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Physiotherapy Management of a Pediatric Patient with Tubercular Meningitis and Hydrocephalus: A Case Study

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ABSTRACT :

Tubercular (T.B.) meningitis is a critical manifestation of extrapulmonary tuberculosis that primarily affects the central nervous system. One of its common complications is hydrocephalus, which can severely impact a child's neurological and functional development. The prognosis depends heavily on early diagnosis and comprehensive management, which includes medical, surgical, and rehabilitative interventions. This case study highlights the role of physiotherapy in the management of an 8-year-old male child diagnosed with T.B. meningitis and hydrocephalus. The patient underwent ventriculoperitoneal (V.P.) shunting and was managed through intensive physiotherapy sessions. Detailed physiotherapy goals and strategies were employed focusing on tone regulation, respiratory function, prevention of complications, and regaining developmental motor milestones. This report emphasizes how timely and structured physiotherapy interventions contribute significantly to the overall recovery and quality of life in pediatric neuro-tuberculosis cases.

INTRODUCTION

Tubercular meningitis remains a significant public health challenge, especially in developing countries. It is the most severe form of extrapulmonary tuberculosis and is associated with high morbidity and mortality. The disease results from the hematogenous spread of Mycobacterium tuberculosis to the meninges and brain parenchyma. In children, the developing nervous system is particularly vulnerable, often resulting in complications like hydrocephalus, stroke, and long-term cognitive and motor disabilities. Management requires a multidisciplinary approach, and physiotherapy plays a vital role in reducing neurological deficits, enhancing recovery, and improving quality of life. This case report discusses the rehabilitation of a child who presented with T.B. meningitis complicated by hydrocephalus and underwent V.P. shunting, followed by a structured physiotherapy rehabilitation program.

Case Presentation

An 8-year-old male child was admitted to the Pediatric Intensive Care Unit (PICU) with complaints of altered consciousness, reduced spontaneous movement, and generalized weakness. The child had a history of normal growth and development, with all developmental milestones achieved at appropriate ages. Immunization was reported as complete, and there was no significant family or past medical history.Upon admission, the child was hemodynamically stable with a heart rate of 96 bpm, respiratory rate of 26/min, and body temperature of 97.4°F. He was initially managed with oxygen via room air. Neurological evaluation revealed poor visual tracking and sluggish pupillary response to light. The Glasgow Coma Scale (GCS) score was E4V1M4. Positive Brudzinski's and Kernig's signs suggested meningeal irritation. A contrast-enhanced CT scan of the brain revealed features consistent with tubercular meningitis and obstructive hydrocephalus, secondary to aqueduct stenosis. The child underwent a neurosurgical procedure for V.P. shunt insertion on the right parietal region on the 7th of February. Post-surgical management included multidisciplinary care, with the physiotherapy team being involved from day one to initiate early rehabilitation and prevent secondary complications.

Clinical Examination and Physiotherapy Assessment

On initial physiotherapy assessment, the patient displayed fluctuating muscle tone with a tendency toward rigidity, poor voluntary control, and decreased responsiveness to environmental stimuli. Reflex examination revealed:

Right side: Biceps (++), Triceps (++), Knee (++), Ankle (+++)

Left side: Biceps (+), Triceps (++), Knee (++), Ankle (+++)

The plantar reflex was bilaterally flexor, with downgoing toes, indicating an intact corticospinal tract. Passive range of motion (PROM) in all joints was within normal limits, with no joint deformities. However, there was notable muscular weakness, especially in hip flexors, adductors, abductors, knee flexors, and ankle dorsiflexors.

The child was bed-bound, with reduced spontaneous activity and low responsiveness. Consciousness fluctuated but gradually improved post-operatively. Tone remained elevated in some muscle groups, and reflex responses were exaggerated.

Physiotherapy Management

The physiotherapy plan was tailored to the child's fluctuating neurological status and post-operative condition. The management was focused on the following goals:

1. Tone Management and Prevention of Spasticity
   Passive range of motion exercises were initiated in all major joints of the upper and lower extremities to maintain joint mobility and prevent contractures. Techniques such as prolonged stretching and sustained holds were applied to muscle groups with increased tone. Rhythmic rotation and joint approximation techniques were used to provide proprioceptive input and regulate tone.
2. Positioning and Pressure Ulcer Prevention
   Correct positioning was emphasized to prevent deformities and pressure sores. The child was repositioned every two hours in bed, alternating between supine, side-lying, and prone positions as tolerated. Special attention was given to bony prominences with the use of pillows and roll supports. The physiotherapy team also guided the nursing staff and caregivers on maintaining hygiene around the catheter site and the importance of frequent turning.
3. Respiratory Management
   Given the reduced level of consciousness and risk of pulmonary complications, chest physiotherapy was a critical component. Techniques included percussion, vibration, and postural drainage to clear secretions. Breathing exercises using proprioceptive neuromuscular facilitation (PNF) techniques were gradually introduced as the child's consciousness improved. Incentive spirometry was later added to improve lung expansion.
4. Consciousness and Responsiveness Training
   Once GCS improved, the child was engaged in simple interactive tasks to stimulate alertness and responsiveness. Visual and auditory tracking activities were introduced. The child was encouraged to turn his head toward sound and light stimuli, and simple commands were used to assess voluntary responses.
5. Functional Rehabilitation
   With improved consciousness and better postural control, the child was gradually mobilized out of bed. This included supported sitting on the edge of the bed, progressing to high sitting, and eventually to standing with assistance. Balance training exercises were implemented using therapy balls, bolsters, and parallel bars. Gait training was initiated using a walker under close supervision. Stair climbing with support and coordination tasks such as stepping, reaching, and transferring weight were gradually introduced.
   Progress and Outcome
   Within two weeks of consistent physiotherapy, the child showed significant improvement. GCS improved to 15, and he was fully oriented to person, place, and time. He could turn his head voluntarily to either side and swallow water without aspiration. Muscle tone and reflexes normalized over time, and strength began to return in key muscle groups. Catheterization was discontinued after 10 days, and the child began to regain independence in daily activities.
   By the end of the rehabilitation program:
   The child was able to stand with minimal support.
   He could walk short distances with a walker.
   He began climbing stairs with supervision.
   Functional independence was restored gradually.

DISCUSSION

This case underscores the significance of early physiotherapy intervention in pediatric patients with neuro-infectious conditions like T.B. meningitis. Hydrocephalus as a complication can further hinder recovery due to increased intracranial pressure and neurological impairment.

CONCLUSION

This case illustrates that comprehensive physiotherapy management, beginning early in the course of the illness and tailored to the patient's evolving neurological status, is vital in pediatric T.B. meningitis complicated by hydrocephalus. A collaborative approach involving surgical, medical, and rehabilitative disciplines leads to optimal recovery and reintegration into daily life.

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