

Brain Waves

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TRAUMATIC BRAIN INJURY CAUSED BY VIOLENCE

The Centers for Disease Control (2004) reports that at least 1.4 million traumatic brain injuries (TBI) occur each year with an estimated 80-90,000 individuals experiencing permanent disability. Among those with severe injuries requiring medical attention and hospitalization, the most common causes of injury are motor vehicle crashes (64%), violence-related injuries (21%) and falls (11%). Age is closely linked to the cause of TBI. Older adults are more likely to be injured by falls, while younger adults are more often involved in motor vehicle crashes and violence-related injuries.

Despite the decrease in violence-related TBIs over last couple of decades, it remains the second leading cause of death in the US. Within the past two decades, violence-related deaths have surpassed motor vehicles crashes as the leading cause of TBI-related death. Firearm-related incidents account for 40% of TBI-related deaths, while motor vehicle crashes accounted for 34% of fatalities and falls about 10%. This may be due in part to improved safety measures decreasing the incidence of motor vehicle crashes and falls as the number of violence-related deaths have stabilized.

Violent injury can occur in a number of ways. Someone intentionally striking another person in the head with a fist or an object is one common example. Another example is a fall intentionally caused by another person in which the injury is sustained in the fall, such as the head hitting the ground. Violent injuries can be caused by an assault, in which one person injures another, or can be caused by the person injured, such as in an attempt at suicide. The most devastating type

of violent injury is from a gunshot wound, which can cause brain injury that is very different from the injury experienced in a car crash or fall. The focus of this newsletter is on brain injuries due to gunshot wound.

Risk Factors for Violent Brain Injury

Males between the ages of 20-24 have the highest firearm-related TBI death rates. Injury from a gunshot is more prevalent among minority populations, but such injury can occur to anyone. Firearm-related death among minority populations is more often caused by another person (up to 70%), such as in an assault, whereas the non-minority population has a higher percentage of self inflicted (suicidal) death (up to 78%).

Based on data collected by the TBI Model System program, those sustaining brain injury from a gunshot are likely to be male, unmarried, unemployed at the time of injury, and living alone. This is consistent with prior research with other samples which have also indicated that living in an urban setting, alcohol/drug use at the time of injury, and access to firearms are linked to violence related injuries.

What Happens to the Brain?

Passage of a bullet can cause laceration (tearing) injuries to the brain, as well as shock waves with cavitation (temporary stretching). A bullet passing through the brain creates a brief wave effect in the tissue leading to rapidly alternating expansion and contraction of the tissue. This creates an area of disrupted tissue surrounding the path of the bullet. The area of disrupted tissue can be as much as 30 times larger than the missile diameter and can

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cause injury to parts of the brain a considerable distance from the actual bullet path. Sometimes a bullet fragments after entering the brain and causes multiple paths of injury in the brain.

Treatment of Brain Injury Caused by Gunshot Wound

A gunshot wound (GSW) to the head is often fatal. For those who survive the injury, the presentation at the emergency room can vary a great deal. Sometimes people are fully conscious and able to talk after being shot in the head and other times the person is unconscious (comatose). For those who are unconscious, the Glasgow Coma Scale (GCS), which is based on a person's verbal responses, ability to follow commands, and eye opening, can be used to measure the severity of the injury. Scores on the GCS range from 3 to 15, with higher scores indicating better functioning. A GCS score of 3-5 indicates that in most cases (90% or more) the person will not survive the injury. A GCS score of 13-15 is certainly much better, but does not mean an absence of brain injury. Any time a person experiences a gunshot wound to the brain, there will be brain injury.

Medical treatment is necessary following a gunshot wound to the brain if there is to be a chance of survival. Typically, a neurosurgeon performs a procedure called debridement that involves removing the bone and bullet fragments that can be reached. Sometimes fragments are so deeply imbedded in the brain or near very sensitive areas that the surgeon decides that the risk of removal is too great. People can survive with bullet and bone fragments in the brain, but it is preferable to remove the fragments if possible. Often the greatest concern is about secondary effects that cause further brain injury and even death. Bleeding from ruptured blood vessels and swelling (edema) can be severe and difficult to control. The entry of a bullet and scalp tissue along with the bullet into the brain provides a path for infection, and it is common for people with gunshot wound to receive strong antibiotics. Even with that treatment, an infection can be difficult to overcome. Finally, the type of injury experienced with a gunshot wound increases the chances of having seizures. A seizure is an uncontrolled abnormal release of

nerve impulses in the brain. Seizures, particularly a seizure that lasts for several minutes, can cause further brain injury. For this reason, people who experience gunshot wound to the brain are often given medications (called anti-convulsants) to decrease the risk of seizures.

Outcome After Brain Injury Due to Gunshot Wound

It is difficult to predict what type of physical and mental problems a person might experience following a gunshot wound to the brain. It depends on what areas of the brain have been injured, which varies from case to case. Some areas of the brain may have been spared injury, meaning that the functions controlled by those parts of the brain are unaffected. Because the frontal area of the brain is often injured, many people with gunshot wounds have difficulty with attention, learning, memory, and problem solving. These mental difficulties, along with physical problems (for example, paralysis of one side of the body) can impact the independence of the injured person. It is common following a gunshot wound for the injured person to need some assistance and supervision from family members. Sometimes people are able to return to work and to live independently, but that cannot be guaranteed. Return to driving may be impacted by the presence of seizures.

A person can experience emotional problems following a gunshot wound to the brain. In part this may be caused by the area of the brain injury. In many cases, problems with depression are caused by the change in lifestyle for the injured person. The sudden lack of independence and the presence of significant mental and physical problems weighs heavily on some people, leading to depression. In some cases depression was a problem before the injury, particularly among those whose brain injury was caused by a suicide attempt. It is important that people experiencing emotional problems after brain injury receive treatment. In most cases, there is a good response to anti-depressant medication and counseling.

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-This information sheet is found with others at <http://main.uab.edu/tbi/show.asp?durki=17116>

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The University of Alabama at Birmingham Traumatic Brain Injury Model System (UAB-TBIMS) web site offers educational materials along with information on ongoing research and clinical services. All of our materials are on the web site may be used freely for educational purposes only. Items are available by mail upon request. Contact 205-934-3283 for materials.



REHAB TIP SHEETS

These tip sheets were created by UAB rehabilitation professionals to offer other professionals and consumer care providers with photo illustration and step-by-step instructions on performing common activities of daily care for people with TBI.

- ◆ Wheelchair Positioning
- ◆ Lift Transfers of Patients
- ◆ Swallowing Strategies
- ◆ Managing Irritability and Temper
- ◆ Bed Positioning for the Immobile Patients
- ◆ Assisted Pressure Relief
- ◆ Assisted Transfers of Patients
- ◆ Walking following Brain Injury
- ◆ Resting Hand Splint Application



CAREGIVER'S GUIDE TO SELF-HEALTH: SOLVING PROBLEMS AND REDUCING STRESS

Caregiving for a loved one is an expression of affection and commitment, but Caregiving can be an emotional roller coaster. Inadequate resources and continuous caring can lead to burn out, exhaustion stress and depression. This interactive program is designed to offer caregivers 3 techniques (Card Sort, Problem Solving, & Stress Relief) to help improve their health and quality of life.



HOME-BASED COGNITIVE STIMULATION PROGRAM

The UAB Home-Based Cognitive Stimulation Program provides activities to use with individuals following their brain injury. These activities are designed to assist the individual in recovery of their thinking skills. Each activity provides a group of tasks listed by their level of difficulty. The tasks range from the least challenging (Level 1) to higher levels that are progressively more challenging. You select activities you feel might be appropriate and increase the level of difficulty by selecting appropriate tasks as progress warrants. Work on several tasks each day and change activities every few days to provide variety.



EDUCATING THE TRAUMATICALLY BRAIN-INJURED STUDENT

A booklet for classroom teachers that discusses common types of brain injury, classroom interventions, and working with parents



NEWSLETTER (Brain Waves)

This UAB-TBIMS newsletter is published annually in cooperation with the Alabama Department of Rehabilitation Services (ADRS) and the Alabama Head Injury Foundation (AHIF). Our goals are to:

- 1 provide information on medical, research and social issues of importance to individuals with TBI and their families; and
- 2 offers local, state and national educational resources of interest to individuals with TBI and their families.



CONSUMER FACT SHEETS

The UAB-TBIMS web site also offers Fact Sheets from the Model System Knowledge Translation Center, which summarizes research, identifies health information needs and develops information resources to support the Model Systems programs. Ten topics are currently available.

- 1 Understanding TBI, Part 1: What happens to the brain during injury and in the early stages of recovery from TBI?
- 2 Understanding TBI, Part 2: Brain injury impact on individuals' functioning
- 3 Understanding TBI, Part 3: The recovery process
- 4 Understanding TBI, Part 4: The impact of a recent TBI on family members and what they can do to help with recovery
- 5 Sleep and TBI
- 6 Driving after TBI
- 7 Cognitive Problems after TBI
- 8 Emotional Problems after TBI
- 9 Fatigue and TBI
- 10 Facts about the Vegetative and Minimally Conscious States after Severe Brain Injury



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Alternate formats are available upon request.

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