Traumatic Brain Injury

Number 1 killer of children and young adults

Review of SCI Lecture

Statistics

- MVAs cause 50% of all head injuries
- Falls = 21%
- Violence = 12%
- Sports = 10%
- Male > Female
- Ave. age at time of injury between 15 & 24
Prevention

• The only true “cure” for TBI
• Preventive measures
  – Wearing seat belts & bike helmets
  – Responsible alcohol consumption (no drinking and driving)
  – Use of proper protective equipment in athletics

Classifications

• Head injuries classified according to the Glasgow Coma Scale:
  – Mild
  – Moderate
  – Severe
  can also be classified according to
  • Open vs. closed
  • High-velocity vs. low velocity impact
  • Diffuse vs. focal

3 Factors Affecting Outcome

• 1. Premorbid Status
• 2. Primary Injury: the amount of immediate damage to the brain from the impact of the brain injury
• 3. Secondary Injury: the cumulative effect of secondary brain damage produced by systemic and intracranial mechanisms that occur after the initial injury
3 Factors Affecting Outcome

1. **Premorbid Status**
   - normal vs. altered (encephalitis, CVA)

2. **Primary Injury**: depends on the nature, direction, and magnitude of forces applied to the brain, skull, and body

Factors Affecting Outcome

3. **Secondary injury**: following TBI, numerous conditions decrease the energy supply to the brain, causing secondary injury to the brain
   - Hypoxic-ischemic injury (HII)
   - Intracranial hematomas
   - Intracranial infection, cerebral artery vasospasm, tumors, obstructive hydrocephalus, post-traumatic epilepsy

Types of Primary Injury

- **local brain damage**: injury is localized to the area of the brain underlying the site of impact
  - produces predictable neurologic signs
- **Coup-contrecoup injuries**: a severe blow to the head damages under the site of impact and directly opposite the site due to the brain bouncing within the skull
- **polar brain damage**: occurs when the head is accelerated and decelerated (MVA)
  - brain impacts on the skull
- **Diffuse axonal injury (DAI)**
Clinical Rating Scales

- **Glasgow Coma Scale (GCS):** documents the level of consciousness and defines the severity of the injury
  - relates consciousness to motor response, verbal response, and eye opening
  - Has been extensively tested for inter and intra rater reliability and is highly reliable
  - Patients scoring an 8 or less are identified as having coma & severe brain injuries
  - Scores 9-12 = moderate brain injuries
  - Scores 13-15 = mild brain injuries
  - (Martin & Kessler, Table 11-1, p353)

Clinical Rating Scales

- **Rancho Los Amigos Level of Cognitive Functioning (LOCF):** outlines a predictable sequence of cognitive and behavioral recovery seen in pts with TBI
- **Rappaport’s Disability Rating Scale (DRS)**
- **Glasgow Outcome Scale (GOS)**
Diagnostic Procedures

- EEG
- CT
- MRI
- Cerebral Blood Flow Mapping
  - PET

Interdisciplinary team

- Patient & family
- PT, OT, SLP
- MD, rehab nurse, case manager/team coordinator
- MSW
- neuropsychologist

Acute Management

- PT is indicated in early management of the pt with moderate or severe head injury
- Initial rx revolves around prevention of complications:
  - respiratory distress
  - contracture development
  - skin breakdown
  - PROM; splinting; passive standing in tilt table
Acute Management
- Functional mobility training: begins when the pt’s medical status is stable
  - increase upright standing tolerance
  - increase pt's active movement capabilities
  - sensory stimulation (reviewed later)
  - **always check in with the RN because a pt’s status can change dramatically in a short period of time and alerts the RN that PT is beginning which can alter the pt’s status (increased vital signs)**

Direct Impairments
- 1. Cognitive
- 2. Neuromuscular
- 3. Visual / perceptual
- 4. Swallowing
- 5. Behavioral
- 6. Communication

Direct Impairments
- 1. Cognitive
  - Altered Level of Consciousness
    - Coma: defined as “not obeying commands, not uttering words, and not opening the eyes.” & sometimes the GCS score is used to define coma, a score of _____ defines a coma
    - Vegetative: decreased level of awareness with intact eye opening and sleep-awake cycles, but no ability to follow commands or speak
**Direct Impairments**

- **2. Neuromuscular**
  - Often present with abnormal tone
  - From spasticity that affects entire body & function to low tone of indiv muscle groups that does not impact function
  - Proprioception & kinesthesia are common sensory deficits
  - May see balance deficits, nystagmus, hemiparesis, ataxia, vestibular loss, visual deficits, etc

- **3. Visual/Perceptual Impairments**
  - Hemianopsia
  - Blindness
  - Spatial neglect
  - Apraxia
  - Somatagnosia
  - Right-left discrimination

- **4. Swallowing**
  - Dysphagia is very common
**Direct Impairments**

5. **Behavioral Deficits**
   - Are the most enduring & socially disabling of any of the impairments commonly seen after TBI
   - Patient will have a behavioral program created by the neuropsychologist
   - Sexual disinhibition, emotional disinhibition, apathy, aggressive disinhibition, low frustration tolerance & depression often lead to a life of seclusion & loneliness

6. **Communication**
   - Expressive or receptive aphasia
   - Reading comprehension
   - Written expression
   - Language skills deficits
   - Dysarthria

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**Indirect Impairments**

- Contractures
- Mobility
- Skin breakdown
- Heterotropic ossification
- Decreased endurance
- Infection
- Pneumonia
- Impaired speech secondary to trach
- DVT

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Management Based on Cognitive Level

• Because the cognitive level of the pt determines the extent to which s/he can be actively involved in the treatment, the organization of PT treatment information is built around the pt’s cognitive level

• Treatment considerations for pts in Rancho Los Amigos levels (LOCF)...

LOCF

• 1. No response
• 2. Generalized response
• 3. Localized response
• 4. Confused - agitated
• 5. Confused - inappropriate
• 6. Confused - appropriate
• 7. Automatic - appropriate
• 8. Purposeful - appropriate

Low Level Management

• LOCF I - III
• Evaluation: PROM, spontaneous activity, response to stimulation, muscle tone and reflexes, and the presence of gross motor skills (postural reactions)
Low Level Management

• **Goals**: prevent any complications (contractures, decubiti) and increase the pt’s level of interaction with the environment (by encouraging active movement and response to stimulation)

Low Level Management
(Treatment)

• **PROM**: can be reasonably aggressive, but must use caution

• **Sensory stimulation**: used for arousal and to elicit movement. Must watch for the response to the stimulation (can manifest as changes in HR, RR, BP or eye movement, facial grimacing, head turning, vocalizations). Must note the following:

  – **latency**: time delay between stimulus and response
  – **consistency**: how many times (within a set number of reps) does a pt respond to the same stimulus
  – **intensity**: the response should be proportional to the stimulation
  – **duration**: brief form of stimuli should result in brief forms of response
Low Level Management  
(Treatment)

- **Visual stimulation**: utilize pictures of family and friends; systematically stimulate all areas of the visual field (account for visual field deficits); document visual attentiveness and tracking

- **Olfactory stimulation**: provided by placing scents under a pt’s nose for 10 - 15 seconds during quiet breathing (best results from the pt’s own favorite smells)

- **Tactile stimulation**: provided during functional activities (turning, bathing, dressing)

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Low Level Management  
(Treatment)

- **Vestibular stimulation**: provided by C/S ROM, rolling on a mat, rocking, or pushing the pt in a wc.

- **Auditory stimulus**: use normal conversational tone, discuss topics that have meaning to the pt. Avoid background noise (it competes with meaningful stimuli)

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Low Level Management  
(Treatment)

• Positioning:

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Mid-Level Management

• **LOCF IV**: present very specific challenges because these pts are in a confused and agitated state
  - **Evaluation**: in addition to those areas evaluated in LOCF I - III, must assess functional tasks (ambulation, basic transfers)
  - **Goals**: increase or maintain ROM, prevent deconditioning, improve response to simple commands, prevent outbursts through a highly structured environment

Mid-Level Management

- **Special considerations**: 
  - remember the pt is confused: the pt should be seen by the same person at the same time, in the same place every day; establishes a routine
  - expect no carryover: teaching new skills is UNREALISTIC
  - model calm behavior
  - be prepared with numerous activities
  - offer options: “would you rather play ball or go for a walk?”
  - expect egocentricity: the pt will tend to only think about him or herself.

Mid-Level Management

- **Treatment**: ROM, gross motor activity
  - **attempt to improve endurance rather than progress to more challenging tasks (because that requires new learning)**
  - may need to employ creative techniques: “come walk with me to get the cards” instead of “let’s take a walk”
  - attention deficits are addressed through activity participation (pt attention can gradually improve during activities)
Mid-Level Management

• **LOCF V - VI**: these pts are confused but no longer agitated; can follow simple commands but if demands increase and structure decreases, performance diminishes; carryover is present but best for relearned activities; new learning very limited

Mid-Level Management

– **Evaluation**: usually possible to perform a formal eval but should be concise with simple instructions

– **Goals**: increase pt participation in program; increase/maintain ROM; increase conditioning; treatment of any motor deficit (i.e. hemiparesis, peripheral nerve injury, etc)

Mid-Level Management

– **Treatment**: should…
  • maintain structure: pt performance still depends on it
  • emphasize safety
  • keep instructions to a minimum: too much can confuse and irritate the pt
  • use physical props to improve compliance: timer so pt has concrete sense of time; videotape of performance so pt can view that performance realistically
High-Level Management

- **LOCF VII - VIII**
  - Usually during this stage that the pt is D/C’d from inpatient facilities
  - Prior to D/C, it is necessary to wean the pt from the structure that was critical in early rehab
    - the pt has some insight now into his/her strengths and weaknesses and should be involved in decision making as much as possible

High-Level Management

- **Goals**: assist the pt in integrating the cognitive, physical, and emotional skills that are necessary to function in the real world.
  - judgement, problem solving, planning are emphasized

High-Level Management

- **Treatment**: focuses on community skills, social skills, ADL
  - Judgement, problem solving, and planning are emphasized
High-Level Management
- these pts will require vocational and driving services to reach their optimal functional level
- PT services at this point usually are for specific motor disorders and do not differ significantly from the types of therapy provided to pts without cognitive dysfunction.
- **overall goal is for the pt to function optimally in society**

Issues That Cross All Levels
• **ROM**: decreases occur due to several reasons
  - prolonged bed rest; decreased consciousness; spasticity; lack of voluntary movement
  - Treatments for spasticity include oral meds, nerve and motor point blocks, serial casting, positioning systems

Issues That Cross All Levels
• **Mobility**: must take the cognitive issues into consideration
  - early rolling (low-level); supervised wc propulsion (mid-level); assisted ambulation; power wc
Issues That Cross All Levels

• **Documentation:** must precisely record the physical and cognitive functioning.
  – For example, a pt may have a high physical functioning level but require close supervision due to poor safety awareness. This should *not* be documented as independent physical capacity because of the cognitive impairment.

Issues That Cross All Levels

• **Adaptive equipment**
  – wheelchair: manual or power; variety of controls
  – advanced computer technology
    • simple letter board for communication
    • or complex environmental control unit

Issues That Cross All Levels

• **Outcome prediction:** our ability to predict outcomes is very limited due to the extreme complexities of the issues related to head injury.
  – being able to live independently, earn an income, manage daily activities and affairs are the outcomes that survivors strive for
    • many can reach this level
    • many cannot
Integrating Physical and Cognitive Components of a Task into Treatment Interventions

- **Cognitive and Behavioral Impairments:**
  - Disorientation: calendar, memory book
  - Attention deficits: stopwatch or timer
  - Memory deficits: memory book, computerized schedule books, watches and pillboxes
  - Problem-solving deficits: create situations that alert to safety; route finding tasks, obstacle courses

- Behavioral deficits: consistent schedule, structured environment, keeping patient occupied
- Aggressive behaviors
- Motor deficits: high level balance activities, use of movable surfaces

Treatment Guidelines for Behavioral Impairments

- Agitated patient
  - remove all jewelry
  - remove anything from around your neck - ID tag, necklaces, ties
  - see the patient regardless - if they are too agitated to treat, then walk the halls with them or provide some quiet supervision
Treatment Guidelines
- Throw your goals out the window!! #1 goal is SAFETY - for you and the patient
- call for help if you need it
- talk normally - listen to yourself. Talking in a calm and soothing voice does not mean a sing-song voice. Be natural - joke around if it helps, be matter of fact if it helps, but don’t baby these folks

Treatment Guidelines
• Don’t push it - if the patient refuses and it seems like pushing them will agitate them, stop and take a break

Treatment Guidelines
• Verbal aggression
  – remain calm and concrete
  – be “with” the patient
  – be aware
  – empathize
  – key words and verbal praise
  – give space
Treatment Guidelines
- Watch body language and voice tone; calm non-threatening nonconfrontive
- remember the client will process information more slowly, less accurately
- don’t attempt to teach or counsel until de-escalated
- DO NOT argue, threaten, get angry, get aggressive, bend or discard rules

Treatment Guidelines
- DO NOT get into a power struggle or make false promises
- DO redirect without going off the subject
- use humor where appropriate
- “listen”
- lessen stimulus: get patient to leave area or get others to leave

Treatment Guidelines
- Offer help: “what can I do to help?”; “let me help you with…”
- provide orientation information
- reinforce limits
- FOLLOW THE PLAN
Wrap up Today’s Lecture

Questions???