CEREBRAL PALSY
OUTLINE

• History
• Definition
• Aetiology
• Clinical features
• Classification
• Treatment
• Prognosis
HISTORY

• At the end of the 19th century, Sigmund Freud and Sir William Osler both began to contribute important perspectives on cerebral palsy.

• Originally described by Little in 1861.
WILLIAM JOHN LITTLE (1810-1894)
DEFINITION

• Cerebral palsy is a group of permanent disorders of movement and posture causing activity limitation that are attributed to nonprogressive disturbances in the developing fetal and infant brain.

• The Motor disorders are often accompanied by associated comorbidities.
WHAT IS NOT CP?

• Deterioration of acquired motor activity over a period of time

• Hypotonic child develops hypertonia over a period of time during evaluation is a case of CP, *Reverse* is not CP.

• Mild motor dysfunction improving over a period of time is not CP.
DEMOGRAPHY

• Prevalence : 1-3/1000

• Incidence over past four decades : Unchanged 3.6/1000

• Male : female of 1.4:1
ETIOLOGY

Common causes:

1. Prenatal: malformations, intra-uterine stroke, CMV
2. Perinatal: prematurity, HIE, neuroinfection, hyperbilirubinemia
3. Postnatal: head trauma, anoxia, infection, child abuse
PATHOGENESIS

• Term babies: without perinatal hypoxia inflammatory mediators (maternal illness, fetal or neonatal) is the main cause to affect brain development.

• Preterm babies: Multiple risk factors Apnoea, hyperbilirubinemia, hypoxia, metabolic problems
CLASSIFICATION

1. Physiological
2. Topographical
3. Functional
4. Etiological
PHYSIOLOGICAL CLASSIFICATION

- Based on the abnormal tone noted on examination
  - Spastic: 70-80% of all CP
  - Dyskinetic/Athetoid: 10-15%
  - Ataxic
  - Atonic/Hypotonic
  - Mixed
TOPOGRAPHICAL OR ANATOMICAL

- Monoplegia
- Hemiplegia
- Triplegia
- Quadriplegia/Tetraplegia
- Diplegia
- Paraplegia
- Double hemiplegia
# GROSS MOTOR FUNCTIONAL CLASSIFICATION SYSTEM (GMFCS)

<table>
<thead>
<tr>
<th>Level</th>
<th>Function</th>
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<tbody>
<tr>
<td>I</td>
<td>Ambulatory in all settings</td>
</tr>
<tr>
<td>II</td>
<td>Walks without aids but has limitation in community settings</td>
</tr>
<tr>
<td>III</td>
<td>Walks with aids</td>
</tr>
<tr>
<td>IV</td>
<td>Mobility requires wheelchair or adult assist</td>
</tr>
<tr>
<td>V</td>
<td>Dependent for mobility</td>
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Remain fairly stable over time
HEMIPLEGIC (25%)

- Middle cerebral artery
- Involvement of arm and leg on one side (arm > leg)
- Motor handicaps least likely to be disabling
- Intelligence is normal to dull.
- 25% cognitive abnormality.
- 1/3 have seizure
Hemiplegia on the right side.

Contractures of hip, knee and foot
SPASTIC QUADRIPLEGIA

• Most common
• Involves all four limbs.
• Bilateral hemisphere involvement
• Severely impaired and intellectual disability
• Often have bulbar symptomatology.
  – Have high risk of associated learning disability and epilepsy
  – Hypotonic in early infancy, later spasticity emerges.
SPASTIC QUADRIPLEGIA

Fisting

“Scissoring” of lower limbs
DIPLEGIC /LITTLE’S DISEASE

• Classical form
• 10-33% of all CP cases
• Involves legs more than arms.
• Hypotonia-Spasticity
• Often associated with premature births
• 11-20% are severely impaired
• Intellectual disability not so profound.
• Have learning disabilities and vision problems
LITTLE’S DISEASE

Contractures of hips, knees, and feet (talipes equinovarus)
EXTRAPYRAMIDAL CP

• Defects of posture, involuntary movements (i.e., athetosis, dystonia), ataxia and hypertonus (rigidity)

• Hallmark of bilirubin encephalopathy (*kernicterus*)

• 9–22% of all CP cases.
EXTRAPYRAMIDAL CP

Persistent asymmetric tonic neck reflex
ATHETOID

• 15-20% of CP cases.
• Involuntary, purposeless movements of face, arm, trunk
• Effects virtually all coordinated movements
• Have hypotonia, poor head control and head lag.
• Develop rigidity and dystonia over several years.
• Due to damage to basal ganglia
  - status marmoratus
• Kernicterus may be the cause
ATAXIA (10%)

- Cerebellum
- Poor balance and lack of coordination
- Show hypotonia and very delayed motor development.
- Hydrotherapy is enjoyed by children
ATAXIA (10%)
EARLY POINTERS OF CP

1. Consistent fisting of hands beyond 2 month
2. Persistent ATNR, Moro’s reflex
3. Persistent tone abnormalities
4. Paucity of movement
5. Excessive or disorganised movement
6. Hyperextension of head and neck
7. Stereotyped behaviour
8. Feeding difficulties-swallowing
9. Delayed social smile
CLINICAL FEATURES

• Muscle weakness
• Spasticity
• Loss of coordination
• Developmental delay
SIGNS AND SYMPTOMS

• Persistence of primitive reflexes
• Weakness in limbs
• Standing and walking on tiptoes
• Abnormal gait
• Swallowing difficulties
• Poor control over hand and arm movement
• Scissoring, arching of body, cortical fistling
• Commando Sign, Bunny hopping and “W” sitting
ABNORMAL MOVEMENT PATTERNS CAUSED BY PROBLEMS IN MUSCLE TONE

**FIGURE 2–17** Normal standing posture—early infancy.

**FIGURE 2–18** Abnormal scissoring.

**FIGURE 2–19** Abnormal flexed-knee posture.

**FIGURE 2–20** Amphibian reaction (evidence of lateral trunk righting against gravity).

**FIGURE 2–21** Drag crawling.
ABNORMAL MOVEMENT PATTERNS CAUSED PROBLEMS IN MUSCLE TONE

FIGURE 2–28  No protective arm reaction (abnormal).

FIGURE 2–29  Normal toe-standing (intermittent).

FIGURE 2–30  Abnormal persistent toe-standing.

FIGURE 2–31  Normal kneel-sitting.

FIGURE 2–32  Normal early walking—toddler.

FIGURE 2–33  Abnormal walking; spastic diplegia.
CLINICAL DIAGNOSIS

Essential findings

1. Delayed developmental motor milestones

2. Abnormal muscle tone

3. Hyper-reflexia

4. Absence of regression or evidence of more specific diagnosis.
ASSOCIATED PROBLEMS WITH CP

• Intellectual disability-common
• Seizure disorders
• Visual and visual-motor abnormalities
• Deafness
• Speech and learning defects
• Behavioural problems and psychological
ASSOCIATED PROBLEMS WITH CP

• Gastrointestinal
  – Failure to thrive
  – Obesity
  – Constipation
  – Gastroesophageal reflux: with associated aspiration
• Dental caries
• Orthopedic: contractures, scoliosis, hip dislocation
• Pulmonary: Asthma, Pneumonia, Recurrent respiratory infections.
MANAGEMENT

• Investigations
  – Neuroimaging
  – Metabolic work up to rule out inborn error of metabolism
NEUROIMAGING AND CP

• Not necessary for the diagnosis
• Helps in providing clues to the aetiology
• MRI is preferred to CT scan of the brain
COUNSELING BEFORE TREATMENT

- Not progressive
- Affects voluntary muscles
- Normal Life Expectancy
- Follow up
GOALS

• Ultimate goal:
  – Minimize disability while promoting independence and full participation in society

• Team effort: Multidisciplinary approach

• Family centered approach
TEAM WORK

- Paediatrician
- Neurologist
- Orthopedician
- ENT surgeon
- Ophthalmologist
TEAM WORK

• Therapist
  – Speech and language therapist
  – Adjunctive therapy: hippo therapy (therapeutic horseback riding), aquatic exercise

• Child psychologist

• Social worker
ASSESSMENT

• Visual assessment
• Hearing assessment
• Mental assessment
MANAGEMENT

Should be initiated as early as possible:

• Physiotherapy and occupational therapy
• Infant stimulation
• Nutrition
• Anticonvulsants
• Positioning and parent education
• Hygiene
• Pain Management
DRUGS USED

• Spasticity
  – Baclofen-2mg/kg/day
  – Benzodiazepines

• Dystonia
  – Trihexiphenydydyl
  – Tetrabenazine

• Botox
ORTHOPEDIC INTERVENTIONS

• Muscle releases and lengthening

• Split tendon transfers

• Osteotomies

• Arthrodesis-correct deformity and stabilize joint

• Spinal fusion and instrumentation
OTHER MANAGEMENT

Feeding:

• Upright position during and after

• Thickening of feeds

• Drugs - antacids, prokinetics, H2 blockers

• NGT feed

• Antireflux surgery - fundoplication
PREVENTION

• Good Obstetric Care
• Prevention of intrauterine Infection
• Preterm & LBW Prevention
• Prevention of Birth Asphyxia
• Chorioamnionitis management
• Iodine / Iron supplementation
• Steroids to mother in Preterm labor
• Mag. Sulphate - Tocolysis
PROGNOSIS

- Children with hemiplegia but no other major problems walk by 2 yr.
- More than 50% of spastic diplegia learn to walk
- Of spastic quadriplegia 25% will require total care, 33% will walk (after 3 yr.)
- Dyskinetic CP intermediate chance
- General rule: Children with independent sitting by 2 yr walk, those who are unable to sit by 4 yr age rarely walk
TAKE HOME MESSAGE

• CP: Disorder of movement and posture
• Nonprogressive
• Associated disorders
• Counselling of parents
• Supportive care
• Physiotherapy
• Surgery when required
THANK YOU