



## LIVING WITH BRAIN INJURY

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Individuals who are involved in impaired driving crashes often incur severe trauma to their bodies. Many victims/survivors experience silent, unseen and sometimes undiagnosed injuries to the brain. In fact, impaired driving crashes are a leading cause of traumatic brain injury.

Society in general, including some health care providers, has the mistaken notion that in order for a person to have traumatic brain injury, he or she must suffer coma, skull fracture, lacerations and broken bones. This is simply not true.

Immediately after a crash, it is not unusual for a head-injured person to discuss what happened with law enforcement officers and emergency medical personnel, or even exchange driver's license and insurance information. Later, when the consequences of the head injury begin to interfere significantly with the person's life, neither the injured individual nor the family relates the problems back to the crash.

Even an injury that has been labeled a mild traumatic brain injury can be a significant injury that impacts family, personal relationships, employment and general well-being.

## INJURIES TO THE HEAD AND BRAIN

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When someone acquires a brain injury in an impaired driving crash, their brain is bounced back and forth within a bony structure, otherwise known as the skull. This bouncing back and forth causes bruising,

bleeding and even stretching or tearing of important brain structures. Most traumatic injuries to the brain will result in bruising of the frontal, occipital and temporal lobes.

**T**he motion of bouncing back and forth is sometimes referred to as acceleration and deceleration. An acceleration injury, or closed head injury, is the most common type of brain injury. A closed head injury is just as the term suggests; it is without an open wound or penetration to the head. Mild degrees are frequently referred to as concussions.

**I**n the event of an open head injury, the scalp is penetrated, torn or punctured, the skull is broken and the brain may be left exposed. This type of injury could be caused by a bullet or a flying object striking the head. Unfortunately, it is not uncommon for an open head injury to be accompanied by an acceleration injury, or become complicated by pieces of skull, skin, hair and debris that are pushed into the brain. This material can cause bruising, bleeding and swelling. Open head injuries are also a cause of concern because they expose the brain to infection.

**T**here is a less common injury to the head called a crushing head injury, where the skull is crushed and broken. Although this type of injury can cause damage to the base of the skull and to the nerves running through it, any long-term damage results directly from damage to the brain. An isolated injury to the skull can be less severe, but a

break in multiple bones of the skull can cause trauma by lacerating or bruising the brain.

When the brain is deprived of air, a secondary injury can occur. If a victim/survivor's airway is obstructed in any way, the brain does not receive the oxygen it requires, killing brain cells in the process. Also complicating matters is the possible loss of blood, reducing both blood pressure and a fresh supply of oxygenated blood to the brain.

And there are additional concerns. Within the first 24-48 hours following a head injury, the brain is at serious risk for swelling and bruising. As the brain swells, the skull in effect squeezes the brain, cutting off circulation. If this continues, brain swelling can cut circulation completely, causing the brain to die.

## CLASSIFICATION AND DIAGNOSIS

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Doctors classify brain injuries because these categories help the medical team determine the severity of the injury, course of treatment and possible outcomes. There are four classifications of brain injury: mild, moderate, severe and catastrophic.

Unlike persons with severe brain trauma, whose injuries are obvious, people with mild traumatic brain injury may not have noticeable medical problems. Although the term mild is used to describe the medical aspects of the problem, the end results of a head injury can be permanent and devastating. Mild brain injuries are the most common of all brain injuries.

**E**ven when consciousness has been lost for up to twenty or thirty minutes, victims/survivors are often sent home from the hospital within twenty-four hours. The family is instructed to awaken the victim/survivor every two hours.

**R**eflexes, strength and other gross measures of the neurological examination may have fallen within normal range at the hospital. Magnetic resonance imaging (MRI), computerized tomography (CT) of the head, electroencephalograms (EEGs) and x-rays may have revealed nothing. However, the test results do not mean that the brain has not been injured. These tests have significant limitations and are unable to detect subtle changes in brain function.

**D**eep areas of the brain are commonly injured in crashes. These sections are called the subcortical areas and are very important for processing information and for communication between different parts of the brain. Since the outer portion of the brain may be working normally, deficits in brain function may not be noticed until complex tasks are undertaken. Complicated tasks are usually not required when one is hospitalized, so deficits may not be noticed until the injured person returns home.

**C**omplex tasks are those which require several portions of the brain to work together simultaneously. Examples are balancing activities, complex hand activities, recognition and drawing of pictures, engaging in conversation without forgetting what the other person said, discriminating

sizes and shapes, interpreting touches and feelings and making judgments.

The diagnosis of mild closed head injury is best made by an experienced physician or neuropsychologist skilled in cognitive perceptual motor testing. Neuropsychological tests are standardized tests that evaluate the function of many different areas of the brain and can show abnormalities that other medical tests cannot detect. These tests are very important in the evaluation and detection of mild traumatic brain injury. Testing should be given several times to obtain accurate findings because many factors, including distraction, illness, or depression, can affect the outcome of testing.

## CONSEQUENCES OF BRAIN INJURY

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Although every brain injury is inherently different, common symptoms of head injury include cognitive (thinking) problems such as:

- difficulty paying attention and concentrating
- problems making sense of what has been read or seen
- forgetting things
- finding it difficult to learn or complete tasks
- confusion in finding places or following geographical directions
- unclear thinking
- inflexibility
- diminished organizational skills
- poor decision making, judgment and reasoning

**B**rain injury can also cause physical problems such as fatigue, restless sleeping, dizziness, headaches and speech problems. All of these decrease a person's tolerance for stress. Persons with head injuries are at risk of being overwhelmed by overload. They may be less flexible in problem solving, having exhausted their coping reserves.

**P**sychological problems can also result from head injury. Sadness and despair, denial of limitations, lack of interest in previous activities and/or intense or highly changeable emotions can all affect people with head injuries. Some victims/survivors become irritable about things and people in their lives and may even fly into unexpected rages.

**O**ther common psychological consequences are acting impulsively, lack of self-awareness, increased or decreased sexual interest and lack of appropriate social behavior. Some people recognize the changes that have occurred; others do not. Few recognize their own inappropriate social interactions. Some resent others who attempt to control or change their behaviors, which can be very frustrating for family members and other caregivers.

**B**ecause some of the symptoms of head injury are similar to those of depression, a head injury diagnosis is frequently overlooked. But once diagnosed, hope among family members is strong that a full recovery is possible and unusual statements or behaviors are tolerated. Later, after some time has passed, families want their loved one

to “behave” or function better, especially when social skills are impaired.

With mild to moderate injuries, the symptoms may seem reasonably unimportant at first. Only when a person attempts to resume normal activities at home, work, or school, do the symptoms become more noticeable and frustrating.

## CHALLENGES TO EMPLOYMENT

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The sometimes subtle, negative changes caused by head injury conspire against a person’s chances for success on the job. This means a marked decrease in lifetime earnings. The U.S. Department of Labor has defined worker characteristics for successful performance in more than 12,000 occupations.

They include:

- intelligence
- learning ability
- reasoning ability
- mathematical ability
- language development
- spatial perception
- form perception

A mild traumatic brain injury may not affect a victim's overall level of intelligence as measured by I.Q. tests, but impairment in any of the above traits can seriously impact one's ability to work and earn money.

Many times, persons with traumatic brain injury are told that since they only have three or four mildly impaired cognitive problems that they should



be able to return to work or get a new job without any problems. This advice is not always correct.

### *Problems with Learning and Memory*

While pre-injury learning and memory usually remain unaffected, learning new material and new procedures may prove extremely difficult. Many people are able to return to work at their old jobs, but problems develop when they are transferred or promoted. The injured person may begin to lose things such as car keys and important documents. Sometimes even moving office furniture can be quite unsettling.

### *Problems with Attention and Concentration*

Problems of attention and concentration create the largest barriers to successful vocational rehabilitation. The inability to focus on an exam question because a bird is singing outside the classroom, or the inability to follow the boss's instructions at work because of machines running in the background are serious problems.

**T**hese kinds of problems usually stem from injury to the front part of the brain referred to as the frontal lobes. They create the largest portion of the brain just behind the forehead and are very vulnerable to injury.

**P**eople with frontal lobe injury have difficulty holding well-focused conversations, which tends to unnerve friends, co-workers and supervisors. Victims/survivors may lose track of time and be

unable to shift attention when interruptions occur. People with frontal lobe injuries may also become emotionally fragile, which further complicates matters.

### *Problems with Information Processing, Speed, and Capacity*

With closed head injury, one's ability to think and react quickly may be impaired. This causes the person to feel overwhelmed with tasks that were simple before the crash. This not only stresses the injured person but also the employer. The frustration makes the cognitive (perceiving, thinking and remembering) problems worse, leading to more stress and depression.

### *Problems with Executive Functions*

Planning, identifying priorities, sequencing steps to complete a task and monitoring one's own behavior are referred to as the executive functions of the brain. Impairment of these functions can be one of the most disabling aspects of the injury because the injured individual is unaware of his or her own shortcomings.

### *Problems with Emotions*

When the thinking centers of the brain are not able to control the emotional centers, the individual becomes impulsive, uninhibited and irritable with mood swings and emotional outbursts. Lowered tolerance to frustration can have a devastating impact on human relationships and employment.

## REHABILITATION

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Even though a traumatic brain injury may have permanent consequences, many of the problems can be improved upon with comprehensive interdisciplinary rehabilitation. This includes cognitive rehabilitation and cognitive perceptual motor remediation. Improving these skills improves confidence, relieves anxiety and eventually improves function.

As rehabilitation helps the victim/survivor gain better control over behavior through learning compensatory techniques, higher functioning is accomplished, and sometimes a return to gainful employment becomes possible.

Comprehensive rehabilitation ideally includes treatment from a number of health care providers experienced in treating head injury. These may include a physician (usually a physiatrist), a physical therapist, an occupational therapist, a speech pathologist, a neuropsychologist, a social worker, a vocational counselor, a recreational therapist, a nutritionist and a case manager.

This list of professionals indicates the complexity of problems associated with head injury. These professionals will work together with the injured victim/survivor and the family to identify and achieve rehabilitation goals. The sooner treatment is begun, the greater the likelihood of a successful outcome.

It is crucial that people understand that not all physicians are qualified by education, expertise or training to diagnose and treat traumatic brain injury. A physician or neuropsychologist with specific expertise in head injury should be sought.

Before the first appointment, it would be helpful to prepare a written list of problems noticed since the crash. The injured individual may have little insight into the problems, so family observations are critical.

## GRIEF

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Traumatic brain injury and any resulting disability constitute a major loss for a victim/survivor. Victims/survivors face life-altering changes and will react

### **Common Grief Reactions:**

- *disbelief*
- *sadness, sorrow*
- *fear, vulnerability*
- *anger, rage*
- *guilt*
- *impaired concentration*
- *diminished self-concern*
- *search for meaning*
- *social withdrawal*
- *sleep or appetite disturbance*
- *decreased motivation*
- *spiritual confusion*

with any number of thoughts and feelings. These thoughts and feelings are collectively referred to as grief. Grief is not an event but a process of experiencing the emotional, mental, physical, social and spiritual effects of a loss.

Anger, guilt and deep sadness are normal. Grief may be compounded by the death of a loved one who was also in the crash.

Family and friends are also profoundly affected by

the crash and any subsequent injuries. They too are victims/survivors and grieve the losses they suffer as a result of a brain injury. As a family member or loved one, you may feel the fear, sadness and anger associated with grief. You may also be grieving the death of another family member or friend who was involved in the crash.

**G**rief is a personal experience. A loss to one person may not be considered a loss to another. Adjustment to losses caused by the crash hinges upon many factors, including: the coping style of the individual; the quality of the victim/survivor's support system; the nature of the trauma; the damage the trauma caused; and the presence of additional stressors. There is no time limit as to how long or short you will grieve. Your grief is your own and it is your right.

## HOW TO COPE

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The methods of coping you choose to employ after a crash can be either productive or self-defeating. Dealing with physical changes and emotional pain may make you feel like you are on a roller coaster ride with many highs and lows. Coping is an attempt to adapt new circumstances into existing life: you may try a variety of means to achieve this; some that work and others that do not.

### *Coping Tips*

- Take things one day at a time. Set simple goals and develop a daily routine, but be flexible enough to learn as you go.

- Keep in mind that everyone involved, including the head-injured victim/survivor and the caregiver or caregivers, requires a certain level of care, privacy and control. Therefore:
  - make decisions together if possible
  - offer choices when possible
  - make time for yourself
  - give privacy to others
  - respect one another
- Accept responsibility for your own physical, emotional, mental and spiritual healing. Allow others to help you as you learn.
- Follow the instructions of doctors and therapists to insure proper rehabilitation. Attend regularly scheduled medical appointments for continued therapies and follow-up.
- Keep the lines of communication open between friends and family. Tell them how you are feeling and what you are thinking.
- You may experience feelings of sadness, anger, anxiety and/or fear. Acknowledge these feelings by sharing them with family and friends, a counselor, a support group or by writing them down in a journal if you can.
- Pursue the professional help of a psychiatrist, psychologist, counselor, social worker or other mental health provider if your feelings of sadness, anxiety and/or anger persist.

## HEALING

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Recovery, even without treatment, is most rapid during the first weeks to months after head injury, unless the brain stem was damaged. While rehabilitation is usually more beneficial soon after injury, rehabilitation specialists can still help victims/survivors to regain function months or even years after their injury. Don't assume it is now too late for

you to be helped. Instead, consult with a professional to help you decide what is still possible for you or your loved one.

## DIVISIONS, SUBDIVISIONS, STRUCTURES AND FUNCTIONS OF THE BRAIN

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If you want to develop an understanding of brain injury, it is useful to learn about the composition of the brain. Victims/survivors hear a litany of medical terms when they reach the hospital, all of which can be overwhelming and confusing.

Coupled with unfamiliar medical terminology, reading about the anatomy of the brain is enough to make your head spin. The brain is the most complex organ in the body. So complex that there are multiple ways in which to explain its various regions, divisions, structure, and functions. Here is a very basic overview for your reference.

### *Forebrain*

#### **Telencephalon**

The telecephalon is the large division of the brain that is responsible for many functions. The brain is often described synonymously with the cerebrum, the structure that makes up the bulk of the brain. The cerebrum consists of two hemispheres (halves): a right hemisphere and a left hemisphere. These hemispheres are covered in “gray matter” called the cerebral cortex and have distinctive fissures (cracks or folds) that provide a roadmap with landmarks.

**T**he landmarks help to divide the brain into

pairs of lobes, which are regions of the brain. Each lobe serves a specific function, although each lobe does not function on its own. The four distinct lobes are referred to as the frontal lobes, the occipital lobes, the temporal lobes, and the parietal lobes.

**T**he limbic system is the interlocking structures of nerve cells located between the cerebrum and the diencephalon, another segment of the forebrain. With the limbic system, one can feel and express emotions. Because the limbic system lies close to the cerebrum, feelings are tied to thoughts, perceptions and attitudes.

**T**he cerebrum houses the interrelated structures of the amygdala and the hippocampus. The amygdala perceives emotions and translates these emotions to the appropriate psychological responses. The hippocampus, also a structure located in the telencephalon, is responsible for forming long-term memories. Together, the amygdala and hippocampus are important players in our emotions, thoughts and memories.

**F**inally, the basal ganglia, also located in the cerebrum, play an important role in motion. The basal ganglia help the cerebellum to adjust and alter our movements.

### **Diencephalon**

The diencephalon is the division located in the midline of the brain and contains the thalamus and hypothalamus. The thalamus is an information center where information comes and goes to the



cortex. The thalamus plays an important part in pain sensation, attention and alertness.

**T**he hypothalamus controls the autonomic nervous and endocrine systems. It plays an important role in feeding, mating and fighting. The hypothalamus sends messages to the pituitary gland and handles messages sent from the autonomic nervous system.

### *Midbrain*

#### **Mesencephalon**

The midbrain is located deeper within the brain's structure, lying between the forebrain and the hindbrain. It acts as a switchboard of sorts, maintaining communication between different parts of the brain. The two primary structures of the midbrain, the tectum and the tegmentum, are crucial for hearing and sight. The tectum has structures that together form part of our visual and auditory systems, while the tegmentum plays a role in our sleep cycles, attention and reflexes.

### *Hindbrain*

#### **Metencephalon**

The metencephalon is the anterior subdivision of the hindbrain, or back of the brain, which contains two primary structures: the pons and the cerebellum. The pons is a special band of nerve fibers that link the midbrain with the medulla and acts as a high-tech switchboard.

The cerebellum handles certain reflexes, especially those that have to do with balance.

### **Myelencephalon**

The myelencephalon is the posterior subdivision of the hindbrain and is composed of the medulla oblongata, commonly referred to as the medulla. Nerve tracts run through the medulla connecting the spinal cord and the higher brain centers. The medulla controls vital involuntary functions, such as breathing, blood pressure and heart rate.

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or call 1-877-MADD-HELP (1-877-623-3435).*

Division	Subdivision
Forebrain	Telencephalon
	Diencephalon
Midbrain	Mesencephalon
Hindbrain	Metencephalon
	Myelencephalon

Primary Structure(s)	Primary Function(s)
Cerebrum (divided into two halves, which are divided again, making four lobes) <ul style="list-style-type: none"> <li>• Amygdala</li> <li>• Hippocampus</li> <li>• Basal ganglia</li> </ul>	Important players in our emotions, thoughts and memories. Also important in helping to alter and adjust our movements
Cerebral cortex	Helps provide a landmark, dividing the cerebrum into four interrelated lobes
Thalamus	Plays an important roles in pain sensation, attention and alertness
Hypothalamus	Sends messages to the pituitary gland and handles messages to and from the autonomic nervous system
Tectum	Contains structures that make up part of our visual and auditory systems
Tegmentum	Crucial in our hearing and sight. Also plays a role in our sleep cycles, attention and reflexes
Pons	Links the midbrain with the medulla
Cerebellum	Handles certain reflexes, especially those that have to do with balance
Medulla oblongata	Controls vital involuntary functions, such as breathing, heart rate and blood pressure

## NOTES

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