APPROACHES AND INNOVATIONS IN REHABILITATION TECHNIQUES IN TBI

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LEARNING OBJECTIVES

➢ Introduction

➢ Types of management
  Acute management
  Contracture management
  Positioning

➢ Low-cognitive-level physical therapy management: stimulation
  Vegetative state, Agitated patients, Confused patients

➢ Mid-cognitive-level physical therapy management: structure

➢ Higher-cognitive-level physical therapy management: school/community reintegration

➢ Chronic management
DEFINITION AND PREVALENCE

• “An acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment”

Individuals with Disability Education Act (IDEA)

• In India, children between 1 to 15 years form about 35% of total population.

• The average incidence of TBI 1.10 - 2.36 per 100 per year.

• Overall prevalence of approximately 30%
Brain injury different in Children?

More Devasting than adults

Cognitive Impairments may not be immediately obvious

1. Child gets older

2. Increased cognitive and social expectations for new learning

NEVER ASSUME A CHILD WITH BRAIN INJURY RECOVER BETTER AS THERE IS MORE PLASTICITY IN GROWING YOUNGER BRAIN
ACUTE MANAGEMENT
Acute Management

For children with Ranchos level I to III and paediatric levels V to III

PREVENT:

- Prolonged inactivity and sensory deprivation (skin breakdown) complications.
- Respiratory complications.
- Contracture development.

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Positioning

USES

• Improves pulmonary hygiene
• Maintains skin integrity
• Prevents contractures
• Support for body alignment and movement.

CHANGE IN POSITIONING

• Changes in position for the child confined in bed should be made every 2 hours.
• When the child is sitting, pressure relief procedures like recline on a mat in side-lying or by tilting the wheelchair backward to a semi-supine position for every 30 minutes.
Design Positioning Program

CONSIDER

1. Orthopedic and neurologic positioning precautions
2. Influence of abnormal tone and primitive reflexes on posture

Sidelying - Decrease the influence of abnormal primitive reflexes
Upright positioning - even at an early stage of recovery, may be achieved with the use of an adapted wheelchair.

Adapted wheelchair should incorporate

1. Tilt-in-space or reclining seating system
2. Postural support
3. A removable headrest
Contracture Management

• Prevention of soft tissue contractures cannot be overemphasized.
• Dystonic extensor muscle over activity is major contributor to progressive ankle contractures --- will delay functional independence.
• Evidences Support:
  1. Range of Motion Maintenance through exercises
  2. Prolonged stretch in a standing frame or
  3. Tilt table combined with reeducation of functional movement patterns
Contracture Management

4. Use of a positioning program

5. Application of splints and casts may help

**Important:**

Coordination of a *wearing schedule*

Wearing tolerance

Effective in reducing contractures and improving Lower Extremity Function.
Contracture Management

Children with severe extensor posturing...not responding to POSITIONING

1. Splints, or valved casts
   a) Serial casts are warranted
      (changed initially every 3 to 5 days)
   b) **Worn for up to 2-week** intervals until posturing diminishes and volitional control increases
   c) **Continuous use of serial casts** in a active child should **not exceed 2 months**
   d) Bivalved fiberglass cast splints then can **be used at night** to maintain Range of Motion.

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Spasticity Management

Serial casts in conjunction with oral or injectable medications. Injections are combined with traditional physical therapy.

1. Oral medications: Dantrolene (Dantrium), Diazepam (Valium)

2. Nerve and Motor point blocks, eg: Phenol and Botox A

3. Botox --- Maintains passive Range of Motion of the ankle.
LOW-COGNITIVE-LEVEL PHYSICAL THERAPY MANAGEMENT: STIMULATION
Low-cognitive-level Physical Therapy Management: Stimulation

- **Structured stimulation** could prevent sensory deprivation and accelerate recovery.

- Sensory input may be provided through:
  - Vestibular
  - Visual
  - Tactile
  - Auditory
  - Olfactory systems
Treatment Area.

- **Family** and **familiar objects can be** included and **re-evaluated** periodically.
- **Decrease** extraneous auditory and visual activity
- **Purposeful activity and functional skills**, such as bed mobility and transfers.
- **Appropriate schedule for stimulation** --- time of day at which **alertness is optimal**
- If not possible, engage the child at the current level of arousal and attention.
- **Family education** on the provision of **appropriate levels of sensory stimulation**, eg: Environmental stimulation
Vegetative State

- A vegetative state is characterized by an absence of response to external stimuli and an absence of attempts to communicate needs to others.
- They have Periods of eye-opening, sleep–wake cycles, and primitive reflexive movement of the limbs, but they do not demonstrate a response to pain or have self-awareness.
- Families often have difficulty distinguishing between coma and persistent vegetative state as the outward presentation is similar.
- This is due to primary brain damage; therefore, the focus of care is promoting functional movement.
Mid-cognitive-level Physical Therapy Management: Structure

• When the child has emerged from coma (Rancho Levels IV and V and Pediatric Level II) and begins to participate in functional activities, other cognitive deficits may become evident.

• Selection of appropriate activities based on cognitive, physical demands (keeping in mind that the progression of cognitive and physical function) can proceed at different rates.
The Agitated Patient

Factors responsible

- Initially, agitation is in response to poor regulation of stimulation and internal confusion.
- **Factors contributing** include overstimulation by staff, parents, and friends; restraints; occult fractures; pain; constipation; and urinary tract infections.
- Expressed as **bizarre or aggressive behaviors**.
Care the Agitated patients

• Use of a **highly structured environment** to decrease the number of behavioral outbursts and **prevent overstimulation**. (quiet room with no television or telephone, **limited visitors**, and **planned rest periods**)

• Verbal reassurance.

• Pharmacologic management

• **Range of Motion exercises** to the child’s tolerance

• **Functional gross motor activities** such as rolling, coming to sit, standing up, and walking.

• **Work within the child's tolerance level**, **No carryover for new learning**

• Therapist should be **prepared with alternatives or choices of activities**.
Care the Agitated patients

• If unsuccessful, the Therapist may need to resort to involve the child in any activity in which he or she is **willing to participate**.
• Therapy of this nature and **increase alertness, attention span, and activity level**.
• For the child who is extremely difficult to manage, **shortened therapy sessions** can be scheduled.
• As **attention span gradually increases**, the therapist reinforces **longer periods of attention** and **directs** the child with TBI back to **more challenging tasks**.

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THE CONFUSED PATIENT

• Enhance successful participation in functional tasks.
• Give as much structure and assistance as necessary to allow for success.
• Partial weight-bearing locomotion.
• As performance improves, introduce complex environment.
• Orientation of the children to his/her surroundings.
• Thus, the child may begin to work on recall skills.
• Familiarity and routine are calming and reassuring and may assist with behavior management as well.
Care the Confused Patients

• **Therapy journal or verbal rehearsal** may help improve the child’s memory.

• **Integrate principles of motor control** and **motor learning** with principles of therapeutic exercise to body structure impairments, and activity limitations.

• **Developmentally appropriate functional skills** that are **motivating and challenging** with the correct spatial and temporal demands for the child’s abilities.

• **Play activity** within the current capabilities of the child.

• **Repeated practice and intensity of training** is an important consideration in achieving **positive outcomes** in return of movement and **increased PEDI mobility scores**.
HIGHER-COGNITIVE-LEVEL PHYSICAL THERAPY MANAGEMENT: SCHOOL/COMMUNITY REINTEGRATION
Higher-Cognitive-level Physical Therapy Management: School/Community Reintegration

• It is important to remember that not all children will reach a high level of cognitive function (Rancho Levels V to VIII and Pediatric Level I) and have complete physical recovery.

• Toward the end of the inpatient rehabilitation phase, persistent losses of cognitive and physical function become more apparent, and plans must be made to reintegrate the child with TBI back into the home and/or school setting with continued therapies.
Reevaluation & Recommendation

• The family, medical rehabilitation team, and the school district must work together and jointly plan for reentry into the school setting.
• Reevaluation should be done at this stage.
• Recommendations
  • Environmental modifications to the child's home or school.
  • Focus on treating any residual motor deficits
  • Continued training with assistive devices and physical assistance for basic motor skills, such as transfers and gait
Fitness Maintenance

• Body weight–supported treadmill training (BWSTT) - No clear evidence.

• Children who have experienced moderate or severe brain injury often have difficulty maintaining an appropriate level of fitness.

• A fitness program should be designed to address wellness and health.

• The PT can also work with the physical education teacher in designing an adapted physical education program for the child with TBI.
Exercise Training

For children who experience only subtle problems with balance and speed, coordination, timing, and rhythm of movement, participation in challenging physical activities such as walking exercise on a balance board or therapy ball carrying objects, running, jumping, hopping, skipping, or recreational activities may be beneficial in improving activity levels.
Chronic Management

• As the child improves by the time the remaining deficits are to be taken into considerations and appropriate treatment approaches to be implemented to gain recovery.

• Residual deficits are important to be taken into consideration before a period of 6 months to promote normal recovery pattern.

• Normalizing the muscle tone by use of appropriate treatment strategies like sustained passive/active stretching exercises along with weight bearing exercises and treadmill training.
Chronic Management

• **Active involvement** rather than passive treatment options (protocol of **strengthening** the weaker musculature of the body) as the muscles respond in developmental pattern when activated actively with concentric contractions.

• **Therasuit intensive program** provides evidence in **effective** normalization of tone, strengthening and postural correction and stabilization.

• **Balance training**, **gait training**, **coordination training** along with **postural control exercises** combined into a **task based activities** to **gain functional independence**.

• The **session should not be exhausting**, should be **interacting** and playful to **maintain interest** of the child.
The aim of rehabilitation

1. To improve /restore mobility
2. To achieve ADL with or without adaptive technology.

After discharge from the inpatient rehabilitation treatment unit, care may be given on an outpatient basis.

Community-based rehabilitation

vocational rehabilitation

Care in supported living facilities such as group homes.

Leisure facilities for the disabled
Rehabilitation

• Pharmacological treatment
  
  **Medication** is also used to control post-traumatic epilepsy

• Bedridden patients/Wheel chair dependent patients --**caregiving and nursing** are critical.

• Activation database guided **EEG biofeedback** approach which has shown significant improvements in **memory abilities** of the TBI subject which are far superior than traditional approaches (strategies, computers, medication intervention).
1. **Acute stage:**

   i. Positioning and turning of the patient (if allowed).

   ii. Regular passive movements to maintain joint range of motion.

   iii. Breathing techniques and postural drainage without head tilt, without or with suction to remove secretions (if not ventilated).

   iv. To note the vital signs and assess the conscious level periodically, to assist the Physician/Surgeon to judge prognosis and plan further management.
Summarize....

2. Chronic stage:

i. To **normalize muscle tone**.

ii. To **improve strength, endurance**.

iii. To **improve posture and balance**.

iv. **Restore function**.

v. **Assist in the Rehabilitation**.
Thank you

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