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MODERN REHABILITATION INTERVENTIONS IN CHILDREN WITH VARIOUS FORMS OF CEREBRAL PALSY USING, LEVITAS AND K-FLEX TRAINING DEVICES

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Cerebral palsy (CP) is a term describing a group of heterogeneous conditions that cause non-progressive spasticity, ataxia, or involuntary movements; it is not a single specific disease (1). CP is a polyetiological disorder. The leading cause of CP development is damage to or abnormal development of the brain of the fetus or newborn. The pathophysiological basis of CP formation is brain injury occurring during a specific period of its development, followed by the formation of pathological muscle tone (predominantly spasticity), with preservation of postural reflexes and impaired development of sequential righting and equilibrium reflexes. The main difference between CP and other central paralyses lies in the timing of exposure to the pathological factor. The ratio of prenatal and perinatal factors in brain injury in CP is of significant importance (2).

Spastic Diplegia:

The most common type of CP, also known as “Little’s disease.” Spastic diplegia is characterized by bilateral involvement of the limbs, with the lower extremities more affected than the upper extremities, and early development of deformities and contractures. Common associated symptoms include delayed mental and speech development, pseudobulbar syndrome, cranial nerve pathology leading to optic disc atrophy, dysarthria, hearing impairment, and moderate intellectual decline. The prognosis for motor function is less favorable than in hemiparesis. Spastic diplegia predominantly develops in premature infants and is accompanied by characteristic findings on brain magnetic resonance imaging (MRI).

Spastic Tetraparesis (Double Hemiplegia):

One of the most severe forms of CP, resulting from brain developmental anomalies, intrauterine infections, and perinatal hypoxia with diffuse damage to the brain substance, often accompanied by secondary microcephaly.

Clinically, it manifests as bilateral spasticity equally affecting the upper and lower extremities, or with greater involvement of the arms.

This form of CP is associated with a wide spectrum of comorbid conditions, including cranial nerve damage (strabismus, optic nerve atrophy, hearing impairment, pseudobulbar syndrome), severe cognitive and speech deficits, epilepsy, and early development of serious secondary orthopedic complications (joint contractures and bone deformities). Severe motor impairment of the upper limbs and lack of motivation for treatment and education significantly limit self-care and simple occupational activities (3).

Spastic Unilateral CP:

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Characterized by unilateral spastic hemiparesis. Some patients present with delayed mental and speech development. The arm is usually more affected than the leg. Spastic monoparesis is less common. Focal epileptic seizures may occur. Causes include hemorrhagic stroke (more often unilateral) and congenital brain malformations. Children with hemiparesis acquire age-appropriate motor skills somewhat later than healthy peers. Therefore, the level of social adaptation is generally determined not by the severity of the motor deficit but by the child's intellectual abilities.

Dyskinetic CP:

Characterized by involuntary movements traditionally referred to as hyperkinesias (athetosis, choreoathetosis, dystonia) and changes in muscle tone (which may be either increased or decreased). Speech disorders are most commonly observed in the form of hyperkinetic dysarthria. In most children, intellectual functions are preserved, which is prognostically favorable for social adaptation and education. Emotional and volitional disturbances often predominate (6).

Ataxic CP:

Characterized by low muscle tone, ataxia, and increased tendon and periosteal reflexes. Speech disorders frequently occur in the form of cerebellar or pseudobulbar dysarthria. Coordination impairment is manifested by intentional tremor and dysmetria during goal-directed movements. Intellectual deficits in this form range from moderate to severe. In more than half of cases, careful differential diagnosis with hereditary disorders is required (4).

Associated Conditions:

CP may be accompanied by comorbid conditions such as chronic pain, speech and language disorders (with or without hearing impairment), seizures, behavioral problems, hip dislocation, and drooling (3).

Strabismus and other visual impairments may also occur. Many children with spastic hemiplegia or diplegia have normal intellectual levels (8).

Rehabilitation

Physical and occupational therapy aimed at stretching and strengthening muscles, as well as consolidating effective motor skills, are usually combined with other treatment methods.

Levitas training device:

"Levitas" is a mechanotherapy training device that allows the formation and targeted influence on the muscular system. Muscles can be trained individually or in groups. It enables improvement of strength, endurance, and muscle mass. It is a universal device for exercises with elastic support in a suspended position.

K-Flex training device:

The K-Flex trainer is a device for rehabilitation of the lower extremities that uses elastic resistance to strengthen muscles and mobilize joints in cases of contractures.

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It provides smooth movements, adjustable load, and is suitable for restoring range of motion in children with CP who have limb paresis or paralysis.

Assistive devices:

Assistive devices can improve mobility and communication, help maintain and increase range of motion, and support daily activities in severely affected children.

Children without severe intellectual limitations may participate in physical exercise programs and even competitions. Many pediatric institutions provide special programs for adolescents transitioning to adulthood to facilitate reduced dependence on external assistance.

These children achieve their maximum potential with stable, continuous support from governmental and private organizations providing professional rehabilitation (3).

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