Sequelae and Potential Complications of Traumatic Brain Injury
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Traumatic Brain Injury Basics

- Measures of Severity
  - Glasgow Coma Scale (GCS)
    - Measures presence, depth, duration of coma
    - Severity classification criteria for GCS
      - GCS 3-8: Severe
        - GCS less than or equal to 8 is defined as coma
      - GCS 9-12: Moderate
      - GCS 13-15: Mild
    - Often first measure of injury severity

Assessment of Severity

- Duration of Retrograde Amnesia
  - Loss of memory for events preceding onset of brain injury
  - Tends to be 30 minutes or less
  - May include loss of autobiographical memory
  - Typically follows temporal gradient
  - Newer memories more susceptible to loss
  - Retrograde amnesia extending back for years or decades usually accompanied by prominent anterograde amnesia
Assessment of Severity

- Duration of Post Traumatic Amnesia (PTA)
  - PTA begins at time of injury
  - Includes period of coma
  - Typically lasts about 4 times the length of coma

- Estimates of Severity Based on PTA
  - PTA < 5 minutes very mild severity
  - 5-60 minutes mild
  - 1-24 hours moderate
  - 1-7 days severe
  - More than four weeks extremely severe

Assessment of Severity

- Anterograde amnesia is the inability or impaired ability to recall life events beginning with onset of injury
  - Individuals are unable to learn and have defective recent memory

- Neuroimaging Findings
  - Typically provides reliable information regarding extent of lesion

Lesion Characteristics

- Site and Size of Focal Lesion
  - TBI focal lesion usually frontal or temporal lobe
- Diffuse versus Focal
  - TBI versus stroke or penetrating head injury
Nature of the Lesion

- Damaged brain tissue alters neurochemical and electrical status of brain
  - Leads to behavioral distortions involving other functions
  - Causes high level cognitive repercussions
  - Affects personality
  - May affect circulation and metabolism of surrounding tissue
    - Instantly and long term
  - Generally more rapid onset leads to more severe and widespread effects
  - Most common behavioral sequelae of acute brain lesion in conscious patients are impaired learning, attention/concentration, emotional lability, and fatigability

Variables Affecting Outcome

- Age
  - Effect more apparent at ends of age spectrum
  - Young to middle age not as predictive of outcome
- Premorbid Competence
  - Cognitive, social, and emotional reserves
  - Based on Satz (1993) “threshold theory”
  - Postulates brain reserve capacity representing structural or physiological advantages or disadvantages
  - Higher educational levels, higher scores on mental abilities testing, better functioning after TBI, academic achievement
  - Those with pre-morbid impulsivity, anger management issues, and other behavior problems fare less well
  - General physical status
  - Family support

Changes following Brain Injury

- Cognitive
- Emotional
- Physical
Cognitive Symptoms

• Attention
• Memory
• Academic Skills
• Speech and Language
• Decision Making
• Speed of Processing

• Perception
• Visual Spatial Abilities
• Abstract Reasoning/Problem Solving
  – Sequencing
  – Organization
  – Planning

Emotional Symptoms Associated with Brain Injury

• Temper Outbursts
• Antisocial Behavior
• Social Withdrawal
• Lack of Empathy
• Disinhibition
• Impulsivity

• Personality Change
• Depression
• Anxiety
• Mood Swings
• Difficulty Relating
• Emotional Dyscontrol

Alterations in Behaviors

• Changes in Appetites and Appetitive Activities
  – Eating, Drinking, Play, or Sex
  – Altered Personal Habits
  – Hyper- or Hypo-activity
  – Social Inappropriateness
Physical Effects

- Motor Deficits
- Changes in Hearing and Visual Abilities
- Changes in Gustation and Olfaction
- Balance Deficits
- Post Traumatic Headaches
- Seizures
- Spasticity
- Tremors
- Speech Difficulties
  - Dysarthria

Outcomes After TBI

- Severity Typically Predicts Outcome
- Quality of Life Compromised with Increasing Severity
- Severity Associated with Need for Supervision, Ability to Return to Work/School

Outcomes After Mild TBI

- Most often accompanied acutely by
  - Attention deficits
  - Impaired verbal retrieval
  - Forgetfulness
    - Usually appears shortly after injury
- Mild deficits may persist
  - Primarily in cognitive speed of processing
Symptoms Associated with MTBI

• Headache
• Dizziness
• Irritability
• Sleep Disturbance
• Fatigue
  – Typically resolves rapidly

Outcomes Following MTBI

• Considerable disagreement regarding long term outcome
• Studies documenting a low of 7-8% to high of 40% with chronic symptoms

Post Concussion Syndrome (Post Traumatic Syndrome)
  – Complex of somatic, cognitive, and emotional symptoms following MTBI
  – Cause of chronic symptoms unclear
Outcomes Following MTBI

• “Functional outcome following mild TBI is determined by the complex interaction of neurological, physical, and psychological factors, the injured individual’s premorbid personality and coping style, environmental demands and expectations, and support from others.” (Ponsford, Willmott, et al., 2000, p. 577)

PTSD in Mild TBI

• PTSD is an anxiety reaction to a traumatic event
  – Diagnosis questioned in TBI
  – Cannot have reaction with LOC, RA, or PTA in which person has amnesia for event (Sbordone and Liter, 1995)
  – Others theorize MTBI and PTSD may co-exist
  • Rates of PTSD inverse to severity of TBI

Outcomes After Moderate Brain Injury

• 8-10% of TBIs in this category
• Many return to work and school
  – Continue to exhibit residual traces of injury
  – May see frontal lobe or temporal lobe sequelae
  • Loss of spontaneity
  • Personality changes
    – Irritability
    – Impulsivity
  • Learning difficulties
  • Temporal lobe epilepsy
### Complications After Severe TBI

- “Even decades after the injury, severe TBI continues to have significant effects on cognitive, emotional, psychosocial, vocational, and family functioning, as well as independence in living.” (Hoofien, Gilboa et al., 2001)
- Few return to fully independent living

### Cognitive Deficits Following Severe TBI

- Commonly See Attentional Deficits
- Memory Impairments
- Frontal Lobe Deficits
- Deficits in Linguistic Competence
- Visuospatial/Visuoperceptual Deficits
- Executive Dysfunction

### Pediatric Brain Injury

- Children with brain injuries may worsen cognitively and behaviorally as they develop their cognitive skills and behavioral skills fail to mature
- New skills are built onto previously learned skills
  - This is disrupted by TBI
Pediatric Brain Injury

- Interactions of Development and Brain Injury
  - Academic Difficulties
  - Social Difficulties
  - Behavioral Disruption

Life Care Planning Considerations

- Cognitive Deficits
  - Environmental Modifications
  - IEPs
  - IDEA
  - Behavior Management
  - Driver's Evaluations
  - Neuropsychological Evaluations
  - Attendant Care Needs

Emotional/Behavioral Changes

- Family/Caregiver Training
- Neuropsychological Evaluations
- Psychotherapy
- Home Modifications
  - Dead-bolt locks
  - Key storage
  - Locks on food storage
  - Room monitors
Emotional/Behavioral Changes

- Family Counseling
  - “It’s a Family Affair” (Sly and the Family Stone)
- Psychiatric Services
- Case Management as a Liaison

Physical Deficits

- Ongoing Therapy Needs
  - PT/OT/ST
  - Dietary Needs
  - Mobility Needs
  - Health and Strength Maintenance

Neuropsychology in a LCP

- Level of Supervision Needed
- Need for Family/Individual Counseling
- Treatment Plan for Cognitive Rehabilitation
- Ability to Drive (Cognitive Perspective)
- Ability to Return to Work