

Children's cerebral palsy

Children's cerebral palsy is a permanent, **non-progressive movement disorder** accompanied by abnormal muscle tension and abnormal posture. It is a non-contagious, non-hereditary disease that arises from a one-time **damage to the brain tissue** (most often hypoxia). It is characterized by a disorder in the development of the motor areas of the brain or their other damage at an early stage of development. BMD is the result of prenatal, postnatal, or early postnatal damage to the developing brain. A movement disorder is often accompanied by epilepsy, disorders of sensitivity, senses (e.g. visual impairment) and perception, learning disorders, cognition, communication, behavior or mental retardation. Children's Cerebral Palsy is a neurodevelopmental disorder whose manifestations usually change during development.

Children's Cerebral Palsy belongs to the group of developmental diseases because it arises on the basis of a wide spectrum of abnormalities of the developing CNS. Different etiologies acting on different developmental stages can lead to the same clinical picture, and conversely, a similar etiology can cause different consequences.

Children's Cerebral Palsy treatment is complex, multidisciplinary and long-term. Its aim is not to cure or achieve a normal state, but to increase functionality, improve abilities and maintain health in terms of locomotion, cognitive development, social integration and independence. The success of therapy depends on its timeliness and intensity.

⚠ Attention! Not to be confused with acute anterior poliomyelitis, the so-called poliomyelitis!

Classification

- according to the anatomical topography of the disability:
 - mono-, hemi-, di-, quadriparetic form;
- according to the pathophysiological type of movement disorder:
 - spastic forms and non-spastic forms: with dyskinesias, dystonias, hypotonia, ataxia.^[1]

Epidemiology

The incidence of Children's Cerebral Palsy is about 2:1000 live births. The risk increases inversely with the gestational age at delivery.^[2]

Etiology

The movement disorder in cerebral palsy is caused by the involvement of supraspinal movement centers, corticospinal tracts, segmental spinal circuits and the musculoskeletal system.^[1]

It can arise during one of the following four periods:

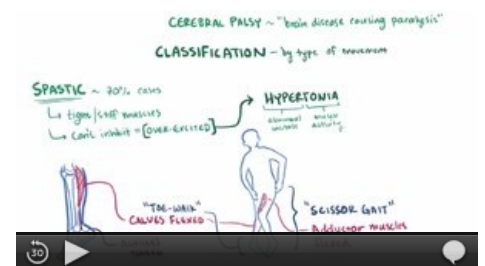
- During pregnancy (prenatal etiology) – intrauterine infection, drugs or placental dysfunction;
- During childbirth (perinatal etiology) – mainly in multiple pregnancies, hypoxia, hemorrhage, hypoglycemia, meningitis;
- In the first months of a child's life (postnatal etiology) – trauma, encephalopathy, encephalitis;
- Or very low birth weight.

In the first and second trimesters, disorders of CNS development occur. At the beginning of the third trimester, it is periventricular leukomalacia (PVL) and intraventricular hemorrhage (IVH). Towards the end of the third trimester, cortical, subcortical and deep gray matter lesions appear.^[1]

- Bilateral spastic and dyskinetic forms – hypoxic-ischemic brain lesion.
- Diparesis – periventricular leukomalacia in premature infants.
- Spastic hemiparesis of mature newborns – middle cerebral artery infarction, periventricular gliosis.
- Spastic hemiparesis of premature newborns – periventricular porencephaly due to intraventricular hemorrhage.
- Dyskinetic form – hypoxic-ischemic damage in the area of the thalamus and basal ganglia (children after the 32nd week of pregnancy).
- Athetoid form – neonatal hyperbilirubinemia with nuclear icterus (very rare).
- Atactic form – mostly unknown cause, possibly structural disorder of the cerebellum.^[2]

Clinical symptoms

- form: spastic, dyskinetic or ataxic;
- distribution: bilateral – diparesis, quadriparesis, unilateral – hemiparesis;



Cerebral palsy (video).

- level of disability: GMFCS scale I – V (*Gross Motor Function Classification System*) – a functional test for evaluating the level and subsequent changes in gross motor skills using standard free movements (free range of motion, walking and sitting); MACS (*The Manual Ability Classification System*) – test of manual abilities;
- comorbidities: epilepsy, mental retardation, sensory disorders.^[1]
- Spasticity: abnormally increased muscle tone, increased muscle reflexes, positive pyramidal phenomena , abnormal movements and posture (pes equinus, internal rotation and adduction of the hips, pronation and flexion of the forearm), the formation of contractures.
- Dystonia: abnormal sustained muscle contractures that lead to abnormal dystonic posture and abnormal movements (flexion, wrist pronation with fingers extended, or trunk torsion).
- Athetosis: generalized, uncoordinated, exaggerated, involuntary hyperkinetic movements, normal or reduced muscle tone.
- Ataxia: dysmetria or intentional tremor of the upper limbs, ataxia of walking and standing - involvement of the lower limbs and trunk (standing and walking with a wide base, swaying gait).^[2]

Spastic forms of children's cerebral palsy

Diparetic form (sometimes referred to as paraparetic)

- Most common (1/3 affected).
- Symmetrical involvement of both lower limbs (weaker, less developed).
- Striking disproportion between the growth of the trunk and the lower limbs.
- Muscle hypertonia, muscle shunts - faulty posture of the lower limbs and pelvis.
- There may be mild to moderate mental retardation.

Hemiparetic form

- The second most common.
- Affected limbs weaker and usually shorter compared to the other side.
- The upper limb is almost always more affected.
- A typical impairment is characterized by the arm being drawn to the torso, bent to full flexion at the elbow, the forearm turned dorsally upwards, the hand bent towards the palm and averted towards the little finger side.
- The occurrence of epilepsy is frequent , or there may also be a sensory deficit and mental retardation.

Quadraparetic form

- A more severe form of the diparetic form.
- All 4 limbs affected by polio.
- Epilepsy and mental retardation or learning disabilities are also present.

Dyskinetic-atactic forms of children's cerebral palsy

- About 10-15% of Children's Cerebral Palsy cases.
- Epilepsy is rare in these forms.
- If choreo-athetosis predominates, intelligence is usually normal, but verbal expression is made difficult by severe dysarthria .
- If dystonia or ataxia predominates, mental retardation is more often present.

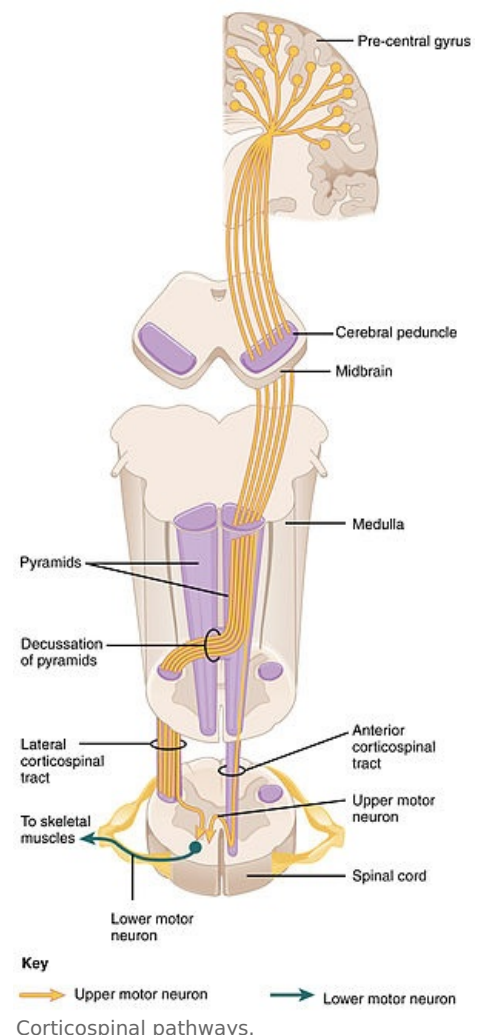
The disease is often a combination of several forms of Children's Cerebral Palsy.

Diagnostics

- Children's Cerebral Palsy is a clinical diagnosis; it is definitively determined only after the 3rd year of age (with immaturity of the CNS, the manifestations are non-specific).
- Examination to clarify the etiology:
- US of the brain, MRI of the brain;
- coagulation (protein C and S, homocysteine, APC resistance) – in case of a proven heart attack;
- EEG; vision and hearing tests;
- genetic examination – for lissencephaly.^[2]

Differential diagnosis

A stable clinical finding without progression of disability is mainly indicative of Children's Cerebral Palsy . An imaging examination (CT, MRI) is important to determine the extent. The progression of the disability is more likely to indicate a neurodegenerative or neurometabolic disability. A slow-growing tumor of the CNS.



Therapy

Children's Cerebral Palsy is a disease that cannot be cured . However, it is possible to improve the conditions and life possibilities of the child with the help of treatment, which usually positively affects the quality of his life. Medical advances in recent years, and especially advances in the treatment of people with Children's Cerebral Palsy, have led to the fact that today many of those who have been treated in time and correctly can lead an almost normal life. Even today, there is still no standard treatment that is sufficiently effective for all patients. A doctor who treats a patient with Children's Cerebral Palsy is more or less dependent on a number of specialized experts, with whose help he first correctly identifies and determines individual disorders and then adapts the entire therapeutic program to them. Several clinical trials are also currently underway on the application of stem cells from umbilical cord blood.

A treatment plan may include:

- Rehabilitation – improvement of locomotion control and postural posture using stimulation and facilitation techniques (e.g. the Vojt method), first by experts, then by instructed parents.
- Antiepileptic drugs .
- Myorelaxans in spastic forms.
- Splints for muscle imbalances.
- Operative treatment – orthopedic corrections (between 6 and 10 years), for example, in the diparetic form, selective dorsal rhizotomy (partial transection of the posterior spinal roots at the level of L2).
- Prosthetic aids.
- Application of botulinum toxin .
- Special care and education from preschool age.



Drug-induced dystonia.

Links

Related articles

- Vojt's method • Method of the Bobath couple • Hippotherapy
- Pyramid phenomena

External links

- Neurologie pro praxi 4/2011: Dětská mozková obrna (<https://www.neurologiepropraxi.cz/magno/neu/2011/mn4.php>)

References

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