Traumatic Brain Injury – A Hidden Disability

Dr Carol Hawley
c.a.hawley@warwick.ac.uk

Collaborators: Professor Stephen Joseph; Dr Anthony Ward; Dr Andrew Magnay; Mrs Julie Long; Dr Bas Mychakliw; Ms Lynda Lavery; Professor Anthony Maden; Professor Jane Hutton; Dr Kevin Morris; Dr Rob Forsyth; Dr Robert Tasker; Dr Roger Parslow; Professor Neil Brooks; Mr John Stilwell; Mrs Carol Davies; Mrs Pippa Stilwell; Dr David Owen.

What is Traumatic Brain Injury?

Traumatic brain injury (TBI), also called acquired brain injury or head injury, occurs when a sudden trauma causes damage to the brain. TBI can result when the head suddenly and violently impacts an object, or when an object pierces the skull and enters brain tissue. Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of the damage to the brain.

Severity of injury is usually measured by Glasgow Coma Scale (GCS) scores, where 15 is fully conscious and 3 is minimally conscious.

Mild = GCS: 14-15
Moderate = GCS 9-13
Severe = GCS 3-8

Major Causes of TBI

- Falls
- Road traffic accidents (RTA)

The Brain

The Frontal Lobe:
- Braughting
- Swallowing
- Reflexes to seeing and hearing
- Controls sweating, blood pressure, digestion, temperature (autonomic nervous system)
- Affects level of alertness
- Ability to sleep
- Sense of balance

The Temporal Lobe:
- Hearing
- Memory
- Visual perceptions
- Categorizing of objects

The Brain Stem:
- Breathing
- Heart Rate
- Swallowing
- Reflexes to seeing and hearing
- Controls sweating, blood pressure, digestion, temperature (autonomic nervous system)
- Affects level of alertness
- Ability to sleep
- Sense of balance

The Cerebellum:
- Coordination and voluntary movement
- Balance and equilibrium
- Some memory for reflex motor acts

Occipital Lobe:
- Vision

Periarticular Lobe:
- Location for visual attention
- Location for touch perception
- Goal directed voluntary movements
- Manipulation of objects
- Integration of different senses that allows for understanding a single concept

Moderate = GCS 9-13

National traumatic brain injury study [1]

Causes of injury (adults 16-65 yrs. n=601)

<table>
<thead>
<tr>
<th>Cause of Injury</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>34.4%</td>
</tr>
<tr>
<td>Road traffic accidents (RTA)</td>
<td>37.3%</td>
</tr>
</tbody>
</table>

Outcomes after HI – A population study [2,3]

<table>
<thead>
<tr>
<th>Age in years</th>
<th>1-6</th>
<th>7-15</th>
<th>16-20</th>
<th>21-35</th>
<th>36-45</th>
<th>46-55</th>
<th>56-65</th>
<th>66-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Who is at risk of TBI?

Over one million people worldwide survive TBI with some residual disability. Males outnumber females by 3:1. At greatest risk are young males aged 16 to 25, and there is another peak among the elderly. Our adult TBI research studied 16-65 yr olds.

Warwick Research on TBI

Recent studies include:

- Return to driving after head injury
  Collaborator: Transport Research Laboratory.
  Funder: Department for Transport (DfT)
- Positive Growth After Head Injury
  Collaborator: Prof. J. Hutton, Statistics. Funder: DfT.
- Risk of further seizures after an initial seizure
  Collaborator: Prof. J. Hutton, Statistics. Funder: DfT.
- Epidemiology of head injury – a study of UK paediatric intensive care units.
  Collaborators: Dr. K. Morris et al. Funders: Birmingham Children’s Hospital and Warwick University.
  Collaborator: Dr. C. Evans. Funder: Dudley Healthcare.
- Outcomes after adolescent head injury.
  Funder: Warwick Primary Care Research Network.
- National traumatic brain injury study.

Return to School after TBI

On return to school, one third of teachers were unaware of the TBI. Special arrangements were made for only 27% of children. Special educational needs were identified for 24%, but only 9% received specialist help. Two-thirds of children with TBI had difficulties with schoolwork, half had attention/concentration problems. One-third of children had difficulty with schoolwork.

Return to Driving after TBI

Although people with brain injury have not been identified as at particularly high risk of road accidents, poor judgement and impulsivity are major sources of risk, with physical problems playing only a minor role. Driving is associated with both social activities and depression, and many people see the ability to drive again as a crucial index of recovery. We studied 381 people who were drivers before TBI (70% severe, 20% moderate, 10% mild).

<table>
<thead>
<tr>
<th>Cause of injury</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>31.4%</td>
</tr>
<tr>
<td>Road traffic accidents (RTA)</td>
<td>37.3%</td>
</tr>
</tbody>
</table>

Future Research

- Use of functional MRI to predict outcomes.
- Use of new and emerging technologies to facilitate rehabilitation and new learning after brain injury.
- Examination of the effect of brain injuries among military personnel.
- Further investigation of outcomes after mild TBI.
- Accidents and Emergency Care for patients with minor head injury.
- Prevalence of TBI among black and minority ethnic groups.

Adults and TBI

The overall annual incidence of traumatic brain injury (TBI) in the United Kingdom is approximately 350 per 100,000, and around 500,000 people in the UK are currently living with the consequences of that TBI. TBI is a ‘hidden disability’ since a person may appear physically normal, yet have considerable cognitive, psychological, social, emotional and behavioral problems.

Traumatic brain injury is a major public health problem and a leading cause of mortality or permanent disability in children and adolescents [6]. In the United Kingdom it has been estimated that each year, approximately 50,000 children acquire significant new neurological or cognitive disability as a result of TBI [7].

We studied a population of children admitted to one hospital Trust with TBI to compare outcomes following mild, moderate and severe TBI.

Methods: Questionnaires were mailed to parents of all 574 surviving children under the age of 18 as part of our follow-up protocol, and 375 completed questionnaires were received (64% of those eligible).

Return of work: 28%.

In the mild group 54% went back to school, and 45% went back to work, half had attention/concentration problems. Two-thirds of children with TBI had difficulties with schoolwork and 36% of children in this group had difficulty with schoolwork.

Children and TBI

Traumatic brain injury is a major public health problem and a leading cause of mortality or permanent disability in children and adolescents [6]. In the United Kingdom it has been estimated that each year, approximately 50,000 children acquire significant new neurological or cognitive disability as a result of TBI [7].

What is Traumatic Brain Injury?

It involves the corpse and refers to the dead, as in “her.”

Prevalence of TBI among black and minority ethnic groups.

Cases and deaths in the UK.

The overall annual incidence of traumatic brain injury (TBI) in the United Kingdom has been estimated at 100 per 100,000 and around 500,000 people in the UK are currently living with the consequences of that TBI. TBI is a ‘hidden disability’ since a person may appear physically normal, yet have considerable cognitive, psychological, social, emotional and behavioral problems.

If you’re interested in learning more about the effects of traumatic brain injury, I recommend reading the World Health Organization’s report on traumatic brain injury. It provides comprehensive information on the causes, symptoms, diagnosis, and management of TBI.

References


