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TO SEE THE EFFECT OF CONSTRAINT INDUCED MOVEMENT THERAPY AND NEURODEVELOPMENT THERAPY IN HEMIPLEGIC CEREBRAL PALSY

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ABSTRACT:

Cerebral palsy (CP) is primarily a neuromotor disorder that affects the development of movement, muscle tone and posture. The underlying pathophysiology is an injury to the developing brain in the prenatal through neonatal period. Although the initial neuropathologic lesion is non-progressive, children with CP may develop a range of secondary conditions over time that wills variably affect their functional abilities.1 Hemiplegia in Infants and children is a type of cerebral palsy that results from damage to the part of hemisphere of the brain that controls muscle movements. This damage may occur before, during or shortly afterbirth.2 The aim of study is to compare the effects of CONSTRAINT INDUCED MOVEMENT THERAPY and NEURODEVELOPMENT THERAPY in patients with Hemiplegic cerebral palsy. It's a comparative study with 30 subjects was requited with hemiplegic CP. Result illustrates comparison between age of Group A & B. It was found that mean & standard deviation of age in Group A is 8.60 ± 4.067 & for Group B 7.93 ± 3.730 with mean difference of 0.67, with p value p= 0.6436 which is not significant. The groups for Upper Extremity functional Index for Pre mean & S.D for Group A & Group B was 29.00±14.041 & 42.73±18.215 & post mean & SD for Group A & Group B was 40.33±12.882 & 52.87±14.232. Pre & Post mean difference for Upper Extremity Functional Index for both the group was 13.73 & 12.53 & p value was p= 0.028 & p= 0.01 which is significant. Conclusion The study shows that constraint induced movement therapy & neuro developmental therapy improves upper extremity functions & tone, but spastically constraint induced movement therapy give more significantly improvement motor function & tone in Hemiplegic CP.

KEYWORDS:

Cerebral palsy (CP) is primarily a neuromotor disorder that affects the development of movement, muscle tone and posture. The underlying pathophysiology is an injury to the developing brain in the prenatal through neonatal period. Although the initial neuropathologic lesion is non-progressive, children with CP may develop a range of secondary conditions over time that wills variably affect their functional abilities.[1]

Hemiplegia in Infants and children is a type of cerebral palsy that results from damage to the part of hemisphere of the brain that controls muscle movements. This damage may occur before, during or shortly afterbirth.[2]

CP describes a group of permanent disorders of movement and posture, causing activity limitation that is attributed to non progressive disturbances that occurred in the developing fetal or immature brain. The motor disorders of CP are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problems.[3]

The term hemiplegia means that paralysis is on one vertical half of the body. A similar medical term, Hemiparesis, means a weakness on one side of the body. In children with hemiplegia, the paralysis in the body occurs on the side opposite the affected part of the brain. For example, if the left side of the child's brain is injured, then the paralysis will be on the right side of child's body.[4]

Hemiplegic cerebral palsy (CP) is the most common syndrome in children born at term, and is second in frequency only to diplegia among preterm infants (Hagberg et al. 1996). In comparison with most types of CP, infantile hemiplegia is usually characterized by an uncomplicated natural history, and the affected child has a reasonable prospect of leading a more fulfilled adult life (Scrutton 2000).[5]

Impaired arm and hand function are the main problems in about half of affected children (Uvebrant 1988) and are the main factors contributing to disability in activities of daily living (ADL).[6]

Several studies on grasping and fine manipulation in children with hemiplegia have been published during the past decade or so (Eliasson etal. 1991, 1992, 1995; Gordon and Duff1999).[7]

In these studies the pathophysiology of upper limb impairment was investigated and it was concluded that disturbed sensory mechanisms are the main but not the only determinants of fine manipulation compromise and that this might have direct implications for therapeutic intervention (Eliasson 1992, 1995; Gordon and Duff 1999).[8]

Symptoms of Hemiplegia in a child-: Stiffness and weakness in muscles on one side of body. Only using one hand during play or favoring one hand before the age of 3 years. Keeping one hand in a fist. Difficulty with walking and balance. Difficulty with fine motor tasks like writing or

using scissors. Delay in reaching expected developmental milestones such as rolling over, sitting up, crawling or smiling.[9]

Cerebral hemiplegia is often the result of a brain injury. A wide range of physical, cognitive and behavioral effects can result from a brain injury. Each child is different and your child may or may not have some of the following effects of braininjury.[10]

Memory, Attention and concentration, executive function, speech and language, social communication, sensory effects, seizures[9].Hemiplegia is not a progressive condition, norisita disease. As children experience growths purt, they may have more problems with muscle spasticity, but this doesn't mean that the initial injury has gotten worse. Children of hemiplegia tend to show some atrophy of the hand arm, shoulder, leg & foot. Th e child's arm and leg on the affected side are often shorter than the other side. The limb may appear shorter but this appearance is not a true length difference and is actually due to the increased muscle tone pulling the limbupward[10].

CAUSES OF HEMIPLEGIA IN CHILDREN-

Inter ventricular hemorrhage of newborn, thrombosis, embolisms and hemorrhage. Transientischemic attack, migraine syndrome, head trauma, brain contusion, subdural hematoma, Sturge Weber syndrome, Todd's paralysis, brain tumor, infection, brain abscess, encephalitis, vasculitis, congenital or perinatalinjury.[11]

Children with hemiplegia can't be cured but therapists can help with some of the symptoms. Medications can be prescribed for the seizures. Orthotics, braces, and splints may help with spasticity and gait.[11]

EPIDEMIOLOGY

According to World Health Organization (WHO) estimation, 10% of the global population has some form of disability due to different causes; in India, it is 3.8% of the population. Nearly 15-20% of the total physically handicapped children suffer from Cerebral Palsy (CP). For India, the estimated incidence is around 3/1000 live births; however, being a developing country, the expected actual figure may be much higher. Despite the advancement in modern technology and improved neonatal care, stagnant or increasing incidence of CP has been observed, which is of great concern.[12]

Monitoring of the CP prevalence and determination of whether changes in risk factors (such as birth weight distribution and number of multiple births) affect the prevalence of CP over time require ongoing, systematic, population-based surveillance. Population- based monitoring of CP prevalence also helps determine service needs for affected children and their families. Descriptions of the frequency of CP subtypes in the population may also yield clues regarding etiology, and studies of functioning can help clinicians and other service providers develop more coordinated, more holistic care.[13]

AIM OF STUDY

The aim of study is to compare the effects of CONSTRAINT INDUCED MOVEMENT THERAPY and NEURODEVELOPMENT THERAPY in patients with Hemiplegic cerebral palsy.

OBJECTIVES OF STUDY

To study the effectiveness of CONSTRAINT INDUCED MOVEMENT THERAPY in Hemiplegic cerebral palsy patients.

To study the effectiveness of NEURODEVELOPMENTAL THERAPY in Hemiplegic cerebral palsy patients.

To determine whether CONSTRAINT INDUCED MOVEMENT THERAPY and NEURODEVELOPMENT THERAPY will be beneficial in Hemiplegic cerebral palsy patients.

SIGNIFIANCE OF THE STUDY

CONSTRAINT INDUCED MOVEMENT THERAPY and NEURODEVELOPMENT THERAPY improves upper extremity motor function in children with CP, potentially overcoming developmental disregard.

MATERIALS AND METHODS

Study Design

Comparative Study

Sampling Convenient

sampling

Sample size 30 subjects recruited.

Group A: 15 Patients

Group B: 15 Patients

ETHICAL APPROVAL AND CONSENT FORM

Ethical approval was taken by TDTRDAV Institute of Physiotherapy and Rehabilitation and Informed consent forms will be obtained from the subjects.

Sampling criteria[31]

INCLUSION CRITERIA

I. Hemiplegic cerebral palsy patients.

II. Both genders

III. Having at least 10° of active extension of each metacarpophalangeal joints, inter-phalengeal joints of all the digits and 10° wrist extension of the affected limb,

IV. Spasticity grade ≥1 according to Modified Ashworth Scale,

V. Mini Mental State Examination≥17.

VI. Age limit 4-14years.

EXCLUSION CRITERIA

i. Subjects with severe aphasia,

ii. Severe shoulder pain affecting therapy or any co morbid condition that could limit upper extremity function.

iii. Subject with Unadjusted hearing and visual impediments.
iv. Subject with Moderate to severe intellectual disability with IQ below 60.
v. Studies reporting non conservative rehabilitation interventions including surgery and pharmacological management (e.g. Botox therapy)

VARIABLES

Independent Variables

i. Constraint Induced Movement Therapy
ii. Neuro developmental Therapy
iii. Conventional Physiotherapy

DEPENDENT VARIABLES

i. Upper Extremity Function
ii. Muscle Tone

PROCEDURE

The subject will be included in the study according to the inclusion and exclusion criteria. The detail procedure will be explained to the subjects before the treatment plan. A consent form will be signed by the family of patients.

Assessment before the treatment will be done clinical evaluation included first an assessment of motor impairments involving, in order of testing, measurements of PROM, muscle tone, MMT, grip strength and two classifications. These assessments were evaluated in supine position, except for grip strength and the classifications which were tested in sitting position. Secondly, a sensory assessment was performed in sitting position, involving, in order of testing exteroception, proprioception patient will be allotted into three groups: Group A and Group B.

Group A will be given CONSTRAINT INDUCED MOVEMENT THERAPY Participants wear a mitt on the less affected arm 90% of their waking hours Perform repetitive task-oriented training with the affected arm 6-7 hours per day Perform for 10 - 15 consecutive weekdays

There are 3 major components;

Shaping is a training method in which a motor task is gradually made more difficult. Shaping programs are individualized consisting of 10-15 tasks selected primarily from a basic battery of tasks. Each task is usually performed in a set of 10-30 sec trials. At the end of each set of 10 trials, the task is changes. Only one shaping parameter is changed at a time. Requires constant therapist involvement.

1. Task practice is repetitive practice of individual functional tasks that takes roughly 15- 20mins. Rest is provided as required. Encouragement is given on an infrequent basis (i.e. every 5 mints) with feedback at end of task as well about how they performed requires less therapist involvement.

2. Package of behavioral techniques is designed to transfer gains from the clinic to daily life Includes a behavioral contract that identifies tasks that the participant will attempt to perform. Furthermore, this allows for identification of barriers and problem solving overcoming these obstacles. The daily administration of the motor activity log promotes adherence.

3. Group B will be given NEURODEVELOPMENT THERAPY patient is in supine position,

The outstretched affected arm shoulder will be on the pillow to avoid shoulder retraction

The unaffected hand will grasp the affected hand and take it up horizontally and side to side. Repeat it 10-15 times for 5 days in a week.

PROCEDURE 2.

Patient is lying on Swiss ball on his trunk in prone position; patient is holding affected hand of the patient on the small table and ask the patient to reach for the toy from the unaffected hand. And weight bearing on affected hand.10-15 repetition for 5 days in a week.

PROCEDURE 3.

Patient is on mat, physiotherapist is holding the thigh of the patient and patient is walking on the palm in prone position, asks the patient to reach for a toy from unaffected hand and patient is holding full body weight on affected arm.

Ask the patient to repeat the same for 10-15 times, and repeat it 5 days in week.

CONVENTIONAL THERAPY

Physiotherapist (PT) is a fundamental part of spasticity management. Muscle over activity produces muscle shortening and muscle shortening increases spindle sensitivity. Muscle contracture and stretch sensitive muscle over activity are intertwined. Therefore rehabilitation and physical treatments aimed at lengthening the over active muscles are fundamental. Address both shortening and over activity. There are a number of different dynamic Occupational and Physical therapy approaches, including the Bo bath technique, Sensory integration therapy, poprioceptive neuromuscular facilitation and the Brunnstrom technique. Consider applying various techniques such as ice (cold), heat, positioning, stretching exercises and use of orthotic devices for these purposes. Cold inhibits spastic muscles, but the effect is short-lived, perhaps outlasting the application of the cold by about half an hour. Paradoxically, heat is also used for relaxation of a spastic muscle. Position the child to stretch the spastic muscles and decrease the sensitivity of the stretch reflex and the brain stem reflexes that trigger spasticity. Also, the therapists should teach these positions to the family so that the child lies and sits this way most of the time at home. Massage and stretching muscles may prevent contractures and promote muscle growth. Spasticity decreases with slow and continuous stretching. This effect lasts from 30 minutes to 2 hours. Use stretching exercises before bracing and serial casting to obtain the necessary joint position]. Also, Orthoses are

generally used in conjunction with occupational therapy and physical therapy with the aims of increasing muscle length (through providing a prolonged stretch), breaking up mass patterns of movement and improving biomechanics and stability. Muscle relaxation after stretching exercises lasts for a short period of time. For longer duration the stretch on the muscle should be maintained for several hours every day. This is possible with the use of rigid splints or serial casting. Repetition for 5 daysin a week for 15 weeks[28].

RESULT AND DATA ANALYSIS

The data analysis was done with the help of SPSSv-20. Descriptive statistics (mean & standard deviation) was used for demographic data. Within group analysis was done with paired t- test. Between groups analysis was done with independent t- test.

DEMOGRAPHIC DATA

A total of 30 subjects were participated both males & females age group of 4-14 years. The mean age for group A subjects were 8.60±4.067. The mean age for group B was 7.93±3.731.

Unpaired T Test	Comparison	
	Age	
	Group A	Group B
Mean	8.60	7.93
S.D.	4.067	3.731
Number	15	15
Maximum	16	14
Minimum	4	4
Range	12	10
Mean Difference	0.67	
Unpaired T Test	0.468	
P value	0.6436	
Table Value at 0.05	2.05	
Result	Not-Significant	

TABLE 5.1: ILLUSTRATES COMPARISON BETWEEN AGE OF GROUP A & B. IT WAS FOUND THAT MEAN & STANDARD DEVIATION OF AGE IN GROUP A IS 8.60 ± 4.067 & FOR GROUP B 7.93 ± 3.730 WITH MEAN DIFFERENCE OF 0.67, WITH P VALUE P= 0.6436 WHICH IS NOT SIGNIFICANT.

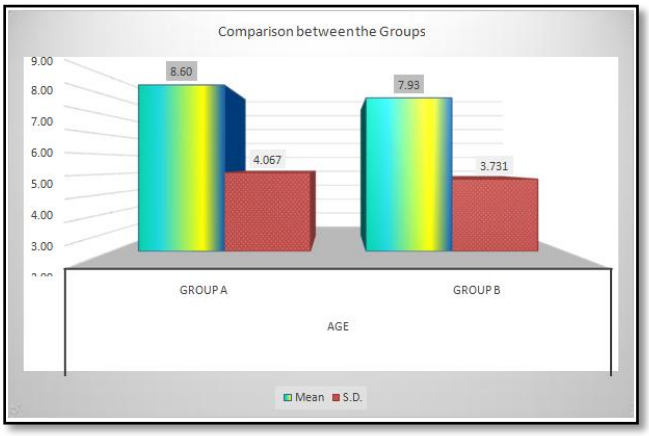

FIGURE NO. 5.1: COMPARISON OF AGE BETWEEN THE GROUPS.

Within Group

Paired T Test	Group A	
	Modified Ashworth Scale	
.	Pre	Post
Mean	2.37	1.53
S.D.	0.743	0.790
Number	15	15
Maximum	4	4
Minimum	1.5	1
Range	2.5	3
Mean Difference	0.83	
Paired T Test	5.229	
P value	0.0001	
Table Value at 0.05	2.15	
Result	Significant	

TABLE NO: 5.2: ILLUSTRATES COMPARISON WITHIN THE GROUP FOR PRE & POST MEAN & SD FOR GROUP A FOR MODIFIES ASHWORTH SCALE WAS 2.37±0.743 & 1.53± 0.790 WITH MEAN DIFFERENCE OF 0.83; P=0.0001, WHICH IS SIGNIFICANT

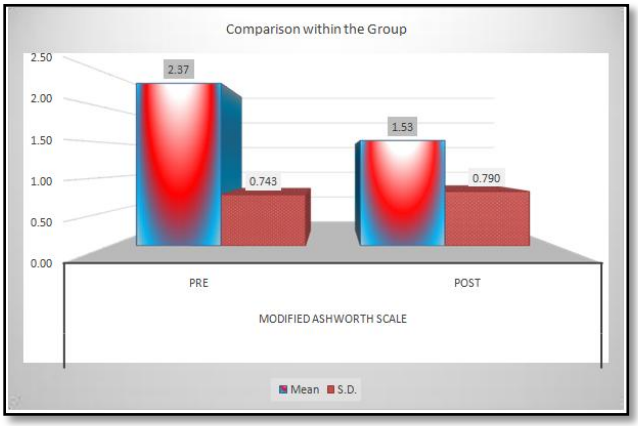

FIGURE NO. 5.2: COMPARISON WITHIN GROUP FOR MODIFIED ASHWORTH SCALE FOR GROUP A

Paired T Test	Group B	
	Modified Ashworth Scale	
.	Pre	Post
Mean	2.40	1.60
S.D.	0.870	0.660
Number	15	15
Maximum	4	3
Minimum	1.5	1
Range	2.5	2
Mean Difference	0.80	
Paired T Test	4.583	
P value	0.0004	
Table Value at 0.05	2.15	
Result	Significant	

TABLE NO. 5.3: ILLUSTRATES COMPARISON WITHIN THE GROUP FOR PRE & POST MEAN & SD FOR GROUP B FOR MODIFIES ASHWORTH SCALE WAS 2.40±0.870 & 1.60± 0.660 WITH MEAN DIFFERENCE OF 0.83; P=0.0004, WHICH IS SIGNIFICANT

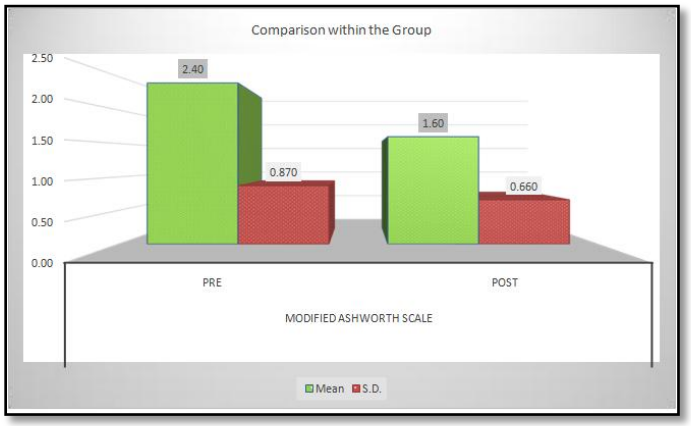

FIGURE NO. 5.3: COMPARISON WITHIN GROUP FOR MODIFIED ASHWORTH SCALE FOR GROUP B

Paired T Test	Group A	
	Upper Extremity Functional Index	
.	Pre	Post
Mean	29.00	40.33
S.D.	14.041	12.882
Number	15	15
Maximum	60	60
Minimum	10	20
Range	50	40
Mean Difference	11.33	
Paired T Test	5.906	
P value	<0.001	
Table Value at 0.05	2.15	
Result	Significant	

TABLE 5.4: ILLUSTRATES COMPARISON WITHIN THE GROUP FOR PRE & POST MEAN & SD FOR GROUP A FOR UPPER EXTREMITY FUNCTIONAL INDEX WAS 29.00±14.041 & 40.33± 12.882 WITH MEAN DIFFERENCE OF 11.33; P=0.001, WHICH IS SIGNIFICANT

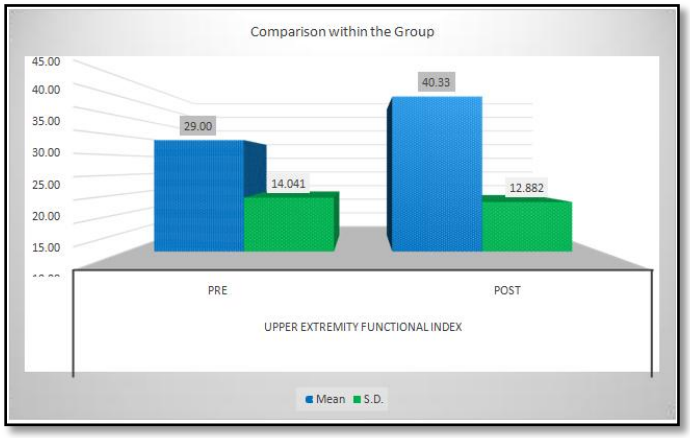

FIGURE NO. 5.4: COMPARISON WITHIN GROUP FOR UPPER EXTREMITY FUNCTIONAL INDEX FOR GROUP A

Paired T Test	Group B	
	Upper Extremity Functional Index	
.	Pre	Post
Mean	42.73	52.87
S.D.	18.215	14.232
Number	15	15
Maximum	72	78
Minimum	15	30
Range	57	48
Mean Difference	10.13	
Paired T Test	2.917	
P value	0.0113	
Table Value at 0.05	2.15	
Result	Significant	

TABLE 5.5: ILLUSTRATES COMPARISON WITHIN THE GROUP FOR PRE & POST MEAN & SD FOR GROUP B FOR UPPER EXTREMITY FUNCTIONAL INDEX WAS 42.73±18.215&± 52.87±14.232 WITH MEAN DIFFERENCE OF 10.13; P=0.0113, WHICH IS SIGNIFICANT

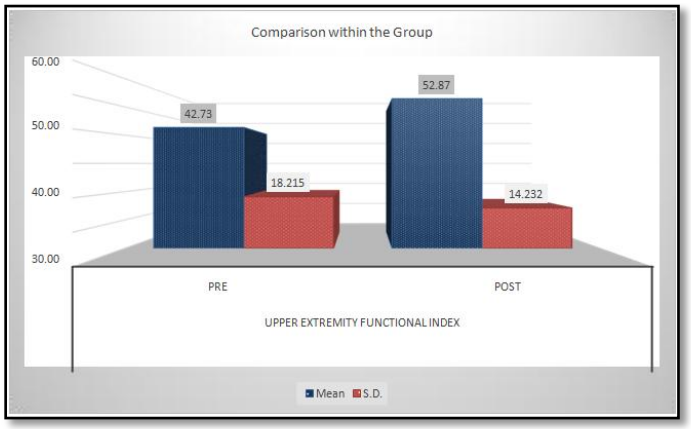

FIGURE NO. 5.5: COMPARISON WITHIN GROUP FOR UPPER EXTREMITY FUNCTIONAL INDEX FOR GROUP B

Unpaired T Test	Modified Ashworth Scale			
	Pre		Post	
	Group A	Group B	Group A	Group B
Mean	2.37	2.40	1.53	1.60
S.D.	0.743	0.870	0.790	0.660
Number	15	15	15	15
Maximum	4	4	4	3
Minimum	1.5	1.5	1	1
Range	2.5	2.5	3	2
Mean Difference	0.03		0.07	
Unpaired T Test	0.113		0.251	
P value	0.9110		0.8038	
Table Value at 0.05 df 38	2.05		2.05	
Result	Not-Significant		Not-Significant	

TABLE NO 5.6: ILLUSTRATES COMPARISON BETWEEN THE GROUPS FOR MODIFIED ASHWORTH SCALE FOR PRE MEAN & S.D FOR GROUP A & GROUP B WAS 2.37±0.743 & 2.40±0.870 & POST MEAN & SD FOR GROUP A & GROUP B WAS 1.53±0.790 & 1.60±0.660. PRE & POST MEAN DIFFERENCE FOR MODIFIED ASHWORTH SCALE FOR BOTH THE GROUP WAS 0.03 & 0.07 & P VALUE WAS P= 0.9110 & P= 0.8038 WHICH IS NOT SIGNIFICANT.

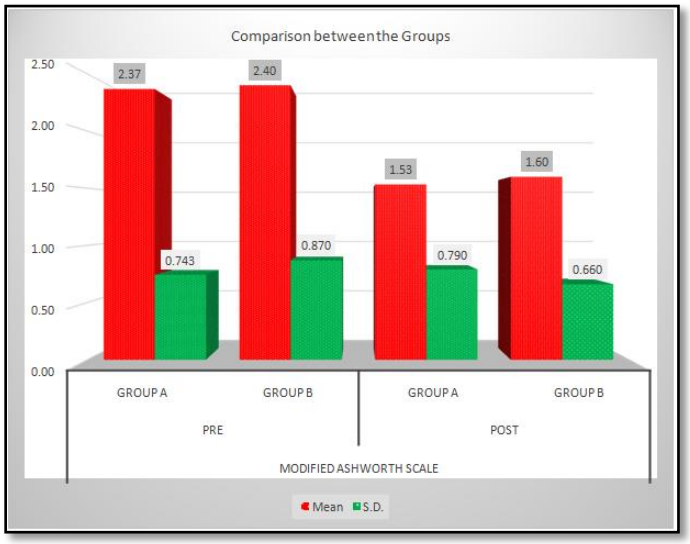

FIGURE NO. 5.6: COMPARISON BETWEEN THE GROUPS PRE & POST MODIFIED ASHWORTH SCALE

Unpaired T Test	Upper Extremity Functional Index			
	Pre		Post	
	Group A	Group B	Group A	Group B
Mean	29.00	42.73	40.33	52.87
S.D.	14.041	18.215	12.882	14.232
Number	15	15	15	15
Maximum	60	72	60	78
Minimum	10	15	20	30
Range	50	57	40	48
Mean Difference	13.73		12.53	
Unpaired T Test	2.313		2.529	
P value	0.0283		0.0174	
Table Value at 0.05 df 38	2.05		2.05	
Result	Significant		Significant	

TABLE NO 5.7: ILLUSTRATES COMPARISON BETWEEN THE GROUPS FOR UPPER EXTREMITY FUNCTIONAL INDEX FOR PRE MEAN & S.D FOR GROUP A & GROUP B WAS 29.00±14.041 & 42.73±18.215 & POST MEAN & SD FOR GROUP A & GROUP B WAS 40.33±12.882 & 52.87±14.232. PRE & POST MEAN DIFFERENCE FOR UPPER EXTREMITY FUNCTIONAL INDEX FOR BOTH THE GROUP WAS 13.73 & 12.53 & P VALUE WAS P= 0.028 & P= 0.01 WHICH IS SIGNIFICANT.

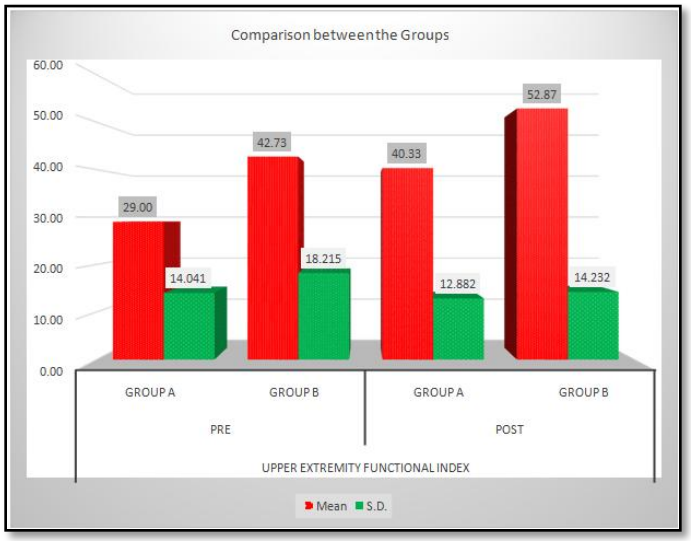

FIGURE NO. 5.7: COMPARISON BETWEEN THE GROUPS PRE & POST UPPER EXTREMITY FUNCTIONAL INDEX

DISCUSSION

This study is to compare the effect of constraint induced movement therapy and neurodevelopment therapy in hemiplegic cerebral palsy children on upper extremity function and tone.

This study is to compare the effect of constraint induced movement therapy and neurodevelopment therapy in hemiplegic cerebral palsy children on upper extremity function and tone.

When compared the result within Group A & Group B respectively on Upper Extremity Functional Index & Modified Ashworth Scale showed that patients treated with constraint induced movement therapy & neurodevelopment therapy has significant improvement in upper extremity function & tone.

When compared the result between Group A & Group B respectively on upper Extremity Functional Index has significant in both the groups & Modified Ashworth Scale for both the group is non- significant.

Training with Constraint induced movement therapy in young children with hemiplegic CP is supported by Ann Christin, Karin Shaw who found that the children who receive Constraint Induced Movement Therapy improve their ability to use their Hemiplegic Hand.

Constraint induced movement therapy produces significant functional improvement & resulted in plasticity as demonstrated by function MRI.

The extent of improvement of motor impairment & gross motor function in children with CP Eun Young Park & Won Ho Kim found that after 1 year of treatment only tone was decreased, Muscle strength & Gross motor function were not significantly improved according to Gross Motor Functional Scale Level.

Improvement in motor function was related to severity of hand functions. Over the study period, upper limb function improved over all, although the changes were significant.

The activity limitation in CP is due to deficit in motor behavior. However, specific deficit in motor behavior may contribute to activity limitation such as deficit in movement planning which can result in slow inefficient & sequential behavior. Thus both constraint induced movement therapy & Neuro developmental therapy have major impact on Hemiplegic CP motor behavior.

CONCLUSION

As result of present study shows that constraint induced movement therapy & neuro developmental therapy improves upper extremity functions & tone, but spastically constraint induced movement therapy give more significantly improvement motor function & tone in Hemiplegic CP.

LIMITATION OF STUDY AND FUTURE RESEARCH

LIMITATION OF THE STUDY:

Sample size was small; therefore the result of the study cannot be generalized for upper extremity function & tone in hemiplegic CP. There was lack of long term follow up of patients to find out the carryover effects of the intervention. Samples were collected from a particular place.

FUTURE RESEARCH:

Further research can be done on various types of CP, varying frequency & duration of Constraint induced movement therapy & Neuro developmental therapy on upper extremity functions & tone & by checking training aspects of other outcome measure like gait, posture, and functional re education.

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