Principles of Cerebral Palsy

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cerebral palsy

Definition

None progressive disease of the CNS secondary to a perinatal insult, resulting in varying degrees of motor milestone delay and dysfunction.

Incidence

2 – 5 % of live births

2 per thousand children at school age
Cerebral palsy

Classification

According to Type of motor dysfunction

- Spastic: 65%
- Athetoid: 10%
- Ataxic: 5%
- Mixed: 12%
- Hypotonic: 1%
Cerebral palsy

Classification

According to Pattern of involvement

Monoplegia: one limb / rare

Diplegia: both LL >> UL / good intelligence / prematurity

Hemiplegia: unilateral usually UL > LL / 33 % seizures

50 % mentally retarded

Triplegia: rare / usually both LL + one UL

Quadriplegia: total body / often mentally retarded / with seizures / severe hypoxia

Double hemiplegia: bilateral UL > LL
Cerebral palsy

Spastic Diplegia

- The most common type
- Speech / intellect: normal – slightly impaired
- UL: gross motor OK
  minor incoordination of fine motor skills
- LL: spastic:
  - hip: flexion, adduction, int. rotation
  - knee: flexor / extensor spasticity / or equal
  - ankle: equinus
  - foot: pes valgus
- Most walk independently by 4 years
Cerebral palsy

Spastic Hemiplegia

- 30% of all CP
- One side affection
  upper > lower extremity
- 50% mentally retarded
- 33% seizures
Cerebral palsy

Spastic Quadriplegia

- All four limbs involved – and trunk
- Often mentally retarded
- With seizures
- Most (80%) non walkers
Cerebral palsy

Clinical Assessment

Goals of Physical Examination

• Determine grades of muscle strength and selective control.
• Evaluate muscle tone and determine type.
• Evaluate degree of deformity / contracture at each joint.
• Assess linear, angular and torsional deformities of spine, long bones, hands and feet.
• Appraise balance, equilibrium and standing / walking posture.
Cerebral palsy

Clinical Assessment

Hip Flexors

- Ilio-psoas
  (the main and most powerful)
- Sartorius
- Tensor fascia lata
- Rectus femoris
- Adductors
Cerebral palsy

Clinical Assessment

Hip Flexors

Thomas test

• easy & simple, well known

• problem: depends on how much is the other hip flexed
Cerebral palsy

With fixed knee flexion, Thomas test should be performed with knee outside at table edge to prevent false positive results.
Cerebral palsy

Clinical Assessment

Hip Flexors

Staheli Test

Prone position

Pelvis over table edge

More accurate
Cerebral palsy

Clinical Assessment

Hip Flexors

Ely / Rectus Femoris Test

• Well known
• Significance?
Cerebral palsy

Hip Adductors

Superficial layer

- Pectineus
- Adductor longus
- gracilis
Cerebral palsy

Hip Adductors

Intermediate layer

- adductor brevis
Cerebral palsy

Hip Adductors

Deep layer

- adductor Magnus
Cerebral palsy

Clinical Assessment

Hip Adductors

Hip abduction / knees extended

Hip abduction / knees flexed

The Gracilis
Cerebral palsy

Hip Rotators

<table>
<thead>
<tr>
<th>Internal Rotators</th>
<th>External Rotators</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gluteus Medius</td>
<td>• Piriformis</td>
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<tr>
<td>\phantom{anterior portion is the main</td>
<td>• Gemilli</td>
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<td>\phantom{internal rotator}</td>
<td>• Obturator internus</td>
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<tr>
<td>• Gluteus Minimus</td>
<td>• Obturator externus</td>
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<td>• Semitendinosis</td>
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<tr>
<td>• Adductors</td>
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<td>• Tensor fascia lata</td>
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</tbody>
</table>
Cerebral palsy

Clinical Assessment

Hip Rotation
Cerebral palsy

Clinical Assessment

Knee Flexion

Hamstring Tightness

The Hamstring Test

Holt’s method

- Hip flexed **90 degrees**
- Popliteal angle
  - degrees less than full extension
Cerebral palsy

Clinical Assessment

Knee Flexion

( Hamstring Tightness )
Cerebral palsy

Clinical Assessment

Ankle

Silfverskiold – 1923

Gastroc. Vs T. Achilles

( Soleus )
Cerebral palsy

Clinical Assessment

Rotational Profile

- Foot propagation angle

- Femoral rotation
  int. / extr. Rotation

- Tibial rotation
  Foot – Thigh Angle
Clinical Assessment
Posture / Gait

- Lying
- Sitting
- Standing
- walking
Cerebral palsy

Clinical Assessment

Upper Limb

- Superficial layer
- Middle layer
- Deep layer
Cerebral palsy

Clinical Assessment

Upper Limb

• Elbow flexion
• Forearm pronation
• Wrist flexion
• Finger flexion
• Thumb in palm
Cerebral palsy

Clinical Assessment

Upper Limb

Wrist dorsi-flexed

Wrist palmar-flexed
Test for spastic wrist flexors

1. Flex wrist
2. Gradually extend
3. Palpate contracted / spastic tendon
   (FCU or FCR)
Cerebral palsy
Clinical Assessment
Upper Limb

Test for contracted FDS / FDL

Extend and stabilize wrist and metacarpal-phalangeal joints

Stabilize DIP & attempt to extend PIP
Stabilize PIP & Attempt to extend DIP
Cerebral palsy

Goals of Management (Treatment)

Achievable goals should be set
The child with CP becomes the adult with CP
Goals based on needs of adults

- Communication: verbal / nonverbal
- Activity of daily living (ADL)
  - feeding, dressing, toileting, bathing …
- Mobility
- walking
Cerebral palsy

Goals of Management (Treatment)

• Turn focus of parents from the disease to the goal-oriented approach. Needs time and a lot of discussion.

• Physician and Physiotherapist must have the same perspective.
Cerebral palsy

Types of Management (Treatment)

• Physical therapy
• Orthotics
• Control of spasticity
• Orthopedic surgery
Cerebral palsy

Spasticity

- Present in most patient with CP (65 %)
- When reduced patients may:
  - perform integrated muscle movement
  - develop muscle strength
  - function at a higher level
Cerebral palsy

Spasticity

- Approaches:
  - Selective dorsal rhizotomy
  - Intrathecal baclofen
  - Botulinum-A toxin
Cerebral Palsy

Selective Dorsal Rhizotomy

Cut 30 – 50% of abnormal dorsal rootlets L2 - S1

- Followed by intensive physiotherapy
- Results encouraging
- May cause hyperlordosis / hip subluxation
- Best for: spastic diplegia, 4-8 yrs, no previous surgery, no contractures, no extra pyramidal signs
- ? Not enough alone
- Orthopedic procedures obtain similar results
Cerebral palsy

Baclofen

GABA agonist – inhibits release of excitatory neurotransmitter at level of spinal cord

- Oral: mixed reports/ side effects/ not selective
- Continuous intrathecal – implantable pump
- Good results in releasing spasticity, and improving function
- Complications of pump and catheter
- Needs specialized centers
Cerebral palsy

**Botulinum-A toxin**

Acts at myo-neural junctions
Inhibits exocytosis of Acetylcholine

- Inject selected muscles at multiple sites
- Spasticity reduction may last up to 6 months
- Reversible, painless, minimal side effects
- Most patients still require lengthening for permanent correction

Role:
- Facilitates physiotherapy and mobilization
- Delays surgical management
- Trial to determine effects of specific proposed surgical treatment
Cerebral palsy

Types of Physical Therapy

- **CNS modifications:** applying external stimuli / effectiveness not proven

  e.g.
  - Neuro-developmental therapy
  - Sensory integration therapy
  - Patterning
  - Conductive education
  - Pressure point stimulation
Cerebral palsy

Types of Physical Therapy

• Conventional PT:

  works peripheral on muscles, tendons, and ligaments

  - Active exercises
  - Passive ROM exercises
  - Passive stretching
  - Bracing
Cerebral palsy

**Physical Therapy**

Involve parents as much as possible

*(even if they resist)*

Do not raise false hopes

which could increase frustration
Post operative PT is essential to maximize benefit of surgical procedures

Goals:
- maintain / improve ROM
- regain pre-operative muscle strength
- maximize ambulation
- improve function – if possible

How frequent ?: as necessary
For how long ?: usually for a limited period
Cerebral palsy

Physical Therapy

Maintenance Physical Therapy

Goals:
- balance and gait training
- maximize voluntary muscle usage
- prevent joint contractures
Cerebral palsy

Physical Therapy

Maintenance Physical Therapy
Prevention of joint contracture – potential benefit

- by supervision of a daily range of joint motion program (can be applied by parents at home)

- for patients who lack the motor strength and voluntary control to maintain joint ROM

*no real proof of benefit*
Cerebral palsy

Physical Therapy

Maintenance Physical Therapy

How often?
For how long?

some parents demand
regular physical therapy sessions
at least twice per week
for life!
There is no evidence that any type of physical therapy can have a beneficial lasting effect on motor function beyond early to middle childhood (age 4-8 years).

Thomas S. Renshaw
( Lovell & Winter’s Pediatric Orthop.)
Children older than this no doubt benefit more by devoting their time (and their families’ and society’s resources) to the development of communication, cognitive, and recreational skills instead of endless therapy sessions.

Thomas S. Renshaw
( Lovell & Winter’s Pediatric Orthop.)
Cerebral palsy

Orthotics

- Immobilization may cause atrophy
- Night splints:
  - Do not prevent nor reduce deformity
  - May cause irritation, pain or stimulate reflexes in spastic muscles and relaxes the weaker opponents – thus may increase deformity rather than reduce it!
- May be useful only in Athetoid
“Experience in the management of cerebral-palsied children with or without bracing leads to the conclusion that a brace has very little place in the management of cerebral palsy, provided the child is given adequate physiotherapy and the fixed deformity is prevented by good combined physiotherapy and surgery “

Sharrard 1976
Cerebral palsy

Orthotics

• In a review of 204 cerebral-palsied children Lee (1982) concluded:

Regardless of spastic hemiplegia, diplegia or athetosis, bracing versus non-bracing was
ineffective in:

- preventing the need for surgery to correct deformities
- preventing recurrences after surgery
- improving the gait.
Cerebral palsy

Orthopedic Procedures

Usually multiple deformities at different joints

Knowledge of complex effects each deformity has on other lower extremity joints
Cerebral palsy

Orthopedic Procedures

Distinguish between

primary deformity : needs treatment

compensatory deformity : can improve without intervention
Cerebral palsy

Prerequisites for effective surgery

- **Type**: spastic
- **Extent**: hemiplegics / diplegics: good results
  quadriplegics: minimal improvement
- **Age**: 3-12 years
- **IQ**: good
- **Good upper limb function**: for walking
- **Underlying muscle power**: not weak
- **Walker / non-walker**: surgery hardly changes state but improves gait
• Turn focus of parents from disease to the goal-oriented approach

• Surgeons should *spend time* with patient at least as much as operation time!

• Involve physiotherapists during all stages of management – and

  *listen to their suggestions and comments*
Cerebral palsy

Ambulation

“Factors“

- Balance
- Muscle control
- Strength
- Functional joint motion
- Sensory input
Cerebral palsy

Goals of Treatment

Walking

• **Community walker**: free in community

• **Household walker**: free at home / wheelchair outside

• **Physiological walker**: walks only in PT dept. or at home between parallel bars / with assistance

• **Non-walker**: wheelchair independent / assistive transfer / dependant
The Hip in Cerebral palsy

Indications For Orthop Surgery

- Prevent structural changes
  usually early

- Improve function
  usually later
Cerebral palsy

Timing For Orthop Surgery

- **For structural changes**: Early
  e.g. Hip subluxation, usually <5 years
- **To improve function (gait)**:
  defer until walking (independently/with aids)
  until gait pattern develops and could be assessed
  walking: 18 – 21 months in hemiplegia
  3 – 4 years in spastic diplegia
- **Optimum time of lower extremity surgery**
  5 – 7 years: can analyze and observe gait pattern
Cerebral palsy

Timing For Orthop Surgery

Surgery is NOT “The Last Resort”

( not after all other methods failed !)
Cerebral palsy

Timing For Orthop Surgery

Surgery should not be unduly staged one by one
(with each birthday)

- Equinus
- Crouch
- Flexion
- Stiff Knee
- Ok
Cerebral palsy
Orthop Surgery
Post Operative Management

• Analgesia:
  - do not be mean!
  - child should not cry to get the dose!
  - sedation (valium) is not enough!

• Immobilization:
  - minimal time / mobilize rapidly!
  - can ambulate in cast one week post oper.
Thank you

Mamoun Kremli
Cerebral palsy

Hip Deformities

- Dynamic deformities
- Tight adductors – scissoring
- Tight flexors – with pelvic inclination
  compensatory knee / ankle/ trunk deformities
- Hip subluxation / dislocation :
  not common in walking patients with diplegia
- Wind-swept deformity : in quadriplegics
- Internal rotation : in spastic hemi & diplegics
Cerebral palsy

Hip Deformities

- Structural deformities:
  - contractures of flexors, adductors, or extensors - with ligs. And capsule
  - acetabular dysplasia
  - femoral ante version
  - coxa valga
Cerebral palsy

Knee Deformities

• Knee flexion deformity:
  Tight Hamstrings
  medial > lateral
  Structural - Functional
• Stiff extended knee
Cerebral palsy

Ankle & Foot Deformities

• Equinus
• Equino-valgus
• Equino-varus
• Pes cavus
Cerebral palsy

**Spastic Diplegia**

- **The most common type**
- **Speech / intellect:** normal – slightly impaired
- **UL:** gross motor OK
  minor incoordination of fine motor skills
- **LL:** spastic:
  - hip: flexion, adduction, int. rotation
  - knee: flexor / extensor spasticity /or equal
  - ankle: equinus
  - foot: pes valgus
- **Most walk independently by 4 years**
Cerebral palsy
Spastic Diplegia
Cerebral palsy

Spastic Diplegia - Hip Adductor Spasm

• Normally base of gate:
  
  5 – 10 cm (heel to heel)

• Indications for surgery:
  
  - scissoring
  
  - hip abduction in supine < 10°
Cerebral palsy

Spastic Diplegia - Hip Adductor Spasm

- Types of adductor “release”: (open – not closed)
  - Adductor longus tenotomy
  - Sliding proximal end & suturing to brevis
  - Adductor longus & gracilis myotomy
- Leave adductor brevis (the major hip stabilizer)
- No anterior branch obturator neurectomy
  (n. to adductor brevis)
- Release brevis - partially - if can not abduct 45° UGA
Cerebral palsy
Spastic Diplegia
Hip Adductor Spasm

Post Operative after Adductor Release

Bilateral Long-leg cast connected with stick
Keeping each hip in $30^\circ$ – $40^\circ$ abduction *only*
For 3 weeks
Cerebral palsy

Spastic Diplegia - Hip Flexion Deformity

Indication for surgery

- Hip flexion deformity never decrease by passive stretching, physiotherapy, orthotics, sleeping prone …

  Eugene E. Bleck 1987

- Hip flexion deformity > 20° needs surgery
Cerebral palsy
Spastic Diplegia - Hip Flexion Deformity

- Iliopsoas is the main and most powerful hip flexor
- Function of Iliopsoas not compensated by other flexors
- Without Iliopsoas:
  - can not lift foot more than few inches from floor
  - can not climb stairs
- Iliopsoas is the main contributor to FFD of hip
- Need to lengthen / preserving strength
Cerebral palsy

Spastic Diplegia - Hip Flexion Deformity

What not to do!

- Yount’s fasciotomy of Tensor F. Lata – not enough
- Souter’s muscle sliding of Sartorius, Rectus Femoris, and Tensor Fascia Lata – 66% recurrence
- Proximal Rectus Femoris tenotomy
  - if it feels tight intraop. it is normally tight
  - if hamstrings spastic:
    overpowers the weekend Quad.in 6m – 1 year
- Myotomy of ant. Fibers of Gluteus Medius
  very important pelvic stabilizer in stance phase
Cerebral palsy

Spastic Diplegia - Hip Flexion Deformity

Iliopsoas tenotomy / lengthening / recession

- **Tenotomy**: not in ambulatory patients in non-ambulatory OK
- **Recession**: good for subluxated hip might weaken it too much
- **Lengthening (z plasty)**: best / easy satisfactory in ambulating patients no risk of too much weakening of flexion power
Cerebral palsy

Spastic Diplegia - Hip Flexion Deformity

• Iliopsoas tenotomy / lengthening / recession
Cerebral palsy

**Spastic Diplegia – The Knee**

- **Crouched gait:**
  - tight hamstrings: needs hamstring release
  - could be secondary to weak triceps surae

- **Type of surgery:**
  - tenotomy: too risky, causes knee extension
  - transfer: results not as good as thought
  - lengthening: best (medial first, then lateral)
Cerebral palsy

Spastic Diplegia – The Knee

• **Lengthening hamstrings**: reduces hip extension power increases hip flexion
• **Add hip flexor (Psoas) lengthening if concomitant hip flexion is present**
• **Hamstring transfer to femur instead of complete release**
Cerebral palsy

Spastic Diplegia – The Knee
Tight Hamstrings

• Surgery when popliteal angle 45° and above
• Start medially, ? then laterally if needed
• Lengthening better than release
• Add distal rectus femoris release
  if concomitant cospasticity
• Add psoas lengthening
  if preexisting hip contracture
Cerebral palsy

Spastic Diplegia – The Knee

stiff knee gait

- mainly caused by Rectus Femoris
- treat by:

   Rectus Femoris release:
      proximal ?
      distal – better

Distal transfer (medially to Sartorius)
The Hip in Cerebral palsy

Effect of Knee Surgery on The Hip

Hip flexion Deformity increases after hamstring release

Better to transfer hamstring insertion to keep hip extended
Cerebral palsy

Spastic Diplegia – The Foot & Ankle

Equinus deformity

( a little equinus is better than calcaneus)

• Velocity of muscle growth:
  early: rapid  (birth – 4 years: doubles)
  late: slow  (4 years – maturity: doubles)

• ETA  If done early returns more commonly
  Recurrence rate:  75 % if done at 2 years
                  25 % if done at 4 years
                  14 % if done at 7 years
Cerebral palsy

Spastic Diplegia – The Foot & Ankle

Toe Walking

• **Dynamic** :

  Treat by :

  
  Bracing

  Spasticity reduction

  Surgery (careful!)

• **Fixed** :

  Treat by :

  Serial casting

  Surgery
Cerebral palsy

Toe Walking

Gastrocnemius Release

**Indications:**
- isolated gastroc. Contractures
- dynamic toe walking

**Problems:**
- reduces knee flexion power
- might not be effective
Cerebral palsy

Toe Walking

ETA

Indications:
- fixed deformity
- tight TA

Problems:
- over lengthening

Types:
- z-plasty
- sliding:
  - percutaneous
  - open
Cerebral palsy

Spastic Diplegia – The Foot & Ankle
Equino - valgus

- More frequently seen
- Tight TA and Talonavicular subluxation
- No perfect muscle balancing procedure
- Treatment:
  - ETA and subtalar arthrodesis
  - Osteotomies
Cerebral palsy

Spastic Diplegia – The Foot & Ankle

Equino - varus

• Not very common

• **Treatment:**
  - split transfer of tib. post. tendon
    lateral half, posterior to interosseous memb.,
    to peroneus brevis laterally
  - elongation of tib. Post.
    and split transfer of tib. ant. Laterally

**prerequisite:**
  - passively correctable foot
  - good tib. ant.
Cerebral palsy

Spastic Hemiplegia

- 30% of all CP
- One side affection
  - upper > lower extremity
- 50% mentally retarded
- 33% seizures
Cerebral palsy

Spastic Hemiplegia

Type 1

- Weak tib ant. / triceps surae not tight
- Functional drop foot in swing phase
- Plantar flexion disappears in stance phase
- Treatment:
  AFO with 90 degree plantar stop
Cerebral palsy

Spastic Hemiplegia

Type 2

- Weak tib ant / spastic triceps surae and tib post
- Equinus in all phases of gait – and varus secondary knee hyperextension (in late stance)

Treatment:

ETA + elongation or split transfer tib post

AFO needed
Cerebral palsy

Spastic Hemiplegia

Type 3

• Same like type 2 + tight hamstrings often with cospasticity of Rectus Femoris
• Ankle equinovarus, knee crouch and stiff
• Treatment: same like type 2 + hamstring lengthening (medial) + distal Rectus Femoris release/transfer
AFO important
Cerebral palsy

Spastic Hemiplegia

Type 4

• Same like type 3 + hip flexor and adductor spasticity

• Equinovarus, crouch stiff knee, in addition to hip adduction and flexion

• Treatment: same like type 3 + hip adductor release and Psoas lengthening
Cerebral palsy

**Intoeing**

- Usually caused by femoral ante-version
- Internal tibial torsion adds to intoeing
- If severe: Derotation osteotomy
  - Delay to late childhood if possible
- Derotation osteotomy of femur might cause tightening of medial hamstrings
  (might need lengthening)
Cerebral palsy

In-toeing

Why?

Femoral Ante-version

Normal anteversion

Excessive anteversion
Cerebral palsy

In-toeing

Why?

- Not related to spasticity of internal rotators
- Usually caused by femoral ante-version
- Femoral ante-version caused by:
  - Iliopsoas (flexor) spasticity – which causes FFD & lack of hip extension - which reduces torque on proximal femur - thus normal derotation of physiological ante-version does not occur
Cerebral palsy

Why Does Anteversion Cause In-toeing?

- Anteversion rotates Greater Trochanter posteriorly
- On stance phase need Abductor power
- Abductor power optimized when Greater Trochanter is lateral not posterior
- Internal rotation in stance phase brings Greater Trochanter laterally
Cerebral palsy

In-toeing

Pitfalls in derotation osteotomy

• Failure to recognize concomitant excessive external torsion of tibia
• Over correction with loss of all internal rotation of hip – causing gait problems:
  pelvis can not externally rotate during gait
Cerebral palsy

In-toeing

Indication for derotation osteotomy

- Severe femoral anteversion, with loss of all external rotation.
- Dynamic in-toeing causing gait abnormalities.
- Dynamic in-toeing causing secondary foot deformity.
- Usually not before 8-10 years.
Cerebral palsy

Spastic Quadriplegia

Management

Most are non walkers (80%)

Aim for comfortable sitting on wheelchair

Specific objectives:

- Back: Scoliosis: fixation – straight spine
- Hips: good sitting – level pelvis - ROM (30°-90°)
  good lying
  hygiene
  not painful
- Knees: reasonable ROM (20°-90°) – for sitting / lying
- Feet: plantigrade - rest comfortably on foot rest
Cerebral palsy

Spastic Quadriplegia

Walkers: 20%

• Good head control
• Good trunk control
• Can attempt to stand
Cerebral palsy

Hip Problems in Spastic Quadriplegia

- Adduction and flexion deformity
- Wind swept deformity
- Internal rotation deformity
- Hip thrust and extension deformity
- Hip at risk
- Hip subluxation
- Hip dislocation
Cerebral palsy

Hip Problems in Spastic Quadriplegia

- Adduction and Flexion deformities
- Wind-swept deformity
Cerebral palsy
Hip Problems in Spastic Quadriplegia

Hip Adduction and Flexion

- Scissoring, uncomfortable sitting, hygiene
- Hip adductor release
  - Obturator neurectomy
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip at risk

(valgus, anteverted, acet. dysplasia)

Femoral Anteversion more than true Valgus
Cerebral palsy

Spastic Quadriplegia

Hip Management

Hip at risk

Often progresses to subluxation or dislocation unless treated

- Hip adductor release
- Hip flexor release
- ? Obturator neurectomy
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip Subluxation and Dislocation

Orthotics and physical therapy methods have not been demonstrated to have any effect on prevention of subluxation or dislocation of the hip in CP.
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip subluxation (partially out)

(> 30% uncoverage / broken Shenton’s line)
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip subluxation (partially out)

Reimer’s migration index

Dislocated

Subluxated 50%
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip at Risk \hspace{1cm} \rightarrow \hspace{1cm} \text{Hip subluxation}

At 2.5 years \hspace{1cm} \text{At 7 years}
Cerebral palsy

Hip Problems in Spastic Quadriplegia

High risk of hip subluxation and dislocation in non-walking diplegics and quadriplegics

Should obtain a pelvic x-ray annually
Cerebral palsy

Hip Problems in Spastic Quadriplegia

• The independently walking child with spastic diplegia rarely dislocates, if ever, and only those who have partial weight bearing with crutches or walkers subluxate.

• Full wt. bearing = internally rotate
• Partial wt. bearing = subluxate
• Non ambulatory sitting = dislocate

Eugene Bleck
Cerebral palsy
Spastic Quadriplegia
Hip Management

Hip subluxation

- Hip adductor release
- Hip flexor release
- ? Obturator neurectomy
- ? Femoral varus / ?derotation osteotomy
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip dislocation is painful in 50 %

Hip dislocation increases deformity

Should prevent / treat hip dislocation
Cerebral palsy

Spastic Quadriplegia

Hip Management

Hip Dislocation

• If detected early ( < one year ) :
  Surgery: soft tissue
  femoral osteotomy
  ? Acetabuloplasty (secondary Dysplasia)

• If detected late ( > One year ) :
  painless: leave alone
  painful: surgical resection
Cerebral palsy

Hip Problems in Spastic Quadriplegia

Hip Dislocation

( completely out )

Painful dislocated > 1 year

Surgical resection
Cerebral palsy

Spastic Quadriplegia

Hip Management

Extension Contracture

• Rare
• Caused by tight contracted Hamstrings
• Interferes with comfortable sitting
• Does not allow hip flexion
• Treat by lengthening proximal Hamstrings
Cerebral palsy

Spastic Quadriplegia

Hip Management

Extension Thrust

• More common than extension contracture
• Rigid and sustained hip extension
• Throws child out of wheelchair
• Treated by proximal lengthening of Hamstrings
Cerebral palsy
Spastic Quadriplegia Management

- **Scoliosis**: Fixation – straight spine

- **Hips**: (dislocation painful in 50%)
  - **Hip at risk**: (valgus, anteverted, acet. dysplasia)
    - Hip adductor and flexor release, ? Obturator neurect.
  - **Hip subluxation**: same + ? Derotation / varus osteotomy
  - **Hip dislocation**: if detected early: surgery
    if detected late: no pain – leave
    pain – proximal resection
Cerebral palsy

Errors in Surgical Planning

• Frequent surgical procedures for “new” deformities – were not identified initially

• Planning over-correction
  - to avoid quick recurrence
  - to compensate for another deformity
e.g. excessive ext. rot. of femur when int. tibial as well as femoral anteversion
Cerebral palsy

Errors in Surgical Planning

- Planning significant under-correction of bony and joint deformities
  e.g. hip dislocation with ligament contracture does not correct with little muscle lengthening
  e.g. significant anteversion or dislocated hip can not benefit by muscle surgery alone

*Slight under-correction is better than over-correction e.g. intoing*
Cerebral palsy

Errors in Surgical Planning

- Recurrence of deformity
  - very early surgery often ends in recurrence
  - after muscle lengthening need aggressive stretching and splinting to avoid recurrence
Principles in Cerebral palsy

Conclusion

• Set goals for management - not treatment
• Same perspective by surgeon and physiotherapist – both indispensable!
• Look at multiple-level joint problems
• Know indications and limitations of various management options
• Keep dynamic thinking – re-evaluate
Thank you
Thank you

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