



# CEREBRAL PALSY

## ETIOLOGY AND CLASSIFICATION

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### Cerebral Palsy

- Heterogenous group of motor disorders that results from injury to the developing brain
- Insult/injury can occur in the prenatal, perinatal or postnatal period
- It is non progressive although clinical picture changes with time
- It is not a single disease
- It is not inherited

### Motor Disorder

- Aberrant motor control
- Abnormal tone, posture, movement, balance and coordination
- Interferes with function
- It is permanent
- Motor deficits vary in severity

### NIH Definition of CP

- CP is an “Umbrella like term” describes a group of chronic disorders impairing control of movement that appear in the first few years of life and generally do not worsen over time
- Disorders are caused by faulty development or damage to the motor areas in the brain that disrupts the brain's ability to control movement and posture
- Symptoms include difficulty with fine motor tasks
- Difficulty with balance or walking and involuntary movements.
- Differ from person to person and may change over time



## Definition and Classification of Cerebral palsy

“Cerebral palsy (CP) describes a group of disorders of development of movement and posture, causing activity limitation, that are attributed to non- progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior and/ or by a seizure disorder”

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## Maternal Risk Factors

- Higher parity (> 5) greater risk
- Higher risk in African American (low B. Wt)
- Higher risk in presence of chorio-  
amnionitis
- Higher risk in presence of thrombophilic factors
- Severe Toxemia/ hypertension
- Maternal epilepsy
- Maternal Hyperthyroidism
- Abruptio Placenta (Acute and Chronic)

## CP is a Multi-handicapping condition (syndrome)

- Motor disorder
- Medical conditions
- Sensory impairments
- Learning disabilities
- Attentional deficits
- Language and perceptual deficits
- Behavioral problems
- Mental retardation

## What causes Cerebral Palsy? Congenital Causes 85-90%

- Malformations of the brain and blood vessels
- Neurological damage as a result of
  - Intrauterine viral infections (TORCH)
  - Affects of environmental toxins (Infarcts)
  - Poor oxygenation of brain as a result of placental factors
  - Vascular factors ( Congenital heart disease, coagulopathies, Sepsis DIC)



### **Causes of Cerebral Palsy - Perinatal causes**

- Birth asphyxia (severe acidosis with hypoxia )
- Periventricular leukomalacia (damage to white matter)
- Severe untreated jaundice; hypoglycemia
- Sepsis (meningitis/ encephalitis)
- Premature infant with complications
- Intracranial bleeding
- Multiple births (ie twin to twin transfusions)

### **Causes of Cerebral Palsy Postnatal causes 10-15%**

- Infections (Viral and bacterial)
- Post surgical vascular complications
- Asphyxia due to aspiration or drowning
- Traumatic brain injury

Accidental                      20%

Non-accidental                80%

### **Classification of Cerebral Palsy Type of tone and movement Physiological**

- Spastic (increased muscle tone)                      60- 70%
- Ataxic (balance and coordination)                      10- 15%
- Athetoid (involuntary, uncontrolled)                      10- 20%
- Mixed type    10%
- Hypotonic or Atonic (Deleted from current classification)

### **Spastic Syndromes**

- Commonest presentation of CP
- Upper motor neuron signs
- Variable expression
- Symmetric or asymmetric
- May involve more than one extremity

### **Types of Cerebral Palsy Involvement of body parts Anatomical**

- Hemiplegia (one arm and leg on the same side)
- Diplegia (both legs more involved than arms)
- Quadriplegia (all four extremities involved)
- Triplegia (three extremities involved)

In premature babies Diplegia is most common



In full term infants Quadriplegia & Hemiplegia more common

### Common Types of CP In Infants < 1500 gm

- Diplegia 57%
- Quadriplegia 22%
- Hemiplegia 11%
- Mixed 10%

### Dyskinetic Syndromes

- Extrapyramidal signs
- Choreiform ----- Ballismic
- Choreo-Athetoid
- Dystonic
- More common in full term infants with severe perinatal asphyxia or secondary to kernicterus

NOTE: Rule out metabolic and genetic disorders

### Ataxic Syndromes

- Heterogenous group with multiple etiologies
- Congenital abnormalities of cerebellar area
- Genetic causes
- Metabolic disorders

NOTE : Rule out other conditions  
Ambulatory Status in Types of CP

### Ambulatory Status in Types of CP

Clinical type	Ambulatory	Non-ambulatory
Hemiplegia	100%	0%
Diplegia	85%	15%
Quadriplegia	68%	32%
Athetoid	77%	23%
Ataxic	100%	0%
Atonic	0%	100%

### Gross Motor Functional Classification

- **Level 1:** Clumsy child; no assistive devices
- **Level 2:** walks independently but limited in outdoor activities
- **Level 3:** walks with assistive mobility devices
- **Level 4:** Self-mobility severely limited even with assistive devices
- **Level 5:** No self mobility even with assistive devices

Palisano R et al DMCN 1997;39;214-223



## Differential Diagnosis of CP

### SPASTICITY

- Familial Spastic paraparesis
- Intrauterine drug withdrawal
- Transient dystonia of prematurity
- Tethered cord
- Congenital tightness of heel cords
- Toe walkers (Autism, Use of walkers)
- Rule out neuro-degenerative diseases (Primary and Metabolic)

## Differential Diagnosis of CP

### ATHETOSIS / ATAXIA

- Metabolic disorders e.g Glutaric aciduria
- Dopamine responsive dystonia
- Chromosomal disorders e.g Angelman's
- Rett Syndrome
- Intracranial lesions

## Worster- Drought Syndrome

- Pseudo-bulbar form of Cerebral palsy
- MRI may be normal
- If MRI shows polymicrogyria of the perisylvian fissures; then it is "Congenital Bilateral Perisylvian Syndrome"
- Severe feeding and swallowing difficulties with excessive drooling
- Severe Speech disorders

## W-D Syndrome

- May develop seizures
- Abnormal shape to jaw and tooth mal-alignment
- Mild spasticity of extremities
- Congenital foot abnormalities
- Ambulation is clumsy
- Learning problems are common

## Medical Investigations

- No specific tests
- Clinical history, high risk factors and family history important
- History of neurological deterioration
- Most important investigation is an MRI study ( include MRI of spinal cord if indicated)



## Medical Evaluations

- Pediatric Neuro-development exam
- Screen for regulatory disturbances, sleep, feeding, and behavior
- Screen for ophthalmic problems
- Screen for auditory impairment
- Evaluations by speech language therapists, occupational and physical therapists,
- Evaluation by clinical neuro-psychologists
- Educational evaluation by either a psychologist or special educator

## Other Laboratory Investigations

- Chemistry panel
- Urine screen for amino acids, organic acids, carnitine.
- Plasma ammonia, lactate, pyruvate, acyl-carnitine, very long chain fatty acids
- CPK ( In very hypotonic weak children)
- EEG
- Chromosomal analysis /Genetic studies including DNA studies when indicated.