

ORTHOPAEDIC EVALUATION

OF

THE CHILD WITH SPASTICITY



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PEJORATIVE TERMS IN CP

- SPASTIC CHILD / CP CHILD
- MRCP??
 - < 30% of children with CP have mental retardation
- Atmosphere of Inclusion
- Focus on the disease – not the child

Definition of Cerebral Palsy

“A qualitative motor disorder of movement & posture appearing before the age of 3 years, due to non-progressive damage of the brain occurring before growth of the nervous system is complete.”

— *MacKeith, Polani, 1958*

Definition of Cerebral Palsy

“However, it may contribute to a misunderstanding of the secondary musculoskeletal pathology, which is not static but is most definitely progressive.”

— *Boyd, Graham, 1997*



Presentation - Variable

- Normal intelligent child with simply toe walking – mildest form with good prognosis
- Wheelchair bound / bedridden, spastic quadriplegic CP with seizures, non communicative – poor prognosis.



CLASSIFICATION

- SPASTIC
- DYSKINETIC
 - Choreo-athetoid
 - Dystonic
- ATAXIC
- MIXED



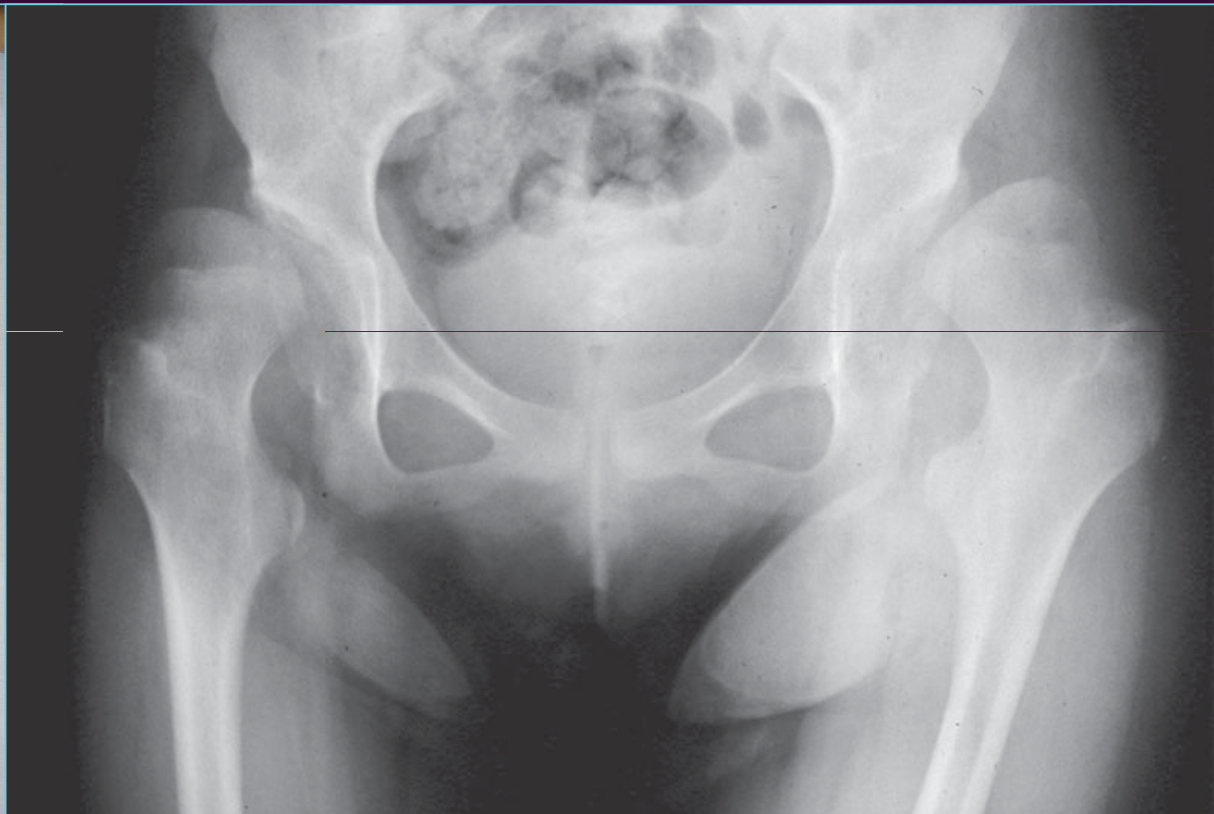
TOPOGRAPHY

- HEMIPLEGIA
- DIPLEGIA
- QUADRIPLEGIA
- MONOPLEGIA



Quadriplegia

“HIPS AT RISK”



Neurological Control System in CP

- Pyramidal system is the locus of the Manual / Voluntary motor control system
- Damage to this system cause abnormalities by releasing the activity of the lower system from control
- Patient with CP will demonstrate
 - Loss of selective motor control
 - Dependence on primitive reflex patterns for ambulation
 - Abnormal muscle tone / Spasticity
 - Imbalance between muscle agonists & antagonists
 - Deficient equilibrium reactions



Musculoskeletal Progression in Cerebral Palsy

Static
CNS lesion

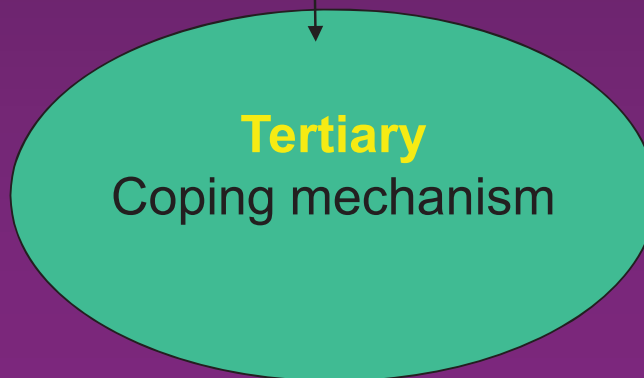
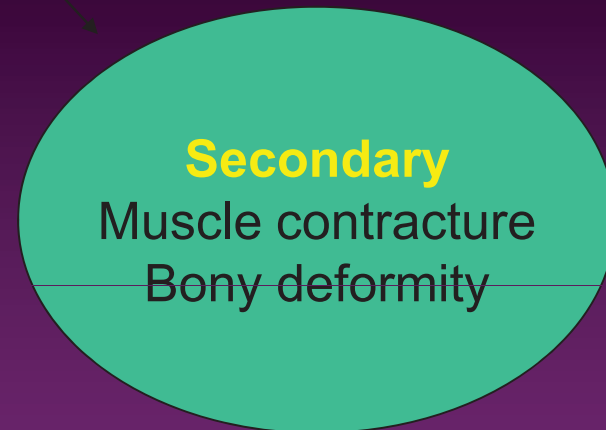
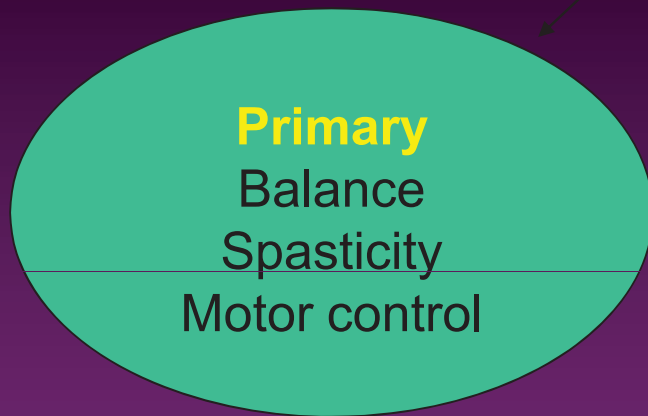
Progressive
Musculoskeletal
deformity



- Upper motor neuron lesion
- Spasticity and weakness
- Failure of longitudinal muscle growth
- Fixed contracture
- Bony torsion
- Joint instability
- Joint dislocation or degenerative changes



Gait Deficits



BASELINE ASSESSMENT

CP GROUP EVALUATION



1. Medical History

2. Family and Environment

Chief concerns and expectations

3. Observations

Vision

Hearing

Communication

Play

Behavior

Basic cognition



BIRTH HISTORY

- Preterm / Breech / LBW
- Prenatal risk factors
- Perinatal problems
- Jaundice, Convulsions



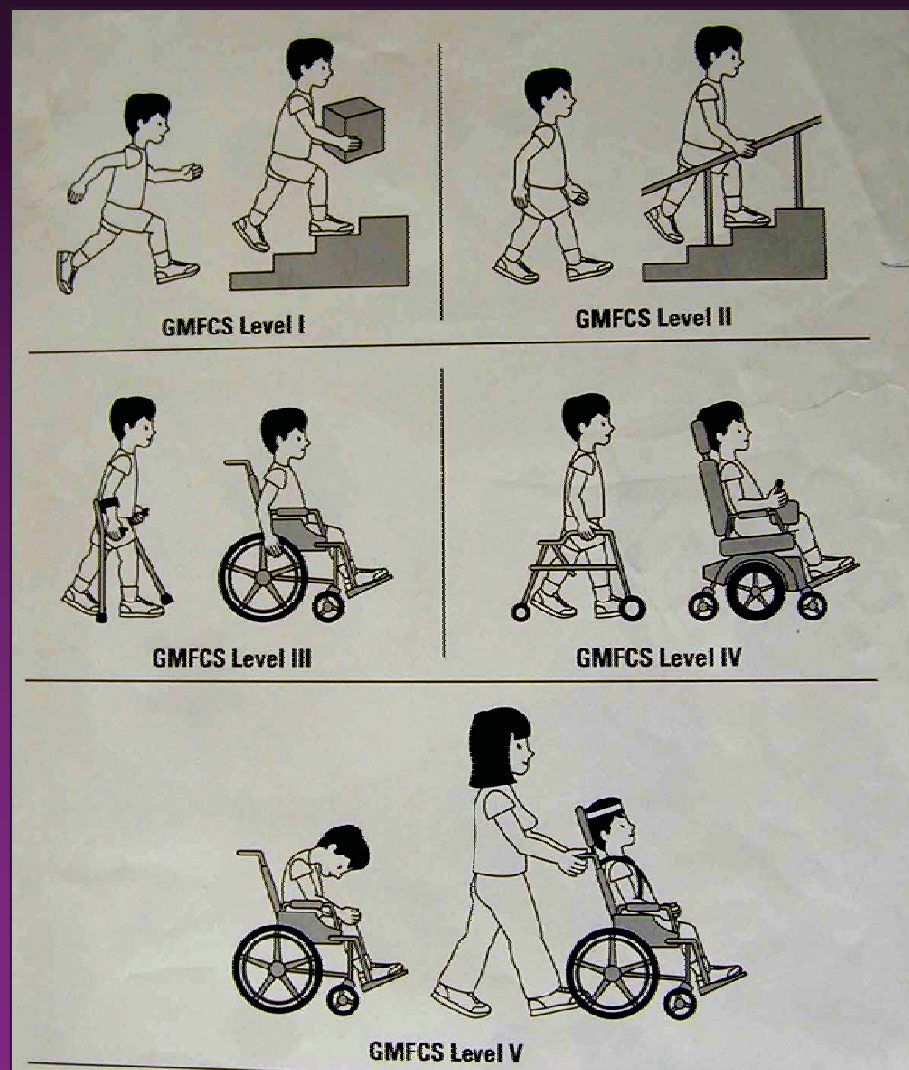
4. Development Assessments

- Gross Motor (GMFCS)
- Fine Motor (Melbourne assessment)
- Oromotor



Gross Motor Function Classification System

Palisano. Eur J Neurol 1997;8:98



5. Postural and Neuromuscular control

Tone abnormality

- Static (Modified Ashworth Scale)
- Dynamic (Tardieu Scale)

Asymmetry



Modified Ashworth Scale

Grade	Description
0	No increase in muscle tone
1	Slight increase in tone – a catch and release at the end of the range of motion
1+	Slight increase in tone – catch, followed by minimal resistance in remainder of range
2	More marked increase in tone through most of range (< 50% of range)
3	Considerable increase in tone, passive movement difficult (> 50% of range)
4	Affected parts rigid in flexion or extension

Bohannon RW, et al. *Phys Ther* 1987

Modified Tardieu

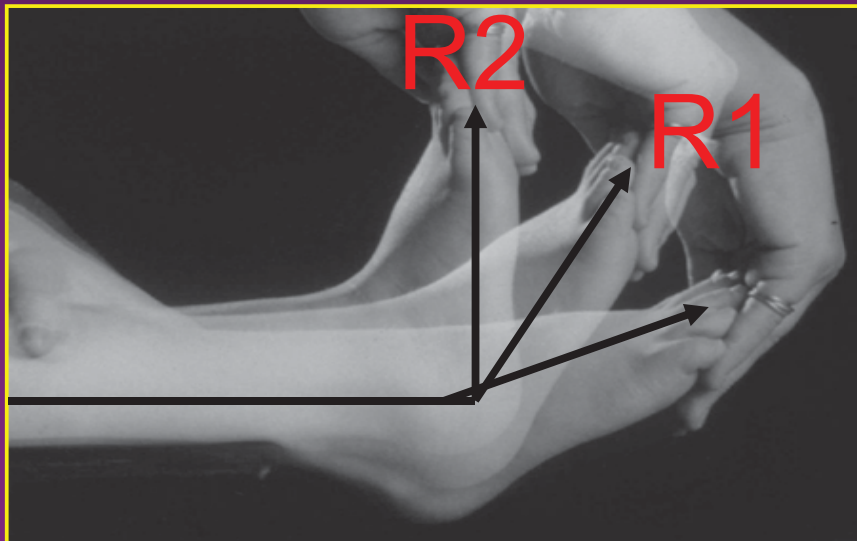
- The “catch” results from overactive stretch reflex, seen in the fast ROM at a particular angle (R1)
- The passive ROM (R2) as determined by slow velocity
- More important than R1 & R2 values is the relationship between R1 & R2
- The functional outcome is affected by the baseline value of R2 ($R1 - R2 = \text{dynamic range}$)
- Eg: A child with equinus having baseline R2 of -20 and R1 of -40 is in too much equinus to have good result with BTX $-40 - (-20) = (-20)$

EXAMPLE in the leg; with passive stretch:

R1= spasticity

R2= contracture

R1-R2= Dynamic tone abnormality that can be corrected by BOTOX



6. Musculoskeletal examination

- ROM
- CONTRACTURES
- DEFORMITIES
- STRENGTH (MRC GRADES)
- SELECTIVE MOTOR CONTROL

7. Gait (Observational gait analysis)

8. Sensory issues

Somatosensory

Vestibular

Common contractures

- Gastrosoleus (Equinus) – Silverskiold test
- Hamstrings – Popliteal angle
- Rectus – Ely's test
- Iliopsoas – Thomas test
- Adductors – Phelp's test
- Pronation flexion at wrist
- Shoulder internal rotation

Silverskiold test



ORTHOPAEDIC ASSESSMENT



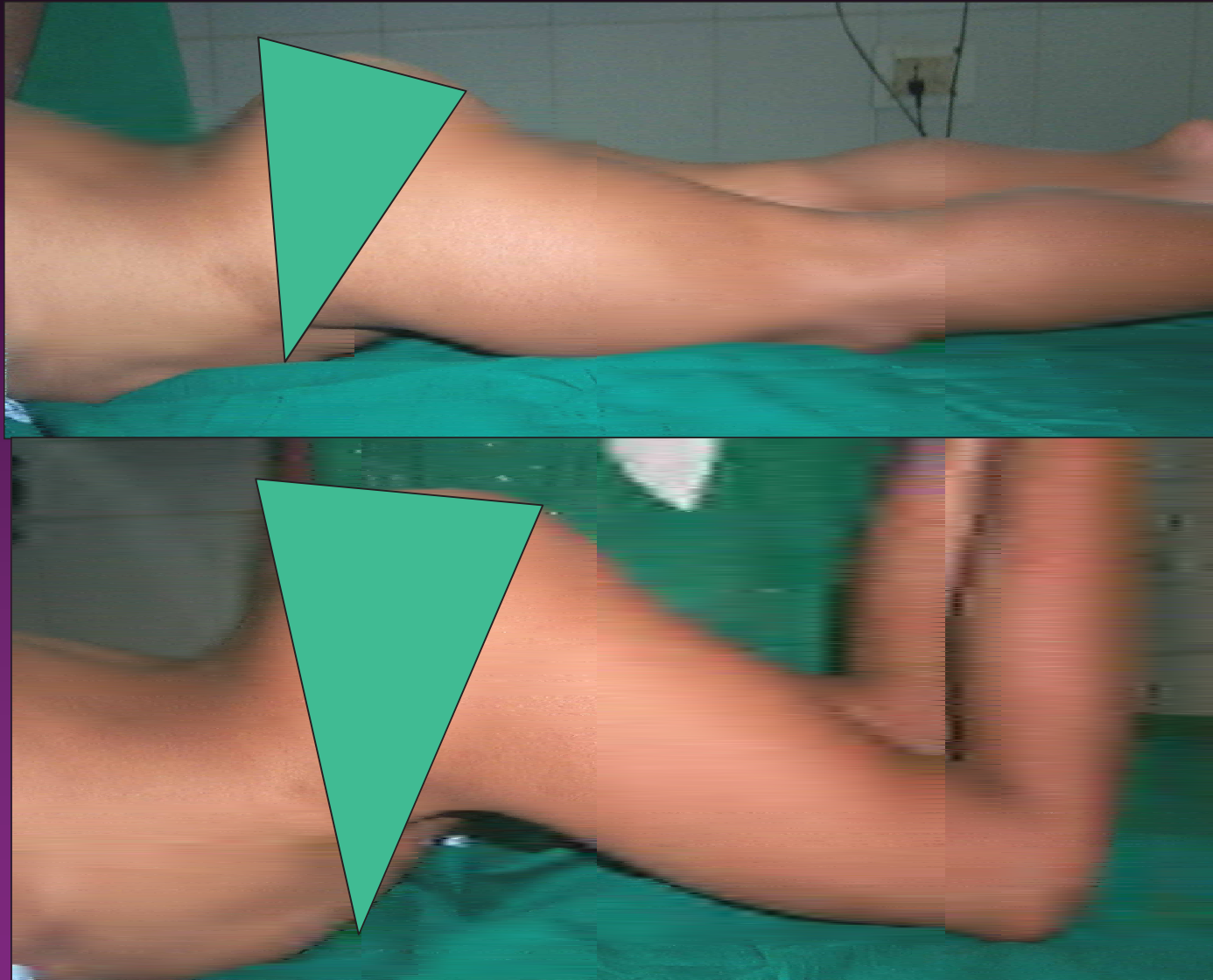
ASSESSMENT



Thomas test – Hip FFD



Prone Rectus – Ely's test



EVALUATION

- AMBULATORY POTENTIAL – GMFCS
- DEFORMITIES / CONTRACTURES – Special tests
- GRADES OF SPASTICITY – Ashworth / Tardieu
- STRENGTH – MRC Grades
- SELECTIVE MOTOR CONTROL
- SENSORY SCREENING
- Observational Gait Analysis using Digital video with freeze-frame playback

Dimensions of Disability

Pathophysiology

Interference with normal physiology, developmental processes, structures

HANDICAP

Societal Limitation

Barriers to full societal participation

IMPAIRMENT

Loss or abnormality of body structure or function

DISABILITY

Restricted participation in typical societal roles

Functional Limitation

Restricted ability to perform functional activities

