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CASE REPORT - PUBLIC HEALTH

APPLICATION OF SHORT-CONCENTRATION MODIFIED CONSTRAINT-INDUCED MOVEMENT THERAPY FOR INFANTILE HEMIPLEGIA WITH FUNCTIONAL ABILITY DIFFICULTIES: CASE STUDY

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Abstract

BACKGROUND OF THE STUDY : Infantile hemiplegia refers to brain injuries that occurs Prenatal or at Perinatal and lead to hemiplegia/ total paralysis of one side of the body, including the face, arm and leg. The main purpose of this article is to provide valuable information to Occupational therapist about the short concentration Movement therapy view point and treatment alternatives for patients with infantile hemiplegia.

OBJECTIVE : To assess the functionality of the affected upper limb in infant diagnosed with hemiplegia aged between 0 and 1 years after applying short-concentration modified Constraint-Induced Movement Therapy (mCIMT).

METHODS : Prospective case study. A M-CIMT protocol was applied for twelve weeks, with two hours of restraint per day. The study variables were quality of functional ability of the upper limb, recurrent use, participation of the affected upper limb in self-care and unstructured activities, active joint position, hand grasp–release action, hand grasp strength, supination and extension elbow movements. Four measurements were performed, using to measure the functional ability assessment based on Functional Status Score (FSS).

RESULTS : The subject was composed of infant with moderate manual functional ability. Statistically significant differences were detected in all the studied variables ($p < 0.021$), between the pre-treatment and post–treatment results (2–Weeks), except for upper limb dressing, putting on lower body dressing. In the 8-12 week, the changes were statistically extremely significant, except for protective extension, grasp strength, grasp–release and all functional variables (level of functionality and participation of the patient's upper limbs) in the FSS Evaluation $p < 0.0011$. The greatest increase occurred in spontaneous use from pre assessment to post Assessment ($p = 0.01$), reaching 88.87% active participation in bimanual sensory tasks. The quality of movement of the upper limb exhibited a significant value due to the increase in dissociated movements and hand grasp ($p = 0.01$).

CONCLUSION : A short-concentration (50 hours) of M-CIMT increased the functionality of infant diagnosed with hemiplegia between birth - 1 years of age with moderate manual ability.

KEY WORDS : Paediatric Occupational Therapy, Infantile Hemiplegia, functional Ability difficulties, Modified Constraint-Induced Movement Therapy

INTRODUCTION

Hemiplegia in infant is now recognised as an important cause of morbidity and mortality. There are essential developmental differences in hemiplegia in infant compared with adults who make the recognition and treatment of infant challenging. Hemiplegia in infant is relatively rare and frequently results in a lack of recognition and delay of diagnosis. The aetiologies of hemiplegia in infant are brain lesions, no single risk factor predominates. A wide variety of conditions predisposes to cerebral infarct or haemorrhage in infant and the underlying mechanism and cause in each individual can only be recognized with an informed and careful diagnostic approach. Increased awareness of hemiplegia will result in being brought to medical attention as rapidly as possible. With more rapid diagnosis, newer forms of thrombolytic and Neuro protective agents may become future treatment options for these infants. Large multicentre collaborative intervention trials are necessary to determine the role of antithrombotic and other therapies in paediatric patients with hemiplegia. Although rare in infant the effects of hemiplegia have a significant impact on Childs development and lifelong burden of illness.

Thus, in directive to improve the affected upper limb "non-use", Modified Constraint-Induced Movement Therapy (M-CIMT) is used, which consists of constraining the healthy upper limb with a complete or partial containment

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(Modified activities), thus promoting the use of the affected upper limb functional Ability difficulties in activities of daily living and self-care. The functional ability tasks integrate the repetition of the motor action with a variety of upper extremity activities. The use of M-CIMT has spread in recent years among paediatric occupational therapists, due to the large number of studies that support the effectiveness of this intervention compared to previous interventions that do not restrict the use of the healthy side. However, in its innovative conception, two premises had to be met: the restriction of the less-affected upper limb and the functional application of an intensive treatment applied in a structured way to the upper limbs. Different alternatives of M-CIMT have emerged over the years, under the term "Modified Constraint-Induced Movement Therapy" (M-CIMT). there are a variety of protocols used for CIMT, in which different repression systems are proposed.

In this line, one of the modifications widely used in paediatrics is the one based on M-CIMT, which obliges the healthy upper limb for less than 3 hours. Found that a fewer intensive (UE) Flexor Synergy recovering stages-based treatment (63 hours of treatment over 3weeks) produced similar benefits compared to a further intensive approach (126 hours of treatment over 3weeks). Functional abilities gains may be possible for some infant with a less intense program adjusted to 20 hours of occupational therapy in more than two consecutive weeks. According to Schweighofer et al., the reality of a "functional ability" would be necessary for the maintenance of functionality after occupational therapy, below which the use of the upper limb decreases while the benefits to the individual remain above such threshold. It would be useful to determine the specific doses of therapy in each patient. Consider assessing the functionality of ability the affected upper limb in infant diagnosed with infantile hemiplegia with moderate manual ability between birth and 1 years of age after applying low-intensity modified constraint-induced movement therapy (20 h) at individual educational programme. Many occupational therapists use a M-CIMT or another special treatment tool to help patients with the functional ability difficulties. When the activities are executed on a m-CIMT rather than done on a plinth, the hand muscles may be activated more effectively as a patient's function is perturbed when a self-care beneath them, and the muscles respond in instruction to help the patient maintain the ideal hand function. Due to the clinical symptoms found in infantile hemiplegia, there is an impairment in activities of daily living, which further affects the quality of life of the infant. So far, paediatric therapy has been beneficial. It is necessary to preserve the hand functional ability difficulties and self-care activity.

CASE HISTORY :

As narrated by parents, the one-year-old male master was apparently one month back. Then, he suddenly develops focal seizure, which was relieved by consultation and medication given by their family doctor. The episodes of sudden fever continued two to three times weekly. But later, the child experienced a high-grade temperature; the parents immediately rushed he to a nearby government hospital, where he was admitted to the general ward for two days. On the second day, he experienced his first episode of convulsions and was referred to a private hospital in their local place, and he was urgently admitted to the intensive care unit. Investigations like MRI was done, and the child was diagnosed with infantile hemiplegia. During the period of stay in the PICU, the child developed a few episodes of seizure for which medications were given and brought under controller. It further leads to loss of right-side upper limb weakness, and right lower limb weakness. After a stay of 30 days in the PICU, the child was shifted to the general ward. As the child's condition was deteriorating and there was availability physical therapy, a lack of availability for occupational therapy treatment, The child was referred to Magil milestone therapy centre for further treatment. The child was referred for Paediatric occupational therapy for further management on the 15th of March 2022. After master receiving Paediatric occupational therapy 6 days a week /3month, (February-April-2022) each session lasted 45 to 50 minutes; therapy was planned in such a way to feed his Flexor Synergy recovering stages, and to improve his muscle tone, self-care and functional abilities. Based on the assessment report and a detailed discussion with medical history from the parent, the following goals were included in the therapeutic intervention program. Therapy was playing based with unstructured to structured activities and included Sensory Integration and Modified Constraint-Induced Movement Therapy. His family members were invited to actively participate in sessions and home program was provided to his family on a regular basis to encourage continuity at home.

METHODOLOGY :

This is a case study, Before initiating the study, a well-versed consent form was given mother to the infant family to participate, which definite the right to withdraw from the study at any time, if required by the participant.The

inclusion criteria were a medical diagnosis of right infantile hemiplegia, age between birth and 1 years, lack of activity of the affected upper limb, ability to exceed 10° extension in the metacarpophalangeal and interphalangeal joint, ability to comprehensive a 20° extension of the wrist of the affected upper limb, adequate intellectual development to understand the non-verbal orders given for the execution of tasks and cooperation in their performance. In the same way, the exclusion criteria were visual problem that prevented the specific from carrying out the intervention.

Treatment plan decided was to (GAS) Goal attainment scale performance pre and post intervention followed by Short concentration Movement therapy application, also along with extraction of retained primary self care management followed by Weefim 7 point rating follow scale. Upper extremity each major joints component should assess Muscle tone by Modified aswarth scale (MAS).Upper extremity sensory component, General, Avoiding avoider, Sensory seeking, Registration by stander, component assess by sensory profile tool. FSS scale component assess Posture, alignment, self care, Function ability by Functional status score. And also following brun storm UE recovery stages pre and post intervention assess Upper extremity. These scales component pre and post intervention statistically analysed.

PAEDIATRIC OCCUPATIONAL THERAPY INTERVENTION

Figure 1 : The Occupational Therapy intervention protocol is depicted in follows Figures

Problem identified	Goal	Treatment strategy	Intervention
Functional ability	To integrative tone in postural alignment	NDT	Scapula mobilization
			Weight bearing activities
			Trunk rotation
			Bed mobility
Head/neck control	To enhance head and neck control	Facilitatory approaches and vestibular stimulation	Swing activities
			Head control in prone activities with a wedge
			Full body extension and supine lateral rolls with flat swing
			Chair swing activities
Sensation	To integrative sensation	Multisensory strategy	Tactile activities
			Proprioceptive activities
			Vestibular activities
Oro motor	a strength of grade	Oro-motor rehabilitation	Oro-motor muscular retraining
Hand function- Flexor Synergy	Hand functional activities	Constraint-Induced Movement Therapy	Affected side-involving activities maximum as per movement therapy protocol

OUTCOME MEASURE

Table 1: Characteristic of data pre-post-evaluation- Modified Ashworth scale (MAS)

Characteristic of data-Unpaired t-test	pre-test Intervention (MAS)	post-test intervention (MAS)
Mean	16.67	84.83
standard deviation	7.76	26.90
standard error (SE) means	3.17	10.98
95% confidence interval difference	98.35	37.98

Table 1; data shows (MAS) pre-post-test evaluation scores of all scale components of subject, mean values are 16.67 and 84.83, respectively standard deviation 7.76 and 26.90 respectively sample size, standard error of mean 1.34 and 1.24, the mean of pre and Post intervention 95% 01confidence interval of this difference 3.17 and 10.98, respectively.

Table 2 : 't' test between characteristics of data pre-post-evaluation- Modified Ashworth scale (MAS)

S. No.		Variable 1	Variable 2	P value	T value	Level of Significance
2		pre-test intervention	post-test intervention	0.0021	5.8050	Very statistically Significant

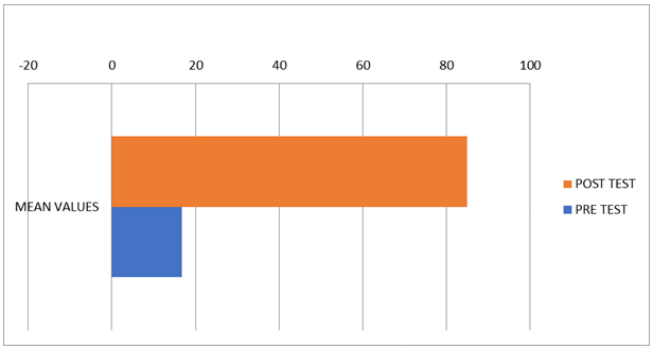

Figure 1 : Mean of Pre control and pre-experimental groups of evaluation - Modified Ashworth scale (MAS)

Table 3: Characteristic of data pre-post-evaluation- FSS

Characteristic of data-Unpaired t-test	pre-test intervention (FSS)	post-test intervention (FSS)
Mean	5.40	10.00
standard deviation	2.07	0.00
standard error (SE) means	0.93	0.00
95% confidence interval difference	6.74	2.46

Table 3 : data shows (FSS) pre-post-test evaluation scores of all scale components of subject, mean values are5.40. and 10.00, respectively standard deviation 2.07 and 0.00 respectively sample size, standard error of mean 0.93 and 0.00, the mean of pre and post intervention 95% 01confidence interval of this difference 6.74 and 2.46, respectively.

Table 4: 't' test between characteristics of data pre-post-evaluation- Functional status score (FSS)

S. No.		Variable 1	Variable 2	P value	t value	Level of Significance
3		pre-test intervention	post-test intervention	0.0011	4.9603	Very statistically Significant

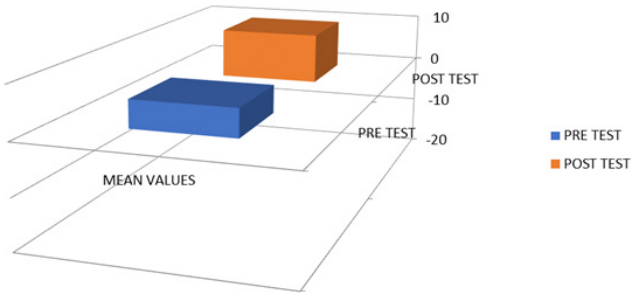

Figure 1: Mean of characteristics of data pre-post-evaluation- Functional status score (FSS)

Table 5: Characteristic of data pre-post-evaluation- Sensory profile (SP-2)

Characteristic of data-Unpaired t-test	pre-test intervention (SP-2)	post-test intervention n (SP-2)
Mean	20.31	57.54
standard deviation	13.26	8.49
standard error (SE) means	3.68	2.36
95% confidence interval difference	47.65	26.81

Table 5; data shows (SP-2) pre-post-test evaluation scores of all scale components of subject mean values are 20.31 and 57.54, respectively standard deviation 13.26 and 8.49 respectively sample size, standard error of mean 3.68 and 2.36, the mean of pre and post intervention 95% 01confidence interval of this difference 47.65 and 26.81, respectively.

Table 6: 't' test between characteristics of data pre-post-evaluation- Sensory profile (SP-2)

S. No.		Variable 1	Variable 2	P value	t value	Level of Significance
6		pre-test Intervention	post-test intervention	0.0001	7.7845	Very statistically Significant

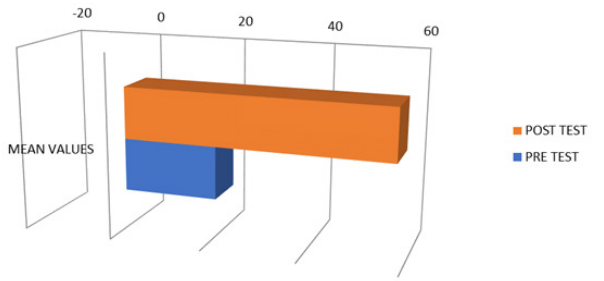

Figure 1: Mean of Pre control and pre-experimental groups of evaluation -Sensory profile (SP-2)

DISCUSSION

The purpose of the study is to determine the Application of short-concentration Modified Constraint-Induced Movement Therapy for Infant with Infantile Hemiplegia with functional Ability difficulties The deterioration of functional difficulties causes a weakness present in the execution of activities of daily living in infant with hemiplegia. Treatment plan decided was to (GAS) Goal attainment scale performance pre and post intervention followed by Short concentration Movement therapy application, also along with extraction of retained primary self care management followed by Weefim 7 point rating scale.Data shows (MAS) pre-post-test intervention scores of all mono subject, mean values are 16.67 and 84.83, respectively standard deviation 7.76 and 26.90 respectively sample scale components standard error of mean 1.34 and 1.24, the mean of pre and post intervention 95% confidence interval of this difference 3.17 and 10.98, respectively.

These results are supported by Chen Y.P., Pope S., Tyler D., Warren G.L. Effectiveness of constraint-induced movement therapy on upper-extremity function in children with cerebral palsy: A systematic review and meta-analysis of randomized controlled trials. Case study obtained significant changes in the functional activities of daily life assessed, excluding in dressing the upper limbs, putting on splints and buttoning buttons. This could suggest the need for improvements in visuomotor coordination and bimanual coordination, and greater strength and precision in the affected grasp to support objects and to perform the activities, which require great ability in the affected upper limb.

Data shows (FSS) pre-post-test intervention scores of all scale components subject, mean values are5.40. and 10.00, respectively standard deviation 2.07 and 0.00 respectively single sample size, standard error of mean 0.93 and 0.00, the mean of pre and post intervention 95% confidence interval of this difference 6.74 and 2.46, respectively. These results are supported by Rostami H.R., Arastoo A.A., Nejad S.J., Mahany M.K., Malamiri R.A., Goharpey S. Effects of modified constraint-induced movement therapy in virtual environment on upper-limb function in children with spastic hemiparetic cerebral palsy: A randomised controlled trial.

The advantage of combining a short-concentration Modified Constraint-Induced Movement Therapy of treatment with the occupational of therapy in the infant own home is that this modification is better accepted by both parents and the infant, as reported by authors such as , who showed better rates of parental competence among those who had applied low doses of treatment.

Data shows (SP-2) pre-post-test intervention scores of all scale components subject, mean values are 20.31 and 57.54, respectively standard deviation 13.26 and 8.49 respectively single sample size, standard error of mean 3.68 and 2.36, the mean of pre and post intervention 95% confidence interval of this difference 47.65 and 26.81, respectively. The objective of study supported Eliasson A.C., Krumlinde-Sundholm L., Gordon A.M., Feys H., Klingler K., Aarts P.B.M., Rameckers E., Autti-Rämö I., Hoare B. Guidelines for future research in constraint-induced movement therapy for children with unilateral cerebral palsy: An expert consensus. Dev. Med. Child Neurol. 2014;56:125–137. doi: 10.1111/dmcn.12273.

Likewise, some infant showed higher levels of frustration or low tolerance was shown by both the infant and the family members with higher doses of treatment. To minimize such feelings, some authors have proposed adapting the original protocol, suggesting the use of the repression only during the intervention period, reducing the dose and using a protocol that is "infant friendly" and enhances infant engagement. Thus, our proposal could positively affect these aspects.

CONCLUSION

Application of short-concentration Modified Constraint-Induced Movement Therapy for Infant with Infantile Hemiplegia with functional Ability difficulties and its role in enhancing participation and improving functional ability of self-care and also to facilitate infant upper extremities performance and Modified Constraint-Induced Movement Therapy Day to day function meaningfully. The short-concentration Modified Constraint-Induced Movement Therapy focuses on the child's goal setting and hand function, thereby enhancing un structure and promoting flexor synergy pattern wise recovery. Movement Therapy analysis includes an understanding of the landscape task, Internal and external factors contexts that both facilitate and independent performance.

LIMITATIONS OF THE STUDY

This case study has several limitations. First, given the broad scope of the study and the amount of literature within each diagnostic category, it was possible to provide only a general synthesis of the overall effect of mCIMT intervention types. We were not able to include detailed metaphors of case study for direct comparison; however, descriptions of the interventions and characteristics are provided in Supplemental Table 1,2,3,4,5,6 for orientation and comparison. we were unable to teach out the effects of variations in activities and specific characteristics of individual interventions (e.g., type of activities, settings for physical modalities). The issue with collection of interventions was frequently noted in the other case study included in this fusion, indicating a need for more thought in the design of future rehabilitation research studies.

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