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Physical therapy for a child with sudden onset Hemiplegia: A Case Report

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Abstract
Hemiplegia is a general term used to describe the wide variety of motor deficits that result from stroke. Motor deficits are characterized by paralysis, typically on side of the body opposite to the side of the lesion. Infantile hemiplegia is a condition that may be noted at birth or develop in first 6 years of life- there is often an abrupt onset. Infantile hemiplegia can originate from variety of primary etiologies such as cerebrovascular accident, intraventricular hemorrhage of the newborn, thrombosis: embolism or hemorrhage, transient ischemic attack, brain tumor (primary or metastatic) or infection: brain abscess, encephalitis, subdural empyema or meningitis.
The clinical symptoms of a child with spastic hemiplegia may differ from child to child and over time. The symptoms include paralysis of the muscles of one side of the body, often using only one hand during play or favoring one hand before three years of age, keeping one hand in fist, balance and co-ordination problems, difficulty with fine motor tasks like writing or using scissors and delay in reaching expected developmental milestones such as rolling, sitting, standing etc.
The purpose of this study was to review the recovery of two year old child who had acute onset infantile hemiplegia, including description of physical therapy examination, evaluation and intervention.

Keywords: Whistleblower protection policy, Public Grievance Law and Justice

Introduction

Case description

Child and history

A 2 year old male child had frequent episodes of cough and cold with troubled breathing for which investigations were done. In October 2014 he was diagnosed with mid muscular VSD with left to right shunt and pulmonary hypertension based on the investigation reports of color doppler and echo. Investigations also suggested that he had left ventricle diastolic dysfunction and left atrium volume index was increased. Patient was on medications for the same and was treated conservatively.
Child was admitted in hospital with complaints of cough, cold, fever, excessive cry and reduced activity on 7th September 2015. Investigations were done patient was diagnosed with right lower lobe pneumonia with prominent bronchovascular margins based on the reports of chest X-ray and sputum analysis. Patient was noticed to have absent left nasolabial folds with incomplete closure of left eye and drooping of left angle of mouth. On examination child had boggy anterior fontanel and brisk reflexes. CT Brain was done for the same and it showed wedge shaped non enhancing hypo dense area in right frontal matter and right basal ganglia.
MRI brain showed ill defined, irregular, heterogeneously hyper intense lesion involving right frontal parenchyma, right gangliocapsular and thalamocapsular regions with thick irregular enhancing peripheral wall and dural enhancement in right temporal region. That was causing effacement of right lateral ventricle. Minimal midline bowing to left side was seen by3.8 mm. MR spectroscopy suggested of tumefactive demyelinating lesion.
MRI brain was repeated after 6 days which showed a large peripherally enhancing hypodense lesion in right basal ganglia/ thalamus extending superiorly in corona radiate and anteriorly in right frontal matter causing mass effect. As compared to previous MRI there was significant peripheral enhancement of the lesion with increase in central hypodensity. Hence was referred to neurosurgery department. Child was assessed and right frontal craniotomy was performed with evacuation of thalamic abscess and removal of abscess wall on 19 September 2015. Patient was then referred for physiotherapy treatment and is under regular physiotherapy treatment since then.

Examination

Patient was examined by physiotherapist after the reference to the physiotherapy department post craniotomy. 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. The child's father and uncle were present at the time of examination. The child was able to follow all directions and has good receptive language skills. He did not speak to the physical therapist during the initial examination but used to communicate by moving his head indicating yes or no.
The physiotherapy examination continued with an assessment of child's impairments.
On the day of first assessment, his gross motor function was as follows: He could come to sit by himself. His spontaneous mobility was bottom shuffling. He was unable to transfer himself from ground to furniture and vice versa. He could not transition to stand from sitting or from sitting on chair position. He was unable to maintain kneel or half kneeling position independently. He could walk with two hands held by the caregiver. He had to be physically carried for outside home

ambulation. On GMFCs he was on level 4 on first day of assessment.

At present, he has improved gross motor functional level. He is able to transfer himself to and fro from furniture. He can come to stand independently from floor as well as from sitting on chair position. He can maintain kneeling position. He can come to half kneeling position but needs assistance to maintain half kneeling position. He walks independently at home and needs supervision for outside home environment. He 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. He is still unable to ascend, descend stairs independently and is currently on GMFCSs level 2. Child shows beginning of pes cavus deformity in Left foot with a tendency of equinovarus. His left plantar fascia is tight. TA is tight on left side. These are well controlled by using Ankle foot orthosis.

He demonstrates a broad base of support while functioning in activities where his center of mass is placed high i.e. standing and walking. He shows decreased anticipatory control. While in sitting he can use some counterbalance during movement. He is able to perform saggital plane movements of flexion and extension very well but has difficulty for frontal and transverse plane movements, transverse more as compared to frontal plane. He is able to overcome inertia but tends to use momentum and movements are often sudden and jerky to initiate. His movements are generally wide ranged and fast. He is unable to perform mid and end range movements with slow speed thus showing decreased eccentric control. That is why he often falls off while lowering himself from standing position and is unable to walk slowly.

He is able to reach for and grasp objects with either hand. He prefers using his Right hand. He tends to use too much pressure while holding an object and often seems to release objects suddenly. Fine tremors are noticed in the hand while it is in use for manipulation. He has just started using upper extremity for playing with toys which make noise or lights up after squeezing them etc. He has poor bilateral and bimanual hand function. He does not use hand to feed himself and for other activities of daily living. He is dependent on care-givers or all ADLs of bathing, toileting, eating. He assists for lower body undressing and is dependent for dressing.

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 he has difficulty terminating motor unit activity especially in trunk and lower extremities. He can recruit postural as well as movement motor units throughout the body but demonstrates increased use of movement motor units. He 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. He shows decreased co-activation of agonists and antagonists especially at lower extremities hips. He shows extraneous movements in the form of fine tremors, often affecting the smoothness of movement.

Child has primary impairments of communication and social skills as well as cognitive and behavioral abilities. He demonstrates reduced verbal communication skills. His nonverbal communication is mainly through eyes and gestures of the face. He tends to look at the object he wants or physically approaches the person if he wants something to be done by that person. He does not use pointing.

He has problems with regulatory system and is unable to modulate himself and often shows increased arousal levels. His arousal lowers only after doing physical work. He shows hyperactivity as seen by inability to sit steady at one place. His eye contact has improved over a period of time he still shows decreased attention span. He likes proprioceptive inputs and often enjoys being hugged tightly and kissed.

Child's physiotherapy program was play based and was performed in the familiar settings of home, preschool, 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. He 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. He also practiced ascending and descending steps backward and sideways and climbed up and down vertical climbing bars. 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 and finally by placing his feet and lower calves up a wedge from its thin end for this reaching task (thus increasing the length of hamstring muscles required to be able to reach forward to retrieve the toy). 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). 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 or stairs except by crawling. He 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

Ramp walking Ascending and descending, forward and backward between parallel bars

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 (eg, stacking large blocks, completing puzzles, threading beads) Standing and reaching (eg, 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.
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

Discussion
Child is self-motivated, cognitively able, and mobile. In addition, his 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, Atpre School, 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 his 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. Prior to craniotomy, this child did not receive physiotherapy intervention. Following intervention time increased dramatically. 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 craniotomy and intervention. 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 E of the GMFM did not reflect his increased balance and walking ability with quad sticks because the examination in this case was scored with the orthoses and assistive walking devices.
He newly acquired ability to extend the knee independently in mid-stance and it may have been this that slowed him down, resulting in a slower speed at the second examination.
His 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 he required rests between the short distances walked. On the other hand, he 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. This functional measure demonstrated sensitivity to change, and the improvement was easily observed by all those involved in LA's day-to-day activities.

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