Cerebral Palsy (CP)

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Learning objectives:
1. Define CP.
2. Discuss the etiologies of CP.
3. Discuss the topographic classifications of CP and the specific features of each type.
4. Know the common associated problems of CP.
5. Describe the important strategies of treatment of CP.

Definition:
Is a nonprogressive disorder of posture or movement caused by a lesion of the developing brain. Cerebral palsy is generally considered a static encephalopathy (ie, nonprogressive). However, the clinical presentation of CP changes as children mature.

Prevalence:
CP is the most common chronic motor disability in children with a prevalence of 2/1000 live births.
The prevalence of CP has increased among small premature infants as more have survived.

Etiology:
In the majority of cases, the cause is unknown; however variable prenatal, perinatal and postnatal factors may be related to CP.
Prenatal factors are more strongly associated with subsequent CP than perinatal or postnatal factors.
Fewer than 10% of children with CP had evidence of intrapartum asphyxia.
Postnatal illnesses or injuries accounts for 10% of cases.
There is a significant association of CP with prematurity and low birth weight infants, particularly those weighing less than 1,000 g at birth, primarly because of intraventricular hemorrhage and periventricular leukomalacia (PVL).

Examples of common etiologies of CP:
1. Developmental anomalies of the brain.
2. Congenital infection.
3. Perinatal trauma (intracerebral hemorrhage, cerebral infarction, or both).
4. Hypoxia ischemia.
5. Hypoglycemia.
6. Hyperbilirubinemia.
7. Thromboembolic.
8. Prematurity.

Associated disorders:
CP is commonly associated with a spectrum of disabilities including:

1. Sensory:
-hearing loss.
-visual impairments.
-strabismus.
2. Cognitive:
- Mental retardation especially in spastic quadriplegic type.
- Learning disabilities.
- Sleep & behavioral disturbances.

3. Neurologic:
- Epilepsy.

4. Musculoskeletal:
- Contractures.
- Hip subluxation/dislocation.
- Scoliosis.

5. Cardiorespiratory:
- Aspiration pneumonitis.
- Reactive airway disease.

6. Gastrointestinal/nutrition:
- FTT.
-Gastroesophageal reflux.
- Constipation.
- Dysphagia.

7. Genitourinary:
- Neurogenic bladder.

8. Skin:
- decubitus ulcers.

9. Dental:
- Caries.
- Gingival hyperplasia.

Classification of cerebral palsy:

Subtypes of CP are defined by the type of neurologic impairment and anatomic distribution (topographic classification):

1. **Spastic hemiplegia:** one side of the body involved, with upper extremity spasticity more than lower extremity spasticity. Usually due to stroke (in utero or neonatal).
Clinical manifestations:
- decreased spontaneous movements on the affected side.
- hand preference at a very early age.
- delayed walking and a circumductive gait.
- examination of the involved extremity show growth arrest , spasticity , equinous deformity of the foot , increased deep tendon reflexes , ankle clonus and a Babinski sign .
- Seizure disorder that usually develops in the 1st 2 yr.

- About 25% have cognitive abnormalities including mental retardation.
- CT or MRI study of the brain may show atrophic cerebral hemisphere with a dilated lateral ventricle contralateral to the side of the affected extremity.

2. **Spastic diplegia:** is bilateral spasticity of the legs greater than the arms. The most common neuropathologic finding is periventricular leukomalacia (PVL). Infants with PVL are at higher risk of cerebral palsy because of injury to the corticospinal tracts that descend through the periventricular white matter. PVL is characterized by focal necrotic lesions in the periventricular white matter and/or more diffuse white matter damage.
Clinical manifestations:
-the 1st indication of spastic diplegia is often noted when an affected infant begins to crawl in which the child uses the arms in a normal reciprocal fashion but tends to drag the legs behind rather than using the normal four-limbed crawling movement .
- In severe cases, application of diaper is difficult because of the excessive adduction of the hips.
- The child may be unable to sit.
- Examination of the child reveals: spasticity in the legs with brisk reflexes, ankle clonus, and bilateral Babinski sign.
- When the child is suspended by the axillae, a scissoring posture of the lower extremities is maintained because of strong adductor muscles contractions.
- walking is delayed, the feet are held in a position of equinovarus, and the child walks on tiptoe.
- Disuse atrophy and impaired growth of the lower extremity in severe cases.
- Subluxation or dislocation of the hips is relatively common in children with severe spasticity .
- Intellectual development is excellent in these patients and the likelihood of seizures is minimal.

3. **Spastic quadriplegia:** is the most severe form of CP because of marked impairment of all extremities and the high association with mental retardation and seizures.
The most common lesions seen on pathological examination are severe PVL and multicystic cortical encephalomalacia.
Clinical manifestations:
- Profound developmental delay.

-neurological examination shows increased tone and spasticity in all extremities with decreased spontaneous movements and brisk reflexes.
- Flexion contractures of the knees and elbows.
- swallowing difficulty is common due to supranuclear bulbar palsies which may lead to aspiration pneumonia.
- Associated developmental disabilities, including speech and visual abnormalities is highly prevalent in this group of children.

4. **Athetoid CP (Choreoathetoid, Extrapyramidal, or dyskinetic CP)**:
Is less common than spastic CP and makes up about 15-20% of patients with CP.This type of CP is the type most likely to be associated with birth asphyxia; Athetoid CP can also be caused by kernicterus.
The neuropathological lesions seen in this type of CP is basal ganglia lesions.

Clinical manifestations:
- Affected infants are characteristically hypotonic.
- Rigidity and dystonia develops over several years.
- The upper extremities are generally more affected than the lower extremities.
- Feeding difficulty, tongue thrust and drooling may be prominent.
- Speech problems e.g. slurred speech.
- Upper motor neuron signs are not present.
- Seizures are uncommon; intellect is preserved in many patients.

5. **Mixed CP:**
Two or more types codominant, most often spastic and athetoid.

6. **Ataxic CP:**
Characterized by cerebellar signs and abnormalities of voluntary movements.

Treatment:

Treatment needs a team of physicians from various specialties as well as physical therapists, speech therapists, social workers, and developmental psychologists.
Management of the child with cerebral palsy should involve:
1. Management of the commonly associated disabilities and health problems.
2. Management of the consequences of the motor disorders:

- Spasticity management: several drugs have been used to treat spasticity, including: oral dantrolene sodium, the benzodiazepines, and baclofen.
Intrathecal baclofen has been successfully used in selected children with severe spasticity.
Botulinum toxin injected into specific muscle groups may be used for localized spasticity.
Rhizotomy procedures (Surgical division of dorsal spinal roots) may be used to relieve spasticity in spastic diplegia.

- Orthopedic problems:
e.g. adductor tenotomy to reduce muscle spasm around the hip, tenotomy of the Achilles tendon to treat a tight heel cord...

3. Physical and occupational therapy:
Is essential to enable children to achieve their optimal physical potential and independence.