



# THE COMPLEXITY OF BRAIN INJURY

*It's  
impossible to know  
everything about brain injury  
when the medical world doesn't yet  
know everything about the brain.  
But what we do know may  
surprise you.*

We've witnessed the scene in countless Hollywood epics: A patient in a hospital, who's been in a coma for months or even years, suddenly wakes up and, within minutes, is chatting like nothing ever happened.

Scenes from real life, however, play out a little differently. The reality behind brain injury is that recovery isn't always cut-and-dry, and that happy endings take time.

"Most people have very little awareness of what brain injury is and how devastating it can be," says Linda Krach, pediatric rehabilitation specialist, director of research, and acting medical director of rehabilitation at Gillette Children's Specialty Healthcare in St. Paul. The slow, subtle, and often cruel changes brought on by brain injury are in stark contrast to both the popular-culture image of a happy ending and what we've come to expect from medicine: a conclusive diagnosis and a quick fix.

## WHAT IS BRAIN INJURY?

"Brain injury" is the term used to describe damage to the brain caused by either external physical force or internal causes. The term refers to damage to the brain done after birth that is not hereditary, congenital, or degenerative. The Brain Injury Association of

Minnesota makes a distinction between "acquired" brain injury, which can be a result of anoxia, aneurysm, brain infections, drug use, and stroke—and "traumatic" brain injury, which can be a result of a blow, sudden impact, severe motion, or penetration. The resulting impairments from any brain injury can be mild or severe and can affect any combination of cognitive, emotional, and physical functions. In other words, it's not like a broken leg.

And that's why it's so daunting for families of victims as well as the medical profession. "The reason this is a very difficult subject to study is that every injury is different," says Allen Brown, medical director for brain rehabilitation services at the Mayo Clinic in Rochester. "We don't get it. We don't get normal brain function for the most part, much less [are we] able to explain the pathology of what's going to happen down the road in recovery."

It's because the brain is such a complex,

vital organ that injury can be so catastrophic. For instance, in the case of a stroke, blood supply is compromised in a part of the brain, and the functions controlled by that part of the brain are affected. Most commonly, this results in impairment on one side of the body, slurred speech, and loss of vision. But for an injury caused by a blow to the head, as might happen during an auto accident, the parts affected are often much more widespread and diffused. When the skull remains intact, the gelatinous tissue that makes up the brain is thrust against the rough inside surface of the skull, with force that may be forward and backward, rotational, or both. This can result in severe and multiple impairments.

## WHAT THE PUBLIC DOESN'T KNOW

"Brain injury devastates individual lives and families and results in huge costs to society in the form of long-term care and loss of productivity," says Tom Gode, executive director of the Brain Injury Association of Minnesota in Minneapolis. More than 2 percent of the nation's population—about 5.3 million people—lives with disabilities resulting from traumatic brain injuries. That number includes 94,000 Minnesotans, and thousands more live with disabilities from acquired brain injury. The survivor of a severe brain

injury typically faces five to ten years in intensive services. The estimated lifetime cost of those services hovers around four million dollars.

And these numbers continue to grow. According to the Minnesota Department of Health, 3,600 people are hospitalized with a traumatic brain injury each year in the state, and an estimated ten thousand seek treatment in emergency rooms and urgent cares around the state. Nationwide, about 1.5 million traumatic brain injuries occur each year. When compared with more high-profile diseases such as breast cancer (200,000 diagnosed nationally every year) or AIDS (44,000 diagnosed nationally every year), the numbers are staggering.

Despite the scope of the problem, the public seems neither aware nor concerned about the prevalence of brain injury. Experts note that may be because it's not easy to recognize the

effects, even though it's likely everyone knows an individual who's been affected. Also, many who have suffered brain injury are unable or unwilling to admit it. "For instance," says Gode, "[football player] Steve Young retires because of concussions but doesn't talk about how the injuries [may] have affected his ability to remember plays."

The lack of public consciousness about brain injury is particularly troubling given that most traumatic brain injuries are preventable (see sidebar below). Vehicle crashes are the leading cause of traumatic brain injury, and the population most affected is males in their teens and early twenties. "They're risk-takers," Gode says, "They're the ones who [think they] are going to live forever." People over the age of seventy-five are also at high risk for brain injury as a result of falls and



*Brain injuries can be mild, severe, and anything in between. Regardless of the situation, support and health care ensures happy, fulfilling lives.*

## PREVENTING BRAIN INJURY

While some causes of brain injury are beyond control, several simple measures can greatly reduce your risk of experiencing a serious brain injury.

### WEAR SEAT BELTS

Every time you drive or ride in an automobile, buckle up. Every time your children ride, buckle them into a child safety seat, booster seat, or seat belt.

### WEAR HELMETS

Wear a helmet and make sure your children wear helmets when:

- Riding a motorcycle
- Riding a bicycle
- Playing a contact sport such as football or ice hockey
- Using inline skates or riding a skateboard or scooter
- Bunting and running bases in baseball or softball
- Riding a horse
- Skiing or snowboarding

### DON'T ABUSE ALCOHOL OR DRUGS

Between one third and two thirds of all brain injuries resulting in hospitalization are accompanied by a high blood-alcohol level.

### KEEP YOUR HOME SAFE

Keep a safe house for children and the elderly by:

- Keeping often-used items within easy reach

- Installing grab bars in the tub or shower
- Using nonslip mats on the bathtub and shower floors
- Installing handrails and lights on all stairs and outside
- Installing window guards to keep young children from falling out of open windows
- Using safety gates at the top and bottom of stairs when young children are around
- Making sure the surface on your child's playground is made of shock-absorbing material, such as sand

### PRACTICE GUN SAFETY

Keep firearms and bullets stored in a locked cabinet when not in use. Although firearms cause about 8 percent of traumatic brain injuries, they cause 27 percent of TBI-related deaths.

### PRACTICE PEDESTRIAN SAFETY

Use crosswalks, and teach your children to do the same. If you're a motorist, watch for crosswalks and get in the habit of stopping for pedestrians.

### AVOID RISKS IN CONTACT SPORTS

Players should always wear safety gear appropriate for the sport, and the playing surface should be soft and free of debris. Make sure your child's coach knows what to do in the case of concussion-type injuries. Just because an injured player can remember his or her name and the day of the week doesn't mean that the injury isn't serious. —*Jayne Solving*

auto accidents. Physical assaults—both with and without firearms—are a major cause of traumatic brain injury for adults. Young children are also at risk, primarily from bicycle-related injuries. Children between infancy and one year are affected disproportionately by brain injury as well. Their still-developing brains are particularly susceptible to

injury if they fall, or if they are violently shaken.

#### IMMEDIATE TREATMENT

After a serious traumatic injury, such as a car accident, the immediate priority is stabilizing the patient medically. A surgeon will take care of the physical issues such as bleeding and fractures,

and for the most part, many patients who would have died a decade ago are now able to survive the initial injuries. But diagnosing the extent of the brain injury presents a number of challenges for a clinical team.

If a severe brain injury is suspected, a CT scan is usually taken but is often inconclusive. Severe bruising or blood clots may show up, but "a CT scan is relatively insensitive," Brown says. "When a CT scan looks normal, it's easy for people to say, 'oh, that's good,' when damage may still have occurred. Especially for mild injuries, imaging studies don't help."

Families of the injured often want to know how the injury is going to affect their loved one, but much of that takes time to determine. However, physicians have several tools available to them that can help them speculate what may lie ahead, such as the CT scan, the so-called "Glasgow" scale that tests various responses in a patient, the length of post-trauma amnesia, and if and how long a patient lost consciousness.

"Assuming you can examine [a patient] well, the initial course of neurologic recovery can give you a hint of what is to come," Brown says. But it often takes time and a team of individuals to assess the extent of the damage. Psychologists, social workers, physical therapists, speech therapists, occupational therapists, and other health and human-services specialists all play a role in testing and determining deficits.

#### BRAIN INJURY'S EFFECTS

The physical effects of brain injury are usually obvious: paralysis, poor balance, poor coordination, difficulty carrying out motor movements, changes in the five senses, numbing sensations in parts of the body, slurred speech, change in sleep patterns, and fatigue are just a few examples.

The cognitive, psycho-social, and behavioral effects are more difficult to identify. An adult or child who has suffered brain injury may have a shortened attention span, difficulty solving problems, and an inability to understand abstract concepts. There may be a loss of the sense of time, place, or identity. There can be

## WORKING THROUGH JOB ISSUES

If our work life is one of the main methods we use to form our identities, then having difficulties when returning to work after a brain injury can be a devastating loss of self.

This is especially true for adults who have experienced mild or moderate brain injuries. "There can be a lot of confusion in the beginning," says Ardis Sandstrom, associate director of the Brain Injury Association of Minnesota in Minneapolis. "People may not realize that there's something wrong with them."

That can be the case for those who don't know that they have a brain injury—maybe they've been told only that they suffered a concussion or postconcussive syndrome. It's also common for people to not recognize that they've changed since an injury. "Sometimes they don't pick up on the fact that they are doing things different," she says.

Issues at work can manifest themselves in many ways after a brain injury. For instance, says Sandstrom, "maybe they can't organize the way they used to." Sometimes those with brain injuries become easily fatigued, forgetful, or overwhelmed. Whatever the case, it's often first attributed to emotional or behavioral issues, not to brain injury. In fact, says Sandstrom, "many individuals may take six months to a year before things start to fall apart for them."

What can a person who's suffered a brain injury do if he or she is having difficulty at work? If the brain injury is severe, county and social services will provide employment opportunities as part of partial- or full-care services for an individual. If an injury occurred while a person was working, workers' compensation should provide rehabilitation counseling.

Beyond these options, the Department of Economic Security offers rehabilitative and job-placement services through Workforce Centers located around the state. Other nonprofit and for-profit employment services can help those with a brain injury assess their skills, learn new skills, look for new employment, or meet with a job coach. A person may require a change as simple as a modified work day or work space to be productive and successful in a job held before the injury, or he or she may require a change of positions or industries.

But these life and work changes hinge on recognizing problems upon a return to work, and recognizing that those problems are a result of a brain injury. Says Sandstrom, "You first have to identify that there is an issue."

For more information on work issues and brain injury, contact:

The Brain Injury Association of Minnesota  
612-378-2712, [www.bia-minn.org](http://www.bia-minn.org)

Minnesota Workforce Centers  
888-GET JOBS, [www.mnjobs.org](http://www.mnjobs.org)

Your local county social service agency.

—Stephanie Wilbur, J.D.

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difficulties in self-expression and understanding others, as well as problems with reading, writing, or working with numbers. There may also be an inability to accept one- or two-step commands simultaneously. For instance, says Krach, "You tell a child to clean his room, and he can't determine what order in which to do the tasks."

A brain injury may impair social skills, which can result in self-centered behavior and the inability to empathize with others. An individual can become apathetic, irritable, or emotionally unstable. He or she can lose inhibitions, which can result in aggression, cursing, frustration, temper tantrums, and inappropriate sexual behavior.

Witnessing these effects can be demoralizing for the loved ones of the individual affected by brain injury, but it's important to seek help when the problems become apparent. "Sometimes less significant injuries can lead to more problems down the road," Krach says. If the parents of a child who was knocked unconscious leave the emergency room without knowing the possible effects, they may think the problems are simply behavioral and may not know to seek help. "A patient can have short-term cognitive problems, which sets up a cycle where they continue to fail."

Krach says that much of the work in rehabilitation is educating families and the community about what kind of changes to expect in the patient and how to address them. "We have social systems in place. We can work with schools to use techniques to compensate for the deficits," Krach says. "The priority is to get people into therapy as soon as possible, but even years after the injury, therapy can be helpful."

**PROMISE IN RECOVERY**

The fact is most people recover from brain injury even if they'll always have deficits. "The vast majority will be able to cope with their injury fairly well," Gode says. "Rehabilitation services are doing more and more. Fifty percent will be employed twelve months later, even though lots are not going to be back to work full time."

However, Brown notes that one of

the biggest obstacles for people who struggle with a brain injury is getting the community to understand what's happened to them. "If only they had a crutch or a cast," says Brown. "For example, an employer will say 'you're not trying.' It doesn't have to be visually apparent for it to be a grossly disabling neurologic impairment," he says.

Understanding what to do about brain injury is as complicated, subtle, and far-reaching as understanding the injury itself. Much of the hope for victims of brain injury lies in the education of families and the community, which could translate to increased resources for treatment and adaptive equipment. Research is under way, but there's no quick fix on the horizon. "We all hope that people can be cured of their problems," Krach says, "but research is a long way from being implemented in people who are currently having problems."

—Jayne Solinger

**UNCERTAIN** of what signals a brain injury? Here are the most common warning signs.

- Headache
- Memory problems
- Concentration and attention problems
- Personality change
- Difficulty organizing tasks, preparing meals, or planning and organizing activities.
- Fatigue
- Inability to fall asleep or to remain asleep
- Balance and dizziness problems
- Irritability, anger, and frustration
- Difficulty reading or watching television
- Speech and communication problems, such as the inability to find the right words, an inability to express thoughts, and an inability to understand others
- Depression related to the brain injury and to changes caused by the injury



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