

Functional Issues in Pediatric Traumatic Brain Injury



Scott S. Rubin, Ph.D.

Associate Professor
LSU Health Sciences Center,
New Orleans



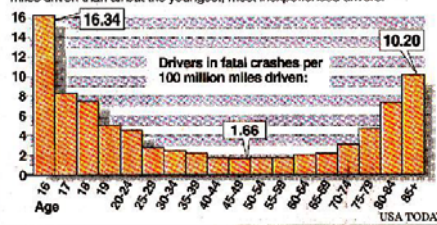
Adjunct Associate Professor
Louisiana State University, Baton Rouge

TBI Data –At Risk Groups

- Males - 15 and 24 years of age
 - 2:1 Males:Females
- Young children and individuals over 75 years of age
 - Falls around the home are the leading cause of injury for infants, toddlers, and elderly people. Violent shaking of an infant or toddler is another significant cause.

Seniors' Fatality Rates High

Nationally, drivers age 75 and older are involved in more fatal crashes per miles driven than all but the youngest, most inexperienced drivers.



Pediatric TBI

- More age related data:
 - 95% of children survive "TBI"
 - 65% of children survive "severe TBI"
 - Twin peaks – High mortality rare for those under 2yrs – drops until age 15 where mortality rate raises again.

Pediatric TBI

- Helmets on Bikes?
 - Children under 14 yrs – cost for non-fatal injuries = 113 Million per year.
- Don't forget about injuries do to playground activities and sports – football, soccer, hockey, ballet, etc.

Pediatric TBI

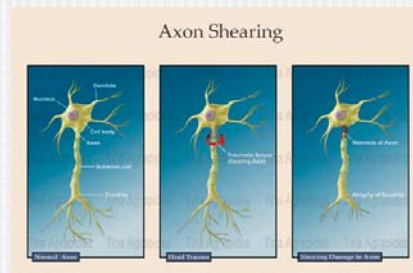
- In general... Kids with TBI tend to be better off than older groups.
- Above age 2 – young age (under 21yrs) and shorter time in coma indicate better outcome!
- Children under 2 – worst outcome.

Pediatric TBI

- Basics of Neurological Damage: very abbreviated!!!



Pediatric TBI



Pediatric TBI

- Seizures in TBI
 - 3 types of presentation: Immediate seizures (within minutes – hours), Early (within 1 week), Late (after 1 week of injury).
 - Two or more “Late” seizures = diagnosis of post-traumatic epilepsy.
 - Amount of seizure poorer prognosis.

Pediatric TBI

- Seizures continued...
 - Children 3-9% incidence of “early” seizure. That is HIGHER than in adults.
 - Risk of “late” seizures is lower for children than in adults.

Pediatric TBI

- Next series of slides a group of factors to consider.

Pediatric TBI

- Precocious Puberty in TBI
 - Happens in Non-TBI - Onset of puberty before age 9 (in boys) and 8 (girls).
 - IF precocious puberty affects child with TBI = magnifies that of the normal child – social and family difficulties.
 - Incidence of precocious puberty higher in TBI children than normal. Higher incidence for girls (for all kids – and higher in girls with TBI).

Pediatric TBI

- Patterns of intellectual development and TBI in children.
 - Depending of extent of axonal injury and localized damage... generalities = Neuropsychological deficits may not appear if skill is underdeveloped (emerging skills) however, deficits may "emerge".

Pediatric TBI

- Children with TBI appear to exhibit deficits in:
 - IQ decreased
 - Problem solving
 - Memory – academic performance
 - The more severely brain damaged – the more the deficits (no kidding).

Pediatric TBI

- Does the MRI reflect cognitive outcome?
- Nope... well, not specifically but– kind of.
- More severe diffuse injury = poorer testing on cognitive measures.

Pediatric TBI

- Studies have shown – those children with severe TBI vs mild–moderate TBI = more deficits in:
 - Reading – spelling – arithmetic.
 - Studies show significant improvement from onset to 6 months – but non-significant improvement from 6 mo to 2 yrs (compared to non-tbi).
 - 79% of severe TBI children receiving "special education" or have failed a grade.

Pediatric TBI

- Higher incidence of pre-morbid behavioral problems in children with TBI.
- Higher incidence of Low SES in TBI children.

Pediatric TBI

- Executive function (central processor) problems evident in children with TBI:
 - Specifically – reduced initiation, reduced follow-through, poor planning, poor organization, difficulty with self correction.
 - Might that affect education?

Pediatric TBI

- Family difficulties increase with TBI child.
 - Many families report financial difficulties due to the TBI.
 - 30% of families report that an adult lost a job because of care for child.
 - Siblings of kids with more severe tbi = higher incidence of depression and lower self-esteem.

Pediatric TBI

- The better parents can “cope” with the child’s injury = better outcome for child!!
- However – research has shown more family members may be more “punitive” with the tbi child. Leads to worse behaviors in child... snowball...

Pediatric TBI

- Children with TBI tend to have more social – behavioral problems.
 - Basis may be combination of problems in language – executive function – and self-management deficits (impulsivity...)
 - Problems in interpretation of implied meanings, sarcasm, negotiation, and pragmatics are factors.

Pediatric TBI

- Studies indicate real problems with child’s detection of sarcasm, response to sarcasm, recognizing bragging and responding to bragging.
- Difficulty with social interaction can lead to real problems in “quality of life”... less friends (a major affect – as considered by the children).

Pediatric TBI

- A series of specific deficits associated with childhood TBI:
 - Cognitive Deficits –
 - Communication and language
 - Memory – learning new information
 - Perception – across modalities
 - Judgment and problem solving
 - Mental flexibility

Pediatric TBI

- Social – behavioral problems
 - Self esteem
 - Self control
 - Awareness of self and others
 - Awareness of social rules
 - Sexuality
 - Grooming

Pediatric TBI

- Physical problems –
 - Sensory deficits (hearing and vision)
 - Coordination of movement
 - Stamina
 - Balance and strength
 - Speech problems (dysarthria)
 - Spatial orientation

Pediatric TBI

- EDUCATIONAL Factors
 - Specific to children... but similar factors may affect adult TBI patient work and social interactions.
 - Presentation will include attention, perceptual difficulties, memory (learning), organization, reasoning, and problem solving.

• Ref: Savage, R.C. & Wolcott, G.F.

Pediatric TBI

- Attention:
 - Difficulty following instruction in class.
 - Attention problems causing off task behavior.
 - Attention problems resulting in pragmatic deficits (irrelevant topics, interruptions, off task behavior).
 - Attention lost due to difficulty of task.
 - Not attending to new information due to perseveration on previous (ideational apraxia?)

Pediatric TBI

- Perceptual deficits:
 - Visual-spatial deficits = problems in math.
 - Lack of perception of emotional information from others – affecting classroom behavior.
 - Visual field cuts may indicate seating assignment - - - remember hemisphere and field relationships??

Pediatric TBI

- Memory (thus learning)
 - Forgetting to do assignments.
 - Missing classes and forgetting materials.
 - Problems finding classrooms!!
 - Difficulty remembering names (and episodic memories) of classmates can lead to social isolation.
 - Amazing how simple the problem – but the breadth of difficulties is amazing!!!

Pediatric TBI

- Organization Difficulties:
 - Coordinating activities in increasingly complicated academic schedule.
 - Organizing information on topics (conflicting topics and materials).
 - Losing assignments and arranging course materials.

Pediatric TBI

- Reasoning and Problem Solving –
 - Mathematical problems often involve reasoning – word problems and relationships in algebra.
 - May do better with multiple choice rather than reasoning through an essay.
 - Inability to problem solve school related activities (I lost my schedule, don't have a pass, etc.).

Pediatric TBI

- Transition to Augmentative communication strategies (by level of recovery) ...
 - Next series describes stages of recovery and then AAC considerations by level.
 - Levels pertain to child AND adult!!
 - Areas to consider for Augmentative – alternative communication – a) level of coma, b) language abilities (letters, pictographs, etc), c) motor abilities (switches, pointing, typing, etc.)

Why AAC Intervention?

- Goal is to provide AAC intervention so that the individual could participate in a rehabilitation program
- A short term communication system to meet the changing communication needs of the person with TBI

- But first - - - levels of coma.

TBI - Coma

- Levels of Coma: Based on 6 point Scale (I believe proposed by Alexander) – Stairstep Pattern of Recovery.
- Level 1 - "Coma"
 - Severe with this ending by the emergence of "gross wakefulness"
 - May provide coma stimulation.

TBI - Coma

- Level 2 – "Unresponsive Vigilance"
 - Once have Gross Wakefulness – pt is at this level.
 - Still unresponsive to environment.
 - There is still no "interaction" and Coma Stimulation continues.

TBI - Coma

- Level 3 – "Mute Responsiveness"
 - Onset of this level marked by development of "Purposeful Wakefulness".
 - Somewhat responsive to environment – may react to localization stimuli.
 - To check for this stage – look for eye movement, limb movement, mouth movement. May open eyes to command.

TBI - Coma

- Level 4 – “Confusional State”
 - Marked by the return of some speech.
 - Problems maintaining coherent thought.
 - See attentional disturbance, sleep-wake cycle disturbed, amnesia, denial of illness, confabulation, perseveration.
 - Patient fatigues easily.
 - New memories not being formed – Post Traumatic Amnesia still present.

TBI - Coma

- Level 5 – “Independent Self Care”
 - Marked by clearing of Post-Traumatic Amnesia.
 - Begin to understand what happened.
 - Basic orientation but not specifics of accident.
 - Attention improved and confusion goes down.
 - See mild (?) attention problems, improving amnesia, lack of concern about illness (Anosodiaphoria), limited insight and reasoning.
 - Still fatigue easily and may lack judgment.
 - Still language problems: proverb interpretation & idioms.
 - Some see such improvement in patient that they overestimate abilities of patient.

TBI - Coma

- Level 6 – “Intellectual Independence”
 - A matter of degree from previous level – but marked by better memory formulation and independence for some activities.
 - Still retain characteristic TBI behaviors
 - Flat affect, difficulty problem solving, forming strategies, impaired concentration, forgetfulness, apathy, irritability, limited insight, tangential, and personality changes present.

Pediatric TBI

- Augmentative and Alternative Communication issues – grouped by level of Coma.
 - Early (low level) stages
 - Middle stages
 - Late (high level) stages.

AAC Considerations

- The early stages
- Assessment
 - Impossible to assess cognition, speech or language since the person is usually unable to stay awake long enough
 - Note response and movements which can be later used for augmenting speech

AAC Considerations

- Early – Assessment continued
 - Choice making between two people and objects, precursors to a yes/no response
 - Family member input is needed to determine pre-injury interests and preferences

AAC Considerations

- Early stages
 - Intervention
 - Stimulate the individual and to elicit consistent and purposeful responses
 - Use of single switch to operate a tape recorder to play favorite music or recorded letters from home

AAC Considerations

- Early Intervention – continued
 - Switch access to environmental controls (e.g., light, fan or radio)
 - Limited number of symbols to make choices
 - Symbols should be brightly colored or exaggerated

AAC Considerations

- Middle stage
 - Assessment
 - Use messages for indicating needs of comfort (e.g., hot, cold, hurt, hungry)
 - Use messages for location, time of day and other personal information
 - Agitation and poor awareness of their communication deficits
 - Difficulty accepting AAC interventions
 - Limited willingness to participate in AAC assessments
 - Aim of AAC assessment is to identify residual capabilities that the individual may have and utilize them to achieve specific communication goals

AAC Considerations

- Middle Assessment - Continued
 - Assessment procedures are non-standardized and informal
 - Proper seating and positioning
 - Assessment of motor control to determine scanning or direct selection options
 - Work with surgical team
 - Attention capacity
 - Visual perceptual and visual acuity deficits
 - AAC person may want to accompany patient on visits to determine viable AAC options

AAC Considerations

- Middle stages
 - Intervention
 - Address attention and memory deficits
 - Address motor control issues
 - Most AAC systems are nonelectronic (communication boards, alphabet boards, yes/no response, word and picture boards and dependent scanning or mini-topic or context boards)
 - Photographs, line drawings, printed words or phrases
 - Difficulty recognizing symbols with too many elements

AAC Considerations

- Middle Stages Intervention - Continued
 - Small activity displays rather than large complex overlays
 - Use of single switches to activate call buzzers or appliances/tape recorders
 - Communication partners need to introduce topics for conversation, suggest AAC modes to be used at specific times, assist in resolving communication break down and create motivating opportunities
 - Patient and allow ample time for preparation, clarification and repair of messages
 - Refrain from rushing in to offer excessive encouragement which is confusing and distracting
 - Use systematic cuing instead

AAC Considerations

- Late stage
 - Assessment
 - Regained cognitive ability to become natural speakers
 - Those who have not regained the ability usually experience severe language or motor control disorders
 - Participation pattern analysis of the individual and families

AAC Considerations

- Late Stage Assessment - Continued
 - Patterns change from acute rehab to outpatient rehab to independent living to employment
 - Assess opportunity barriers
 - Identify communication needs, assess specific capabilities and constraints and match these with an AAC system

AAC Considerations

- Late stage
 - Intervention
 - Generally oriented, demonstrate goal-directed and socially appropriate behaviors
 - Difficulty learning new information due to residual cognitive impairments
 - Those who have acquired natural speech are able to converse with their families and friends but may need writing systems
 - Patients with residual motor and language deficits may need a life time system


Late Stage Intervention - Continued

- 78% use direct select and 16% utilized scanning
- Need pictorial or nonorthographic symbols
- Need to implement encoding strategies to enhance speed during communication however, prognosis for learning this is guarded
- New learning difficult and takes practice and time
- May be prepared to make changes as needed

Pediatric TBI

- *Transition*
- Functional Treatment Issues: By skill area
 - *Considerations for child and adult.*

Functional Skills for Tx

- Functional Memory
 - Orientation
 - Recalling schedules
 - Recalling events
 - Learning new tasks
- 

Functional Skills for Tx

- Functional Reading
 - Signs
 - Coupons
 - Menus
 - Advertisements
 - Brochures
 - Applications
 - Newspapers
 - Magazines

Functional Skills for Tx

- Money Management
 - Coins and paper money
 - Calculations
 - Purchases
 - Credit cards
 - Investments

Functional Skills for Tx

- Study and Testing Skills
 - for school or for education for new occupation
 - Following Schedules
 - Classroom behavior
 - Initiating asking for help
 - Concentration (attention)
 - Study habits (time management – completion of work)

Functional Skills for Tx

- Telephone Skills
 - Placing a call
 - Recording the information
 - Using telephone book
 - Making emergency calls

Functional Skills for Tx

- Transportation
 - Planning for use of public transportation
 - Organizes and executes trips
 - Obtaining a drivers license
 - Use of Maps
 - Problem solving breakdowns, etc

Functional Skills for Tx

- In depth examples of "skills" – For banking
 - Complete checks
 - Filling out deposit and withdrawal slips
 - Balancing checkbook
 - Managing savings record
 - Using Cash card
 - Recording transactions

TBI

- Gold-standard for treatment - - child AND adult.
 - For all types of rehabilitation!!!
- “Easy Streets” – have one? Or get one!!!

Functional Skills for Tx

- Easy Street



Functional Skills for Tx

- Easy Street



Functional Skills for Tx

- Easy Street



Life with TBI

- After treatment ends... patients typically have a different life than before the injury
- Life long alterations may include –
 - Long term use of strategies – some will even need reminders on what strategy to use in what situation.
 - Close self monitoring... what is said and how situations are handled.
 - Approach each situation (or task) step by step with monitoring.

Life with TBI

- Long term adjustments continued –
 - Follow a less active life style.
 - Friends from before the injury tend to dissipate and new friendships are difficult to establish.
 - Some can not return to work – others have to make modifications in vocation.

Pediatric TBI

- **Discussion Period:**

- *Child OR Adult?*



- Thank you!

- SRUBIN@LSUHSC.EDU or
- SRUBIN@LSU.EDU