International Journal of Physiotherapy and Research,
Int J Physiother Res 2024, Vol 12(3):4723-26. ISSN 2321-1822
DOI: https://dx.doi.org/10.16965/ijpr.2024.114

Case Report

Optimising Functional Recovery in a Paediatric Stroke patient secondary to Sickle Cell Disease: A Case Report

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ABSTRACT

Out of many causes of Paediatric Stroke, Sickle Cell Disease is one of the crucial conditions with the risk of Stroke highest during the first decade that is between the ages of 2 & 5 years.

Reported here, however, is a case of a 10-year-old male child with sudden onset left side hemiplegia with facial muscle weakness, who was a known case of Sickle Cell disease since 6 months of age. With the inability to use the upper extremities & walk independently, the patient was functionally dependent with a Fugl Meyer score of 55/126 & Berg balance scale score of 18/56. After 4 months of Physiotherapy Treatment patient was able to use the Upper extremities for functional activities and was able to walk independently with a Berg balance scale score of 46/56.

With very few cases of pediatric Stroke receiving Physiotherapy care being reported in the literature, this case report establishes the role of Physiotherapy in preventing long-term neurodevelopmental disability.

KEYWORDS: Functional Motor Recovery, Paediatric Stroke, Physical Rehabilitation, Sickle Cell Disease.

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Access this Article online	Journal Information
Quick Response code	**International Journal of Physiotherapy and Research** ISSN (E) 2321-1822 | ISSN (P) 2321-8975 **https://www.ijmhr.org/ijpr.html** **DOI-Prefix:** https://dx.doi.org/10.16965/ijpr
DOI: 10.16965/ijpr.2024.114	**Article Information** Received: 00 Apr 2024 Accepted: 00 Jun 2024 Peer Review: 00 Apr 2024 Published (O): 30 Jun 2024 Revised: 00 May 2024 Published (P): 30 Jun 2024

INTRODUCTION

Stroke in children and young adults is a morbid disease responsible for enormous indirect societal costs and a high burden of years with disability per affected patient. young childhood. Stroke in young is mainly due to Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) and inherited thrombophilia, nonmodifiable Stroke risk factors like obesity and increased mortality are associated with cryptogenic Stroke. Most Strokes in children are from 'rare' causes of Stroke, such as focal cerebral arteriopathy, vasculitis, or congenital heart disease; although Sickle cell remains an important global contributor to Stroke, functional recovery in these cases is not very well reported in the literature [1].

Sickle cell disease (scd) is a group of inherited disorders caused by mutations in the Haemoglobin subunit beta (hbb)[2]. the prevalence of sickle cell carriers among different tribal groups in India varies from 1 to 40 percent [3]. Sickle erythrocytes can lead to recurrent vaso-occlusive episodes that are the hallmark of scd [4]. Changes in the shape and physical properties of erythrocytes, resulting in hemolytic anemia and blockage of bloodflow, can damage any

organ. Four major are acute and chronic pain, cardiopulmonary disease, central nervous system disease, and kidney disease(5). Cerebrovascular disease is among the most common and debilitating complications of sca, with 53% experiencing silent cerebral infarction by age 30 and 3.8% experiencing overt Stroke by age 40 years [2]. The risk of Stroke is highest during the first decade, and it is most significant between ages 2 and 5 when it reaches 1.02% per year [6].

CASE DESCRIPTION

A 10-year-old male was brought to the Neurophysiotherapy OPD on the 11th of November 2023 with the chief complaints of Inability to move the left upper limb & lower limb for one month. He had a known case of Sickle cell disease diagnosed at the age of 6 months. The patient was apparently alright a month back when he started to experience severe pain in his back & head, due to which he was immediately taken to the hospital. Then he started experiencing an inability to lift Rt's Upper Limb & lower limb. Investigations done on 30.11.2023 indicated Acute Infarct in the Right frontal- parietal Regions & Left parietal regions with moderate narrowing of terminal portions of bilateral ICAs, Rt. ACA & MCA. After weeks of admission, 2 units of blood transfusion were done for the patient.

The patient's chief complaint was the Inability to move the upper extremities and grasping and releasing objects. He also had slurred speech & Difficulty in producing facial expressions. Deep sensations for Jt. The position was altered. There was hypotonicity in Lt. Upper Limb & Lower Limb Muscles. Brunnstorm recovery stage of hand, Upper limb & Lower limb was 1. Muscle strength for Shoulder, knee, and Hip Flexors, Elbow, Wrist flexors, and ankle dorsiflexors was Grade 0. The patient had Fair dynamic sitting balance when assessed with perturbations, and he was unable to stand independently.

Problem List Based On ICF:

Table 1: Categories present related to the component of body function, structure, activity and participation in ICF

Body Structure	Body Function	Activity Limitation	Participation Restriction	Personal Factors	Contextual Factors
Acute Infarct in Right Fronto- parietal Regions & Left parietal regions with moderate narrowing of terminal portions of bilateral ICAs, Rt. ACA & MCA.	1. Loss of strength for all muscles of left upper & Lower extremity. 2. Fair Sitting balance 3. Inability to stand independently	Inability to move the left upper & Lower extremity, leading to affected basic activities of daily living.	Unable to resume school due to inability to walk independently.	Positive – Young age, Family Support. Negative – Lack of motivation.	Inability to resume school & involve in play with children of same age.

ICA- Internal CArotid artery, ACA- Anterior Cerebral Artery, MCA- Middle carebral Artery.

Physiotherapy Intervention: The primary goal of rehabilitation was to prevent complications, minimize impairments, and maximize function. The Focused Short-Term Goals were to normalize muscle tone, improve muscle strength, improve sitting and standing Balance, and improve the ability to lift and carry objects for one month. The long-term Goals were to improve hand function and gait Ability.

For normalizing the tone, Rood's approach of weight-bearing on joints of the upper and lower extremities was used. To improve muscle strength, Abdominals, and Back Extensors, a Core stabilization exercise consisting of Bridging For 15 seconds hold with 10 repetitions and initial curl-ups with Straight hands reaching for 10 seconds hold with 10 repetitions.

Upper Extremity & Lower Extremity PNF was started in an assisted pattern with the goal of improving strength. As a progression for lower extremity strengthening, Squatting with a hold of 10 secs and Lunges with 10 secs hold given. Facial muscle exercises with the irradiation principle of PNF and with feedback via a mirror 5 times per week over 3 weeks were given. Cathodal tDCS was delivered during the first 20 min of each 60-min intensive therapy session. The anode was placed over the ipsilesional supraorbital region & cathode was

centered over the contralesional primary motor cortex (M1). Stimulation current was ramped to 1.5 mA and held for 20 min. Continued for Over 10 consecutive weekdays to promote motor learning.

RESULTS

On a repeat evaluation after 2 months of ongoing rehabilitation, Improvement was significant for the upper extremity subscales and balance scale. Table 2 shows patient-related outcome measures and their progress over 2 months.

Table 2: Showing the outcomes at different intervals

Outcomes	Before (December 28, 2023)	After 2 months (February 28, 2024)	After 4 months (April 28, 2024)
Fugl-Meyer Assessment Upper Extremity	12/36	22/36	28/36
Wrist	0/10	2/10	3/10
Hand	0/10	2/14	5/14
Co-ordination/speed			
Sensation	0/6	2/6	5/6
Passive Joint Motion	5/12	12/12	12/12
Joint Pain			
Berg Balance Scale score	24/24	22/24	24/24
Palpation Meter	21/24	23/24	24/24
Distance Between 2 Inferior angles	14/56	42/56	46/56
Height discrepancy between inferior angles	18 cm 1.6 cm	17 cm 0.5 cm	11 cm 0.2 cm

achieved as on 28/02/24
Fig. 1:
Facial deviation as on 28/11/24

Figure 2 - Facial Symmetry

DISCUSSION

Childhood Stroke results in Long-term neurodevelopmental disability in 50 % of the cases, with broad-reaching implications in daily life. A study done by Anna Cooper et al. [7] on trajectories of motor recovery in childhood Stroke suggests that preschool-aged(1-6Yr.) children may have the best motor outcomes and recovery trajectory, Also suggesting that older children (>6) may have less plasticity implied by lower adaptive behavior scores(7).

It was expected to get a lower Functional motor recovery in the present case, but a problem-specific approach led to an improvement in the functional status.

tDCS intervention, used for the facilitation of movement, was also found in a study by Ciechanski P et. al., which concluded that tDCS intervention combined with comprehensive motor rehabilitation in chronic hemiparesis secondary to childhood Stroke are safe, feasible, and can enhance motor learning in school-aged children [8].

Joint compression & PNF techniques were used to normalize the tone and improve motor strength. A study by Patel BR et al. shows Joint Compressions, when done appropriately, can help to promote increased co-activation of muscles around the joint and help a children maintain joints in alignment against gravity in patients with diabetic neuropathy [9].

PNF approaches enhance functional movements by employing concentric, eccentric, and isometric contractions to facilitate, inhibit, strengthen, and relax muscle groups was studied by Kruse A et al. & Guiu-Tula FX et al. [10,11]. Improvements in functional ability often lead to improved Quality of life [12].

CONCLUSION

With targeted problem-specific intervention, this patient achieved near-normal functional recovery within 4 months of treatment, thereby reducing long-term functional morbidity.

Conflicts of interest: **None**

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How to cite this article: Optimising Functional Recovery in a Paediatric Stroke patient secondary to Sickle Cell Disease: A Case Report. Int J Physiother Res 2024;12(3):4723-4726. **DOI:** 10.16965/ijpr.2024.114