

# TRAUMATIC BRAIN INJURY

## WHAT IS IT?

Traumatic Brain Injury (TBI) is caused by impact to the head in turn causes damage to the brain. TBI can happen at the time of the impact or later on. The injury may be confined to one area of the brain or it can involve several areas of the brain. There are three ways the brain is injured:

## **BRUISING AND BLEEDING**

If a person is driving a car at 45 kilometres per hour and is struck head-on by another car travelling at the same rate of speed, the person's brain goes from 45 kilometres per hour to zero in an instant. The soft tissue of the brain is propelled against the very hard bone of the skull. The brain tissue is "squished" against the skull and blood vessels may tear. For example, one might imagine a dam that breaks, causing water to flood the streets of a town.

The biggest danger is that there is no room in the brain for the extra blood. The skull doesn't expand. The blood begins to press on brain tissue, which is softer. The delicate brain tissue will stop working properly or may even die off. The more bleeding in the brain, the greater the chance the pressure will make critical areas of the brain stop working. Areas that control breathing or heart rate could be affected, and a life or death situation could develop within hours of the accident. Some people have sustained a head injury from a car accident and seem "just fine" right after at the accident. Some have even gotten out of the car and directed traffic. Within a short period of time, they began to get more and more confused until they eventually lapse into a coma. So, you can see why emergency workers at the scene of the accident are so anxious to have people go to a hospital following a car accident.

During a car accident, the brain, which is very soft, is thrown against the front part of the skull, which is very hard and bruising can happen. But the injury process is not over. The brain and the rest of the body, flies backward and this bouncing of the brain first against the front of the skull and then against the back of the skull, can produce bruises in different parts of the brain. Thus people can have a bruise not only where their foreheads hit the steering wheel, but other areas of the brain as well. Doctors call this a "contra coup" injury.

## **SWELLING**

If I drop a bowling ball on my foot, my foot will turn “black and blue” due to blood leaking under the skin. But my foot will also do something else – it will swell up. The body realises that the foot has been injured and sends agents to heal the injured area. The problem with the brain is that there is no extra room and the pressure begins to build up. This pressure pushes down on the brain and damages structures in the brain. If there is too much pressure, this can stop important structures that control breathing or the heart rate. Sometimes, doctors will install a “relief valve” (intracranial pressure monitor) to let off the excess pressure. Swelling is usually secondary to bruising and bleeding.

## **TEARING, SHEARING AND TWISTING**

If you take a block of ice and hit it with a hammer you will see little cracks in the ice. Energy from the hammer has been transferred to the ice, producing the web-like cracks. The same thing can happen in the brain after a head injury. Tearing in the brain is very serious because in a sense it “cuts the wires” that make the brain work. In fact this can be the most problematic of all the possible ways the brain can be damaged. One of the problems with tearing is that it happens on a microscopic level and this tearing may not show up on typical medical tests and devices that take pictures of the brain will not see these small tears. Two common ways of viewing the brain are with a CT Scan (using X-rays) and an MRI (using magnetic fields) to create pictures of the brain. Both of these techniques are very good at seeing blood and tumours in the brain, but they are not good with tears (which are very small). When tearing occurs the connections between various parts can be sheared, twisted and otherwise damaged. The connections are called “axons” and the shearing and twisting is referred to as “Diffuse Axonal Injury”. The shearing of axons results in poor transportation of messages between various sites of the brain. Of course there are lots of possible ways for messages to travel to various parts of the brain but the transfer will be less efficient with axonal injury. This is a little like a 6 cylinder car that is only running on 5 cylinders; you don’t notice it much until you drive up a steep hill and struggle to make it.

## **HOW DID I GET IT?**

The most common causes of brain injury are car or bike accidents, sports, falls or assaults. Brain injuries, especially mild brain injuries, may not be evident at first. Even if a brain injury is considered “mild”, it can still have a major impact in all areas of your life.

## **HOW DO I KNOW I HAVE ONE?**

You might have a positive CT scan or MRI. More likely, though, you will have hit your head, been unconscious or dazed and confused, or have memory loss of events before/during/after your injury.

Two parameters are commonly used to define TBI severity:

1. The Glasgow Coma Scale (GCS)
2. Post Traumatic Amnesia (PTA)

The GCS measures eye opening, verbal response and motor response, with scores ranging from 3 to 15 (3 being deepest coma). 'Mild' refers to scores 13 to 15, 'moderate' 9 to 12 and 'severe' below 9.

PTA is the time from injury to the recovery of a continuous memory thread (although memory impairment may and frequently does, remain). 'Mild' commonly refers to less than 24 hours but usually minutes to a few hours, 'moderate' one to six days and 'severe' seven days and over. More than seven days is commonly regarded as extremely severe. These are arbitrary definitions with considerable overlapping results. Whatever measure is used, increasing injury severity is generally associated with increasingly significant consequences.

## **ALL BRAIN INJURIES ARE NOT THE SAME....**

Because TBIs range from mild to very severe, people's abilities and needs can vary greatly.

Injury severity ranges from very severe (which usually results in a 'vegetative state') to mild injury. Functioning levels, service needs and results will vary according to this severity. Individuals in a 'vegetative state' may make a recovery over a prolonged period of time, so it is important not to allow serious complications to set in. Large studies have shown it is only in the situation of brain death that there is no prospect of recovery.

A '**severe**' classification describes injuries that may require longer-term rehabilitation, typically focusing on developing independent living skills. Many people with severe brain injuries are unable to return to their usual activities. Those who can, do so after a number of years, often in a reduced capacity and/or with supervision.

The level of disability in the '**moderate**' brain injury range is highly variable. An individual may take at least six months and up to three years to return to usual activities, although some research suggests up to two-thirds of people are unable to return to work a year after injury. This is not helped by our kiwi attitude of "getting back on the horse".

**Post Concussive Syndrome and Mild Brain Injury** are the most common forms. People often receive little or no medical attention and return to their usual activities in a few days. However, symptoms may persist long after people feel physically better, which can be frustrating, frightening and confusing for people. A proportion of those even with a mild brain injury (some studies say up to 50%) continue to suffer consequences that decrease their ability to function at the level they did before the injury.

### **COMMON CHANGES AFTER TBI**

A lot of people have other injuries they are recovering from besides their TBI. Sometimes people don't notice their TBI because they are focussing on their physical recovery. They could believe medication they are taking could cause changes to their thinking (and this could be true!). People with TBIs may not realise their thinking is slower. Family and friends may notice these changes first. It can be difficult to help a person with TBI understand that although they may not notice any changes, others do. Some people find it useful to think of the post-TBI difficulties as like a road with potholes. If you don't know where the potholes (of performance problems) are then you will likely fall into them as you go about your business. It may be that your partner or colleagues pick up on these problems before you do.

#### **How you think may be different:**

Attention may be disturbed. You may not be able to do things for as long as you could before your TBI, even things you enjoy.

Planning and organising can often be more difficult. It may take more time to follow a new recipe or forgetting a step. You may have difficulty completing tasks and be more easily distracted.

Learning new things may take longer.

Motivation may be less.

Understanding and communicating with others can change.

**What you do may be different:**

Fatigue means you may have to do less more often, have more frequent breaks and get more rest and sleep.

Poorer balance and co-ordination can mean using aids to assist you, doing things more slowly or being unable to do things at all.

Vision, taste, smell and hearing can all be affected. You may think people are shouting when they are speaking normally. You may be very sensitive to the brightness of the sun.

Speech can change in a number of ways. Some people find it hard to find words, some people get words mixed up, some people are thinking of a word that their tongue just won't spit out. Some people find their speech has slowed down, some people find their speech has sped up. Some people may find their speech has slurred.

**How you feel can change:**

Moods can change. Feelings like anger and irritability may occur often and be more intense. They can flare up quickly; sometimes the angry feelings can be out of proportion to the event. You may be irritable about things that didn't matter before or find that the irritability is more difficult to control, especially when you are under pressure.

Anxiety and depression are both related to chemicals in the brain. As the brain is healing, the level of the chemicals struggle to regain former balance. Also the nature of the accident (eg car accident, assault) can itself contribute to feeling anxious and depressed.

Impulsive thoughts and actions may occur. Impulsivity is typically defined as action without forethought. Because many people have difficulty planning and organising, when a thought arises ("I'm going to visit my mate"), you may act on that thought. However, when the mate lives 200 kms away and you don't pack your overnight bag, it can be a problem, especially when your mate is not at home and you don't know anyone else in town.

Sometimes the person with TBI doesn't notice the changes like family and friends do. Find someone you trust to give you feedback on their perception of how things are going for you and listen to them.

## **SOME THINGS THAT MAY HELP YOU**

### **PHYSICAL NEEDS**

Headaches – get some medication (check it out with your doctor first), lower lights or wear sunglasses, reduce noise or get some earplugs, have frequent rest periods.

Fatigue – do less during the day, schedule breaks before you need them, allow extra time to complete tasks, don't overdo it even if you are not tired.

### **SOCIAL-EMOTIONAL-BEHAVIOURAL NEEDS**

Impulsivity – use a schedule and stick to the structure, ask your doctor about a professional who can help.

Distractibility – avoid large groups if possible, sit at the front of the room/class, break down tasks into small steps, use checklists, decrease distractions, monitor fatigue.

Irritability – use structure, identify what happens before you become irritable, intervene early with a diverting strategy.

Aggression – know your triggers, attend an anger programme with a qualified person.

Motivation – ask a buddy to help cue you to keep on task, use a daily written task sheet, break tasks down into manageable, realistic steps.

Depression – consult a professional, attend for cognitive behavioural therapy, look at getting on an antidepressant medication.

### **COGNITIVE NEEDS**

Organisation – keep a consistent daily schedule, use a daily planner, keep materials organised and in one place, write steps associated with common tasks on cue cards, mark use of pre-deadline deadlines, get rid of loose papers and use a notebook system.

Goal setting – set intermediate and longer term goals, review your progress and revise goals accordingly.

Attention and concentration – choose tasks that are of appropriate length to attention span, focus attention for specified periods, decrease distractions, sit at the front in classrooms, consult your doctor about medication to increase attention.

Comprehension and memory – learn active listening strategies, link new information to previously learned material, organise materials graphically, utilise memory aids such as cue cards and organisers, learn mnemonics for material you need to remember, relate information to personal experiences.

Initiating tasks – work to a schedule, use a timer or watch to define when you start, “not feeling like it” is not a reason not to do it!