



Rehabilitation guidelines for children with cerebral palsy

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Abstract

Cerebral palsy (CP) is a group of physical and movement disorders in children, which is formed due to damage to a part of the brain that controls movements and gestures. Children affected have trouble moving and balancing. They cannot control the movement of their arms, legs and bodies like normal people, so they tend to face developmental delays. As a result, children with cerebral palsy must have a correct and appropriate rehabilitation program. Each patient has different symptoms, so there is no standard program that can treat all patients. A good rehabilitation plan must be an individualized plan approved by an interdisciplinary team who work with the patient, his/her family, teacher and caretaker.

Keywords: Children with cerebral palsy, rehabilitation

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1. Introduction

Cerebral palsy is not a specific disease, but a group of symptoms caused by permanent brain disabilities in child patients. These disabilities are stable and do not expand but they will affect the part of the brain that controls or coordinates movements of muscles. As a result, patients will have abnormal movements and balance such as contraction of the facial muscles, tongue, body, arms and legs, and balancing difficulties, or they may not be able to position themselves to sit, stand or walk, depending on the damage to the brain or severity of the disability. We can conclude that cerebral palsy is a type of motion disability.

Cerebral palsy was first described in 1843 by Dr. William Little, an English surgeon who specialized in osteoarthropathy. He noted that cerebral palsy was caused by brain damage due to birth trauma. At that time, Dr. Little explained only one type of cerebral palsy which was spastic diplegia cerebral palsy. [1]

Later in 1889, Sir William Osler became an iconic researcher who first started to do a research on cerebral palsy, and wrote a book entitled “The Cerebral Palsies of Children” It was the first book that explained cerebral palsy. Also, Sir Osler was the first person to coin the term “cerebral palsy” to help people understand this type of disorder - a term accepted and recognized widely to this today.

Sir Osler researched cerebral palsy in more detail and found many more different types of brain abnormalities which corresponded with the findings of Dr. Little. Moreover, Sir Osler explained to the public the fact that if children with cerebral palsy are correctly and appropriately treated and rehabilitated, they are able to develop and have a better quality of life. This clearly supported the establishment of a rehabilitation program for children with cerebral palsy. [2]

2. Background of Cerebral Palsy

Cerebral palsy is a group of symptoms caused by brain abnormalities while the children’s brains are developing. Normally, it happens in children of up to six to seven years old. It results in disabilities in terms of movements, balance and gestures. The mentioned brain abnormalities will be stable, not worsening or recovering. In other words, cerebral palsy is an abnormality to the part of the brain that controls the organ functions, not to the nerves, arms, legs or body, and it is not a contagious disease. Signs of cerebral palsy can often occur or be noticed before the child turns three years old. The main symptom that can be seen is developmental delays such as in rolling, sitting, crawling, walking, writing and using scissors. In some cases, there may be other coexisting signs such as seizures and intellectual disabilities.

A definition of “cerebral palsy” has been proposed by many researchers and scholars, but the most ac-

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cepted and recognized as the most comprehensive and referenced is that by Peter Rosenbaum (2006). He defines cerebral palsy as “a group of permanent disorders of the development of movement and posture, causing activity limitation that are attributed to non-progressive disturbances which occurred in the developing-fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior; by epilepsy, and by secondary musculoskeletal problems” [3].

Although there is more than one definition among scholars, all definitions go the same way. So, it can be summarized that children with cerebral palsy are children who have motion abnormalities which are caused by damage or disease to the part of the brain that controls body movement. Patients will have movement and gesture abnormalities which can occur while the brain is developing or not fully developed. They will not be able to control movement of their arms, legs and body. Damage to the brain is permanent and it will not properly develop, and the muscles can be weakened if the patients do not have a correct and continuous rehabilitation in time.

The causes of cerebral palsy can occur in three stages, all during the period when the brain is developing and deprived of oxygen for four minutes or more. (1) Prenatal causes are the most common accounting for about 75-80% of the total cases and arise from the start of pregnancy up to six months. Examples of prenatal cause include: maternal infection during pregnancy that deprives oxygen from the baby's brain; chronic health problems in the mother such as diabetes or hypertension; genetic disorders; chromosome abnormalities and congenital brain defects such as intracranial water congestion; underdeveloped brain; and brain atrophy. (2) Perinatal causes account for about 10% and can occur during the last three months of pregnancy up to the first week after birth. These are examples of perinatal causes: premature birth, delivery complications such as nuchal cord, newborn choking on amniotic fluid and delivery that requires extra equipment such as forceps and vacuum. (3) Postnatal causes are about 12-21% and may arise from the first week after birth up to the child reaching seven years old. The causes mostly consist of complications that affect the child's brain or deprive him or her of oxygen for four minutes or more such as drowning, seizures and choking, infections such as meningitis, encephalitis and rubella, and accidents that affect the brain such as skull fracture causing brain hemorrhage. [4]

Parents often notice such abnormalities before the child turns one year old. They tend to sleep in an abnormal position due to weak or contracted muscles. For children older than five months old, they are likely to clench their fists rather than extend their hands and children over two years old show signs of

not being able to balance themselves properly while walking. Once the parents notice such abnormalities, they should bring their children to be treated immediately. Children with cerebral palsy cannot be completely cured but therapy and rehabilitation are very important tools for them as they can still develop their capacity and skills. Many patients can be happy and live a normal life like other children if they receive correct and appropriate rehabilitation, but there is no standard or ideal program for all patients - it depends on the determination of the physician who must identify the specific disabilities and needs of each patient. Progressive, efficient development and rehabilitation of each child depend on the design of each individualized rehabilitation plan, and caregivers/family members are the most important supportive factors for children with cerebral palsy.

3. Situation of Children with Cerebral Palsy

In terms of epidemiology of people with brain disabilities globally, the ratio of children with cerebral palsy is around 2.0 – 2.5 to 1,000 newborns. Also, cerebral palsy is found in premature babies more than normal ones. [5] A study in Europe found that this disorder is 70 times more likely in infants whose birth weight is below 1,500 grams than those who weight more than 2,500 grams at birth. In Sweden, the prevalence of cerebral palsy is 1.4, 14, 68 and 57 in infants who weight more than 2,500 grams, 1,500-2,499 grams, 1,000 – 1,499 grams and less than 1,000 grams at birth, respectively. (ratio 1: 1,000) [6]

In the United States, the Cerebral Palsy International Research Foundation of USA is a private, non-profit organization whose mission is to conduct research and studies to promote and support the development of quality of life for children with cerebral palsy in the United States. It has determined that the average number of newborns with cerebral palsy in USA is 8,000 per year - in 2014 there were 1.5 – 2 million adult and child sufferers of CP while in 2017 the number had decreased to one million. Statistically, the number of patients is tending to decrease. [7] Also, the annual report of the Cerebral Palsy Alliance in Australia in 2013 showed that there were about 17 million CP patients around the world with 34,000 (0.2%) of them living in Australia. [8]

Meanwhile, in Thailand there is little information on children with cerebral palsy. From a survey done by the National Statistical Office in 2007, the number of children who require special needs from birth until the age of 24 was 182,599 or 9.75% of disabled citizens. Among them, 13,309 were children with cerebral palsy, or 7.29% of the total number of children with special needs, which can be categorized into three age ranges as shown in Table 1.

4. Rehabilitation Guidelines for Children with Cerebral Palsy

According to the rehabilitation guidelines of the World Health Organization (WHO, 2011), they set five goals for rehabilitation services: to protect, to decelerate, to improve or restore, to compensate losses and to treat malfunctions of different body systems. To make the guidelines of rehabilitation for children with cerebral palsy most effective, WHO recommends starting the rehabilitation before the babies turn six months old and/or starting the process as soon as possible. [10]

The rehabilitation guidelines for children with cerebral palsy put forward by Somnath Chatterji (2015), a researcher at WHO, recommends that a good rehabilitation principle should include an opportunity for the patients and caregivers/family members to take part in defining goals and a rehabilitation program that consider the context of their familial environment. This is to increase the patients' capacity to rehabilitate and develop to the fullest by working together with a multidisciplinary team. [11] Somnath (2015) and Tie-man (2004) have presented study results that suggest the same. The rehabilitation of children with cerebral palsy should consider the familial environment as a main factor as they must deal with this constantly in their daily lives all the time. And whenever they feel safe and trusted, there will be a more positive impact to the rehabilitation process.

Christine Thorogood (2013), Associate Professor specializing in rehabilitation of children with cerebral palsy at Jacksonville University, Florida, USA, recommends a rehabilitation program that includes four main therapies [12]

4.1. Physical therapy

This therapy stimulates the patient to learn and control the movement of each joint that is essential to the body movement and prevent abnormalities of the bone and muscle systems that may come from unnatural movements. It can help prevent or decrease convulsion and maintain flexibility of joints and soft tissue. Stretching for exercises can strengthen muscles and it should be practiced according to the child's development. It should start with control of head and neck then continue to the body and self-help skills in daily living afterwards. Moreover, the physical therapy includes horseback-riding therapy (treating children with cerebral palsy by having them riding a horse). The Physical Therapy Student Union of Thailand (PT-SUT) has reported research results regarding the latter. It has certified that horseback-riding therapy is beneficial to the physical development of patients in terms of positioning, balancing and moving, and this also includes mental development. Most importantly, this type of therapy can be combined with a physiotherapy because the mechanism of horse-riding is a three-dimensional movement which is similar to the way humans walk. When the child patients sit on a

horse, they have to try to balance themselves, especially when the horse is walking. The horse's walking rhythm will teach them about balancing, positioning, weight unloading, righting and equilibrium reaction. Hence, it can be concluded that horseback-riding therapy is beneficial to the patient's muscles – it helps decrease contraction and facilitate better body movement.

4.2. Speech and language therapy

Children with cerebral palsy usually have dysarthria which affects the control of muscles on the face, neck, throat and head. This can lead to problems when speaking, chewing and swallowing. Also, the majority of cerebral palsy patients have drooling problems which are caused by abnormalities of the mouth's muscles that control how we swallow, so they have difficulties swallowing their saliva, drool and have articulation problems. Although children with fewer severe symptoms can speak and communicate, speech abnormalities can still be found such as speaking slowly and not clearly, or pronouncing words incorrectly and not clearly. Therefore, patients need to rehabilitate themselves by joining a speech training program to correct the way they speak and stimulate language and communication development. Each child must be assessed in order to define and design an appropriate individualized rehabilitation program.

4.3. Occupational therapy

This therapy is designed to promote and rehabilitate the capacity of children with cerebral palsy by aiming to train the control of fine motor skills, for example, grabbing things by the hands and using the eyes and hands at the same time. The therapy should focus on daily life skills training such as eating, getting dressed, showering and using the toilet, including skills relating to hygiene of both men and women. Moreover, it should also include rehabilitation and development of language such as learning, knowing, hearing and understanding. This can be simply done by training the child patient to do the things that the caregivers say and to appropriately express their feelings through actions, postures and facial expressions without trying to speak. Next, the child should be trained to adapt themselves, interact with others and make friends. They should also learn daily life skills to take care of themselves such as getting dressed, eating and using the toilet. Each activity must be preceded by an occupational therapist's recommendation, by taking into account the development and capacity of the patient.

4.4. Recreational therapy

A rehabilitation or relaxation plan integrates social, emotional and mental aspects. Its aims are to encourage children with cerebral palsy to join recreational activities and to adapt to their capacity, interests and development in daily life. Moreover, it enhances their skills and experiences on interacting

Table 1. Statistics of children with cerebral palsy

Age range	Number of children with special needs	Number of children with cerebral palsy	percentage
0-6 years old	17,640	1,349	7.64
7-14 years old	50,874	4,357	8.56
15-24 years old	114,085	7,603	6.66
Total	182,599	13,309	7.29

Source: National Statistical Office,(2008), Disability survey in 2007. [9]

with others within the environment around them. Examples of recreational therapy are arts, crafts, sports, games and dances. Apart from the benefits to the body, mind, emotions and socializing skills of the patients, it has been found that recreational therapy can reduce stress, depression and worries. Most children with cerebral palsy face stress and worries when they step into teenagehood. This type of therapy can develop their emotional intelligence quotient (EQ), make them happy and realize their own feelings and those of others. It can also develop their social intelligence quotient (SQ). Social intelligence is the capacity to adapt, accept and face the truths in life. It explains the capacity of patients to efficiently adapt themselves in society. The challenge for recreational therapists of cerebral palsy patients is to design an activity that matches the symptoms and degree of severity. They need to focus on the child's participation and can use supplementary equipment to help the patient move around, such as a wheelchair, iBOT wheelchair and walker rollator. Furthermore, modern recreational therapy includes activities to develop independent living skills (IL). Independent living is an idea to train children with cerebral palsy to live independently like others regardless of how severe their condition is. It aims to teach the patients to help themselves to the highest degree and to depend less on others. The main principal of this training is self-determination. The child has all rights and opportunities to live independently, the same as other people. This is a new approach to rehabilitation that emphasizes on changes to the patient themselves by boosting their self-independence and reducing their dependence on others.

Christine Thorogood rehabilitation program for cerebral palsy mentioned above, has been found to be consistent with the concept of Professor Fehlings (Darcy Fehlings, 2015), who is a professor at the Department of Pediatrics, Toronto University, the President of the American Academy for Cerebral Palsy and Developmental Medicine and chairperson of The Cerebral Palsy Foundation (CPF). Professor Fehlings states that the international rehabilitation program for children with cerebral palsy consists of four standard programs: physical, occupational, recreational and speed and language therapies. There is no single standard program that suits all patients. Each child must

be diagnosed to identify the type of symptoms they have by a specialized interdisciplinary team that will define therapeutic options and an individualized rehabilitation plan for cerebral palsy. Most importantly, the rehabilitation should be conducted as soon as the abnormalities are diagnosed and/or during the second and third years after birth. This is the most appropriate period in which to commence rehabilitation. [13]

In addition, the United Cerebral Palsy Association (UCP) also presents four types of rehabilitation for children with cerebral palsy. This program also correlates with concepts of Christine Thorogood and Darcy Fehlings, and emphasizes that the best way to rehabilitate afflicted children is to design an individualized rehabilitation plan. Most importantly, an interdisciplinary team needs to work with the patient, their family, teacher and caregiver. UCP also offers a fifth treatment, namely drug therapy. General drugs to treat cerebral palsy are muscle relaxants and can be categorized into three groups: Diazepam, Baclofen and Dantrolene Diazepam, commonly known as Valium. These drugs can only be prescribed by a specialized physician. [14]

Children with CP suffer from multiple problems and potential disabilities such as mental retardation, epilepsy, feeding difficulties, vision, and hearing impairments. Screening for these conditions should be part of the initial assessment. The child with CP needs an individualized treatment plan. Management is not curative; however, it can improve the quality of life of these children and their families. Physicians, in cooperation with the child, family, and members of a multidisciplinary team, can coordinate a complex care system to the maximal benefit of each child. [15]

A 2013 systematic review of Cochrane found that the treatments with the best evidence are medications (Anticonvulsants, Botulinum Toxin, Diazepam), therapy (Bimanual Training, constraint-induced movement therapy, context-focused therapy, fitness training, goal-directed training, home programmes, occupational therapy, pressure care) and surgery. [16]

5. Conclusions

From global epidemiology data on people with cerebral palsy, it has been found that 2.0-2.5 out of

1,000 newborns will have cerebral palsy. However, statistics also show a decline in the number of children in the newborn to seven years age group suffering from this disability. The most common causes of cerebral palsy are accidents, damage to the brain or deprivation of oxygen to the brain for four minutes or longer. There are many types of cerebral palsy namely: spastic CP which is the most common; athetoid CP, which is the second most common; and ataxia CP.

Cerebral palsy is not a disease or sickness but a disability which cannot be cured. All children with cerebral palsy must be treated correctly and rehabilitated appropriately. The treatment should start before the children turns six months old and/or immediately after noticing any sign to ensure maximum benefit of treatment. There are four main rehabilitation therapies.

Rehabilitation is very important and vital for patients. They should follow the rehabilitation program provided by a specialized interdisciplinary team and appropriate home programs are highly recommended in some cases. Christy et al. (2010) explains that the most effective and appropriate period for rehabilitation is four hours a day and it should be done continually five days a week for three weeks. These numbers ensure the maximum benefit for children, family and caregiver need to possess knowledge and understanding of the issue concerned to make the rehabilitation program fully effective.

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