TBI
Umphred
Chapter 10
Traumatic Brain Injury
Traumatic Brain Injury
TBI

- ❑Causes
  - ❑ MVA
  - ❑ Recreational vehicle accidents
  - ❑ Firearms
- ❑Males 2x > Females age 15-24y
- ❑MVA leading cause of HI in minorities
  - ❑ Violence & pedestrian vehicle trauma are higher than in non-minority
- ❑HI sequelae are devastating, affect virtually every component of the quality of life

Mechanisms of Injury
Coup injury- Site of Injury
Contre-coup- Rebound Effect
Diffuse axonal shearing

- neuronal damage associated with traumatic rotational acceleration of the brain during unrestricted mvmt
- brain tissue deformation occurs through shearing forces & inertial loading incurred during the injury

Contusions refer to more localized hemorrhages that occur at site of injury

2 Categories of HI
Open
Closed
Brain Tissue Damage

- ❑Injuries within the cranium may cause edema = ICP
- ❑Normal ICP 0-15 Hg can ⇧ to fatal pressures
- ❑Perfusion may be also impaired from ICP
- ❑Secondary damage
  - ❑ hypoxemia
  - ❑ infections

Complications
Rarely occurs in isolation without other ortho or internal organ trauma
Skull fxs

- linear, depressed, and basilar

Facial fxs & scalp lacerations
Extremity fxs & internal organ damage can be life threatening complications
Common areas of injury include pelvic, femoral, humeral fxs…
HO

HO

Complications
Complications
Hematoma
SDH- fluctuating periods of lucency
Epidural or extradural- varying degrees of altered consciousness, HA, or other specific symptoms from area of lesion
Extensive hematoma may require surgical evacuation with craniotomy
Large hematoma may cause hemispheric shift
Cranioplasty must be done later

Craniotomy
SDH
Complications
Seizures

- Mild to sever (tonic-clonic)
- Immediate or later
- Linked to more extensive brain damage
- Dilantin, Depakote, Tegretol, Phenobarbital
  - ✓ adverse side effects

ICU Management
Must address direct and 2° injuries
Intubation
Multiple IV lines
Chest tube
Intraventricular catheter, subdural screw, epidural sensor
Swan Ganz catheter
GCS

Swan Ganz Catheter
Pulmonary artery catheter
Heart failure
Sepsis
Pulmonary edema
Cardiogenic shock

GCS
Ranchos Los Amigos Levels of Cognitive Function

Initial Evaluation
Review altered mental status
Coma – lack of responsiveness to verbal stimuli, absent sleep-wake cycle
Persistent vegetative state (PVS) – similar to coma, though tends to be of longer duration
Orientation, level of consciousness, & memory
Residual lethargy
Post-traumatic amnesia
Social Hx
Home environment/D/C disposition

TESTS
Cranial nerves
Sensation
Coordination
Dysmetria, dysdiadochokinesia, ataxia
Musculoskeletal exam
Posturing– decerebrate or decorticate
Functional mobility
Berg or Tinetti
Aerobic & endurance capacity
Vital signs

Skin Inspection
Irritation, rashes, lacerations
Incisions
Pressure ulcers
    Hypertonicity or bed-bound ⇧ risk

Following Evaluation
POC/Interventions are developed
Review Tests and measurements
Levels of hemiplegia assessed
Consider Brunnstrom recover sequence
Review OT & ST assessment to review information related to perception, communication, cognitive impairments
Seating
Adaptive seating for optimal positioning, tone reduction, & pressure relief
Hemi height WC
WC mgt & propulsion

Therex

May not be a specific isolated exercise but may be more functional
Splinting
NDT vs. PNF vs. Brunnstrom
Motor learning principles
How can therex effect tone?
Normalize tone
Equilibrium reactions
Functional reaching
Midline orientation

Functional Mobility Training
Neuro Therapeutic Functional Progression
Maximize functional level
Should we settle for limitations?

Balance Interventions

Balance is commonly effected

- COM within BOS
- COM outside BOS
- Static vs. Dynamic
- Static balance is when you are out cold or dead
- Balance assessed & treated in sit & stand
- Tinetti or Berg

Proper Guarding?
Gait and Locomotion

More advanced functional progression
Quantitative and qualitative parameters
LRD
Assistive devices may reduce normal weight shift and crossing of midline
Look at abnormal gait patterns
    tight gastroc- plantar flex, genu recurvatum, steppage, circumduction, swing pattern
Effects of spasticity
    scissoring, stiff knee, knee snapping
Stretching, motor learning
Assess speed, BOS, AD mgt

Special Considerations
Coma Emergence

Extensive medical management in ICU

Do we do anything in this place?

What would you do for therapy?

Agitation
Challenge for all rehabilitation
⇧ LOS
Reduced recovery
⇩ independence
Control environment & sensory experience
⇧ anxiety & aggression ⇩processing sensory info
Tactile defensive behavior
Strategize interventions
    Redirect, calm, reduce sensory input, shorten task, time out

Integration of Cognitive & Neuromuscular Interventions
Integrate cognitive and functional training
Pt. may have cognitive impairments, sleep disorders, slower processing, decreased attention span
Cognitive and motor skills may not be in synchrony

Alter tasks to include a cognitive task with a motor task
Use problem solving tasks
Work on safety
Use journal/diary

Precautions

Agitated patients
- 24hr SPV
- Calming techniques
- Take-down techniques

Helmet s/p craniotomy
Manage catheters, 0^2 tubes & tanks, feeding tubes, IVs/poles, WC...
Sometimes all at the same time
Discharge Planning and Community Reentry
PTA is involved in all aspect of DC
Ordering DME
Family/caregiver training
Continued care at what level?
Home Eval

Home Assessment

Prior to DC therapy may do a home visit
Identify barriers to function
Safety
Look at doorways, widths, inclines, floor surfaces, entry's and exits, bathroom , bedroom, kitchen/food prep, stairs, rails, furniture placement
“Trial run”

HEP
Individualized HP
Attention to all components of functional status
Include functional activities
Target weak muscles
Should be complete yet not overwhelming
Written instructions with pictures
Use laymen's terms
Caregivers should be included & given appropriate instructions

Community Re-Integration

- Begins rehab
- Rehab team members may accompany or recreational therapy
- Can use community experience as part of therapy
- Work on problem solving skills
- Quality of life
- OP day programs
- Employment


INDEPENDENCE

Working with TBI patients offers a great opportunity to use all your skills, critical thinking, personality, motivation, and even your muscles to offer the best experience that will train them and motivate them towards independence. YOU have an immense impact on the lives of your TBI patients. In the world of PT, mediocre TBI care becomes no care---you must be the BEST!!

CONCLUSION