Original Article

Effects of early regular physical therapy treatment on gross motor function of children with cerebral palsy

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Published online: March 31, 2017

(Accepted for publication February 13, 2017)

DOI:10.7752/jpes.2017.01042

Abstract:

Targeted selection of physical exercises and right use of methods made on the basis of correct diagnosis represent important factors for ensuring target-oriented physical therapy treatment. The objective of our research was measuring effectiveness of physical therapy treatment in cases of cerebral palsy, and defining the influence of correct and targeted physical therapy treatment on functional independence.

Importance of the research outcomes on early regular physical therapy treatment effects [using Gross Motor Function Measure] lies in fact that according to the study, it is essential to start treatment from the very early age for the purpose of effective controlling of anomalous patterns. The study has also shown that the goal and target oriented physical therapy treatment results in decrease of disability levels and increases quality life of persons with disabilities

Key Words: GMFM, pattern, anomalous, blocks

Introduction

Cerebral Palsy is a complex concept implying various deficiencies, which result in disorders of child's movements, posture and balance skills. Besides motor disorders, cerebral palsy is always accompanied with other symptoms of brain disorders including vision, intellectual, hearing, speech, concentration and behavior disorders; early prognosis may be difficult to make. In these conditions social and environmental factors play a huge role, which is evidenced in the fact that parent's awareness is essential for starting the early intervention. Diagnosis depends on the clinical type of the cerebral palsy, the rate of motor development, retained infant reflexes, intellectual development disorders, sensor disorders, and emotional-social [7, 8] and other types of factors.

For the purpose of improving motor skills physical exercises are applied, which are realized in various modes and have different levels of effectiveness. It is considered that correctly selected physical exercises predominantly improve child's functional Independence [1, 2, 3].

In cases of children with cerebral palsy it is of utmost importance to start treatment at early age, i.e. carry out early intervention, which starts during the stage of infancy – during the first 3-4 months of life. At this stage infant's brain adaptive and plastic skills are under work [4, 5, 6]. As it is known, the rate of child development is particularly high during the first 18 months of life. This is the best period not only for teaching but for adapting to limited abilities too. In most of the cases, early interventions result in better results in short period, as anomalous patterns that emerge comparatively later are not yet developed among children at this stage.

Objective of our research was ensuring adequate management of anomalous patterns from the very early age. For this we attempted to study each movement (developed blocks and its causes) of children with cerebral palsy. The study outcomes enable us to predict which exercises will be more effective depending on different forms of cerebral palsy.

Material & methods

The research was carried out studying 16 patients, who underwent treatment at Children's Neurology and Neuro-rehabilitation Treatment and Educational Center in Tbilisi, Georgia, during 2005-2010. Primary evaluation of child's health was made by neurologist, who identified diagnosis and the level of acuity of illness. Children were divided in 2 groups: Group I – represented children who started to undergo treatment from the age of 4 months and Group II – included children, who started to undergo treatment at the age of 12 months. These children underwent specific, physical dose of therapeutic exercises developed by us, according to the acuity of illness, and parents were advised on recommended physical activities to be exercised by children in home environments. The observation went on during 5 years. At each stage of observation the evaluation of pathological motor skills was made according to Gross Motor Function Measure (GMFM) and the following skills of the child were evaluated:

- Holding head steady
- Turning around
- Sitting/sitting up
- Standing and crawling with two hands held
- Standing on knees and kneeling
- Getting up/standing
- Walking

We applied the following methods of patients' physical rehabilitation during the study:

- Treatment rehabilitation process included 4 courses of treatment per year, each course involved 20 procedures. Complete analysis was carried out by the end of each year
- Parents were advised on recommended physical activities to be exercised by children in home environments
- Specific exercises were majorly targeted at child's anomalous movements and blocks, which by using dissociation were divided into the following couples:
 - Head – shoulders
 - Shoulders top muscles (on shoulder bones) – upper extremity
 - Pelvic girdle – shoulder girdle
 - Upper extremities – lower extremity
 - Right leg – left leg

During the treatment attention was paid to the following factors:

- Uniformity of body (bending, stretching out and primitive)
- Illness and specific tonus (on pelvis, shoulders, body, upper extremity, lower extremity)
- Movement patterns (lifting head up, turning to other side, sitting, sitting up, standing up, standing, walking)
- Factors interfering movements (what interferes with the normal movement pattern and why?)
- Pathological patterns (bending, stretching out)
- Evaluation

Results

Group I included 8 patients, who started undergoing treatment from the age of 4 months (the patients, whose diagnosis was changed during the treatment period were excluded from the study).

Table 1 shows data on children from Group I. It illustrates dynamics of data change in 5 years period and their gross motor function development. As it is evident from the Table 1, in the 6th case of the cerebral palsy, the positive effect of using therapeutic physical exercises was 9.6 %, by the end the first year, and 39.8 % by the end of 5 years. In the case of the 4th patient the positive effect of treatment reached was 13.8 %, by the end of the first year of treatment with therapeutic exercises, and 45.8 % by the end of the fifth year of therapeutic exercises.

Table 1: Data on Gross Motor Function of Patients in Group I before the Start of the Treatment and during 5 Years of Treatment

Patient	Before Treatment	After 1 Year	After 2 Years	After 3 Years	After 4 Years	After 5 Years
1	0.4%	8.8%	19.6%	26.4%	34.3%	42.5%
2	0.8%	12.8%	21.7%	27.9%	33.8%	41.8%
3	0.3%	7.7%	18.9%	23.6%	30.2%	36.5%
4	0.9%	13.8%	24.4%	29.9%	36.9%	45.8%
5	0.4%	8.9%	19.3%	25.9%	30.4%	38.4%
6	0.2%	9.6%	20.8%	26.5%	31.4%	39.8%
7	0.6%	10.8%	21.6%	27.1%	35.8%	44.8%
8	0.7%	9.9%	20.2%	26.9%	32.8%	40.8%

Group II included 8 patients, who started to undergo treatment from the 12th month of their lives.

Table 2: Data on Gross Motor Function of Patients in Group II before the Start of the Treatment and during 5 Years of Treatment

Patient	Before Treatment	After 1 Year	After 2 Years	After 3 Years	After 4 Years	After 5 Years
1	9.8%	17.8%	19.6%	26.4%	31.3%	30.5%
2	11.8%	15.8%	21.7%	26.9%	32.8%	40.5%
3	8.7%	14.7%	19.9%	23.6%	29.2%	35.4%
4	12.8%	18.8%	20.4%	25.9%	32.9%	40.8%
5	9.9%	17.9%	20.3%	28.9%	33.4%	38.4%
6	8.6%	13.6%	19.8%	25.5%	32.4%	39.7%
7	11.8%	16.8%	20.6%	27.1%	34.8%	40.7%
8	10.9%	15.9%	19.2%	24.9%	30.8%	38.8%

Table 2 illustrates data on children from Group II and the dynamics of data change in 5 years period on the improvement of their gross motor function.

As it may be observed from the Table 2, in the 6th case of the patient with cerebral palsy, the positive effect of applying therapeutic physical exercises was 8.6 % by the end of the first year, and 39.8 % by the end of 5 years of treatment. In the case of the 4th patient the positive effect of treatment reached was 12.8 % by the end of the first year of treatment, and 45.8 % by the end of the fifth year of therapeutic exercises.

We got positive dynamics in all cases. The results show that GFMF points were increased in case of every child patient, which highlight the effectiveness of physical exercises. Consideration of patients' individual data also makes it possible to make corrections to the load of physical activities.

There are divergent viewpoints among scholars related to the effectiveness of interventions at early stage. But our study outcomes proved the effectiveness of early intervention.

Chart 1. Vertical line: percentage of patients' functional improvement in 5 years period, Horizontal line: target group members, the cases of children from Group I are illustrated in blue, and the cases of children from Group II are presented in red

As it is evident from the first and the second charts there is a visible difference in data on functional improvements of patients in the first and the second groups. The difference of results of the case 1 patient in Groups I and II was 12 % (42.5 % - 30.5 %). This difference in case of patient 2 was 1.3 % (41.8%-40.5%), in case of patient 3 - 1.1% (36.5%-35.4%), in case of patient 4 - 5 % (45.8 %-40.8 %), in case of patient 5 - 0% (38.4 %- 38.4 %), for patient 6 - 0.1% (39.8 %-39.7 %), for patient 7 - 4.1% (44.8 %-40.7 %), and in case of the patient 8 - 2% (40.8 % - 38 %).

Physical therapy (exercises) and normal motor function development have essential role in the process of cerebral palsy treatment, which results in the child's functional development. The early intervention undoubtedly improves child's functional abilities. But when carrying out treatment of children with cerebral palsy, it is important to consider differences between the types of cerebral palsy (movement features characteristic to dyskinetic, spastic, ataxic forms).

Dicussion

The major part of our research implied identification of anomalous patterns and their adequate management, as well as study of movements of children with Cerebral Palsy and a targeted use of corresponding physical exercises, which would seize development of anomalous movements. The physical exercises have significantly reduced anomalous movements and resulted in functional improvements.

Conclusions

As the level of improvement in case of every child patient with cerebral palsy is individual, certain corrections are to be made in therapeutic exercises based on every control medical examination, throughout 5 years, when applying the method of rehabilitation physical exercises as a treatment. It is essential to apply the method of gradual increase of regular physical exercises, for the purpose of the gross motor muscles function improvement

Multiple years of observations on children with cerebral palsy made it possible for us to determine that the start of complex use of physical therapy from the early stage results in better outcomes.

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