



Multi-Therapeutic Approach in Pediatric Traumatic Brain Injury

Mandar Malawade* and Sayali Gijare

Department of Pediatric Physiotherapy, Krishna College of Physiotherapy, Krishna Institute of Medical Sciences, India

Abstract

Traumatic Brain Injury (TBI) is one of the stressful conditions in pediatric age group. Its symptoms mainly affect child as well as family. It involves neurological, psychological, behavioral deficits in the child. The clinical symptoms of a child with TB, depends on the site of lesion. The motor deficits include muscle weakness, facial palsy, affected posture, balance impairments, atypical gait, etc. The behavior of the child is also affected due to trauma and hospitalization. The purpose of this study was to review the recovery of three year old child who had acute onset infantile hemiplegia, including description of physical therapy examination, evaluation and intervention.

Keywords: Traumatic brain injury; Impairments; Physiotherapy

Introduction

Traumatic Brain Injury (TBI) in children is a highly stressful event for the child and the family. Damage occurring at the time of development extensively affects the child's abilities to do what child usually does i.e., play, learn, establish friendships and then gradually develop to become independent young adults. The injury commonly causes variety of physical, emotional, cognitive and behavioral impairments [1]. TBI is a general categorization that describes any injury to the brain that occurs after birth and maybe the result of trauma. TBI is the most common cause of morbidity and mortality in children and young adults [2].

There are about 37,200 children sustain a severe TBI each year. Severe pediatric TBI is associated with significant mortality and morbidity. Among the children who survive their injury, more than 50% experience unfavorable outcomes 6 months after the injury. Although TBI-associated death rates decreased between 1997 to 2007, disabilities for TBI survivors continue to have both a direct and indirect impact on the economic and human integrity of our society [3].

There are various types of consequences are observed in children with traumatic brain injury. It could be neurological, cognitive, behavioral and common life style. The extent of injury happened in to brain leads to the impairments observed in the child with TBI [4,5].

Physical therapy has an extensive role in rehabilitation of children with TBI. The therapy continues as the child gets stable enough with vitals. There are numerous therapeutic strategies to address issues of motor control. The intervention is carried out according to the need.

Case Presentation

A 3 year old girl, while playing in the corridor, her dress got stuck into the cupboard and due to which the cupboard felt on her head and she got injured. As she fell down on her face, she started bleeding above the right eye. At that movement she got unconscious and there were no movements. So the relatives took her to the local hospital. On the way to the hospital, she had two episodes of vomiting. But due to unavailability of the necessary facilities, she was again carried to the multispecialty hospital. During the transport; she again had two episodes of vomiting. In the hospital she was immediately taken for dressing and she was been sutured. Further CT scan was done and it showed extradural and subdural hemorrhage along with left occipital fracture, and hemorrhagic contusions with perilesional edema. She was shifted to Neuro ICU and was kept under observation and treatment. She was referred to the physiotherapist on third day of admission.

Examination

After taking ethical consent from her parents, she was examined by physiotherapist after the

OPEN ACCESS

*Correspondence:

Mandar Malawade, Department of Pediatric Physiotherapy, Krishna College of Physiotherapy, Krishna Institute of Medical Sciences, Karad, Maharashtra, 415539, India, Tel: 91 9923421636;
E-mail: mandarmalawade@gmail.com

Received Date: 30 Oct 2018

Accepted Date: 21 Nov 2018

Published Date: 26 Nov 2018

Citation:

Malawade M, Gijare S. Multi-Therapeutic Approach in Pediatric Traumatic Brain Injury. *Ann Pregnancy Birth*. 2018; 1(2): 1009.

Copyright © 2018 Mandar Malawade. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

reference to the physiotherapy department, while she was admitted in ICU. Following through review of the child's medical record physiotherapy management took place in the patient's room and was continued in the outpatient department when additional equipments were needed. Her parents were present at the time of examination. She was able to follow all directions and has good receptive language skills. She did not speak to the physical therapist during the initial examination but used to communicate by moving her head indicating yes or no. On the first day of assessment, her motor functions were as follows: She was able to move in side lying position or in prone lying. There was weakness in her left upper and lower limb due to which the movements were restricted. Her joint range of motion was full but it was painful in left upper and lower limb. There were no exaggerated reflexes. She was dependent on caretakers for performing the activities of daily living i.e., combing, bathing, and dressing. The facial nerve was affected for left side. Her mouth was deviated to right side. She had chewing difficulties and difficulty in talking. She could walk with two hands held by the caregiver. She had to be physically carried for outside home ambulation. On GMFCs she was on level 4 on first day of assessment.

At present, her gross motor functional level is improved to GMFCs level 2. She is able to transfer herself to and fro from furniture. She can come to stand with minimum support from floor as well as from sitting on chair position. She is able to maintain kneeling position for 30 counts. She walks with support at home and needs supervision for outside home environment. She demonstrates decreased control over speed of walking uses upper extremities in high guard position for balance and tends to fall if an obstacle comes in way. She demonstrates a broad base of support while functioning in activities where her center of mass is placed high i.e., standing and walking. Her anticipatory control is decreased. She is able to perform sagittal plane movements of flexion and extension very well but has difficulty for frontal and transverse plane movements, transverse more as compared to frontal plane. She is able to overcome inertia but tends to use momentum and movements are often sudden and jerky to initiate. Her movements are generally wide ranged and fast. She is unable to perform mid and end range movements with slow speed thus showing decreased eccentric control. That is why she often falls off while lowering herself from standing position and is unable to walk slowly. Ascending and descending is also carried out with minimal support.

She has just started using upper extremity for playing with toys which make noise or lights up after squeezing them etc. She has poor bilateral and bimanual hand function. She uses hands to eat herself for other activities of daily living. She needs little assistance for dressing and undressing.

Child can initiate motor unit activity throughout the body; can sustain it to some extent, more in upper extremities and trunk as compared to lower extremities. But she has difficulty terminating motor unit activity especially in trunk and lower extremities. She can recruit postural as well as movement motor units throughout the body but demonstrates increased use of movement motor units. She can perform concentric and isometric muscle work but has difficulty performing eccentric muscle work, more in lower extremities as compared to trunk and upper extremities. She shows decreased co-activation of agonists and antagonists especially at lower extremities hips.

Child has primary impairments of communication and social

skills as well as cognitive and behavioral abilities. She demonstrates reduced verbal communication skills. Her nonverbal communication is mainly through gestures. She tends to look at the object she wants or physically approaches the person if she wants something to be done by that person. Her arousal level is poor. She needed to be given stimulus to attend which ever activity to be asked for. Her eye contact has improved over a period of time but still shows decreased attention span.

Physiotherapy Management

Child's physiotherapy program was play based and was performed in the familiar settings of home and the usual clinic setting. Activities in all sessions involved part and whole practice of functional activities using concentric and eccentric muscle action in both open and closed chain exercises. Antigravity extensors of the lower limb, particularly hip and knee extensors and ankle plantar flexors, were targeted in activities designed to work the muscles throughout their range, such as ascending or descending stairs. She practiced ascending and descending a single step with one leg leading (closed chain, concentric and eccentric muscle activity, of mid to inner range hip and knee extension and mid to outer range plantar flexion), followed by practice with the other leg. This activity was alternated with ascending and descending a single step leading with alternating legs and ascending and descending a set of steps leading with one leg or alternating legs. She also practiced ascending and descending steps backward and sideways and climbed up and down vertical climbing bars [6,7].

Muscle lengthening activities were practiced as part of the physiotherapy intervention. For example, child played in long sitting that was progressed by using long leg splints (applied with bandages) to assist with the maintenance of knee extension. It was further progressed by child reaching toward the toes to retrieve toys placed strategically at increasing distances along the legs. In this manner, muscle lengthening involved dynamic stretching with child activating muscles at a length suitable for the task.

Initially, child required support in standing but was then able to stand with feet flat on the floor. Child was then encouraged to let go of the support, at first momentarily, but with practice, for an increasing amount of time. Standing balance was encouraged by timing this activity (and by counting with the child). Walking up and down a single step was practiced as well as ascending and descending stairs (using a handrail for support) [6].

Being able to stand with feet flat on the floor allowed practice of the step and stairs. Initially child could not stand with feet flat on the floor (even with support), so was unwilling to attempt steps. She was encouraged to practice best walking with the walker by slowing down the walking speed and putting feet forward reciprocally with equal step lengths. Other specific activities included in the physiotherapy programmer are listed sit to stand from stools of varying height initially with which was progressed to without hand support Squat to stand First with and later without support standing balance Timed, with increasing complexity of fine motor activity while standing (e.g., stacking large blocks, completing puzzles, threading beads).

Standing and reaching (e.g., to pat a ball) Swing Using knee extension against resistance of adult's hands to activate swing. Half-kneeling Balancing activities such as reaching to pick up an object from the floor, ball catching, and throwing, ball patting [8,9].

Activities were practiced three to five times each, depending on their level of challenge for child and were repeated in different combinations, over a single session of up to one hour. Progression of all activities occurred as child's ability improved, for example, by reducing hand support, increasing the distance reached or stepped, and increasing the time to independently maintain a position.

Clinic sessions enabled specific equipment such as parallel bars, climbing bars, and a height-adjustable ramp to be used. These sessions allowed more isolated practice of his current ability and provided additional opportunities

Therapeutic taping was given for her Plantar flexors and Facial muscles (Buccinators, Orbicularis oris, Mentalis) to improve and facilitate specific muscle activity [10,11].

Discussion

Child is self-motivated, cognitively able, and mobile. In addition, her family was motivated, ensuring excellent adherence with the long term rehabilitation program. Increased intensity to three sessions weekly of physiotherapy intervention enhanced carryover and implementation of activities and exercises in all settings such as at home and at the therapist's clinic. In addition, more frequent contact with the family and preschool staff facilitated better communication about the goals and progression of treatment, so that child was practicing functional, therapeutic exercises every day. The decision was made to increase the frequency of her usual physiotherapy intervention was made so as not to waste the opportunity to improve function.

In our experience, pediatric services are reluctant to increase intervention frequency because of the extra time required from therapy staff. In this case we have scheduled her therapy sessions soon as possible. The sessions were planned with more number of sessions per week i.e., three times a week. It could be argued that the functional changes could be due solely to the increase in practice afforded by the increased adherence to intervention.

The selected functional assessment tools were valid in that they demonstrated clinically relevant changes in function after injury. They were easy to implement in a variety of settings with the family and child and did not require any specialized or expensive equipment. Parents and caregivers could easily identify the measurable changes and were aware of what to look for based on specific areas of the assessment.

Child demonstrated a clinically important change in gross motor function. The change in dimension of the GMFM did not reflect her increased balance and walking ability with quad sticks because the examination in this case was scored with the assistive walking devices. She newly acquired ability to extend the knee independently in mid-stance and it may have been this that slowed her down, resulting in a slower speed at the second examination.

Her quality of gait was observed to be more improved and with longer more equal step lengths when moving more slowly. As balance was challenged more it necessitated slower walking and resulted in practice of improved positioning of the whole lower limb, in particular hip and knee extension and some heel contact.

Child was only able to use short bursts of activity when walking with the walker, and she required rests between the short distances walked. On the other hand, she could continue walking at a slower consistent speed for longer distances later. Child showed marked improvement in stair-climbing ability over the course of the study, in being able to ascend and descend stairs in an upright position as compared to crawling up and down stairs [12]. This functional measure demonstrated sensitivity to change, and the improvement was easily observed by all those involved in her day-to-day activities.

References

1. Palisano RJ, Orlin MN, Schreiber J. *Campbell's Physical therapy for children*. 5th ed. Netherlands: Elsevier; 2018.
2. Dunn W. The impact of sensory processing abilities on daily lives of young children and their families: A conceptual model. *Infants Young Child*. 1997;9(4):23-35.
3. Myra Poernack, Nicola Gray, Karin Reuter-Rice. Moderate to severe traumatic brain injury in children: Complications and rehabilitation strategies. *J Pediatr Health Care*. 2016;29(3):e1-7.
4. Fary Khan, Ian J Baguley, Ian D Cameron. Rehabilitation after traumatic brain injury. *Med J Aust*. 2003;178:290-5.
5. Lynch JK, Hirtz DG, DeVeber G, Nelson KB. Report of the national institute of neurological disorders and stroke workshop on perinatal and childhood stroke. *Pediatrics*. 2002;109(1):116-23.
6. Monfils MH, Plautz EJ, Kleim JA. In search of the motor engram: Motor a map plasticity as a mechanism for encoding motor experience. *Neuroscientist*. 2005;11(5):417-83.
7. Neistadt ME. Perceptual retraining for adults with diffuse brain injury. *Am J Occup Ther*. 1994;48(3):225-33.
8. Ada L, Goddard E, McCully J, Stavrinou T, Bampton J. Thirty minutes of positioning reduces the development of shoulder external rotation contracture after stroke: A randomized control trial. *Arch Phys Med Rehabil*. 2005;86(2):230-4.
9. Dan B, Cheron G. Reconstructing cerebral palsy. *J Pediatr Neurol*. 2004;2:57-64.
10. Lombardi F, Taricco M, De Tanti A, Telaro E, Liberati A. Sensory stimulation for brain injured individuals in coma or vegetative state. *Cochrane Database Syst Rev*. 2002;(2):CD001427.
11. Kênia Kiefer Parreiras de Menezes. Physical therapy rehabilitation after traumatic brain injury. *J Neurol Neurophysiol*. 2015;6:4.
12. McNee E, Will E, Lin JP, Eve LC, Gough M, Morrissey MC, et al. The effect of serial casting on gait in children with cerebral palsy: Preliminary results from a crossover trial. *Gait Posture*. 2007;25:463-8.