot. It was September 17, 2017, and she had no idea how much life would change after that call.

"When I finally got to see my son, his head was twice the normal size," Bridgette remembers. "His left eye was hanging out of its socket. He was in a coma."

Just one year later, Bridgette sat down with us to share her family's journey on camera. From the chapel of TIRR Memorial-Hermann in Houston, and later the TIRR Brain Injury Rehabilitation gym, Bridgette and Michael shine a light on life after brain injury.





03:13





[Sarah Lefferts](#)

Advocating for Yourself

Sarah learns that her injury may be invisible, but she isn't - and that it's OK to put her own needs first.

[Read Sarah's Story](#)



Advocating for Yourself

Sarah Lefferts

Sarah learns that her injury may be invisible, but she isn't - and that it's OK to put her own needs first.

It started out as an ordinary September day for Sarah Lefferts. As she was walking, she suddenly slipped on wet tile flooring and fell backward, hitting her head on the floor. When she got up, she was upset that she had spilled coffee on her dress, and she had no idea how much her life had changed in that split second.

Over the next several days, her concussion symptoms progressed. At the time of her fall, she had been working full time, attending graduate school, and had the active social life of an average twentysomething. She was not OK with her new normal and was frustrated that the healing wasn't more immediate.

Sarah, like most of us, didn't understand the recovery that was ahead of her. She said, "I learned a lot about how it was OK to be broken, and how I needed to communicate that to the people around me so they could understand enough to support me – even when I didn't understand my injury."

Her friends and family would go along to her doctors' appointments and take notes so that she could look back later to remember what they had talked about. Early in her recovery, she used a small notebook so that she could keep her thoughts organized. She made to-do lists for everything, including basic things like taking a shower and making food.

"One of the hardest parts of the recovery wasn't the physical healing but the social support. It's a real challenge to figure out how to communicate to your network about what's wrong and what you need from them. You look fine – you can walk and talk, so it's harder for them to understand what you're going through and what you need. Yet it's critical that you seek support from them," explains Sarah. It's challenging to advocate for yourself the way you need to when part of your brain has been damaged, but you need remember to put your own physical and mental health first, even though that isn't something society teaches us.

Under her neurologist's care, Sarah went back to grad school in 2014, completed a triathlon in 2015, and graduated with a Master of Arts in 2016. She is now a member of the BIAA Brain Injury Advisory Council and says that the experience changed her life. "The group of people I have met through the BIAA is empowering and supportive. BIAA taught me that I am not alone in brain injury and that every injury is different. It blew me away when I realized how many people suffer from concussions and other brain injury. I feel like my responsibility on the other side of this injury is to help other people understand that this injury is often invisible, but you are not – and it's OK to always keep striving to heal."



[Melissa Shuman](#)

Truly Not Alone

Before reaching out to her local brain injury association and finding an ABI support group, Melissa had nowhere to turn for advice.

[Read Melissa's Story](#)



Truly Not Alone

Melissa Shuman

Before reaching out to her local brain injury association and finding an ABI support group, Melissa had nowhere to turn for advice.

"Suddenly memories from the day before seemed like they were decades ago," says Melissa Shuman, who has come to live with the reality of brain injury after her son, Justin, sustained an acquired brain injury (ABI) following an attempt at suicide.

Recollecting on the first few days of her son's fight to live, Melissa made it clear she felt like she was fighting just as hard.

"I had been rushing to find out all of this information on my own while he was in a coma. It was exhausting, but who else was going to do it? That's a mother's job." In addition to learning information, Melissa became Justin's primary caretaker. She spent her days coordinating nursing, therapies, feeding, bathing, and everything else in the living room of their home. "I think I scared myself more than anything, and the doctors didn't have too much hope, so after a while I had to stop and just believe he would get better, and advocate for what would be best for him."

In the first several months following Justin's injury, the Shuman family experienced a great deal of change. They did have health insurance, but had difficulty getting many of the services Justin needed covered without a battle. Like so many others in similar positions, Melissa became an expert in fighting with her insurance company and with the agencies providing services to her son. Justin was not a candidate for inpatient rehabilitation because his medical needs required he be sent to Long-term Acute Care (LTAC), which is essentially a step-down from a hospital's Intensive Care Unit. Instead, Melissa demanded Justin come home, and spent weeks preparing and retrofitting the living room of their home to ensure his ability to live there.

"Bringing Justin home was not an easy quest, and I had no idea where to seek insight on what, how, and when to make the transition," Melissa explained.

Melissa is enormously appreciative of the online brain injury support group to which she belongs. "It's an A-B-I group," she laughs, "Not TBI! TBIs are welcome, but we make sure everyone else is, too. That's been good for me, to know I'm not alone, and Justin wasn't alone, and even that my other children are not alone and that someone can relate to what we are going through. A lot of people, actually, relate to what we go through."



[Jane Parks-McKay](#)

Finding the Right Resources

Jane and her husband, Tim, both sustained brain injuries at different points in their lives. They live with the residual effects every day.

[Read Jane's Story](#)



Finding the Right Resources

Jane Parks-McKay

Jane and her husband, Tim, both sustained brain injuries at different points in their lives. They live with the residual effects every day.

"I cannot remember when I learned about BIAA; however, knowing me, I am sure by googling TBI resources. BIAA has been extremely helpful and Greg Ayotte (BIAA's Director of Consumer Services) has been invaluable to me with sharing solutions and information. His patience is legendary. I'm proud to be part of the organization. To know you are not alone through this is priceless. The information that is on the web and accessible through Greg Ayotte's tireless efforts in helping me and our family over the years is invaluable. Knowledge is power, and I don't think with TBI you can be knowledgeable enough."

If Jane encounters confusion from someone about the behavior of either herself or Tim, she will refer that person to the BIAA website for information about brain injury. Most are grateful, many are very surprised, and others tell her they've learned a lot.

Speak to a Brain Injury Expert

Caring professionals at the National Brain Injury Information Center (NBIIIC) are ready to answer your questions.