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Comparison of NDT Versus Conventional Physiotherapy to Improve Fine Motor Function in Hemiplegic Cerebral Palsy

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Abstract

Twenty hemiplegic cerebral palsy subjects with mean age of 9.33 years included in the study. As per the inclusion criteria, subjects were included after the ethical committee approval. Informed consent obtained to conduct the study. Twenty hemiplegic cerebral palsy subjects were assessed for fine motor function using HELP. The children were divided into two groups based on random sampling. Group 1: NDT, *N* = 10. Group 2: conventional physiotherapy *N* = 10. Outcome data Assessments were performed at baseline and after 12 sessions. Within group analysis revealed that there is a significant improvement in balance (*p*-value <0.0001) and reduction of fear of fall (*p*-value < 0.0001) in subjects with Parkinson's disease after balance training. The correlation between the scores of Berg balance scale and fall efficacy scale are strongly negative (–0.921) before treatment and after treatment also there is a negative correlation (–0.699) but it is weak statistically.

Keywords: HELP; Hemiplegic cerebral palsy; Fine motor function.

Introduction

Cerebral palsy (CP) is described as a clinical entity that indicates a non-progressive disorder or brain damage in the early developmental period, often accompanied by sensory disorders, perception, cognition, communication, behavior, epilepsy and secondary musculoskeletal problems.[1] Cerebral palsy (CP) is the most common cause of neurological disability in children,[2] affecting approximately 1 in 1,300 live births.[3] At an early age, the most affected parts of upper extremity involvement are the wrist and hands. Abnormal hand postures such as thumb adduction and/or flexion with limited wrist extension are the primary manifestations of hand involvement.

Abnormal hand postures such as thumb adduction and/or flexion with limited wrist extension are the primary manifestations of hand involvement. Daily living activities and functional independence are affected by increased tonus of the upper limb, impaired posture and function.[4,5] The aim of the treatment for children with disabilities due to brain damage is to prepare and guide them towards their greatest possible independence and to prepare them for as normal adolescences and adult lives as can be achieved.[6] Spasticity is a widespread problem in cerebral palsy (CP) as it affects function and can lead to musculoskeletal complications.[7] It occurs as a result of pathologically increased muscle tone and hyperactive reflexes mediated by a loss of upper motor neuron inhibitory control.[8] Children with CP demonstrate poor hand function due to spasticity in the wrist and finger flexors.[9] Thus spasticity in the flexor muscles of the upper limbs poses a great deal of functional limitation in

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the hands. One common problem associated with poor hand function as a result of spasticity is the inability of the child to grasp objects and difficulty with fine motor tasks such as writing or cutting with hands.[8,9] Hand functioning, the ability of the hands to perform properly in various contexts, requires the integrity of the central nervous system and, therefore, may be disturbed by different brain disorders. Cerebral palsy (CP) is the most prevalent form of physical disability in children.[10] Occurring in 1 out of live births (http://www.cdc.gov/ncbddd/cp/index.html). Almost 50% of children with CP present an arm-hand dysfunction.[11,12] Children with unilateral spastic CP seldom use their paretic hand spontaneously in daily activities.[11,13] For these reasons, increasing attention in the last decade has focused on hand functioning in children with CP. The impact of CP on a child's hand functioning may be formalized through the theoretical framework of the International Classification of Functioning, Disability, and Health (ICF).[13] The aim of the treatment for children with disabilities due to brain damage is to prepare and guide them towards their greatest possible independence and to prepare them for as a normal adolescences and adult lives as can be achieved.[6] Kinesio taping (KT) is a relatively new therapeutic tool used in rehabilitation program of children with cerebral palsy, it has been used for a long time in sport or orthopedic fields, and has been approved as a supplemental intervention for other functional impairments.[6–9] It has been hypothesized that KT may favorably stimulate the coetaneous receptors of the peripheral sensorimotor system, since these receptors are associated with pain, proprioception and motor control.[3] Taping can influence the skin, lymphatic system, circulatory system, fascia, muscle and joint[12] and theoretically leads to enhancing proprioception,[3] diminishing pain and edema, reducing muscle spasms, and strengthening the muscles.[4,5] KT supports the joints by correcting the muscle function, restoring the proprioception, optimizing the postural alignment and stimulating the coetaneous receptors. It can reduce the pain and provide the proprioception feedback for reaching and maintaining the natural body posture as well.[6–9] KT significantly improves handgrip of children with CP. Imbalance between wrist flexor muscles (spastic) and wrist extensor muscles (weak) in children with CP leading to abnormal posture of hand that affects the ability to grasp.[9] Children with cerebral palsy (CP) show increased muscle stiffness and reduced muscle length, which may contribute to reduced function. Stretching is commonly used in the treatment and management of children with CP and is considered to be an important part of preventing or delaying the onset of contractures (National Institute for Health and Clinical Excellence, 2012).[7] Stretching exercises were developed to manage spasticity, including passive and active stretching, positioning, and isotonic and isokinetic stretching. The effect of stretching depends on tension applied to the soft tissue, duration, repetition in session, and daily frequency.[9]

Materials and Methods

Population

Population of the study constitutes 250 children of Latika Roy Foundation, Vasant Vihar, Dehradun.

Source of Subjects

Source of the study constitutes 20 children of Latika Roy Foundation, Vasant Vihar, Dehradun.

Sample

Twenty children with the diagnosis of Hemiplegic Cerebral Palsy with the age group of 2–18 years have been included in the study.

Place

This study has been performed in Latika Roy Foundation, Vasant Vihar, Dehradun.

Study Design

It is a comparative study.

Selection criteria

Inclusion criteria

1. Children with the diagnosis of Hemiplegic Cerebral Palsy.
2. Accessibility of the parents.
3. Age group 2–18 years.

Exclusion criteria

1. Children with other developmental disabilities.
2. Children over the age of 18 and less than 2 years.
3. Failure to reach the parent/caregiver who takes care of the child
4. Children with a history of trauma or injury in the past one month.
5. Botulinum toxin application to the upper

extremity in the previous 6 months

6. A surgery in the past 6 months for the upper extremity(upper limb surgery (i.e. tendon transfer/tendon lengthening)
7. Children with altered parameters for any reasons.
8. Fever
9. Uncooperative subjects

Variables

1. Hemiplegic cerebral palsy
2. Fine motor function
3. NDT (Neuro developmental therapy)
4. Conventional physiotherapy (Stretching and Kinesio Taping)
5. HELP (Hawaii early learning profile)

Protocol

Twenty hemiplegic cerebral palsy subjects with mean age of 9.33 years included in the study

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As per the inclusion criteria, subjects were included after the ethical committee approval

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Informed consent obtained from Latika Roy foundation to conduct the study

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Informed consent obtained from the parents of the subjects

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Twenty hemiplegic cerebral palsy subjects were assessed for fine motor function using HELP

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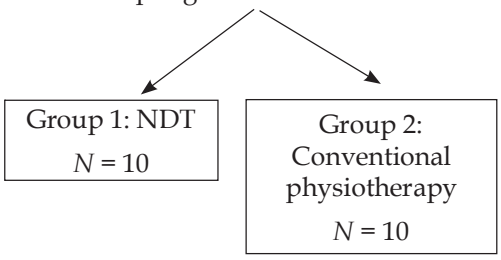
The children were divided into two groups based on random sampling



Procedure

Twenty subjects diagnosed with hemiplegic cerebral palsy aged between 2 and 18 years were included in the study. The study was conducted with children who are attending physiotherapy and rehabilitation programs in Latika Roy Foundation, Vasant Vihar Dehradun. The subjects were included in the study with the permission of their parents after obtaining informed consent following the necessary explanations and briefing. The subjects were divided into two groups on the basis of random sampling. Ten subjects were assigned as Group 1, and the management applied was NDT and the rest of the 10 subjects were assigned as Group 2 and the management applied was conventional physiotherapy. Pre-test and post-test valuesof the fine motor function for the upper extremity was evaluated using the Hawaii Early Learning profile (HELP), which has been tested for validity[10] and reliability[9] in subjects with neuromotor dysfunction. The treatment in both groups was applied by a physical therapist for 45-minute sessions 2 days/ week for six weeks.[14] The strategies for subjects in Group 1 to improve fine motor function were NDT (Neuro developmental therapy) with strategies for the postural control and bilateral functional midline activities with focus on the hemiplegic hand (Fig. 1). The strategies for subjects in Group 2 to improve fine motor function were conventional physiotherapy and the methods used were passive stretching and taping for the hemiplegic hand. Passive stretching to tight muscles destructs the adhesions in muscles and sheath (Fig. 2). It must be decent gentle gradual stretch not overstretch at all, lasting 20 second then relaxation 20 second 3–5 times per session.[14] KT was applied from origin of extensors muscle to metacarpophalangeal (MCP) joint of fingers; and from origin of extensor and abductor policis longs to metacarpophalangeal MCP joint of thumb. Tension of tape in muscular zone was 30% and in joint area was 75%. KT was applied on dorsum aspect of wrist and forearm to support activation of extensor muscles of wrist and thumb.[12] Purpose of KT application in these manners was to improve the function of muscles and joint re-alignment (correction the wrist flexion and thumb in palm deformities). KT was used to correct the wrist flexion deformity in children with CP. When the tape is applied properly, the flexibility of KT does not restrict ROM of soft tissue but also supports weak muscles and provides joint mobility.[5]

Fig. 1: NDT [Picture showing the midline strategy].

Fig. 2: Core strengthening on physio ball.

Fig. 3: Conventional physiotherapy.

Discussion

All testing was completed at Latika Roy Foundation, Vasant Vihar, Dehradun. Twenty subjects with Hemiplegic cerebral palsy with the mean age of 9.33 were selected according to the selection criteria after the ethical committee approval. All the parents of the participants were informed and given verbal instructions for the testing procedure and informed consent form was obtained from the parent of each subject, prior to the participation in the study. The children were divided into two groups on the basis of random sampling. Ten children were assigned as Group 1, and the management applied was NDT and the rest of the ten children were assigned as Group 2 and the management applied was conventional physiotherapy (stretching and taping). Pre-test and post-test values of the fine motor function for the upper extremity was evaluated using the Hawaii Early Learning profile (HELP), which has been tested for validity[11] and reliability[12] in children with neuromotor dysfunction. Both the groups had improvement in the fine motor function post-treatment. The average improvement fine motor function tended to being higher in Group A (15.30 ± 8.769 versus 23.10 ± 9.803) than in Group B (12.30 ± 8.394 versus 13.80 ± 8.509). The results suggest that NDT is a more effective method to improve fine motor function in hemiplegic cerebral palsy as NDT uses proximal points of control to give the child an optimal amount of support or stability to promote isolated distal control (Bobath & Bobath, 1972). Through handling of the trunk, the therapist facilitates movement of the extremities. As the child's proximal control improves, less support and guidance are needed, and handling moves from proximal to distal aspects of the body (Scherzer & Tscharnuter, 1982).[15] The development of trunk stability and central axis control is a prerequisite to upper extremity functions and hand usage. Proximal stability is hypothesized to allow for the independent use of the arms and hands in manipulative and purposeful activity. That is, motor development is believed to progress from gross movements to fine movements and from proximal control to distal control (Tudor, 1981).[16] Observations of motor development in normal children suggest that children first gain control over the shoulder, waving the arm in gross, whole arm movements, and then learn to coordinate fine movements of the elbow, wrist, and fingers (Skinner, 1979).[17] The proximal-distal principle has been adopted by occupational and physical therapists as both a postulate of theories of normal motor development (Ayres, 1954/1974; Gilfoyle, et al., 1981)[18,19] and a principle of treatment (Ayres, 1954/1974; Bobath, 1971; Bobath & Bobath, 1972; Farber, 1982; Stockmeyer, 1967; Voss, 1972).[18,22-25,27] On the basis of the belief that the development or recovery of arm and hand function in persons with sustained central nervous system damage adheres to the proximal-distal principle of ontogeny, therapists often focus treatment on the development of proximal (axial) stability and control as necessary preparation for distal control or fine motor skill (Bobath 1964; Stockmeyer 1967; T Witchell 1951; Voss, lonta, & Myers 1985).[21,25,27,28] Therapists who design treatment programs based on the principles of neurodevelopmental treatment use proximal points of control to give the child an optimal amount of support or stability to promote isolated distal control (Bobath & Bobath, 1972).[23] Through handling of the trunk, the therapist facilitates movement of the extremities. As the child's proximal control improves, less support and guidance are needed, and handling moves from proximal to distal aspects of the body (Scherzer & Tscharnuter, 1982).[15]

Future Research

1. The severity of tone (MAS) in the upper limb can be considered.
2. The study can be performed taking a larger sample size.
3. Levels of MACS (Manual Ability Classification System) can be considered.
4. Other and different methods can be compared to improve the fine motor function in cerebral palsy.

5. The study can be performed in spastic quadriplegic and spastic diplegic cerebral palsy.
6. The study can be performed on either right or left hemiplegic cerebral palsy.

Relevance to Clinical Practice

Children with cerebral palsy (CP) are frequently referred for physical therapy, yet the effectiveness of treatment has not been well-documented. In the relatively few available studies, outcomes are divided between support and lack of support for treatment. The purpose of' this research was to compare the effectiveness of NDT and Conventional Physiotherapy to improve the fine motor function in Hemiplegic Cerebral Palsy and also to document and evaluate the effects of a physical therapy program on fine motor functions of children with hemiplegic Cerebral Palsy.

Conclusion

The result signifies that NDT is more effective than conventional physiotherapy to improve fine motor function in hemiplegic cerebral Palsy

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Ethical Clerence: It is abonafide work done by meand I have not taken any part of thesis from anywhere.

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