



Various types of Brain Injury

ABSTRACT: *Injury to the brain....For persons under age 45, Traumatic brain injury (TBI) is a leading cause of death. It occurs every 15 seconds. The leading causes of TBI are motor vehicle accidents, falls and sports injuries. While the brain is by far the most complex object, it is soft and vulnerable with a consistency of firm pudding....Types of injury and their effects are detailed below.*

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Mobile: 9821224553. (Source: www.braininjury.com, www.home.earthlink.net)

WHAT ARE COUP - CONTRECOUP INJURY

CONCUSSION is a sudden trauma-induced alteration of the alert state.

The person may be unable to concentrate or is confused for a few seconds, or completely lose consciousness and fall down. The brain is capable of recovering from a concussion.

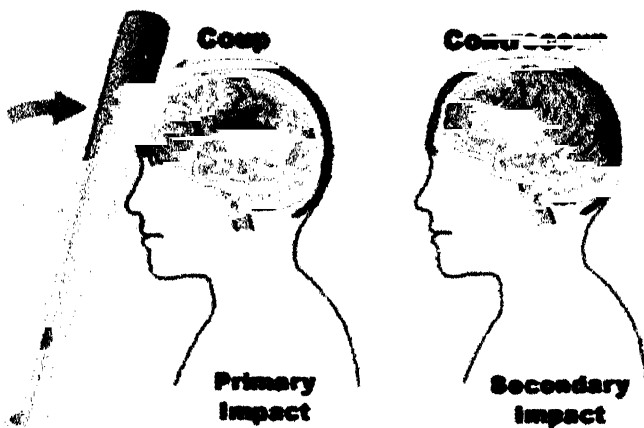
WHIPLASH: Seems to be particularly damaging to the brain.

The brain is vulnerable to traumatic damage in two ways. The cerebral cortex can become bruised - contused - when the head strikes a hard object (or a hard objects strikes the head). Or, the deep white matter can suffer diffuse axonal injury when the head is whiplashed without hitting a hard object (or being hit by one). In serious whiplash injuries, the axons are stretched so much that they are damaged. Cerebral contusions tend to occur at the tips of the frontal and temporal lobes where they bang up against the interior of the skull. Diffuse axonal injury occurs more toward the center of the brain where axons are subjected to maximal stretching.

DIRECT TRAUMA: Any force that penetrates or fractures the skull may cause severe brain injury as destructive shock waves are sent through the brain matter. Displaced fractures

of the skull can also push bone into the brain, causing tissue damage.

Direct trauma to the brain can occur when the skull strikes, for example, the floor in a fall accident or strikes a steering wheel in a car accident. Although the skull may not be penetrated or fractured here the forces imparted to the brain can cause the brain to collide against the inside of the hard skull. When a moving head comes to a quick stop, the brain continues in its movement, striking the interior of the skull. This can cause bruising of the brain (a contusion) and bleeding (hemorrhage). Injury in these types of accidents occurs in parts of the brain closest to the point of impact, quite often the tips of the frontal and temporal lobes. In cases of blunt head trauma the brain can also be injured directly opposite the site of trauma — on the other side of the brain, an injury known as countercoup. This injury typically occurs when a moving head strikes a stationary object like the windshield. At impact the brain opposite the site of impact is pulled away from the skull, injuring the brain there.



brain is more susceptible to injury through lack of oxygen (hypoxia) than any other part of the body. Hypoxia can occur in conjunction with other injuries (heart attack) or from any other situation where breathing or oxygen intake is impaired. Damage from hypoxia is often seen in the hippocampus, an area of the brain necessary for laying down new memories. Exposure to toxic chemicals (lead, toluene, carbon monoxide, among many others) can also cause brain damage, depending on the level of exposure and the duration of exposure, the combination of which is called the "dose."

INDIRECT TRAUMA: The Shaken Baby Syndrome: Severe shaking greatly stretches and damages delicate nerve cells, at times causing very significant injury or even death. In adults, severe whiplash can involve severe forces that may shake or rotate the brain enough to cause permanent brain damage.

DIFFUSE AXONAL INJURY: The brain consists of billions of nerve cells located in the gray matter which communicate with distant nerve cells through long nerve fibers called axons, composing the white matter. Severe sudden twisting or torquing of the brain, as occurs in a sudden acceleration/deceleration - whiplash accident, can stretch, twist, and damage these delicate axonal fibers. Under the microscope the axonal damage is called Diffuse Axonal Injury (DAI). Although diffuse axonal injury generally results from a severe whiplash injury that renders a patient comatose, recent studies have shown that diffuse axonal injury can also occur - but to a lesser degree when there has been only brief loss of consciousness (LOC). Because Diffuse Axonal Injury causes microscopic damage, it cannot be visualized on CT or MRI scans.

HYPOXIA OR TOXIC SUBSTANCE EXPOSURE: The

SECONDARY TYPES OF BRAIN INJURY

In addition to direct neural damage discussed above, injury to the brain can also result as a secondary phenomenon following injury to non-neurologic structures.

EDEMA: Swelling becomes dangerous when the swelling causes a rise in intracranial pressure which prevents blood from entering the skull to deliver glucose and oxygen to the brain. Sustained high intracranial pressure can be relieved through medication, or in more severe cases, by placing a hole in the skull to drain off some of the high-pressure cerebrospinal fluid.

HEMATOMA: Is a collection of blood due to tissue injury or the tearing of a blood vessel. CT scans done at the hospital are particularly effective in detecting brain bleeds. Bleeding into the brain after trauma can occur days after the patient is released from the emergency room. The dura is a tough membrane that covers the entire brain and spinal cord. A blood clot that develops outside the dura, between the skull and dura, is known as an epidural hematoma. A blood clot that develops between the dura and the brain is called a subdural hematoma. Gently resting against the brain itself is a thin,




delicate membrane called the arachnoid. Underneath the arachnoid, between the arachnoid and the brain itself, is cerebrospinal fluid bathing and circulating around the brain. Blood leaking into the cerebrospinal fluid is known as a sub-arachnoid hemorrhage.

HYDROCEPHALUS: Is collection of fluid in and around the brain. The brain is hollow; the interior cavities, called ventricles, contain cerebrospinal fluid circulating from the ventricles up over the surface of the brain where the cerebrospinal fluid is absorbed. If blood somehow gets into the cerebrospinal fluid and blocks the

spinal fluid absorption sites, spinal fluid will back up into the ventricles, enlarging them - a condition called hydrocephalus. If the pressure inside the ventricles becomes excessive (risking damage to the brain), a tube may need to be inserted into the ventricles to relieve the pressure.

HYGROMA: A hygroma is a localized fluid buildup usually in the subdural space. Again, if pressure in the hygroma presses against the brain, surgery may be necessary to relieve the pressure.

CORONAL SECTIONS

INTRACEREBRAL HEMORRHAGE	EPIDURAL HEMATOMA	SUBDURAL HEMATOMA
		
<p>Central large dark area represents the hemorrhage. Note: Midline shift.</p>	<p>The dark area in the lower left area is the hematoma. Note: Broken blood vessel and the shift of midline structures.</p>	<p>The dark area in the upper left area is the hematoma.</p>

HOW DO WE KNOW WHETHER BRAIN INJURY OCCURRED?

Unfortunately, there are no medically accepted criteria that can predict permanent brain damage from a particular trauma. The factors doctors take into consideration, however, include the following. Keep in mind that normal findings on the tests below do not necessarily mean that no brain injury occurred.

LOSS OF CONSCIOUSNESS (LOC): Loss of consciousness means loss of conscious awareness. Hence, loss of consciousness can range from being briefly dazed to several days of coma. Focal head trauma - a bullet - can permanently damage an entire cerebral hemisphere without loss of consciousness, but in blunt head trauma loss of consciousness is usually, but not always, necessary to permanently damage the brain. Generally speaking, the longer a

period of unconsciousness, the more severe the injury. Medical providers at the scene of an accident tally up a "Glasgow Coma Scale" of the patients neurologic status, which can range from a low of 3 (deeply comatose) to a normal value of 15. The Glasgow Coma Scale is helpful in predicting a patient's ultimate outcome — the lower the score the worse the outlook.

POST TRAUMATIC AMNESIA (PTA): Loss of memory for events prior to the injury (retrograde amnesia) and events following the injury (anterograde amnesia) frequently occur after head injury. In general, a patient with longer periods of post traumatic amnesia tends to have more of a severe injury. Individuals are not good at estimating their own length of amnesia. Therefore, family members should make note and track its improvement.

CONCUSSION: A concussion is an alteration of conscious awareness after head trauma. The collection of symptoms following a concussion is called the post concussion syndrome (PCS), and include dizziness, nausea, vomiting, headache, disorientation, forgetfulness, irritability, depression, mood swings, insomnia, and loss of libido. Most cases of PCS resolve after a few months, but approximately 20% of cases can involve longer term problems.

ENCEPHALOPATHY: Signs of encephalopathy include stupor, confusion, memory loss, inattention, agitation, and inappropriate aggression. An encephalopathy after head trauma only means the brain is not functioning properly, does not necessarily mean the dysfunction is permanent.

FOCAL NEUROLOGICAL SIGNS: Allows a doctor to conclude that a specific part is not function-

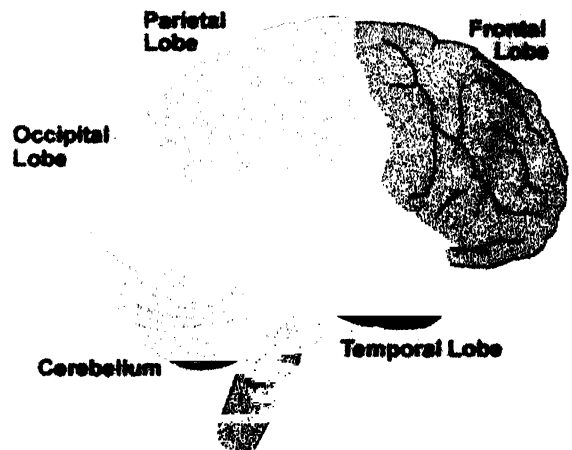
ing.

SEIZURE: A "grand mal" seizure occurs when every nerve cell in the brain rapidly fires electrical discharges at one another. The resulting chaos causes the patient to lose consciousness, fall down and convulse. The same uncontrolled discharges in a focal area of the brain may cause the patient to experience or do what function that focal area normally controls. Such "focal" or "partial" seizures may manifest as recurrent bouts of numbness, fear, anxiety, a forced memory, jerking of a limb or face, lip smacking, sudden staring spells, or inability to speak.

Pupils are Equal and Reactive to Light (PERL). Unequal pupils or unreactive pupils in a comatose patient after a head injury can signify a dangerous rise in intracranial pressure due to swelling, hematoma, hydrocephalus, etc. Urgent life saving surgery is often necessary to relieve the elevated pressure.

SYMPTOMS OF BRAIN INJURY

Any brain function: sleep, attention, concentration, memory, judgment, emotional outbursts, libido, switching between two tasks, and thinking can be disrupted by brain trauma.



LIST OF POSSIBLE PHYSICAL AND COGNITIVE SYMPTOMS WHICH CAN ARISE FROM DAMAGE TO SPECIFIC AREAS OF THE BRAIN

FRONTAL LOBE

- Paralysis.
- Inability to plan a sequence of complex movements needed to complete multi-stepped tasks, such as making coffee, Inability to focus
- Loss of spontaneity in interacting with others, Changes in social behavior, personality
- Persistence of a single thought, Loss of flexibility in thinking, Mood changes
- Difficulty with problem solving

PARIETAL LOBE

- Inability to attend to more than one object at a time, to name an object, to locate the words for writing, to focus visual attention
- Problems with reading
- Difficulty with drawing objects, in distinguishing left from right, with doing mathematics, with eye and hand coordination
- Lack of awareness of certain body parts and/or surrounding space that leads to difficulties in self-care.

OCCIPITAL LOBES

- Defects in vision, Difficulty with identifying colors
- Difficulty with locating objects in environment, in recognizing drawn objects, with reading and writing.
- Visual illusions - inaccurately seeing objects, hallucinations.
- Word blindness - inability to recognize words.
- Inability to recognize the movement of object

TEMPORAL LOBES

- Difficulty in recognizing faces, with identification of and verbalization about ob-

- jects, in understanding spoken words
- Disturbance with selective attention to what we see and hear.
- Short term memory loss, Interference with long term memory.
- Increased and decreased interest in sexual behavior.
- Inability to categorize objects
- Right lobe damage can cause persistent talking.
- Increased aggressive behavior.

BRAIN STEM

- Decreased vital capacity in breathing, important for speech.
- Swallowing food and water
- Difficulty with organization/perception of the environment.
- Problems with balance and movement.
- Vertigo
- Insomnia, sleep apnea

CEREBELLUM: BASE OF THE SKULL

- Loss of ability to coordinate fine movements, to walk, inability to make rapid movements
- Inability to reach out and grab objects, Tremors
- Vertigo
- Slurred Speech

There has been a hypothesis that a person struck in the head who suffers facial fractures may have decreased injury to the brain because of the fracture being a "shock absorber" to the brain. However the presence of fractures of the face does not favor a better outcome. The mortality rate from TBI is higher in the geriatric population at all levels of head injury

The effects though on the brain, equals or even surpasses the effect on the family.

They can be extreme stressors in family and interpersonal relationships.

