

Traumatic Brain Injury

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Understanding and managing traumatic brain injury

Traumatic brain injury (TBI) is the leading cause of disability and death of individuals aged under 45 years (Werner & Engelhard, 2007). A TBI is caused by a knock, blow or jerk to the head or an injury penetrating the skull which interferes with the normal brain functioning (Faul, Xu, Wald, & Coronado, 2010).

Incidence of TBI

Most studies suggest that approximately 20 per cent of TBI patients admitted to hospital have sustained moderate or severe head injuries, with the other 80 per cent having mild injuries. The majority of moderate to severe TBIs result from motor vehicle accidents. Other injury causes include falls, bicycle accidents, assault, sports injuries and recently blast injury from armed conflict. TBI occurs predominantly in young adults, most commonly males.

Mechanisms of injury

Neuropathological evidence suggests that there are several mechanisms of brain injury, some operating at the moment of impact and others as a consequence of secondary complications. This results in significant heterogeneity of injury across individuals. Acceleration or deceleration forces may cause laceration of the scalp, skull fracture and/or shifting of the intracranial contents, resulting in focal and diffuse changes. Focal changes include haematoma formation as a result of tearing of blood vessels, and contusion or bruising, most commonly in the frontal and temporal lobes. Diffuse changes include axonal injury and microvascular damage, as well as widespread neural excitation and metabolic changes. Complications, including brain swelling, infection, raised intracranial pressure and respiratory arrest may cause secondary brain injury. Results of clinical trials examining the efficacy of drugs that block various processes contributing to secondary injury have unfortunately been disappointing.

TBI Severity

TBI usually results in immediate loss or impairment of consciousness, followed by a period of confusion, known as post-traumatic amnesia (PTA). The depth or length of coma, measured using the Glasgow Coma Scale (GCS), and the duration of PTA may be used as measures of severity of TBI.

Recovery from TBI

Following the return of orientation, most of those who sustain TBI exhibit a range of ongoing sensorimotor, cognitive and behavioural sequelae, which vary widely in their nature and severity. Mechanisms of recovery are poorly understood, and there is considerable variability in patterns of recovery. Recovery from moderate or severe TBI tends to follow a negatively accelerating curve, which is most rapid in the first 3-6 months, but may continue for several years. In the case of mild TBI, recovery generally takes place within weeks or months, although some individuals have symptoms which persist beyond this period.

The mechanisms underlying recovery of function are, as yet, poorly understood. Much of the early spontaneous recovery after TBI is explained by the resolution of temporary physiological changes. In addition there are regenerative neuronal changes that have been associated with behavioural improvement. However, particularly in the case of severe injuries, the potential for regenerative growth is limited. It is thought that most recovery beyond this occurs through the substitution or reorganisation of neural structures and/or functions. There is a growing body of evidence to suggest that environmental stimulation and specifically behavioural therapies can alter brain function and organisation after injury, termed plasticity. This may occur by the reorganisation of neural circuits within or associated with the damaged area or via the reorganisation of remaining circuits. The capacity for reorganisation decreases as the size of the damaged area increases, because presence of intact tissue appears to be important to allow this reorganisation of function to occur. It also varies according to genetic differences, pre-injury experience and age.

Psychological sequelae of TBI

In the majority of cases it is the cognitive, behavioural and emotional changes which are most disruptive and disabling to the long-term functioning of individuals who have sustained a TBI.

Mild TBI

Following mild TBI the person may experience symptoms, including headache, dizziness, fatigue, blurred or double vision, sensitivity to noise and/or bright lights, tinnitus, restlessness, insomnia, reduced speed of thinking, concentration and memory problems, irritability, anxiety and depression, and poor balance. In many cases these so-called post-concussional symptoms subside over a period of days or weeks, and usually within 3 months. However in 15-25% of cases these difficulties persist, termed post-concussive syndrome, and sometimes result in significant ongoing disability and adjustment problems.

Moderate to severe TBI

The most common cognitive impairments following moderate to severe TBI include fatigue, deficits of attention and speed of information processing (affecting the ability to focus and divide attention), difficulties with new learning and memory, word-finding problems, and executive difficulties (including impaired planning and problem-solving, goal-directed behaviour, abstract thinking and mental flexibility). Behavioural and emotional changes reflect reduced control and regulation of behaviour, thought processes and emotions. They may include impulsivity, lowered frustration tolerance, irritability, aggression, reduced initiative or apathy, verbosity, egocentricity, reduced emotion perception, mood swings, excessive emotions or a flattening of affect. These changes are also commonly associated with reduced self-awareness, whereby the person with TBI lacks insight into the changes others perceive. These problems occur in differing combinations and in varying degrees of severity.

The majority of individuals with TBI make a fairly good physical recovery, although balance and co-ordination difficulties may impede some activities. On the other hand, more than 60 percent of people with moderate to severe TBI report persisting cognitive and behavioural changes up to 10 years post-injury. Up to one third require some supervision in activities of daily living, most commonly shopping and financial management. More than half are unable to return to employment or to resume previous leisure activities. Difficulty in forming or sustaining relationships is also common.

Rehabilitation following TBI

Historically rehabilitation services have been provided in traditional inpatient and outpatient settings. The emphasis of these programs is multidisciplinary, i.e., different team members evaluate different components of the injured person's physical and cognitive impairments, and ameliorate these directly. More recently, a model of service provision of a 'community-based team' has become more common. This generally comprises occupational therapy, speech pathology, clinical and/or neuropsychology, physical therapy and/or social work services, vocational counselling and educational assessment as needed to assist the individual with TBI to attain self-determined goals. Generic services in the local community may be utilised. A similar approach is applied to the processes of return to work or school (Ponsford, Sloan, & Snow, 2012). Individuals with a TBI who are not able to return home from hospital may attend a residential 'Transitional Living Program' whereby staff provide therapy to enhance independent living skills and interpersonal skills. The ultimate aim is to support the move to independent living, with continuing attendant care or other supports as necessary.

References

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