

The brain injury itself



How is the brain damaged in a traumatic brain injury?

Traumatic brain injury (also known as a TBI) is not usually caused by one event but by a series of events. These are usually classified as primary and secondary events. The primary event is direct damage to the brain at the point of impact. The secondary event refers to the complications that may arise in the minutes, hours and days following the impact – these are due to a lack of oxygen and the reaction of the brain to the initial injury.

It is important to remember that the injuries described cover a range of possibilities. They will not apply to everyone who has sustained a brain injury.

Primary injury

There are two main kinds of primary injury: penetrating or open head injury and closed head injury, which is much more common.

Penetrating or open head injury

A penetrating or open head injury is caused when an object fractures the skull and

penetrates the brain – resulting in direct physical damage to the soft tissue. Examples include colliding with the sharp edge of a brick wall or a bullet piercing the skull and entering the brain. In this kind of injury the damage is usually confined to the immediate area of the injury (localised damage), resulting in quite specific problems similar to those caused by a stroke. Unfortunately, the head is also often shaken which may result in widespread damage.

Closed head injury

A closed head injury involves rapid acceleration and deceleration or rotation of the head. The damage occurs when the head quickly changes speed of motion and is stopped abruptly, for example, by hitting the dashboard of a car. The sudden and violent movement causes the brain to shift and rotate within the skull. This stretches and shears the delicate connecting nerve fibres, resulting in widespread damage called a diffuse axonal injury.

With the violent movement, blood vessels tear and the surface of the brain – mainly the frontal and temporal areas – is lacerated as it rotates across the bony ridges inside the front



Oak Farm Clinic



Oak Farm Clinic, part of the Choice Care 2000 limited, is a 32 bedded unit for Younger Adults with Physical Disabilities recovering from acquired brain injury and neurological disorders.

Services are provided through:

1. A Consultant Neurologist (on a sessional basis).
2. A Psychologist (on a sessional basis) supported by an Assistant Psychologist.
3. Physiotherapy.
4. Occupational Therapy.
5. Speech and Language Therapy.
6. Nurses.
7. Rehab Assistants.
8. ADL Assessments.
9. Risk Assessments.
10. Day Care.
11. Respite and Brief Stays (Crisis Prevention).

Admission Criteria:

The unit will consider admitting service users needing care following a serious trauma, for example, brain injury, and those who are suffering from a debilitating medical/neurological condition, such as Multiple Sclerosis (MS) and Myalgic Encephalomyelitis (ME).

We believe in enabling service users to maximise on their independence, self-esteem and confidence, so that they can: -

1. Lead a fulfilling lifestyle with the benefits of an improved physical and mental state.
2. Reintegrate socially back in to the community.
3. Build strong personal relationships with the family and all significant others.
4. Return to work where such potential exists.

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of the skull, so causing more damage. Further damage and bruising can be caused to the front and back of the brain as it rebounds forward and backward against the rough inside surface of the skull. Additionally, the skull may be fractured in the area where the head hit the fixed surface – causing further localised damage. If the fracture causes a piece of bone to exert pressure on the underlying brain, this is called a depressed fracture. Mild brain injury is likely to involve the full range of damage discussed above as the brain is shaken around inside the skull. This can cause significant problems. The diffuse axonal damage can be devastating and result in permanent disability.

Secondary injury

Unfortunately, secondary injury damage can be caused following the initial injury due to a number of complications. These often include a disruption of the oxygen supply to the brain, which can occur at the time of the accident if the airways are blocked, e.g. by a chest injury or because of blood from the nose or face, or may also occur if there is excessive bleeding from other injuries which itself can reduce blood pressure. Later, blood clots may form as a result of small blood vessels being torn in the initial injury. These can press on the brain and cause further damage, though can sometimes be removed in surgery.

In addition, the brain may swell in the days following the accident and cause pressure (called intracranial pressure) as the brain is forced against an unyielding skull. This again can cut off the blood supply to the brain and cause further damage to its surface.

The complications described here will not occur with all brain injuries. Be assured that the paramedics at the scene of an accident and the medical teams monitor the injured person very closely. They do all that they can to prevent these complications from happening, or at least to minimise the damage that might be caused should complications arise.

Coma

There are two further factors when considering the extent of brain damage – the depth and duration of coma and period of post-traumatic amnesia (also known as PTA). These are both early indicators and can only provide an educated guess about eventual recovery. As with the primary and secondary injuries previously described, there are likely to be individual differences in the eventual outcome. The process of recovery from coma is gradual. The injured person will typically emerge rather than suddenly wake up from this state, becoming progressively responsive to their environment and eventually regaining full consciousness.

What is a coma?

When we hear the word coma many of us think of a person in a state of complete unawareness. In reality, coma simply means unconsciousness, of which there are varying levels.

The injured person may be in a deeply unconscious state where no amount of stimulation will elicit a response. However, in other cases, a person who is in a coma may move, make noises or respond to stimulation.

The length of unconsciousness can be an indicator of severity of injury. A person who remains unconscious for over six hours is likely to have sustained a severe brain injury. Loss of consciousness for 15 minutes or less suggests a mild brain injury and the period between the two suggests a moderate brain injury. See the table below.

While a person is in a coma, the medical team may conduct a number of assessments. The Glasgow Coma Scale (or GCS) is universally used to assess the level of consciousness (or unconsciousness) and later used to determine level of recovery or deterioration.

The scale has three categories:

- Eye Opening
- Best Motor Response (physical movement)
- Verbal Response

Each of these categories is scored from one to 15. The lower the total score on admission, the more severe the injury is assumed to be. The length of time a person remains in a state of coma is considered an indication of the extent of damage that remains and the likelihood of long-term difficulties.

What is post-traumatic amnesia?

Amnesia refers to memory loss. Post-traumatic amnesia (PTA) is a particular kind of memory loss that lasts for a specific amount of time following an injury. It can be for minutes, hours, days or weeks, during which time the injured person can be disorientated and unable to connect continuous memories or events. They can get on with everyday things such as having breakfast, washing and so on, but because they do not have full memory function they cannot remember doing these things. Similarly, people in this state can engage in conversation but may forget that they

have spoken to someone. There may be a permanent memory loss of events immediately prior to the accident and of the accident itself.

The duration of PTA is another indicator of long-term effects following brain injury. The more severe the injury, then the more likely it is that the person will experience significant long-term physical, emotional and cognitive problems. Coma and PTA are both early indicators and can only provide educated guesses about eventual recovery. There are many people who make a better or faster-than-predicted recovery.

Severity of injury according to PTA, loss of consciousness and coma

Severity	PTA	Loss of consciousness/coma
Mild	less than 1 hour	less than 15 mins
Moderate	1 hour–24 hours	15 mins–6 hours
Severe	more than 24 hours	more than 6 hours

In Section 4, Rachel Wilson, head physiotherapist, The Chaseley Trust, writes about the role of the physiotherapist within the rehabilitation process.