



## **Management of Traumatic Brain Injuries with Brain Concussion – A Review**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

A typical occurrence in emergency rooms is traumatic brain injury (TBI) resulting from head trauma which is normally responsible for far more than 1 million visits per year. The magnitude of TBIs varies from mild, intermittent symptoms to longer periods of altered states of consciousness. The precise mechanism of concussion is indefinite. In serious brain trauma, Axon tearing is expected, but there is no evidence for this concussion process. Most concussion patients improve rapidly and

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entirely. Concussion management is usually supportive and some cases may need hospital admissions and ICU care according to severity of injury and related symptoms.

*Keywords: Concussion; head injury; brain trauma; management.*

## 1. INTRODUCTION

A typical occurrence in emergency rooms is traumatic brain injury (TBI) resulting from head trauma which is normally responsible for far more than 1 million visits per year. It is characterised as brain damage caused by external mechanical strength, such as fast acceleration or deceleration, shock, blow waves, or kinetic intrusion [1]. TBI can range between a basic blow and the head a penetrating injury to the brain. It is a significant reason of childhood and adult mortality and disabilities [2].

The magnitude of TBIs varies from mild, intermittent symptoms to longer periods of altered states of consciousness. In a preschooler (0–4 y), teen and young adult (15–24 y) age range, the greatest TBI rates are generally found. An offensive damage to the brain is measured at 25-30 per cent of children under 2 years of age. Prevalence rate in the elderly is further high (>65 y). The ratio of men to women is 2:1 [3].

Patients suffering from TBI of some kind seem to be at potential risk for long-term post-concussive effects, such mood alterations, mental lability or depression, cognitive decline, or sensory changes [4].

A traumatic brain injury is also used interchangeably to refer to the concussion [5]. Thereby, emergency rooms see more patients with mild to moderate head trauma and the relatively limited percentage of patients who may experience severe acute intracranial problems [6] must be identified. Concussion is perhaps the most frequent form of mild traumatic brain injury (mTBI) that may cause severe effects of moderate traumatic brain injury. The acute signs of a concussion are mostly attributed to "physical and not systemic disturbs" [7].

Concussion is a cumulative damage that does not cause focal neurological problems such as pupil dilation or limb muscle fatigue. Symptoms such as dizziness and "spotting stars" are typically subtle. Headache, dizziness, nausea, and imbalance are the most common symptoms. In a subset of instances, consciousness loss

occurs. The first concussion is usually moderate and full recovery in 7–14 days [8].

The precise mechanism of concussion is indefinite. In serious brain trauma, axon tearing happens. Concussions are more likely to result from rotational brain acceleration that causes a disturbed metabolic pathway or biological damage, such as a changed glucose metabolism and adenine nucleotide derangement [9].

Precise examination and management is necessary to avoid short-term and long-term effects of misdiagnosis or maladministration which may lead to a significant injury or death. An initial assessment of a patient with a head injury in the emergency room must be carried out by a healthcare professional trained in safety [10]. The current concepts of acknowledgment and management, including the physical, cognitive and emotional implications and criteria for return to daily functioning, are essential to clinicians [11]. This paper aims to highlight recent updates in management of traumatic brain injury with concussion.

## 2. PATHOPHYSIOLOGY

The principal injury to the brain cannot be reversed, which leads to brain tissue injury, reduced cerebral blood flow (CBF) up-regulation of inflammatory mediators, oxidative stress and vasospasm in brain metabolism. Consequently, these pathways contribute to death and generalized edema of the brain [12]. The total volume of cerebral spinal fluid (CSF), and arterial blood. CBF stays stable under normal circumstances over a variety of blood levels through cerebral self-regulation mechanisms. For example, if one section is increased by a hematoma, a concomitant decrease must occur in another section to avoid intracranial hypertension. The strain of cerebral perfusion (CPP) is a CBF substitute. CPP is classified as mean intra-cranial arterial pressure. A CPP reduction is due to decrease in the amount of CBF, even though it is not optimal. Reduced CBF leads eventually to ischemia and hypoxia and the first brain insult becomes worse [13, 14].

### 3. DIAGNOSIS

Evaluation or diagnosis can only be rendered scientifically, as radiologically, blood testing or computerised neuropsychological diagnostic tools are not used to support proved biomarkers. Following the initial post-injury review, monitoring for symptom progression or evidence of neurological impairment is important as indications and objective findings. Somatic signs are also reported: headache, sleep disorders, dizziness, nausea, eyesickness, photophobia and phonophobia. Common neurological disorders include focus and memory issues, processing speed problems, multi-tasking difficulties, increased distraction, loss of thinking and fog. High levels of irritability, sensitive lability, anxiety, and depression are frequently documented affective symptoms in patients with mTBI [15]. Tiredness is a common mTBI complaint. Fatigue research shows that it has multidimensional manifestations that add to and aggravate fatigue several causes, including somatic symptoms, sleep disruption and cognitive problems [16].

Traditional CT scans and MRI scans most often look normal after injuries, even after repeated concussions [8]. Many of the latest MRI studies include MRI, diffusion tensor imagery, and MR spectroscopy. Serum and cerebrospinal fluid biomarkers are also investigated, especially those that may detect a genetic basis for concussion susceptibility, but have not yet been seen [17-19].

### 4. MANAGEMENT

Acute mTBI treatment is generally delivered by doctors, particularly ED personnel and primary care doctors. The refer to a tertiary care centre should be made as soon as possible in patients with moderate or serious TBI. Concussion treatment is supportive mainly. Supporting care centres for concussion, after the eventual returning to normal life, after the initial physical and cognitive impairment [20].

Cognitive relaxation is accomplished by the elimination or reduction of focus tasks, including school activities and mental activity, which can intensify symptoms and delay improvement. Even so, a literature suggests that students may be exposed to academic danger for 1 to 2 weeks away from school or schoolwork [8].

The more time between an injury and a return to action, the less likely the individual experience

recurrent concussion during the same season, was observed in an unrandomized sample of 635 high-school and school athletes with concussion. Besides the detrimental effects of congestion on physical and cognitive performance in the acute time after the congestion, there are also signs that the brain recovers from metabolic changes [21].

The patient can then experience a steady return to activity while being rational to promote relaxation during the acute post-injury phase (i.e., initial 24 to 48 hours). Even so, for the initial rest duration, there is no known optimum time. In able to avoid the return or deterioration of symptoms, the patient should step by step return to activity. Symptoms recurrence requires activity levels to be reduced until symptoms improve [22].

Concussion manifestations are resolved within 2 weeks with no active intervention in 80 to 90% of high-school and high-school patients [23]. McCrea and colleagues (2013) [8] investigated 570 college and school athletes, 6 and 166 uncompressed athlete inspections. It took more than 7 days for just 10% of the athletes who had a concussion to heal. McCrea and colleagues (2004) [24] confirmed a rebound from concussions in 94 concussed footballers and 56 non-concussed controls.

The admission and observation in an ICU setting is needed for patients with serious trauma. These patients' results differ on the seriousness of the head trauma. Data reveal a 30 percent mortality rate within 2 weeks of the trauma in those patients with severe concussion. Advanced age, high intracranial pressure and the existence of a gross neurological deficit are all poor prognosis factors [25].

Management techniques aim to prevent secondary damage by preventing hypotension and hypoxia and ensuring adequate CPP, a substitute for cerebral blood flow (CBF). Increasing mean arterial pressure (MAP) or decreasing intracranial pressure (ICP) or both will sustain cerebral perfusion pressure. The combination of euvolemicpressors will increase MAP, although the ideal fluid is uncertain in TBI patients [26].

In management of TBI patients, great dosages of barbiturate are effective in reducing ICP and minimizing mortality in the unmanageable ICP refractory setting in all other conventional ICP-

reducing therapies. It is not indicated that barbiturates are used as preventative ICP therapy [27]. The usage is not advisable to preempt late post-traumatic seizures with phenytoin, carbamazepine, phenobarbital or valproate. Early PTS prevention in patients at risk can consist of anti-convulsants. Prophylactic routine epilepsy not advised until 1 week after head injury [28].

Depending on size, test results and ICP measurements, mass lesions can require operative evacuation. While CPP would not be an ideal replacement for blood cerebral fluid and metabolism, owing to a lack of good evidence other modes have not been used extensively. Venous thromboembolism, stress ulcer and seizure prophylaxis and nutritional and metabolic standardisation are also considerations which need to be considered for concussion [26].

Field and colleagues observed that high school athletes improved relatively slowly during the first week of their injury, even though there was no performance gap by 7 days in other fields of testing, contrasting the healing time between high school and college athletes over the period seven days after the wound. In contrast to their school peers, athletes in high school with a concussion saw substantial recall decreases over seven days in terms of controls [29].

## 5. CONCLUSION

Concussion injury is a traumatic brain injury which usually causes unpredictable levels of transient altered cognitive status, fluctuating from minor confusion to unconsciousness for a few minutes. Most concussion patients improve rapidly and entirely. Concussion management is usually supportive and some cases may need hospital admissions and ICU care according to severity of injury and related symptoms.

## CONSENT AND ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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