

Neuromuscular Hip Subluxation/Dislocation in Children with Cerebral Palsy

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Presenter Disclosure Information

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Neuromuscular Hip Subluxation/Dislocation in Children with Cerebral Palsy

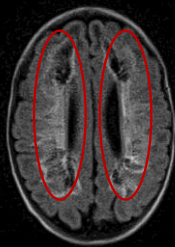
Disclosure Information

The following relationships exist:



CP Hip: Management

- Cerebral Palsy
 - Definition
 - Historical Overview
 - Classification

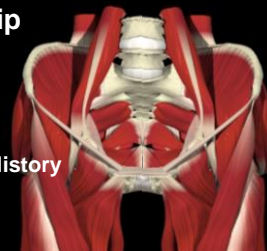


Peri-ventricular Leukomalacia



CP Hip: Management

- Neuromuscular Hip Dysplasia
 - Pathophysiology
 - Pathomechanics
 - Pathoanatomy
 - Incidence / Natural History
 - Goals of Surgery
 - Treatment Options



CP Hip: Management

- DEFINITION(S)
- “Cerebral palsy (CP) describes a group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.”
 - Rosenbaum et al Dev Med Child Neurol 47:571-576, 2005 (2007)



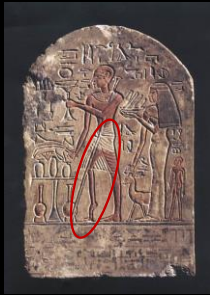
CP Hip: Management

- DEFINITION(S)
- “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.”
 - Rosenbaum et al Dev Med Child Neurol 47:571-576, 2005 (2007)



CP Hip: Management

- CP HALL OF FAME
- HISTORICAL
 - ANCIENT EGYPT
 - CEREBRAL PALSY
 - CLUBFOOT
 - POLIO
 - CONGENITAL



CP Hip: Management

- CP HALL OF FAME
- MODERN ERA
 - 1860s
 - William John Little
 - Neurologist
 - Neonatal Brain Injury



CP Hip: Management

- CP HALL OF FAME
- MODERN ERA
 - 1880s
 - William Osler
 - “Patient as a Textbook”
 - Cerebral Palsy



CP Hip: Management

- CP HALL OF FAME
- MODERN ERA
 - 1930s
 - Winthrop Phelps MD
 - Motor vs Mental
 - Classification
 - Treatment Principles



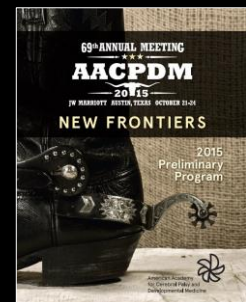
CP Hip: Management

- CP HALL OF FAME
- MODERN ERA
 - 1947: AMERICAN ACADEMY OF CEREBRAL PALSY
 - Multidisciplinary Approach



CP Hip: Management

- CP HALL OF FAME
- MODERN ERA
 - 2015: AMERICAN ACADEMY OF CEREBRAL PALSY AND DEVELOPMENTAL MEDICINE (AAPDM)



CP Hip: Management

- CLASSIFICATION OF CP
 - FUNCTIONAL
- GROSS MOTOR FUNCTION CLASSIFICATION SYSTEM FOR CEREBRAL PALSY (GMFCS)
 - PALISANO ET AL *DEV MED CHILD NEUROL* 39:214-223, 1997

GMFCS for children aged 6-12 years: Descriptors and illustrations

CP Hip: Management

- CLASSIFICATION OF CP
 - COMMUNICATION
- COMMUNICATION FUNCTION CLASSIFICATION SYSTEM FOR CEREBRAL PALSY (CFCS)
 - HIDECKER ET AL *DEV MED CHILD NEUROL* 53:704-7110, 2011
 - SENDER / RECEIVER

CP Hip: Management

- Neuromuscular Hip Dysplasia
 - Pathophysiology
 - Dynamic / Myostatic Muscle Imbalance
 - Pathomechanics
 - Add / Flex Bias
 - Abnormal Loading of Physes

CP Hip: Management

- Neuromuscular Hip Dysplasia
 - Pathoanatomy
 - Proximal Femur
 - Persistent Anteversion
 - Progressive Coxa Valga
 - Femoral Neck
 - Physis
 - Epiphysis

CP Hip: Management

- Neuromuscular Hip Dysplasia
 - Pathoanatomy
 - Acetabulum
 - Complex, Variable
 - Postero-superior Insufficiency Most Common
 - Anterior / Global Also Possible

CP Hip: Management

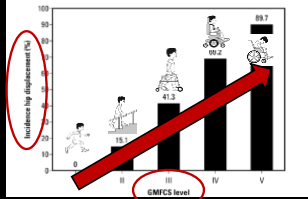
- Neuromuscular Hip Dysplasia
 - Pathoanatomy
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 - Anterior / Global Also Possible

CP Hip: Management

Neuromuscular Hip Dysplasia

– Incidence (MP > 30%)

- GMFC I: 0
- GMFCS II: 15.1%
- GMFCS III: 41.3%
- GMFCS IV: 69.2%
- GMFCS V: 89.7%



Soo, *J Bone Joint Surg Am* 2006

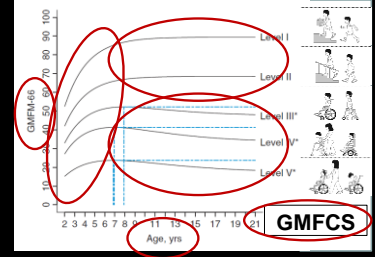


CP Hip: Management

GMFCS

– Change with Age

– Hanna, *Dev Med Child Neurol* 51:295-302, 2009



CP Hip: Re-subluxation

Neuromuscular Hip Dysplasia

– Natural History



4 Years of Age



CP Hip: Re-subluxation

Neuromuscular Hip Dysplasia

– Natural History



6 Years of Age



CP Hip: Re-subluxation

Neuromuscular Hip Dysplasia

– Natural History



11 Years of Age



CP Hip: Management

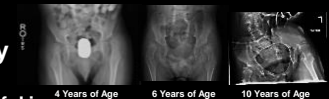
Neuromuscular Hip Dysplasia

– Natural History

- Controversial
- 57-72% Not Painful in Young Adults

• Longer Survival : Greater Chance of Pain

• Noonan, *J Bone Joint Surg Am* 2004



CP Hip: Management

• Neuromuscular Hip Dysplasia

– Natural History

- Controversial
- 57-72% Not Painful in Young Adults
- Longer Survival : Greater Chance of Pain
- Noonan, *J Bone Joint Surg Am* 2004



CP Hip: Re-subluxation

• Neuromuscular Hip Dysplasia

- Natural History
- Predictable
- Avoidable
 - In Most Cases
 - Not Easy
 - Complex
 - Expensive
- Earlier Interventions
 - Better Results!



11 Years of Age



CP Hip: Management

• Neuromuscular Hip Dysplasia

– Treatment Goals

– Techniques

- Multi-disciplinary
 - Orthopaedics
 - Physiatry
 - Neurosurgery
- Proactive
- Comprehensive



CP Hip: Management

• Neuromuscular Hip Dysplasia

– Treatment Goals

– Restore Alignment

- Correct Myostatic Muscle Deformities
- Correct Femoral / Acetabular Malalignments



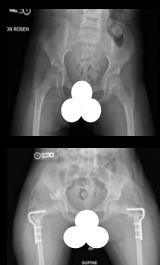
CP Hip: Management

• Neuromuscular Hip Dysplasia

– Treatment Goals

– Prevent Recurrence

- Manage Spasticity
- Maintain Range of Motion
- Orthotics
- Normalize Forces Across Physes



CP Hip: Management

• Neuromuscular Hip Dysplasia

– Treatment Goals


– Right Patient, Right Time, Right Surgery

- 95% Success Rate at 7 Years Follow Up
 - McNerney, *J Pediatr Orthop* 2000
- 75% Success Rate GMFCS IV / V
 - Zhang, *J Pediatr Orthop B* 2012




CP Hip: Management


- **Common Pitfalls**
 - Wrong Disease
 - Neuromuscular Hip Dysplasia
 - ≠ Developmental Hip Dysplasia
 - Subsequent Growth
 - Helpful in DDH
 - Acetabular Remodeling
 - Harmful in CP NMHD
 - No Acetabular Remodeling
 - Recurrent Femoral Deformity
 - Persistent Abnormal Loading
 - Gordon JBJS 1996
 - Stasikelis JPO 2001
 - Huh JPO 2011



CP NMHD

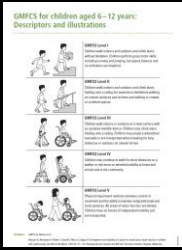


DDH




CP Hip: Management

- **Common Pitfalls**
 - Wrong Patient
 - Gross Motor Function Classification System (GMFCS)
 - Decision Making
 - GMFCS I, II
 - GMFCS III, IV
 - GMFCS V
 - Wrong Time
 - Too Early: Recurrence with Growth
 - Too Late: Extreme Deformity




Graham, J Pediatr Orthop, 2005



CP Hip: Management


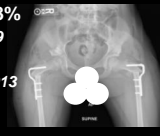
- **Common Pitfalls**
 - No Positive Growth / Remodeling
 - Comprehensive Acute Correction
 - Femoral and Acetabular
 - Reduction / Containment Goals
 - Achieved at Surgery
 - Errors of Omission / Commission
 - More Is Better!




CP Hip: Management


- **Neuromuscular Hip Dysplasia**
 - Complications
 - Overall: 25%
 - GMFCS V (trach or G-tube): 68%
 - Stasikelis, J Pediatr Orthop 1999
 - GMFCS IV / V: 47%
 - Ruzbarsky J Children Orthop 2013







CP Hip: Management

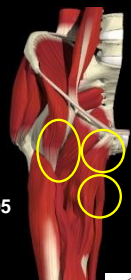
- **Treatment Options**
 - Early Tone Management
 - Botox/Phenol Injections
 - Add, IPS, Gr, Med Hams
 - Long Term Abd Bracing
 - Graham, J Bone Joint Surg 2008






CP Hip: Management

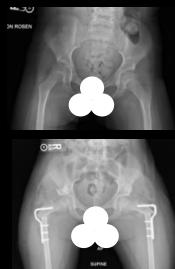
- **Treatment Options**
 - Early Soft Tissue Release
 - Age ≤ 6 Years
 - Migration Index > 30 %
 - Sequential Release
 - Add, IPS, Gr, Med Hams
 - Long Term Abd Bracing
 - Presedo J Bone Joint Surg Am 2005
 - Dobson J Bone Joint Surg Br 2002
 - Shore J Bone Joint Surg Am 2012






CP Hip: Management


- **Treatment Options**
 - Reconstruction
 - Congruent
 - VDRO
 - Dega Acetabuloplasty
 - McNerney
 - *J Pediatr Orthop* 2000






CP Hip: Management

- **Treatment Options**
 - Reconstruction
 - Non-Congruent
 - VRO
 - Chiari / Shelf
 - Dietz
 - *J Pediatr Orthop* 1995





17 yo Male, CPH left
18 Months Post-op



CP Hip: Management


- **Treatment Options**
 - Salvage
 - Resection
 - Leet
 - *J Pediatr Orthop* 2005






CP Hip: Management

- **Recent Review**
 - Incidence
 - Pathophysiology
 - Natural History
 - Treatment Options
- Valencia
 - *Orthop Clin North Am*, 2010






CP Hip: Management

- **Decision Making: Experience**
 - Before you Decide to Operate
 - Get to Know the Family
 - Several Visits
 - When You Decide to Operate
 - More Is Better!


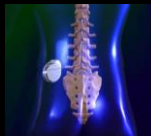







CP Hip: Management

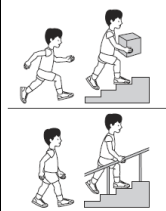
- **Decision Making: Experience**
 - Utilize GMFCS to Guide Decision Making
 - GMFCS I, II
 - GMFCS III, IV
 - GMFCS V
 - Embrace Tone Management




CP Hip: Management

- **Decision Making: GMFCS I, II**
 - Rare
 - Never Give Up!
 - Early Soft Tissue Release
 - Comprehensive, Congruent Reconstruction

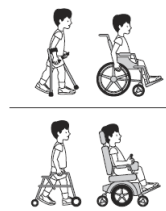


Graham, J Pediatr Orthop, 2005




CP Hip: Management

- **Decision Making: GMFCS III, IV**
 - ≤ 12-15 years of Age
 - 1st, 2nd Attempts
 - Early Soft Tissue Release
 - Comprehensive, Congruent Reconstruction
 - 3rd Attempt
 - Reactive Strategies
 - Salvage Situations

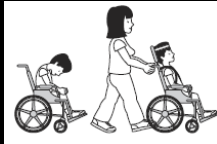


Graham, J Pediatr Orthop, 2005




CP Hip: Management

- **Decision Making: GMFCS V**
 - Philosophical, Ethical Discussion with Family
 - Proactive vs Reactive
 - Tone Management
 - Proactive
 - Similar to GMFCS III, IV
 - Reactive
 - Soft Tissue Release
 - Resection
 - (Arthrodesis)




Graham, J Pediatr Orthop, 2005




CP Hip: Management

- **Latest Developments**
 - Controlled Growth
 - Proximal Femoral Epiphysis
 - Caput Valgum
 - Coxa Valga
 - Epiphyseal Deformity
 - Animal Model
 - McCarthy, *Pediatr Orthop* 2010
 - Cerebral Palsy
 - Lee, *J Pediatric Orthop* 2015




Lee, J Pediatr Orthop, 2015




CP Hip: Management

- **Complex Decision Making**
 - Pathoanatomy
 - Comprehensive Assessment
 - Appropriate Surgery
 - Address All Elements of D
 - Tone Management
 - Facilitates All Aspe Management
 - Early Diagnosis
 - Early Treatment
 - Better Outcomes!



Graham, J Pediatr Orthop, 1997



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