Children's National

Hip Surveillance and Cerebral Palsy

Sean A. Tabaie, MD FAAOS

Assistant Professor of Orthopaedic Surgery & Pediatrics
Children's National Hospital
Washington, DC

Co-Chair of Diversity, Equity and Inclusion for the JER Center for Surgical Care
Medical Director - Motion Capture and Gait Lab at The Fight for Children Sports Medicine Center

CME Lunch and Learn - March 22, 2023

Learning Objectives

- Review the anatomy of children's' hips, the impact of Cerebral Palsy
- Understand the importance of monitoring hips
- Review how parents and caregivers can advocate for their child's hip health

GW

Children's National

Disclosures

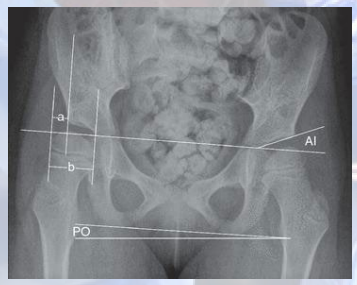
- No conflicts to disclose:
  - No financial or business interest, arrangement or affiliation that could be perceived as a real or apparent conflict of interest in the subject (content) of this presentation.
  - No unapproved or investigational use of any drugs, commercial products or devices.

GW

Children's National

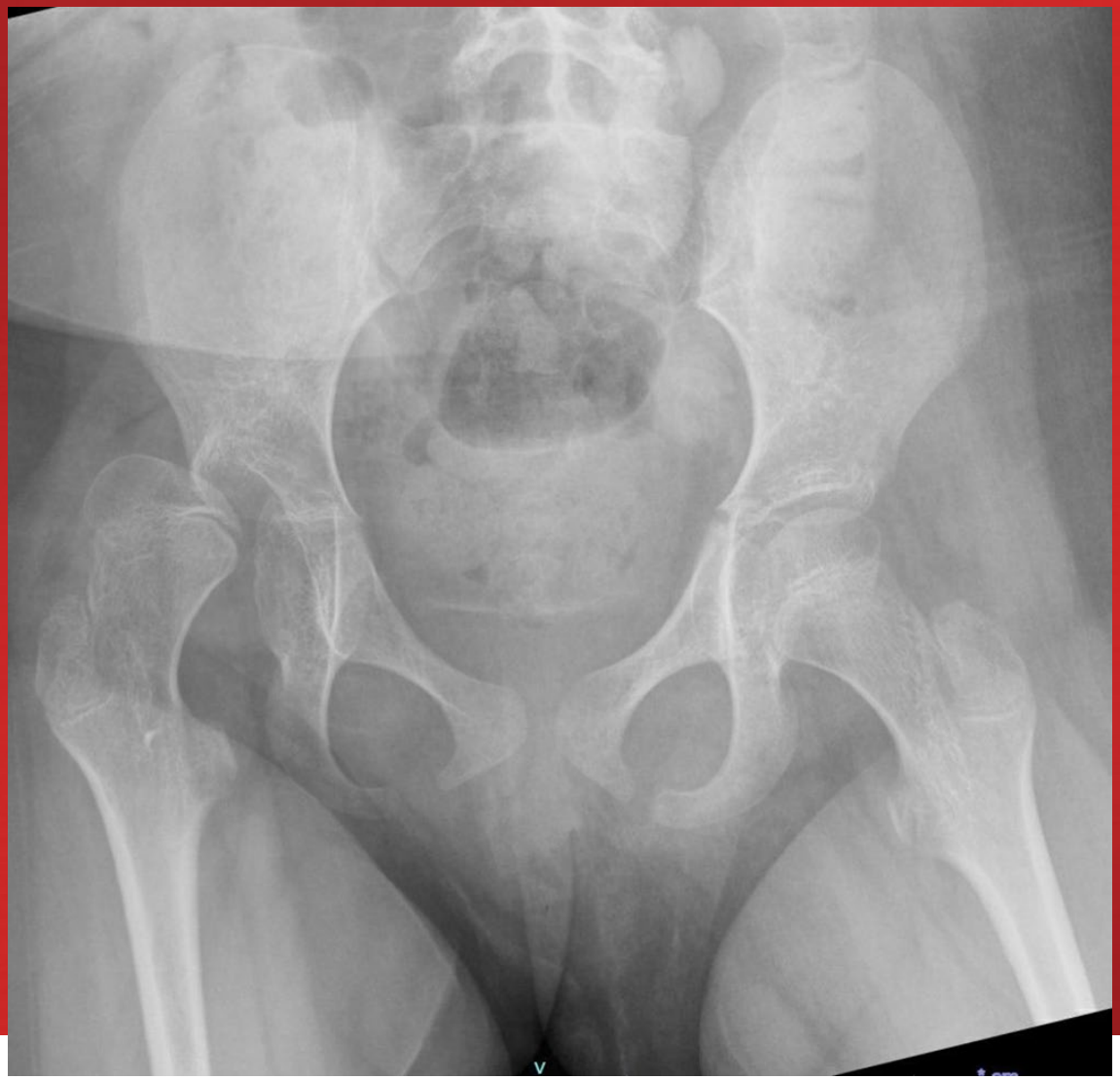
ICE BREAKER

Children's National



Complete Team Approach to the Care of the Cerebral Palsy Patient

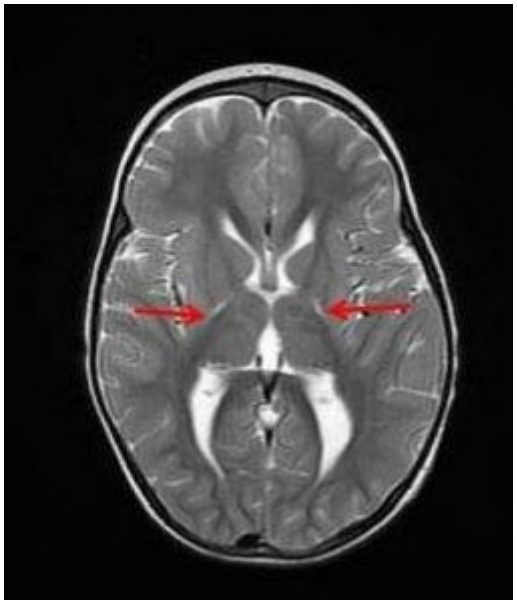
Children's National



Children's National

Introduction

- Cerebral palsy (CP) has an incidence of approximately ***two per 1000 live births*** and is the most common cause of physical disability affecting children in developed countries
- Although CP is by definition a static encephalopathy, the associated musculoskeletal pathology is usually progressive
- All children with CP are at risk of developing progressive hip displacement

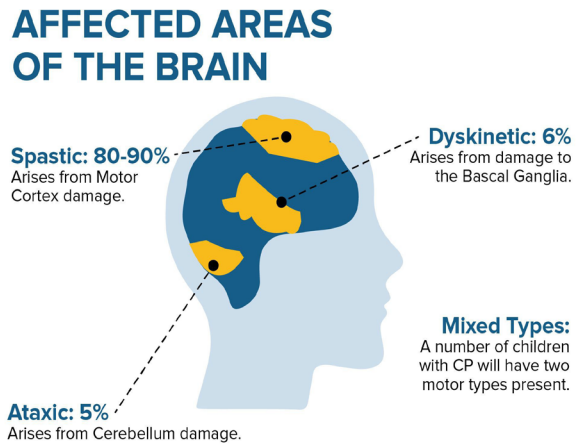


GW

Children's National

Introduction

- Hip displacement in CP
  - #2 deformity
  - Incidence: 35/100
  - Associated conditions: scoliosis, pelvic obliquity



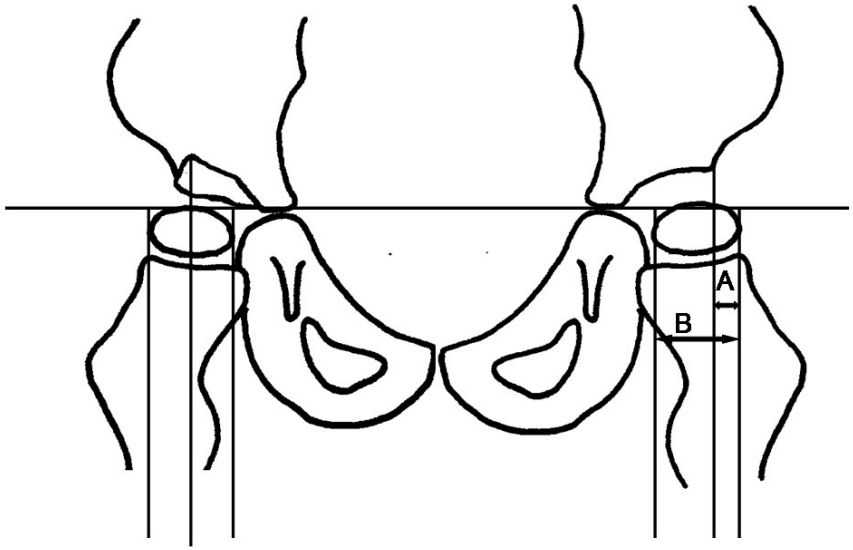
https://unitedcerebralpalsyhawaii.org/what-is-cerebral-palsy/

GW

Children's National

Introduction

- ***Hip displacement*** refers to the gradual, lateral displacement of the femoral head from under the acetabulum

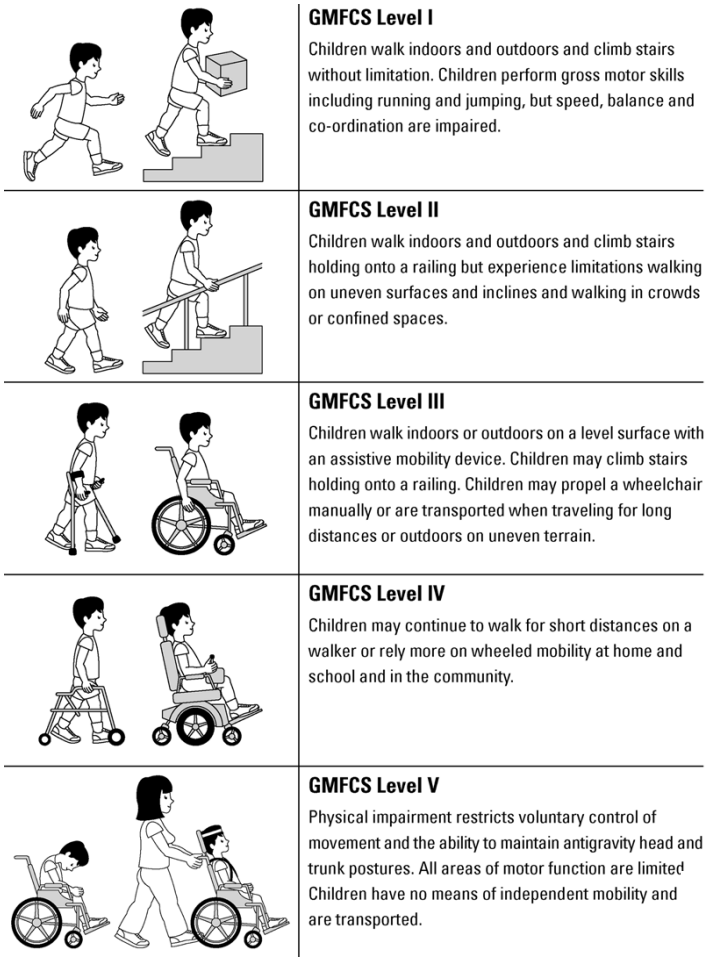


GW

Children's National

Who is at risk…?

- The reported incidence of hip displacement in children with CP has ranged from 2% to 75%
  - Correlated with the severity of involvement and the ambulatory status



GMFCS Level I

Children walk indoors and outdoors and climb stairs without limitation. Children perform gross motor skills including running and jumping, but speed, balance and co-ordination are impaired.

GMFCS Level II

Children walk indoors and outdoors and climb stairs holding onto a railing but experience limitations walking on uneven surfaces and inclines and walking in crowds or confined spaces.

GMFCS Level III

Children walk indoors or outdoors on a level surface with an assistive mobility device. Children may climb stairs holding onto a railing. Children may propel a wheelchair manually or are transported when traveling for long distances or outdoors on uneven terrain.

GMFCS Level IV

Children may continue to walk for short distances on a walker or rely more on wheeled mobility at home and school and in the community.

GMFCS Level V

Physical impairment restricts voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Children have no means of independent mobility and are transported.

GW

Children's National

Who is at risk…?

Hip Displacement in Cerebral Palsy

By Brendan Soo, MBBS, Jason J. Howard, MD, FRCS(C), Roslyn N. Boyd, PhD, MSc(Physiotherapy), Susan M. Reid, MClinEpi, Anna Lanigan, RN, Rory Wolfe, PhD, Dinah Reddihough, MD, FRACP, FAFRM, and H. Kerr Graham, MD, FRCS(Ed), FRACS

Investigation performed at the Royal Children's Hospital, Murdoch Children's Research Institute, University of Melbourne, Parkville, Victoria, Australia

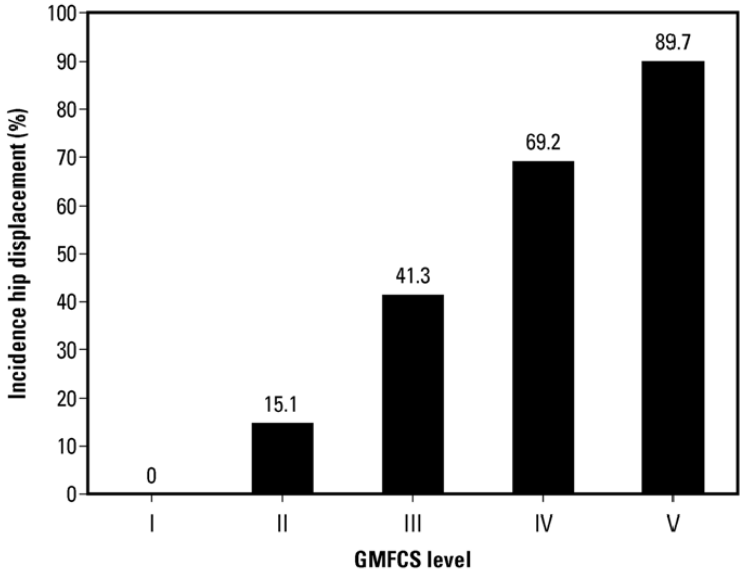


TABLE I Relative Risk of Hip Displacement* at Each GMFCS Level as Compared with Level II

GMFCS Level	Relative Risk	P Value	95% Confidence Interval
I	0		
II	1		
III	2.7	0.01	1.3 to 5.7
IV	4.6	<0.001	2.4 to 8.9
V	5.9	<0.001	3.1 to 11.3

*Hip displacement was defined as a migration percentage of >30%.

GW

Children's National

Why does hip displacement/dislocation occur…?

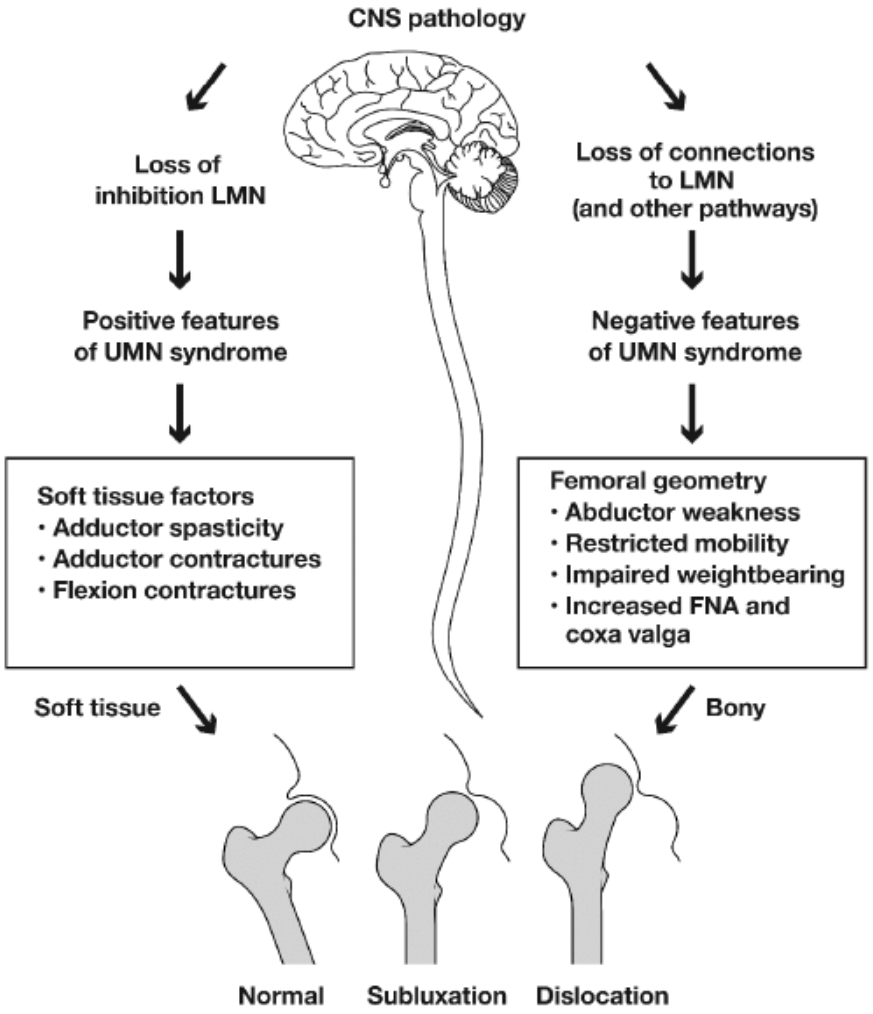
- Hip displacement in children with CP is usually attributed to spasticity and contracture of the:
  - Hip adductors
  - Hip flexors
  - Medial hamstrings

- This may result in muscle imbalance as well as osseous deformity, including:
  - Increased femoral anteversion
  - Acetabular dysplasia

GW

Children's National

Why does hip displacement/dislocation occur… *Don't forget about weakness!*

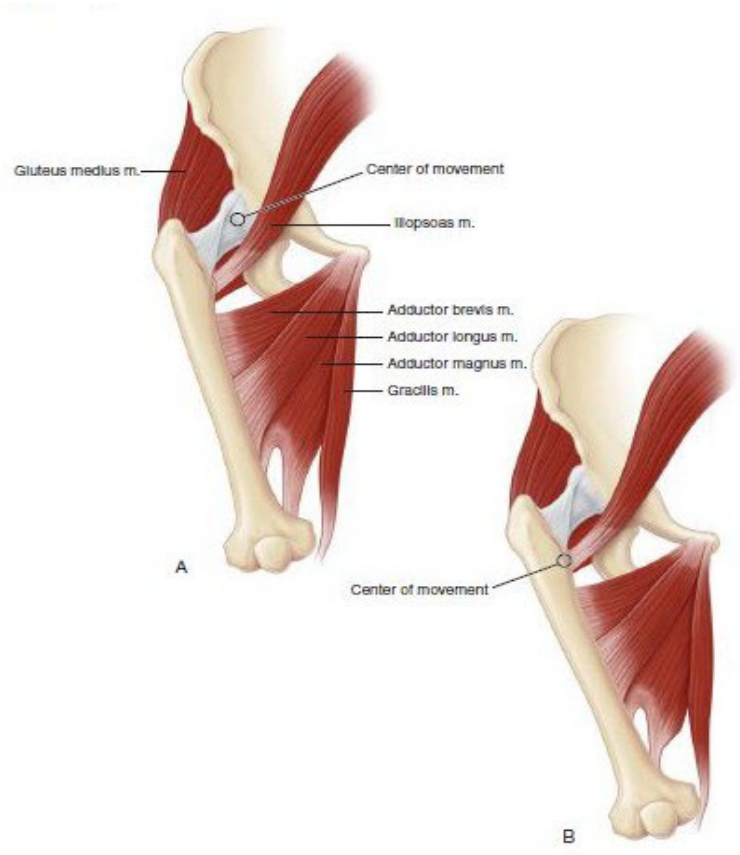


GW

Children's National

Pathophysiology

- NORMAL hip at birth
- **Progressive** spasticity and weakness of hip structures
- Hip subluxes in **posterosuperior** direction against **posterolateral** acetabular labrum
  - SIX-fold increase in hip-force magnitude!



Herring J. A. Tachdjian M. O. & Texas Scottish Rite Hospital for Children. (2008). *Tachdjian's pediatric orthopaedics* (4th ed.). Saunders/Elsevier. Chapter 25.

GW

Children's National

Pathophysiology

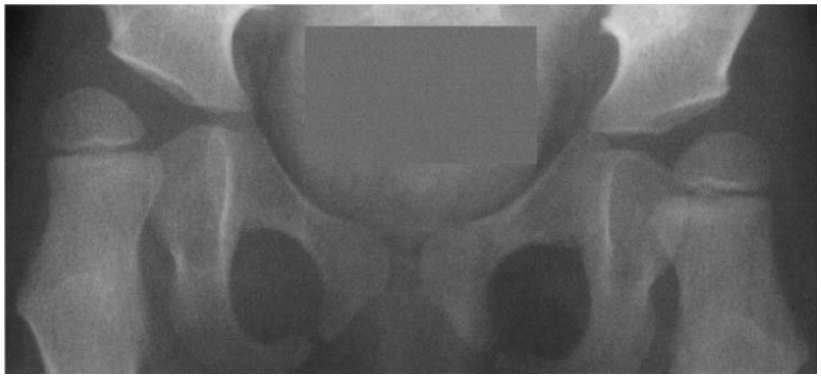
- **Bony deformities**
  - Labrum and superior rim deform femoral head
  - Diminished femoral anteversion remodeling
  - Elongated lesser trochanter
  - Increased neck-shaft angle
  - Posterosuperior acetabular deficiency

GW

Children's National

Sequelae

- In younger children with CP, hip displacement is usually asymptomatic
  - Incidence of pain increases with the duration of follow-up
- Pain and fixed deformity may contribute to difficulties with sitting, standing, walking, dressing, and perineal hygiene
- Unilateral hip dislocation is sometimes associated with the development of pelvic obliquity and scoliosis

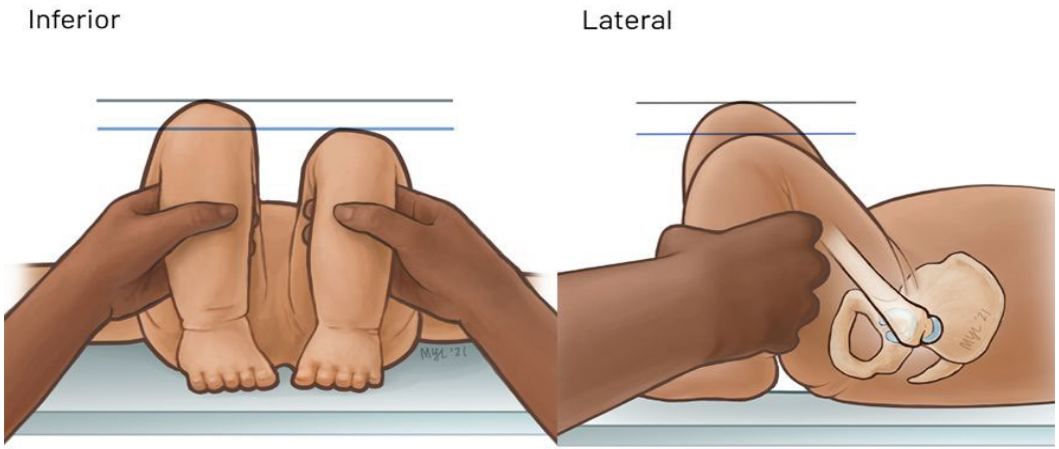


GW

Children's National

Physical Exam

- Decreased hip ROM
- Painful hip ROM
- Galleazi sign



GW

Children's National

Prevention

- Hip subluxation/dislocation is preventable through surveillance and early identification followed by appropriate intervention
  - Studies indicate a significant decrease in the incidence of hip dislocation after the implementation of a surveillance program
- Hip surveillance refers to the process of monitoring and recognizing the important early signs of progressive hip displacement
  - Surveillance and early intervention should involve both clinical and radiological examinations

Prevention


GMFCS I

GMFCS 1:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical and radiographic review at 3 years†
  - If GMFCS level has changed - alter surveillance accordingly
- Repeat clinical & radiographic review at 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If remains GMFCS level 1 – discharge from hip surveillance


GMFCS II

GMFCS 2:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review via yearly surveillance until MP stability
  - If MP unstable/abnormal – continue yearly surveillance
  - If MP stability established – review at 4-5 years
- Repeat clinical & radiographic review at 4- 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable – review at 8-10 years
  - If MP unstable – continue yearly surveillance until stability
- Repeat clinical & radiographic review at 8-10 years†
  - If MP stable – discharge


GMFCS III

GMFCS 3:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review 6 months later†
  - If MP unstable/abnormal – continue yearly surveillance
  - If MP stability established – review at 4-5 years
- Repeat clinical & radiographic review at 4- 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable – review at 8-10 years
  - If MP unstable – continue yearly surveillance until stability
- Repeat clinical & radiographic review at 8-10 years†
  - If MP stable – discharge
  - If MP unstable – continue yearly surveillance until stability established


GMFCS IV

GMFCS 4:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review every 6 months†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP unstable/abnormal – continue 6 month surveillance until stability
  - If MP stability established – continue yearly surveillance
- Repeat clinical & radiographic review at 7 years†
  - If MP stable (<30%) & GMFCS stable – review at pre-puberty
  - Continue yearly surveillance from pre-puberty to skeletal maturity
- Independent of MP, if evidence of pelvic obliquity, scoliosis continue 6 month surveillance until skeletal maturity


GMFCS V

GMFCS 5:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Continue 6 monthly surveillance until 7 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable (<30%) & GMFCS stable – review yearly until maturity
- Independent of MP, if evidence of pelvic obliquity, scoliosis continue 6 month surveillance until skeletal maturity

Legend:

†Verify GMFCS Level
AP = Anteroposterior
GMFCS = Gross Motor Functional Classification Level
MP = Migration Percentage

Curr Rev Musculoskelet Med (2012) 5:126–134
DOI 10.1007/s12178-012-9120-4

PEDIATRICS (M GLOTZBECKER, SECTION EDITOR)

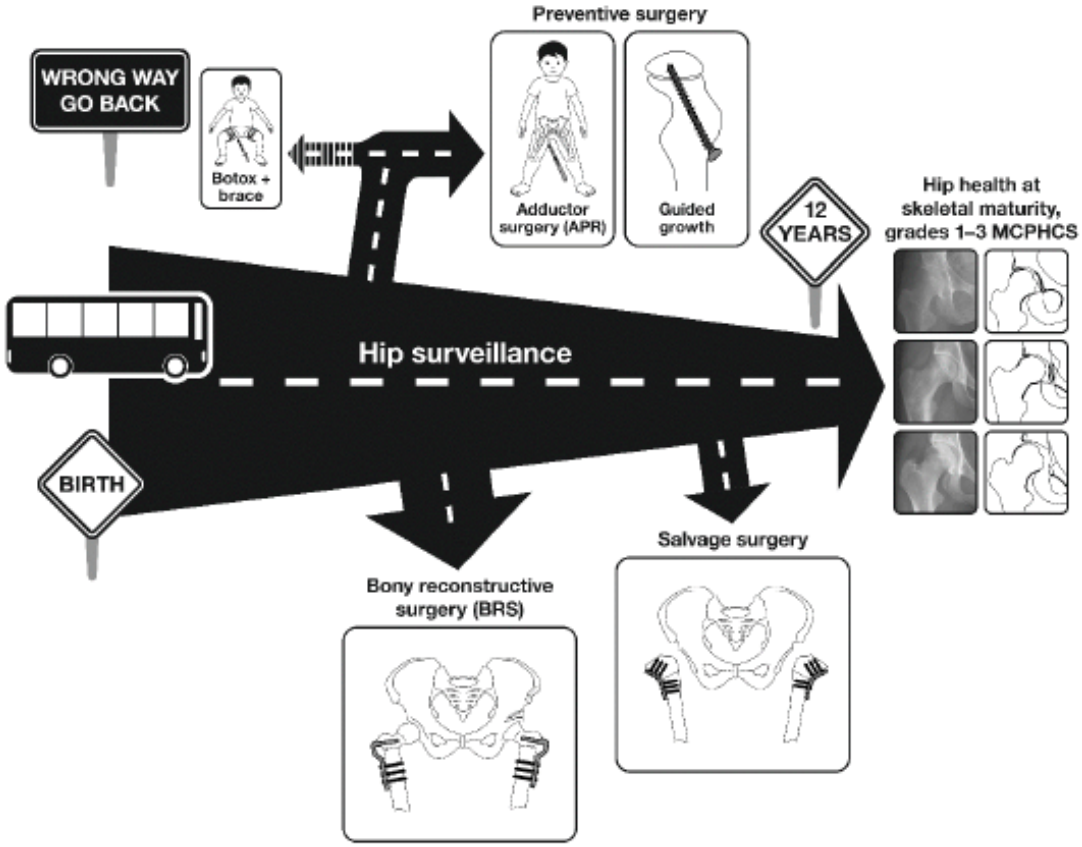
The role for hip surveillance in children with cerebral palsy

Benjamin Shore · David Spence · HK Graham

GW

Children's National

Hip Surveillance



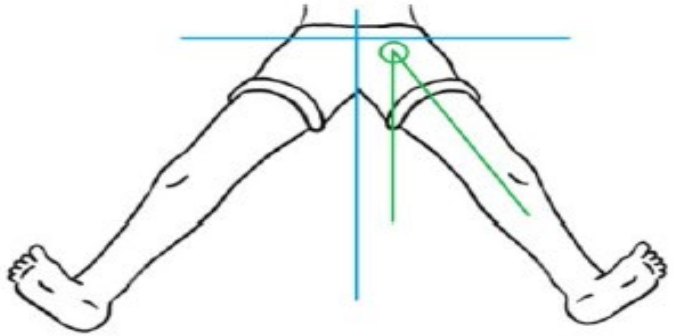
Hip Surveillance In Your Office

Radiographic Assessment

Supine AP Pelvis X-Ray to measure Migration percentage

Clinical Assessment

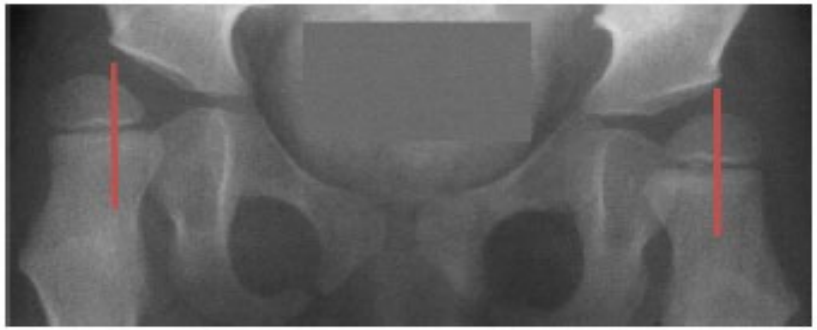
- Ask if there have been changes in function or hip pain
- Verify GMFCS Level
- Measure Hip Abduction



GW

Children's National

Hip Surveillance: When To Refer



A referral should be made to a pediatric orthopaedic surgeon if:

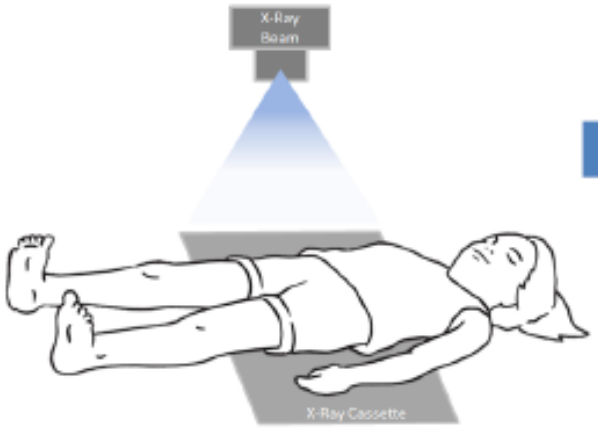
- ***Migration Percentage is over 30%***
- **The child is experiencing hip pain**
- **The child's level of function has decreased**
- **The child's hip abduction range of motion has decreased to below 30 degrees**

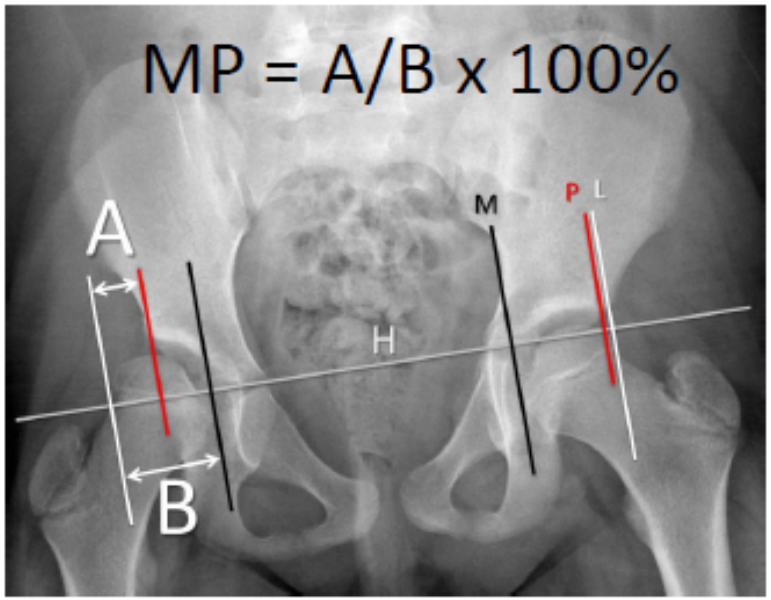
GW

Children's National

Migration Percentage (MP)

Cornerstone to Early Identification





MP is the percentage of the "ball" not covered by the "socket"

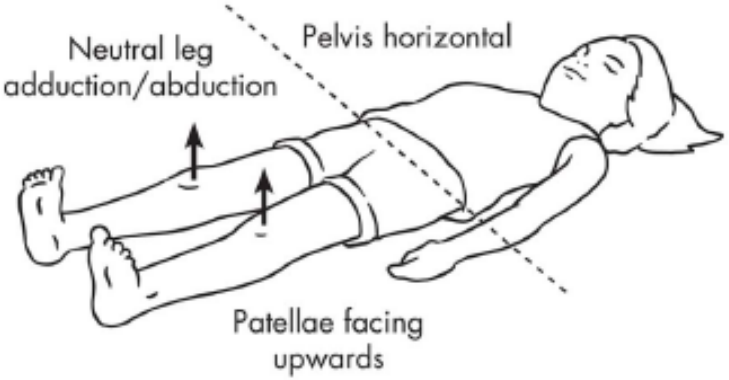
MP greater than 30% = Increased Risk of Progressive Displacement

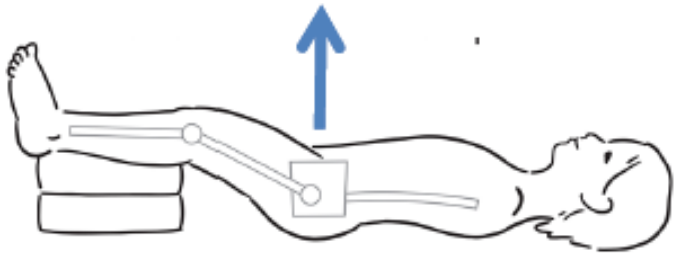
GW

Children's National

Migration Percentage

Confirm that you have a properly positioned AP Pelvis X-ray.





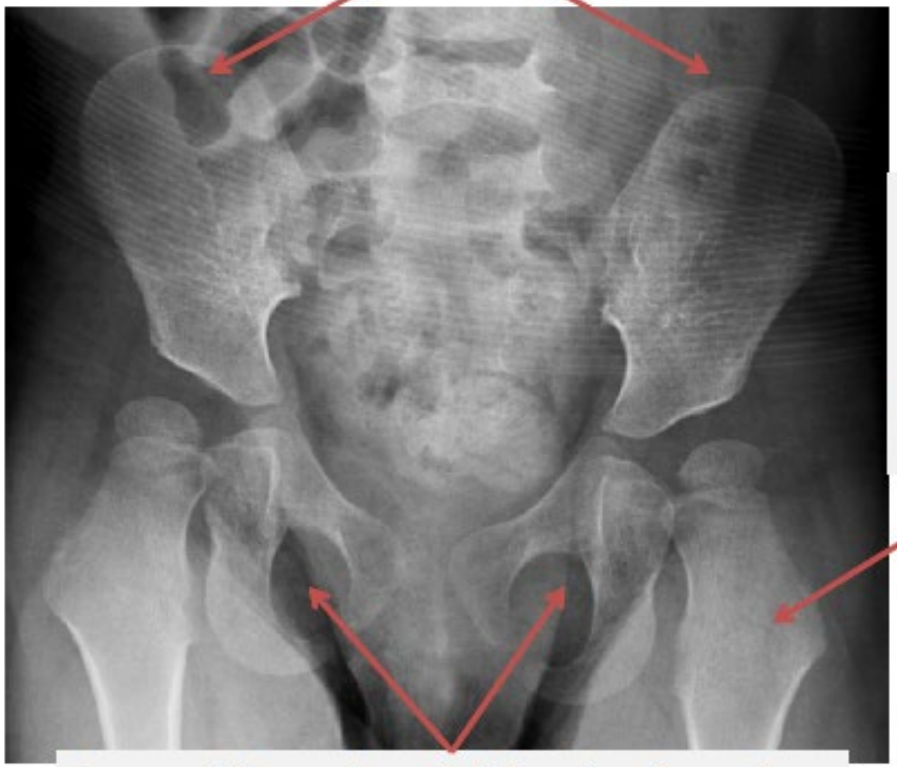
Correct – Flat spine

If a hip flexion contracture is present, use pillows to keep the pelvis facing forward

GW

Children's National

Features of Appropriately Positioned AP Pelvis



GW

Children's National

Features of Appropriately Positioned AP Pelvis

Symmetric Pelvic Wings

Symmetric and oval obturator foramina

Femur in neutral abduction/adduction

Asymmetric pelvic wings

Asymmetric obturator foramina

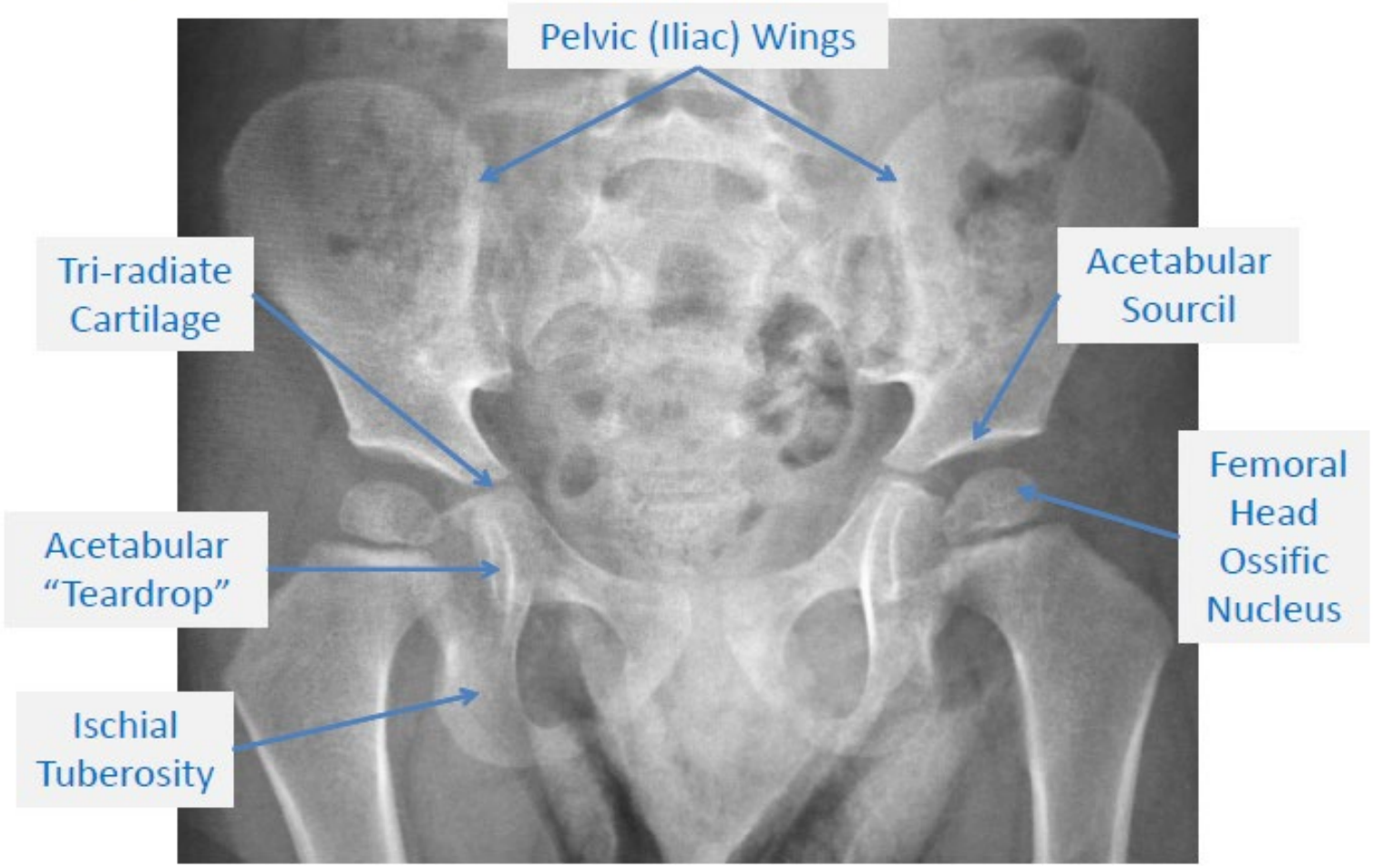
Femur abducted

Obturator foramina not oval shaped and difficult to visualize

GW

Children's National

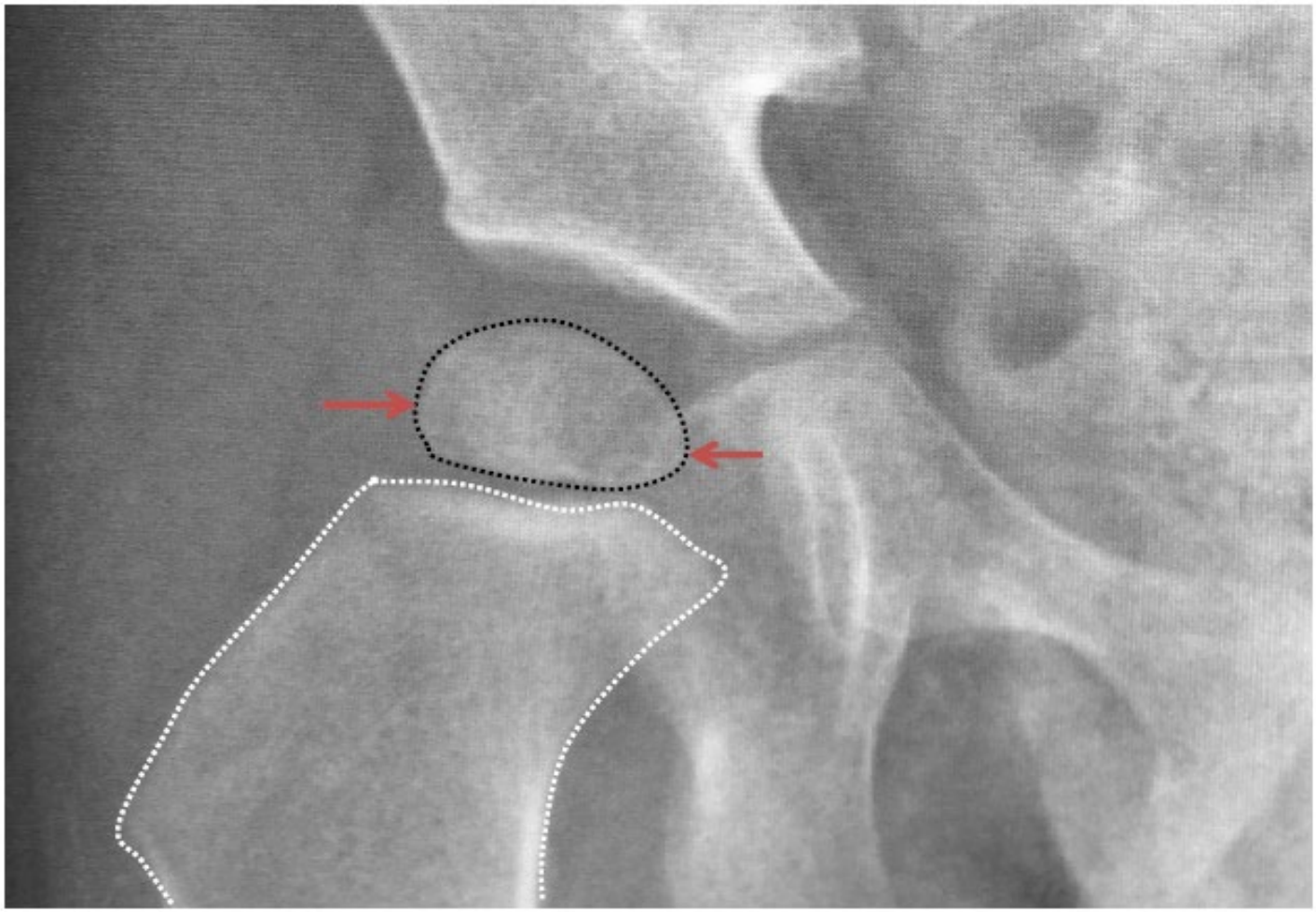
Important Radiographic Landmarks



GW

Children's National

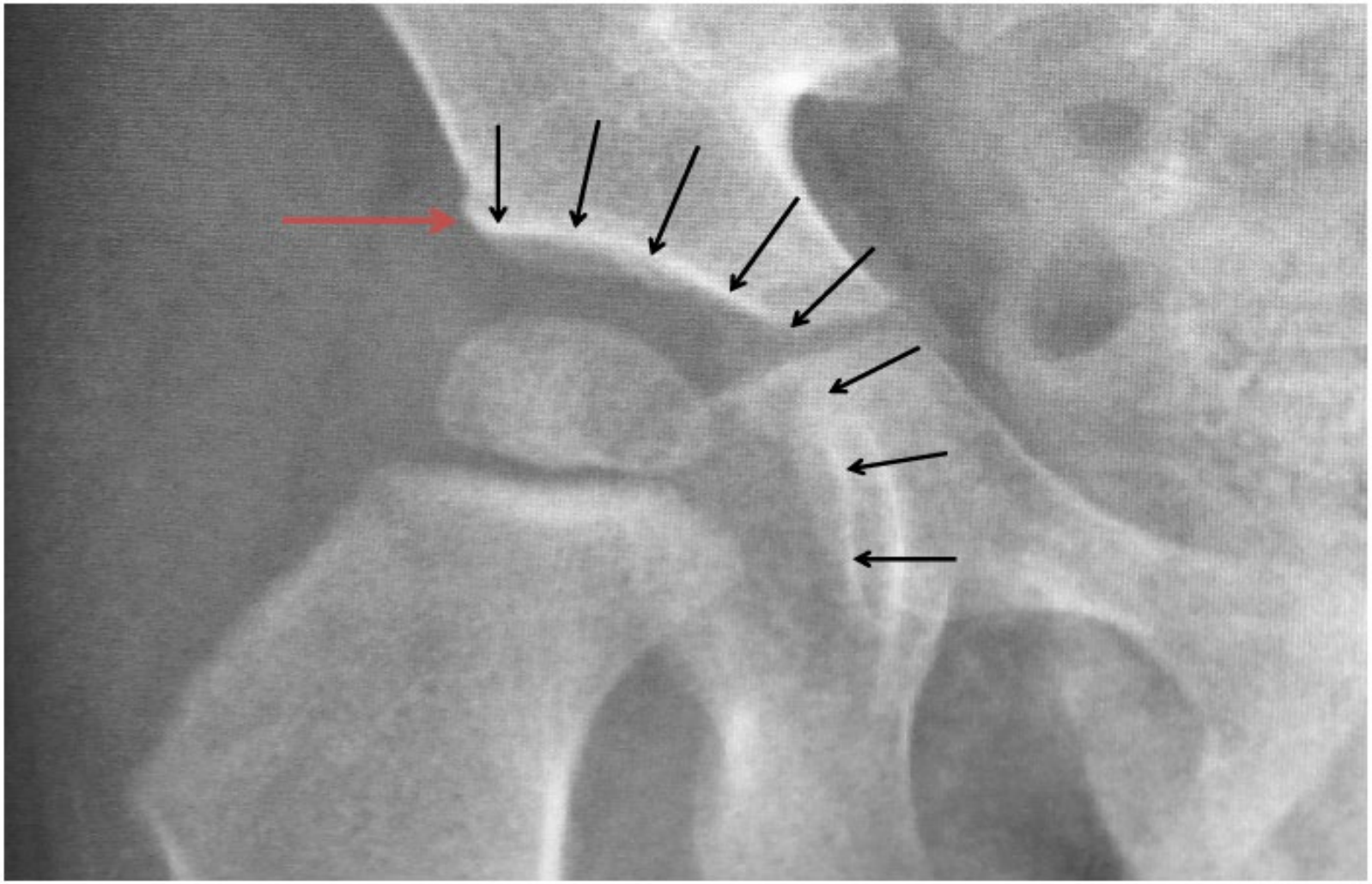
Femoral Head Ossific Nucleus



GW

Children's National

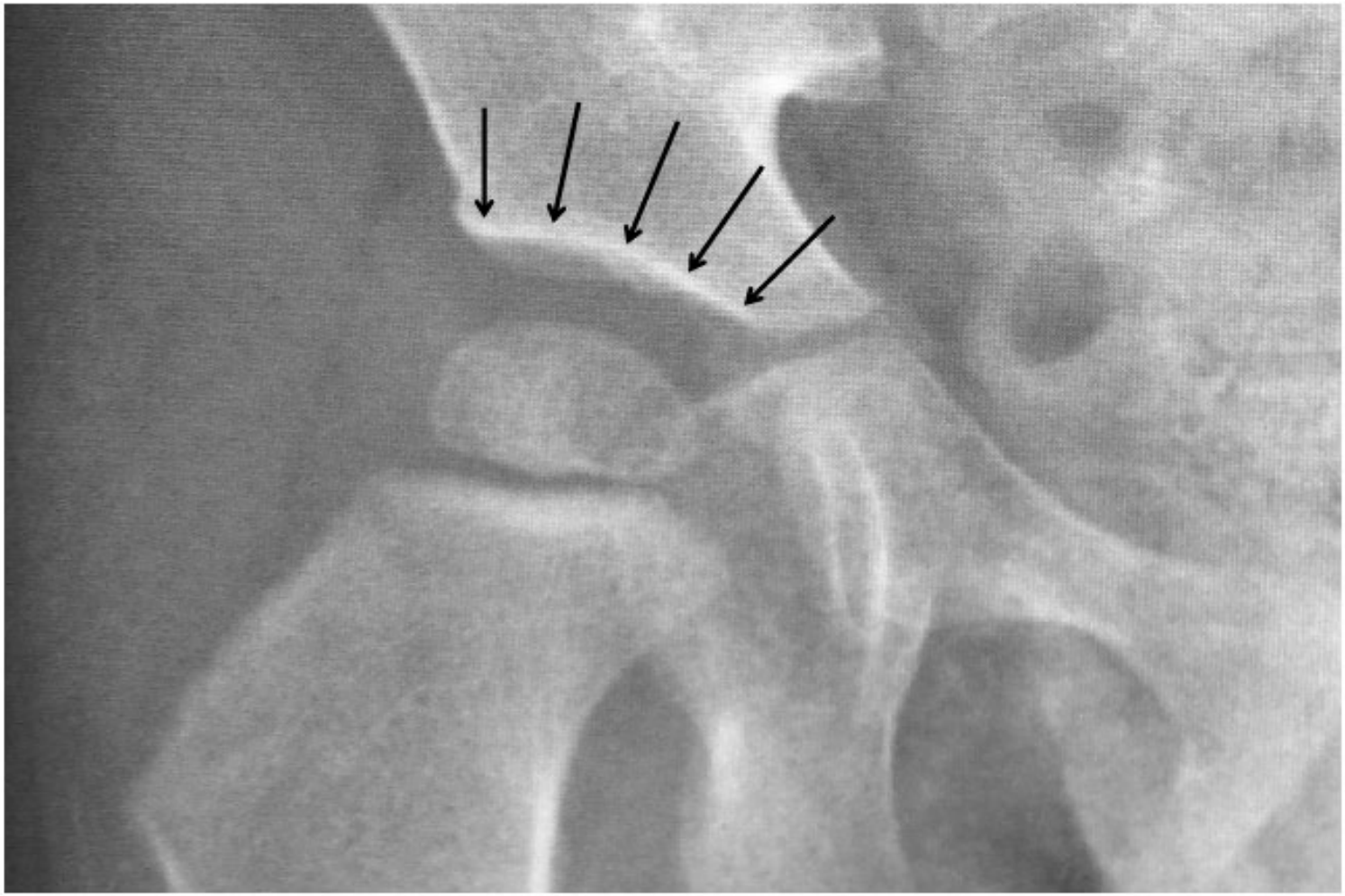
Acetabulum



GW

Children's National

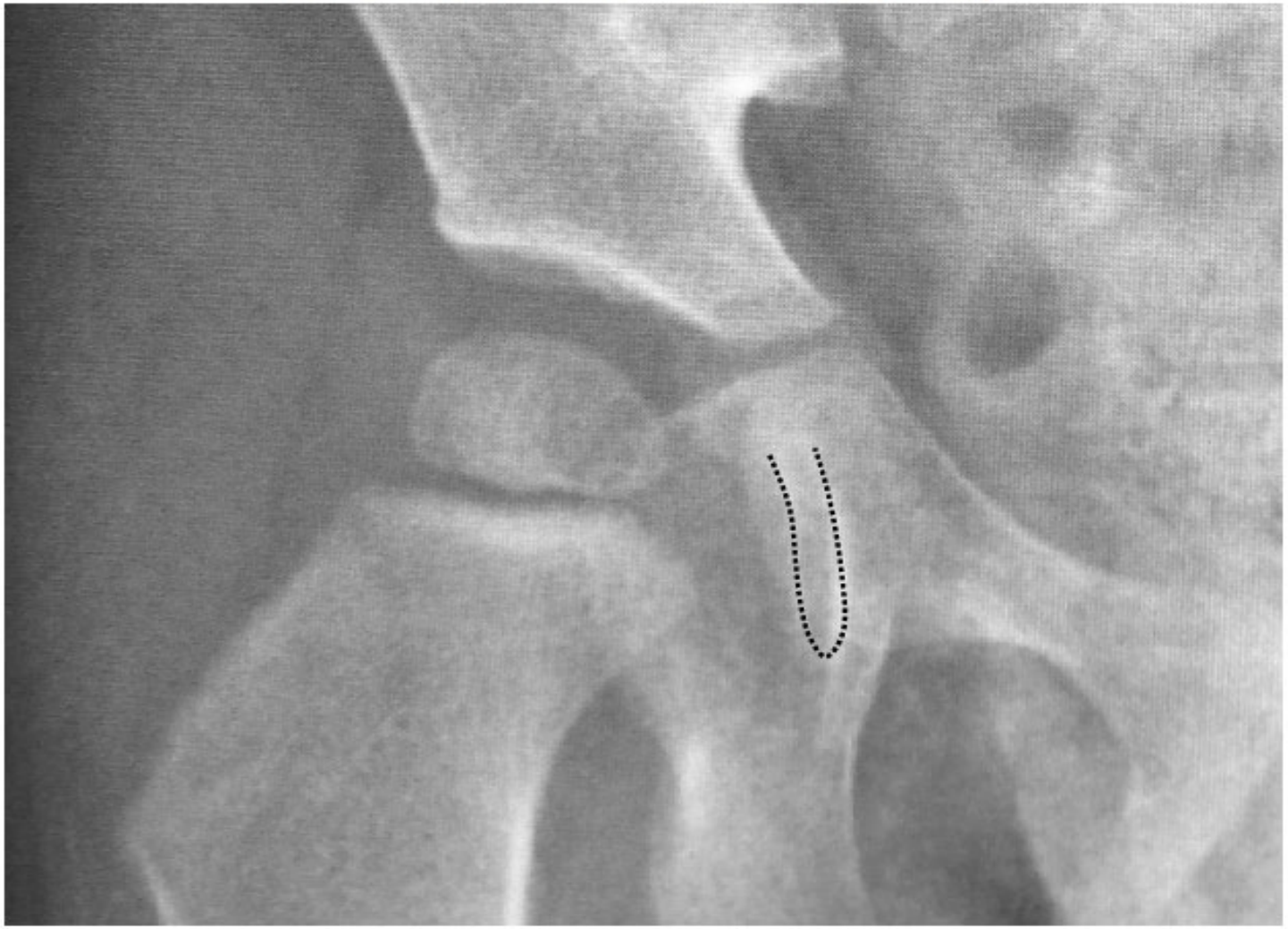
Acetabular Sourcil



GW

Children's National

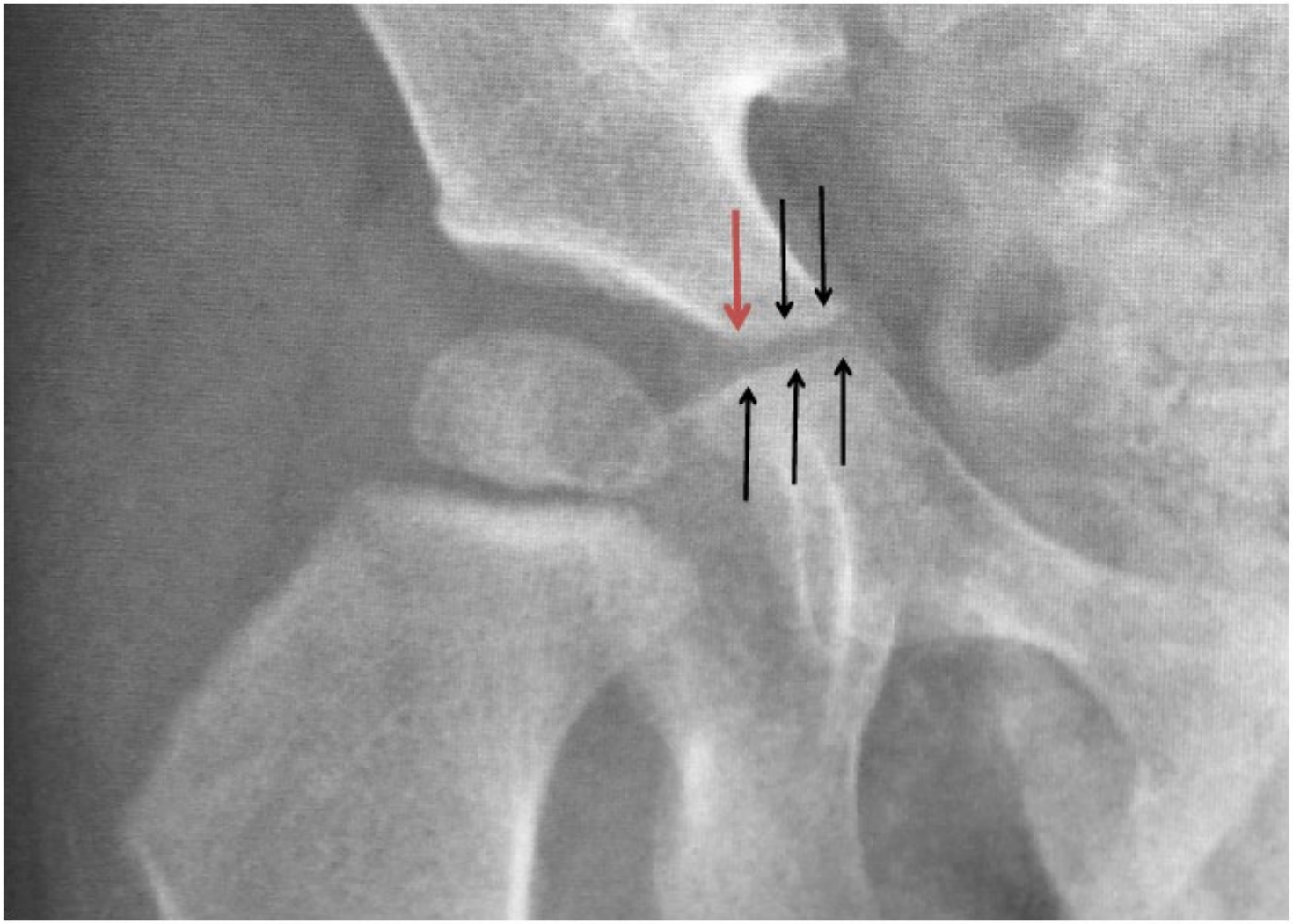
Acetabular Teardrop



GW

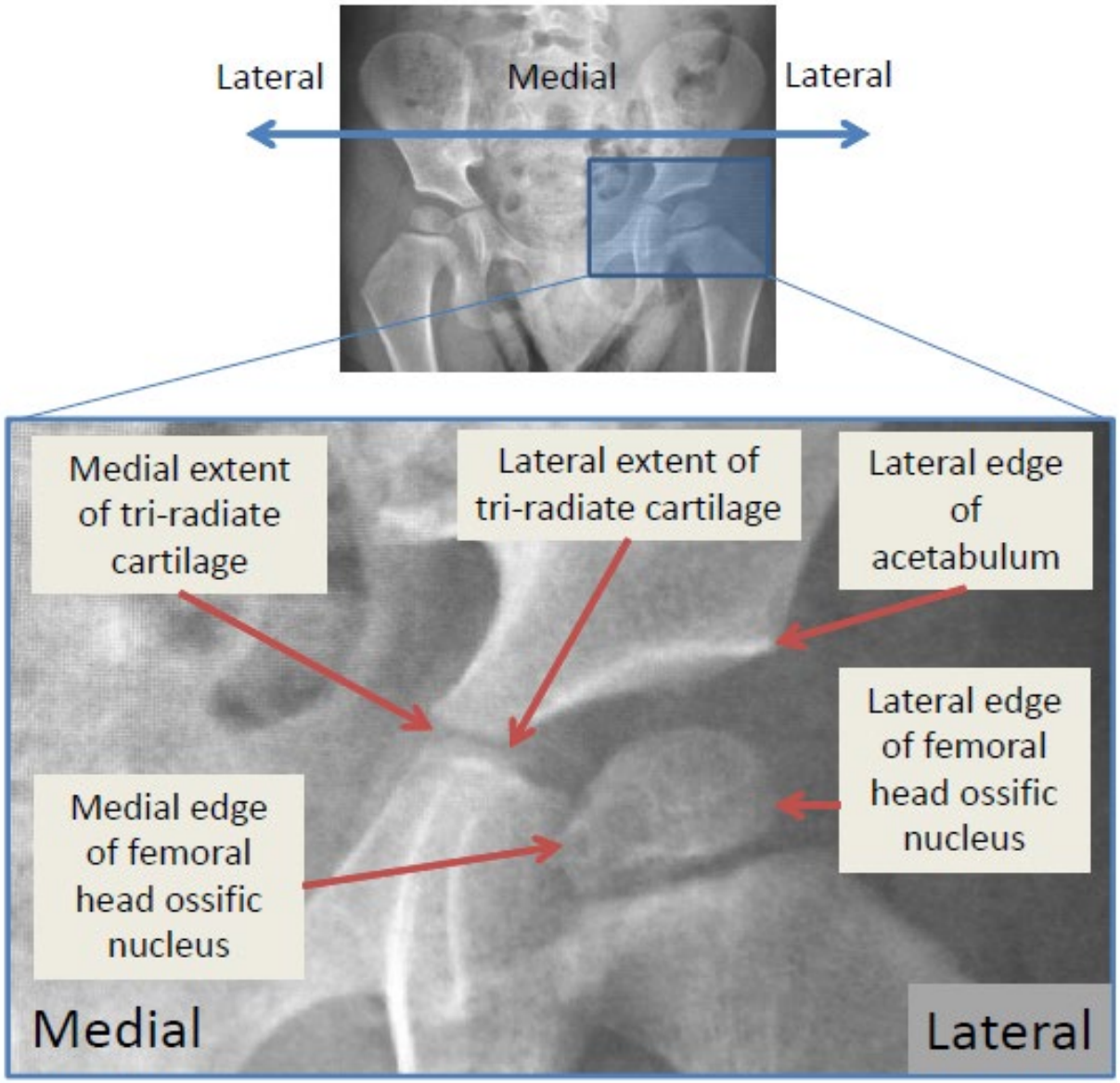
Children's National

Tri-radiate Cartilage



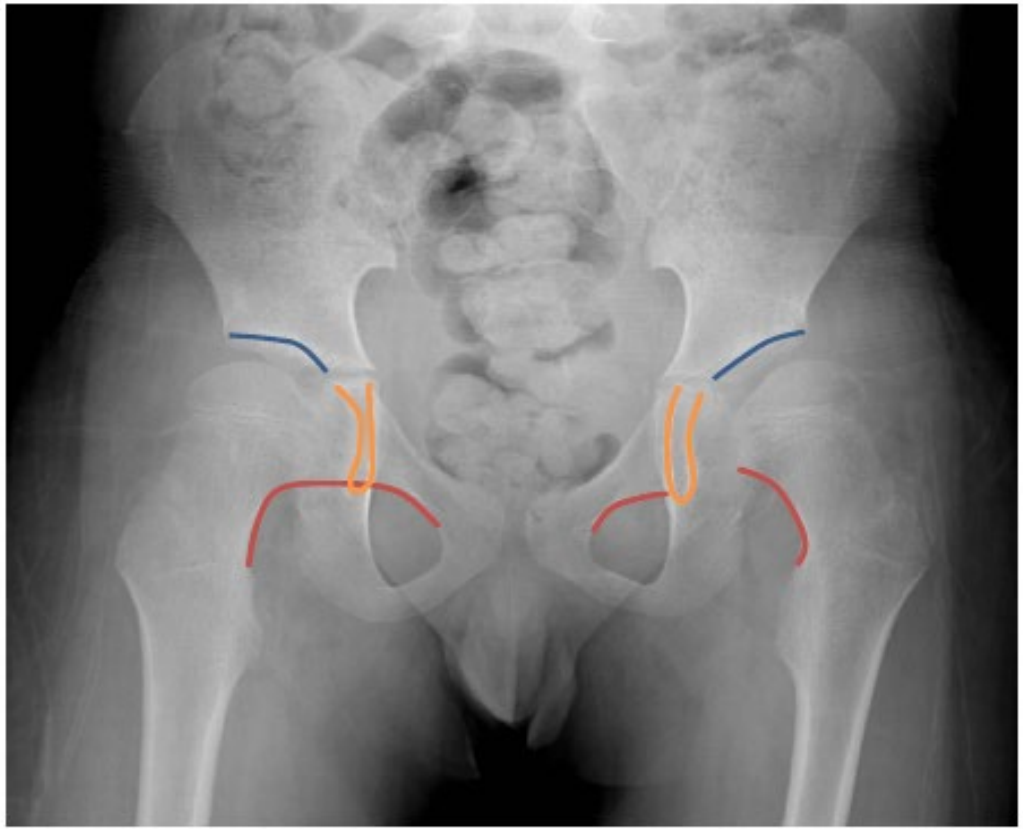
GW

Children's National


Lateral
Medial
Lateral
Medial extent of tri-radiate cartilage
Lateral extent of tri-radiate cartilage
Lateral edge of acetabulum
Lateral edge of femoral head ossific nucleus
Medial edge of femoral head ossific nucleus
Medial
Lateral

Beyond Migration Percentage:

Other Radiographic Dysplasia Signs



- Break in Shenton's Line
- Increased slope of acetabular roof
- Widened teardrop

GW

Children's National

Interpreting Hip Surveillance X-Rays with the HipScreen App: *A Primer for the Radiology Novice*

GW

Children's National

Download on the App Store

hipscreen.org

COMING SOON ON Google play

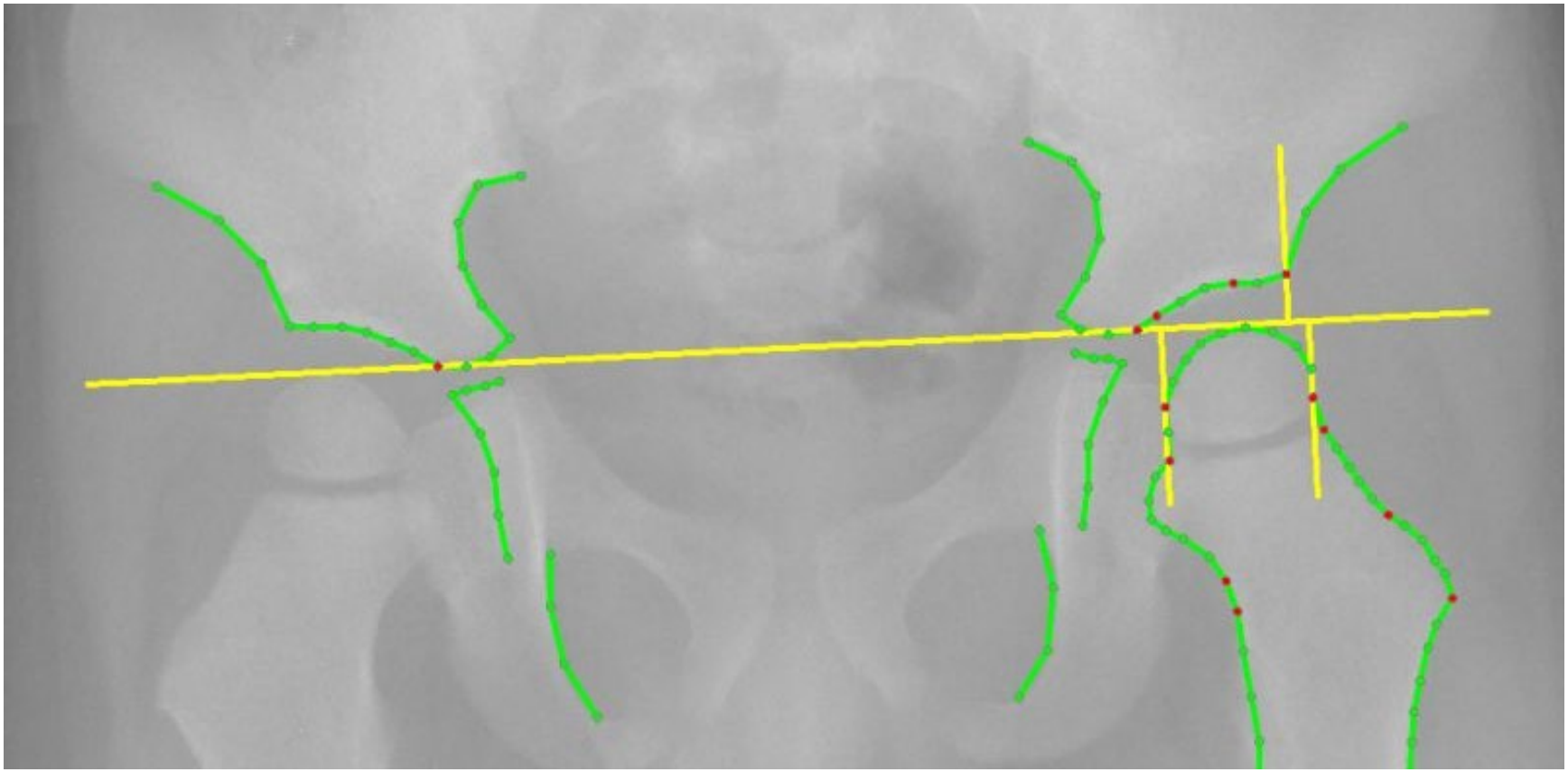
created and designed at

Shriners Hospitals for Children™

GW

Children's National

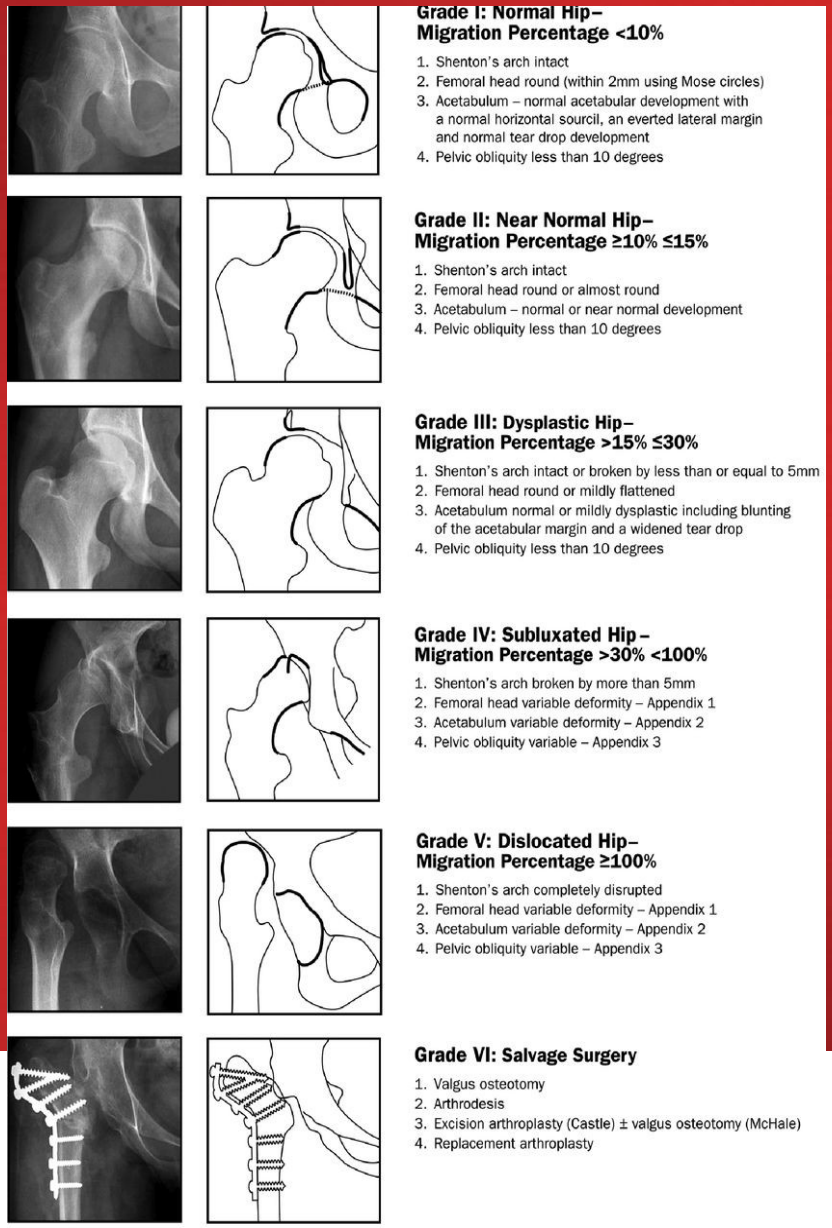
Future Projects..



GW

Children's National

Classifications: Melbourne Cerebral Palsy Hip Classification System (MCPHCS)



Grade I: Normal Hip–
Migration Percentage <10%

1. Shenton's arch intact
2. Femoral head round (within 2mm using Mose circles)
3. Acetabulum – normal acetabular development with a normal horizontal sourcil, an everted lateral margin and normal tear drop development
4. Pelvic obliquity less than 10 degrees

Grade II: Near Normal Hip–
Migration Percentage ≥10% ≤15%

1. Shenton's arch intact
2. Femoral head round or almost round
3. Acetabulum – normal or near normal development
4. Pelvic obliquity less than 10 degrees

Grade III: Dysplastic Hip–
Migration Percentage >15% ≤30%

1. Shenton's arch intact or broken by less than or equal to 5mm
2. Femoral head round or mildly flattened
3. Acetabulum normal or mildly dysplastic including blunting of the acetabular margin and a widened tear drop
4. Pelvic obliquity less than 10 degrees

Grade IV: Subluxated Hip –
Migration Percentage >30% <100%

1. Shenton's arch broken by more than 5mm
2. Femoral head variable deformity – Appendix 1
3. Acetabulum variable deformity – Appendix 2
4. Pelvic obliquity variable – Appendix 3

Grade V: Dislocated Hip–
Migration Percentage ≥100%

1. Shenton's arch completely disrupted
2. Femoral head variable deformity – Appendix 1
3. Acetabulum variable deformity – Appendix 2
4. Pelvic obliquity variable – Appendix 3

Grade VI: Salvage Surgery

1. Valgus osteotomy
2. Arthrodesis
3. Excision arthroplasty (Castle) ± valgus osteotomy (McHale)
4. Replacement arthroplasty

Children's National

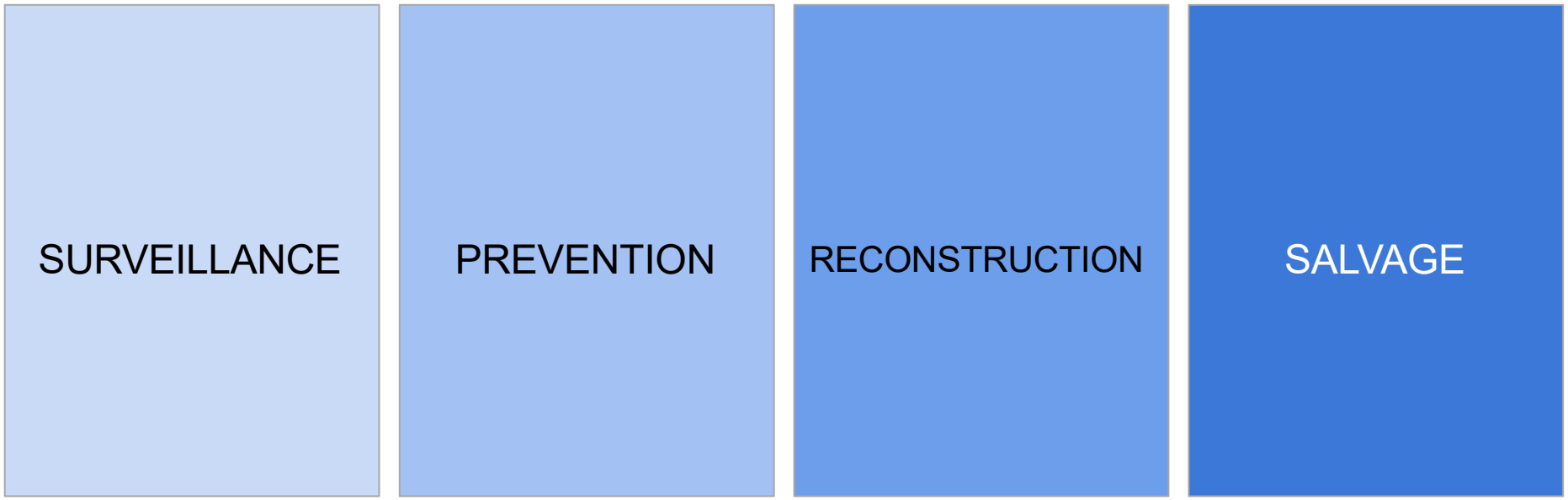
Goals of Treatment

- Diagnose early
- Monitor progression
- Intervene early to prevent hip dislocation
- Reduce hip
  - To maintain ambulation OR
  - To maintain hygiene and positioning AND/OR
  - To provide pain relief

GW

Children's National

Treatment Spectrum



GW

Children's National

Non-Operative Management

- No historical role in
  - Physical therapy
  - Abduction therapy
- Significant role for **surveillance**
  - Appropriate referral for preventative/recons tructive surgeries
  - Avoidance of larger, more invasive salvage surgeries
  - But limited by GMFCS

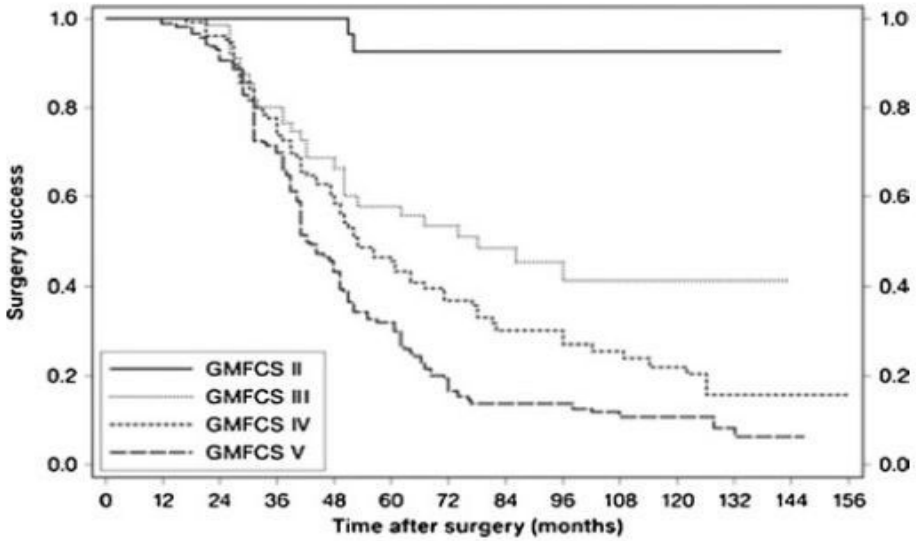


Fig. 3 The success of preventative surgery for hip displacement is directly related to a patient's GMFCS level. (*From* Shore et al. [32]; with permission)

Curr Rev Musculoskelet Med (2012) 5:126–134
DOI 10.1007/s12178-012-9120-4

PEDIATRICS (M GLOTZBECKER, SECTION EDITOR)

The role for hip surveillance in children with cerebral palsy

Benjamin Shore · David Spence · HK Graham

GW

Children's National

Non-Operative Management: Is there a role for "Botox?"

Does Botulinum Toxin A Combined with Bracing Prevent Hip Displacement in Children with Cerebral Palsy and "Hips at Risk"?

A Randomized, Controlled Trial

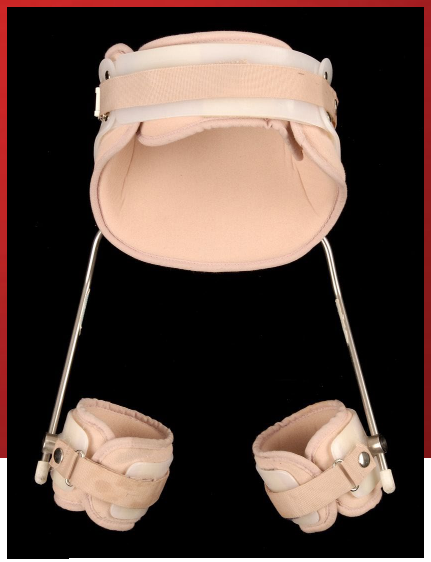
By H. Kerr Graham, MD, FRCS(Ed), FRACS, Roslyn Boyd, PhD, John B. Carlin, PhD, Fiona Dobson, BSc, PhD, Kevin Lowe, MD, Gary Nattrass, MD, FRCS(C), FRACS, Pam Thomason, MPhysio, Rory Wolfe, PhD, and Dinah Reddihough, MD, FRACP, FAFRM

AIM

- To assess the role of botulinum toxin A (combined with variable hip abduction brace) in prevention of CP hip displacement in a randomized trial.

METHODS:

- Treatment group = injections of botulinum toxin A to the adductor and hamstring muscles every 6 months for 3 years + abduction brace
- Control group = no treatment
- Primary outcome measure = serial measurements of the migration percentage.



Children's National

Does Botulinum Toxin A Combined with Bracing Prevent Hip Displacement in Children with Cerebral Palsy and "Hips at Risk"?

A Randomized, Controlled Trial

By H. Kerr Graham, MD, FRCS(Ed), FRACS, Roslyn Boyd, PhD, John B. Carlin, PhD, Fiona Dobson, BSc, PhD, Kevin Lowe, MD, Gary Nattrass, MD, FRCS(C), FRACS, Pam Thomason, MPhysio, Rory Wolfe, PhD, and Dinah Reddihough, MD, FRACP, FAFRM

JB&JS

TABLE II Patient Progression to Surgery and Withdrawal During the Three-Year Follow-up Period

Status	Months from Baseline (*no. of patients*)						
	6	12	18	24	30	36	Total
Group treated with botulinum toxin A and bracing* (n = 47)							
Completed follow-up							32 (70%)
Surgery			5	3	1	2	11
Deceased		1	1				2
Withdrawn		1				0	1
Control group (n = 44)							
Completed follow-up							21 (48%)
Surgery	10	9	1	1		1	22
Deceased							0
Withdrawn		1					1

*One of the forty-seven patients in the group was excluded because of a cervical level syrinx.

- **90 patients, mean age 3**
- **Rate of hip displacement was reduced in the treatment group by 1.4% per year.**

CONCLUSIONS

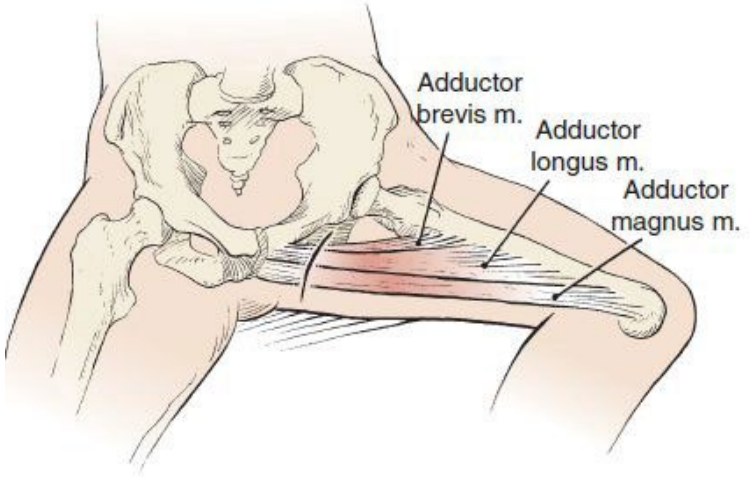
- **Small treatment benefit (delay in surgery).**
- **Progressive hip displacement continued to occur in both groups.**

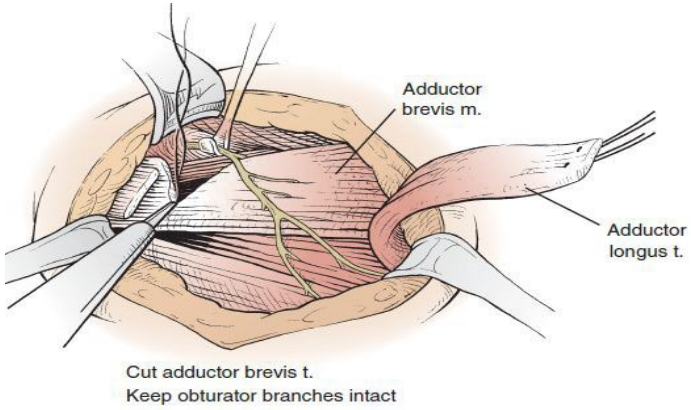
Children's National

Prevention: Soft Tissue Releases

- Indications
  - Abduction < 30
  - Flexion contracture
  - Migration index < 30%
  - < 5 years old

- Procedure
  - Adductor release
  - Iliopsoas lengthening / release





GW

Children's National

Soft-Tissue Releases to Treat Spastic Hip Subluxation in Children with Cerebral Palsy

By Ana Presedo, MD, Chang-Wug Oh, MD, Kirk W. Dabney, MD, and Freeman Miller, MD

AIM:

- To assess the effect of soft-tissue releases in sixty-five children followed for a minimum of eight years

METHODS:

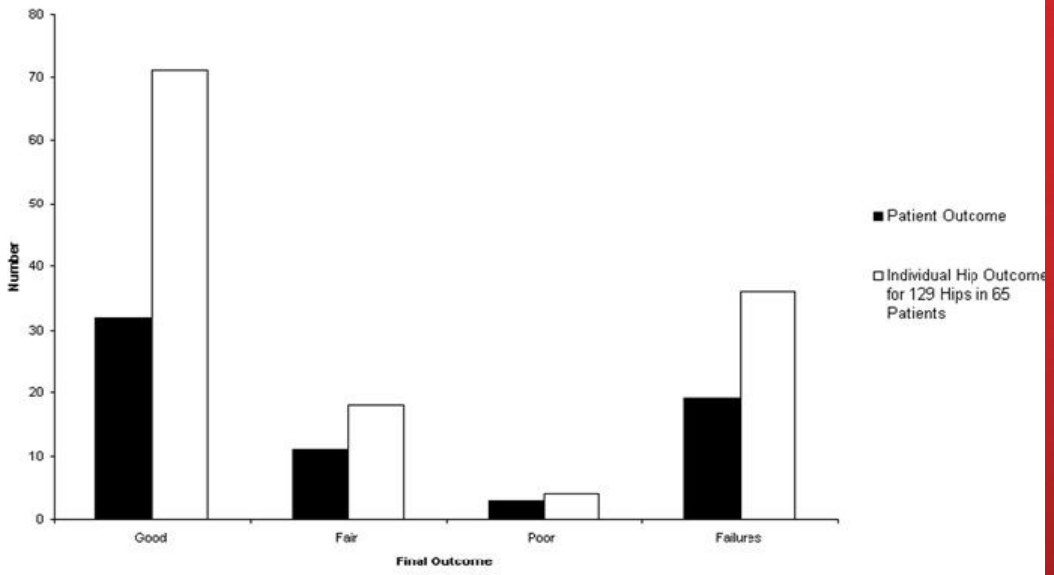
- Retrospective review of 65 patients, 47 of which were quadriplegic
- Open adductor tenotomy and psoas muscle recession or iliopsoas tenotomy were performed on 129 hips, followed for avg of 10.8 years
  - Indication: MP 25-40% and Abduction <45 degrees
- Migration percentage monitored
- The final outcome for the patient was defined according to the worse hip

Soft-Tissue Releases to Treat Spastic Hip Subluxation in Children with Cerebral Palsy

By Ana Presedo, MD, Chang-Wug Oh, MD, Kirk W. Dabney, MD, and Freeman Miller, MD

Fig. 1

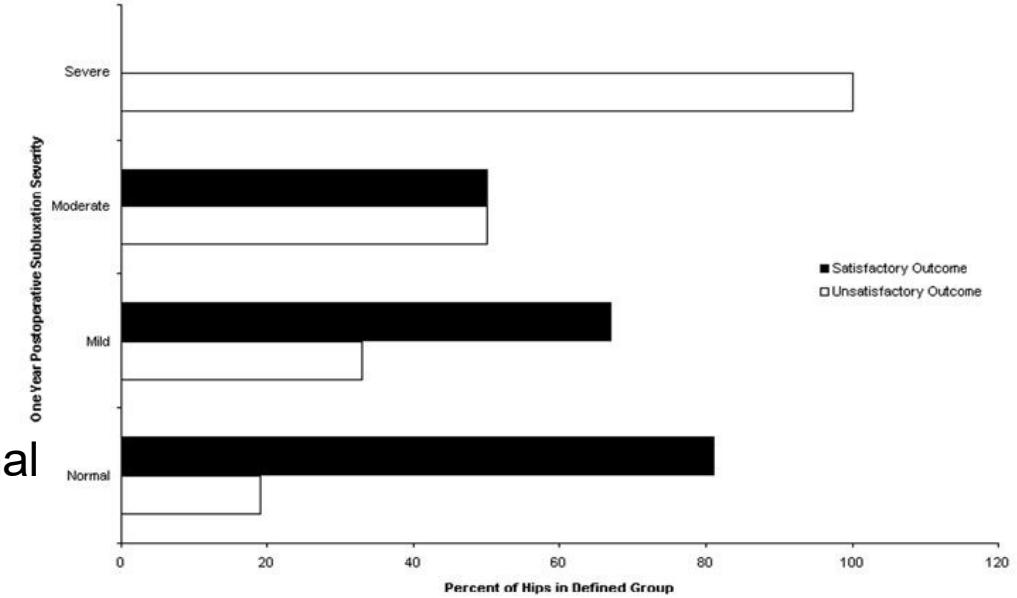
Results for the sixty-five patients and 129 hips. A good outcome was a migration percentage of ≤24%, a fair result was a migration percentage of 25% to 39%, a poor result was a migration percentage of 40% to 59%, and a failure was a migration percentage of ≥60%.



- Avg MP was 34% preoperatively and 18% at final follow-up

Soft-Tissue Releases to Treat Spastic Hip Subluxation in Children with Cerebral Palsy

Fig. 3
Results according to the migration percentage at one year postoperatively, which was significantly associated with the final outcome.



Most predictive of the final outcome ($p = 0.001$).

- Neither the preoperative hip migration percentage nor the age at surgery significantly affected the outcome
- **Conclusions**: Soft-tissue release was effective for long-term prevention of hip dislocation in 67% (forty-three) of sixty-five children with spastic hip subluxation

Prevention: Any role in guided growth?

Guided Growth of the Proximal Femur for the Management of Hip Dysplasia in Children With Cerebral Palsy

JOURNAL OF PEDIATRIC ORTHOPAEDICS

Nicola Portinaro, Pr, MD,† Marco Turati, MD,‡§ Matteo Cometto, MD,* Marco Bigoni, MD,‡‖ Jon R. Davids, MD,¶ and Artemisia Panou, MD**

AIM

- To evaluate the results of temporary medial hemiepiphysiodesis of the proximal femur (TMH-PF) using a transphyseal screw to control hip migration during growth in children with CP.

METHODS

- Retrospective, single center study in CP patients aged 4 to 11 years and GMFCS levels III-V. 28 patients with 56 hips.
- 5 Year follow-up.
- Acetabular index (AI), neck-shaft angle (NSA) and migration percentage (MP) were measured. All complications were recorded.

Children's National

Prevention: Any role in guided growth?

Guided Growth of the Proximal Femur for the Management of Hip Dysplasia in Children With Cerebral Palsy

JOURNAL OF PEDIATRIC ORTHOPAEDICS

Nicola Portinaro, Pr, MD,† Marco Turati, MD,‡§ Matteo Cometto, MD,* Marco Bigoni, MD,‡‖ Jon R. Davids, MD,¶ and Artemisia Panou, MD**

TABLE 2. Factors Affecting the Decrease of NSA were Evaluated by Multiple Regression Analysis

	Estimate	SE	*t* value	Pr > |t|
Intercept	6.938	3.055	2.271	0.025
ΔMP	0.156	0.056	2.793	0.006
ΔAI	−0.021	0.123	−0.171	0.864
ln(Time)	2.692	0.527	5.111	> 0.001
Complication	0.368	0.905	0.407	0.685
GMFCS level IV	1.119	1.381	0.81	0.419
GMFCS level V	−1.153	1.315	−0.877	0.382
Sex	−2.002	1.119	−1.79	0.075
Age	−0.646	0.311	−2.078	0.039

The adjusted R^2 was 0.253.

ΔMP indicates variation of migration percentage; ΔAI, variation of acetabular index; GMFCS, gross motor function classification system; SE, standard error.

Decrease of MP and time from surgery positively influence NSA reduction

Patient age had a negative effect (younger patients showed more improvement in NSA)

Only 3 patients required further bony reconstruction

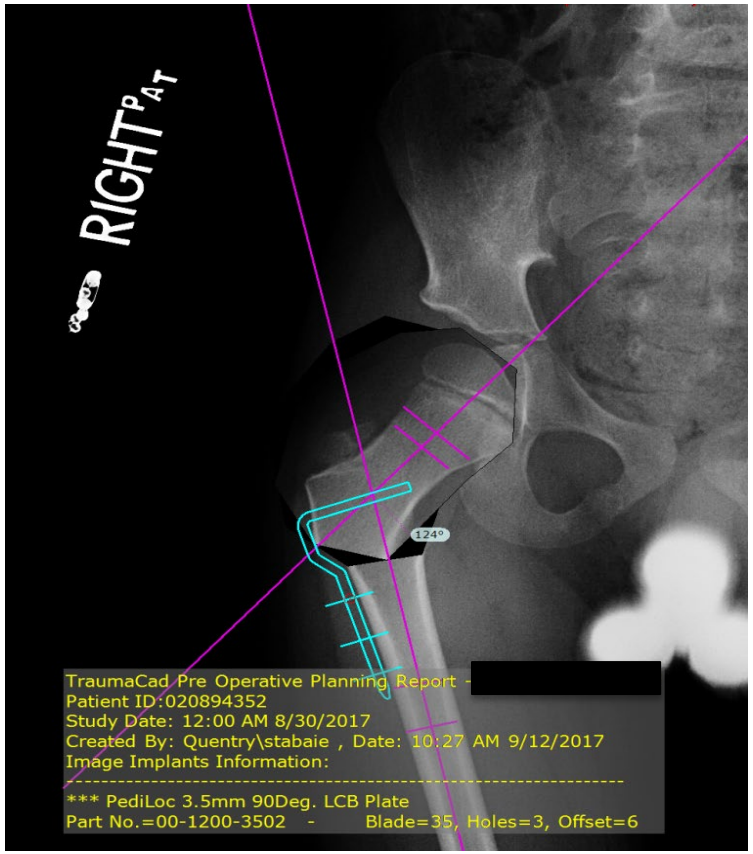
Conclusions: TMH-PF was effective in controlling progressive subluxation of the hip in the majority of cases.

Children's National

Operative Management: Femoral Osteotomy

- Indications
  - Significant hip **subluxation**

- Procedure
  - Femoral varus derotation osteotomy (VDRO)
    - Osteotomy at intertrochanteric level
    - Closing wedge AND/OR femoral shortening
    - Fixation with INCREASED varus (110-125 degrees)
      - Hip screw with side plate
      - 90-degree blade plate
  - PLUS soft tissue releases
  - PLUS immobilization in cast afterward

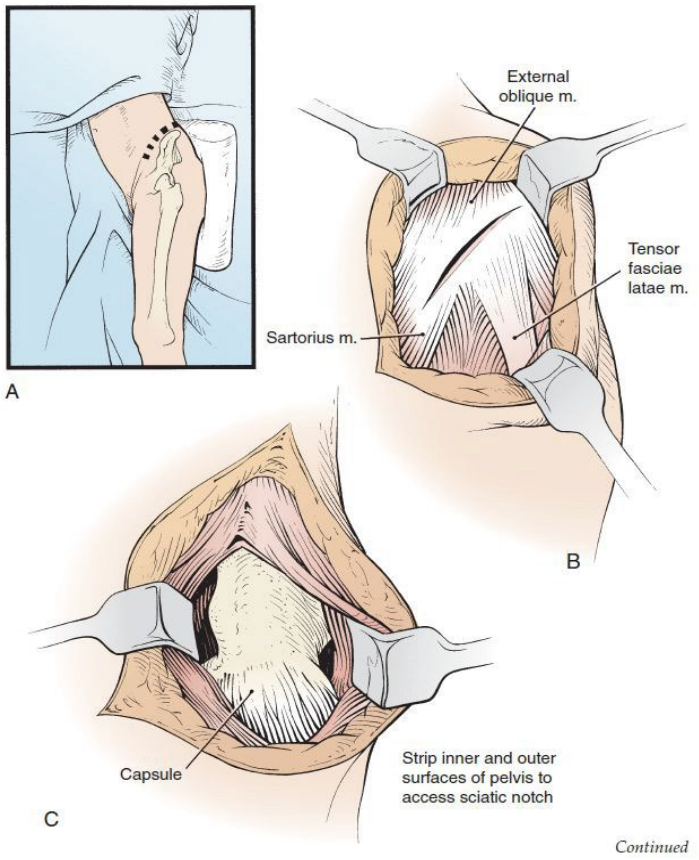


GW

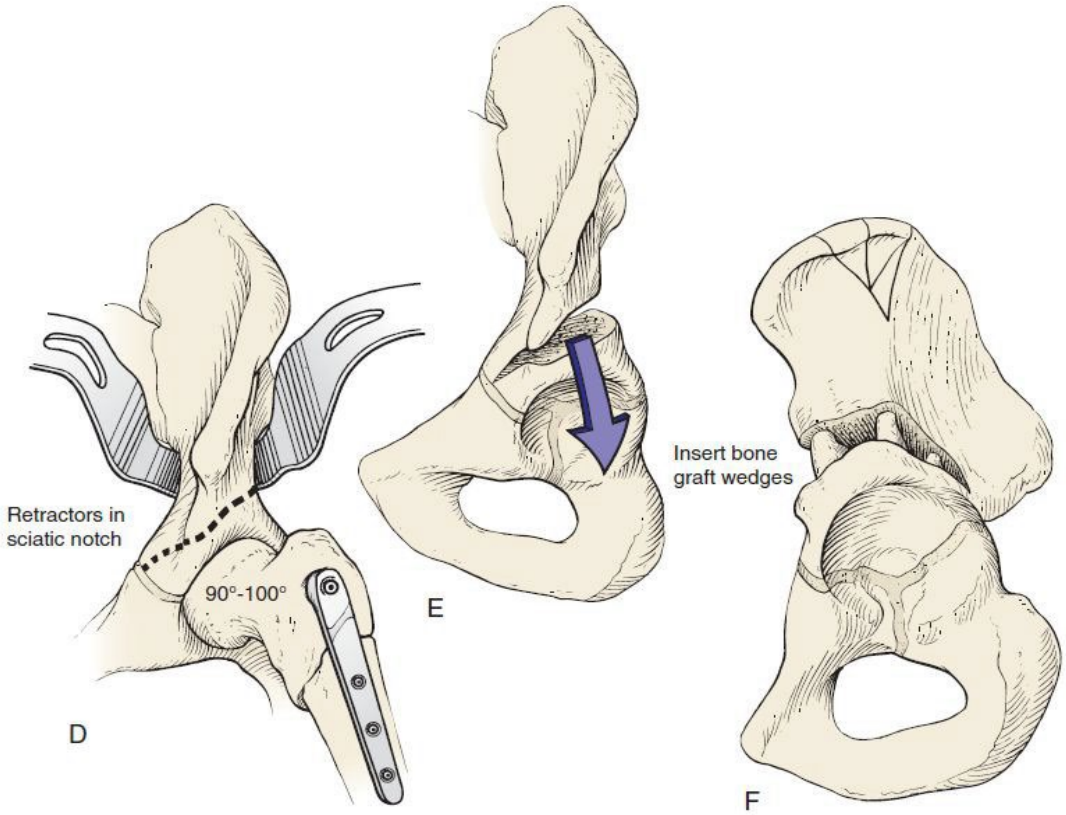
Children's National

Operative Management: Combined Femoral & Pelvic Osteotomy

- Indications
  - Hip dislocation
- Procedure
  - Pelvic osteotomy
    - Pemberton and Dega (reshape acetabulum)
    - Steel and Salter (re-directional)
    - Chiari and Shelf (salvage, increase acetabulum with non-articular cartilage)
  - VDRO
  - PLUS soft tissue releases
  - PLUS immobilization in cast afterward

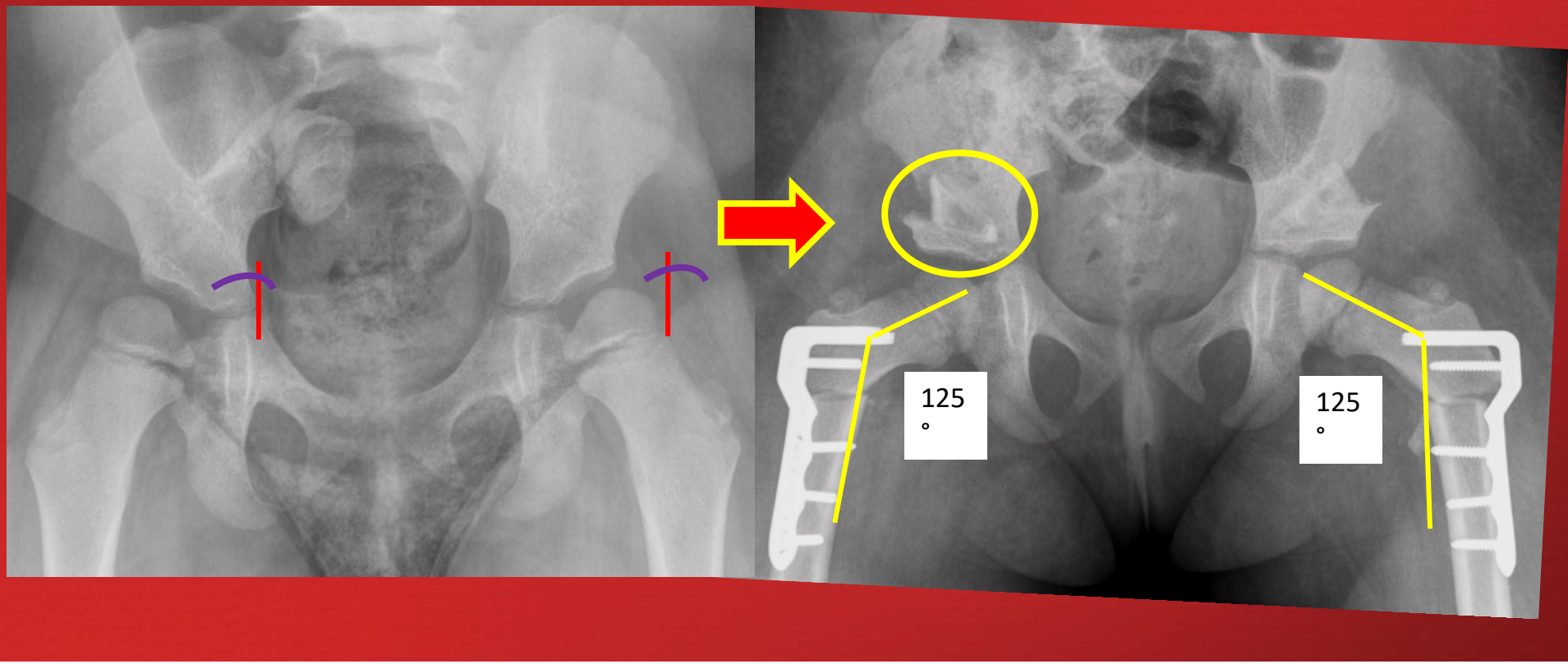


Operative Management: Combined Femoral & Pelvic Osteotomy



GW

Children's National



Children's National

Surgical Management of Hip Subluxation and Dislocation in Children With Cerebral Palsy: Isolated VDRO or Combined Surgery?

JOURNAL OF PEDIATRIC ORTHOPAEDICS

Kenneth Huh, MD, Susan A. Rethlefsen, PT,† Tishya A.L. Wren, PhD,†‡§ and Robert M. Kay, MD†‡*

AIMS

- To compare isolated varus derotational osteotomy (VDRO) and VDRO combined with open hip reduction and/or pelvic osteotomy in children with CP and hip subluxation/dislocation.

METHODS

- Retrospective review was performed of 75 patients with CP (116 hips) and hip subluxation/dislocation treated surgically, with a minimum of 2 years follow-up.
  - 92 VDRO alone 24 VDRO and open reduction and/or pelvic osteotomy

- Clinical variables, functional level, radiographic variables, and complications/revisions were compared between groups.

Children's National

Surgical Management of Hip Subluxation and Dislocation in Children With Cerebral Palsy: Isolated VDRO or Combined Surgery?

JOURNAL OF PEDIATRIC ORTHOPAEDICS

Kenneth Huh, MD, Susan A. Rethlefsen, PT,† Tishya A.L. Wren, PhD,†‡§ and Robert M. Kay, MD†‡*

RESULTS

- Patients requiring combined surgery (VDRO+) had higher baseline MP, AI, neck-shaft angles.
- Postoperative radiographic variables were similar between groups.
- There were no differences in complications or revision rates between groups.
- Of the hips with MP >50% preoperatively and treated with VDRO alone, 41% developed postoperative MP of ≥30% and 21% developed a MP of ≥40%.

CONCLUSIONS:

- The study results confirm that combined procedures should be considered in patients with high MP (MP>50%).
- Recommend performing VDRO and soft tissue release first, and adding pelvic osteotomy if needed.

Children's National

Bilateral Surgery for Unilateral Hip Displacement?

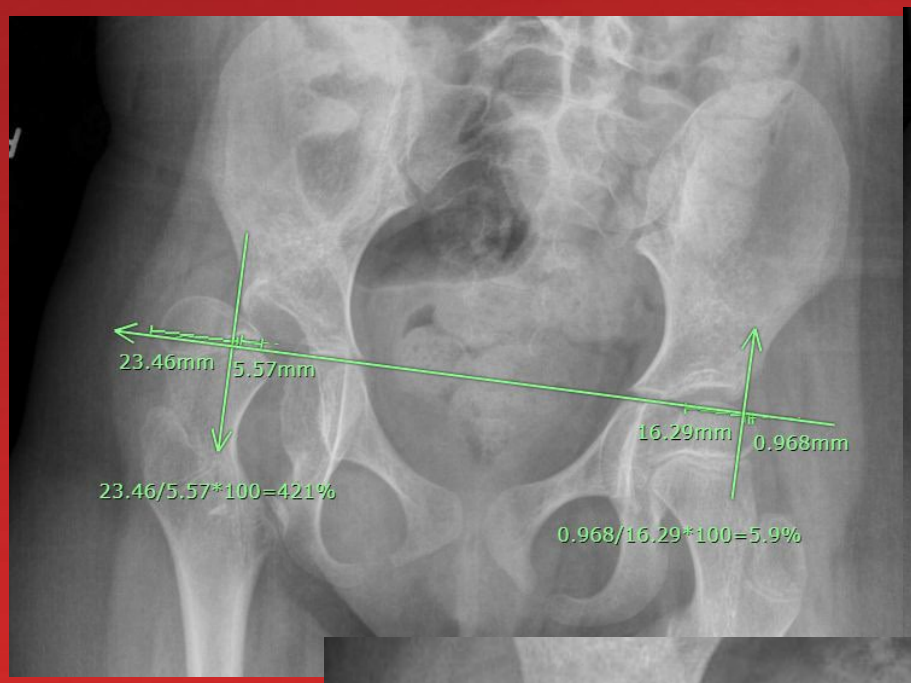
SYMMETRY!!

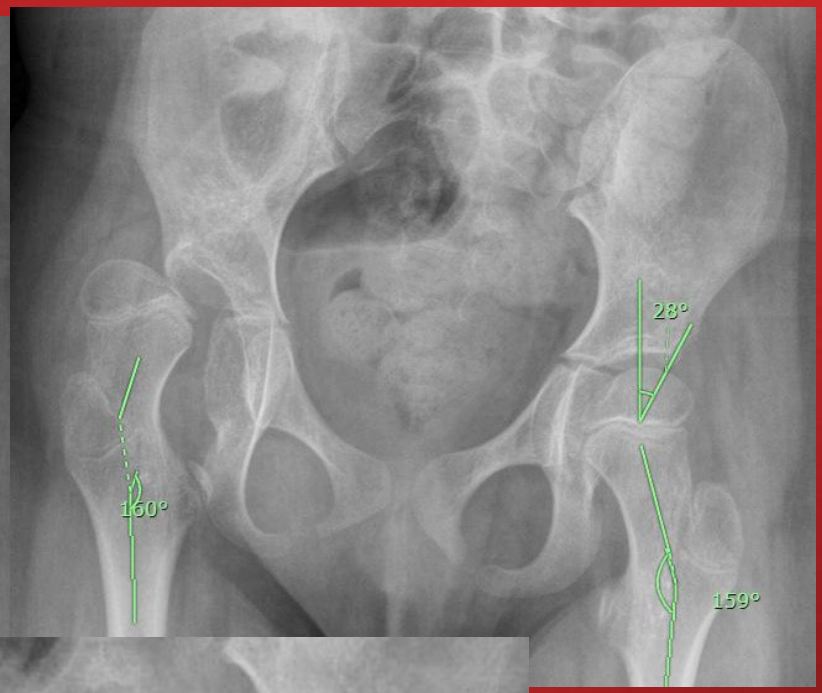
GW

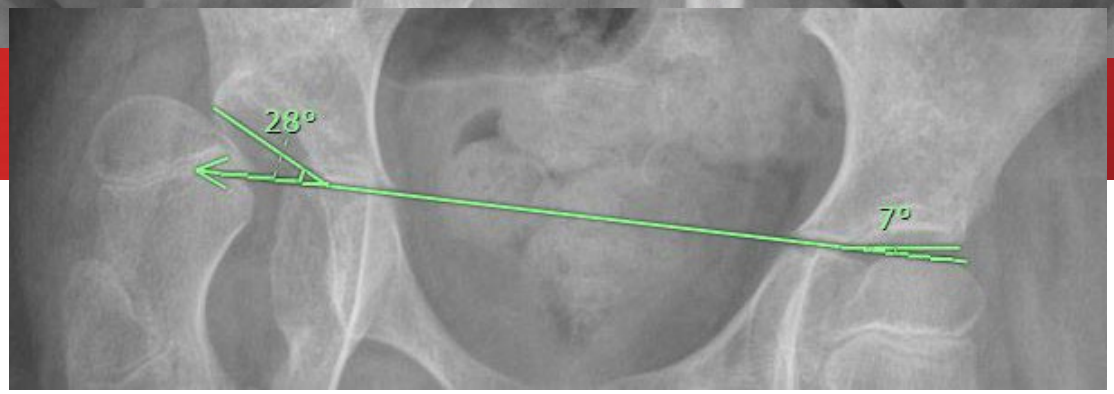
Children's National

Assessment & Discussion

5 y/o non-verbal F with cerebral palsy (GMFCS 5) and global developmental delay now with a dislocated right hip with associated acetabular dysplasia as well as bilateral coxa valga



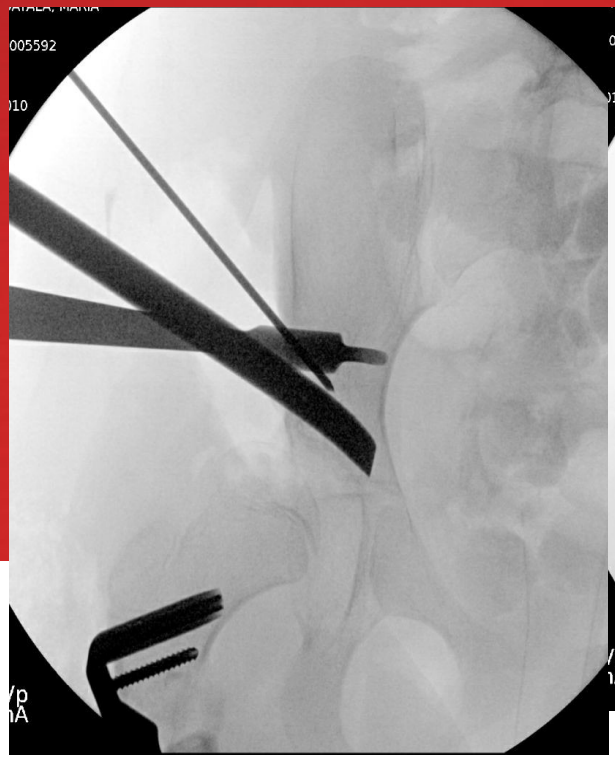
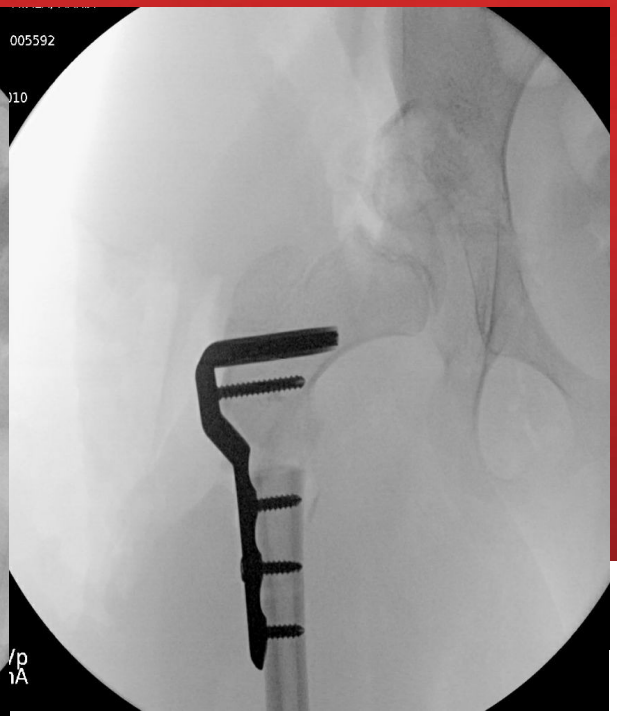




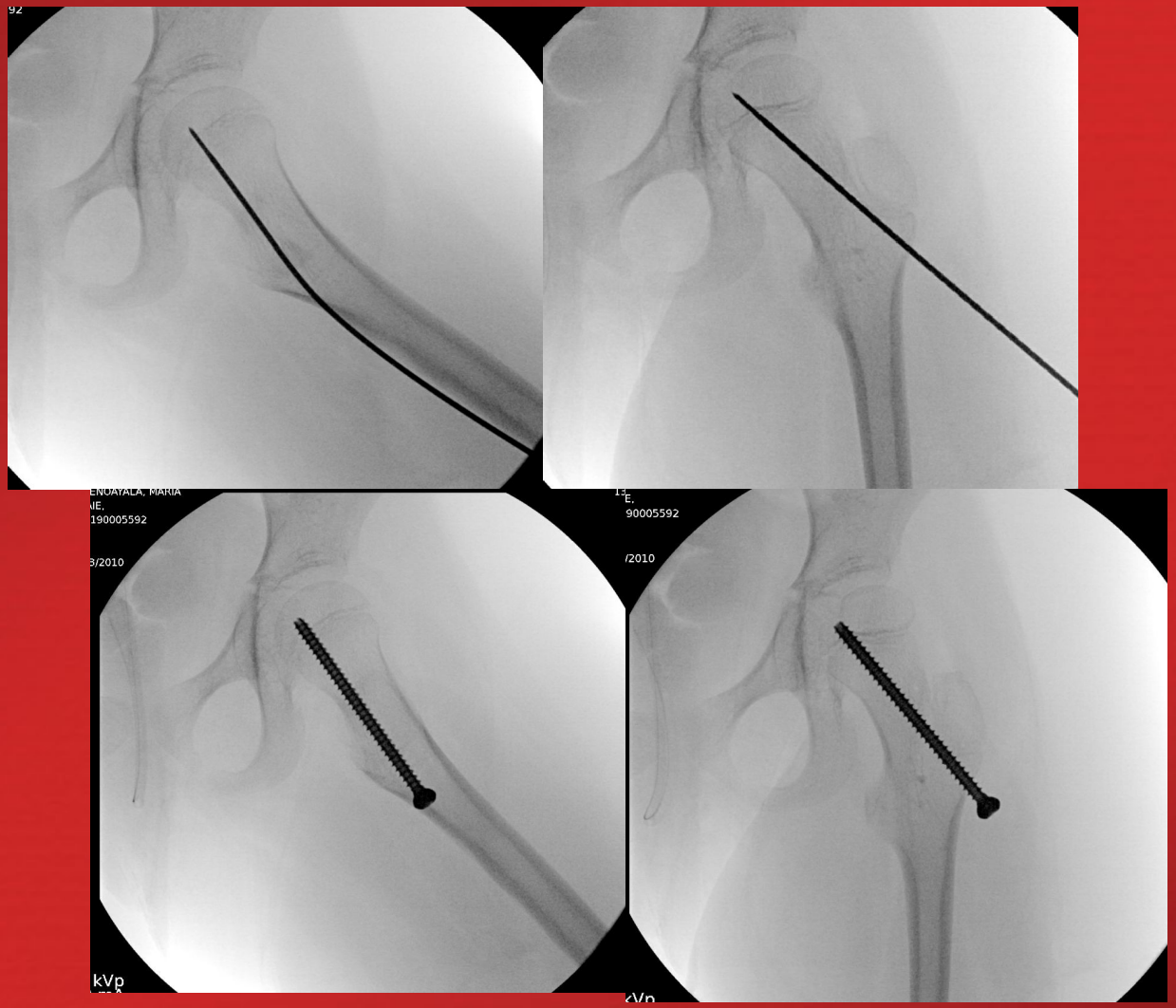
Children's National





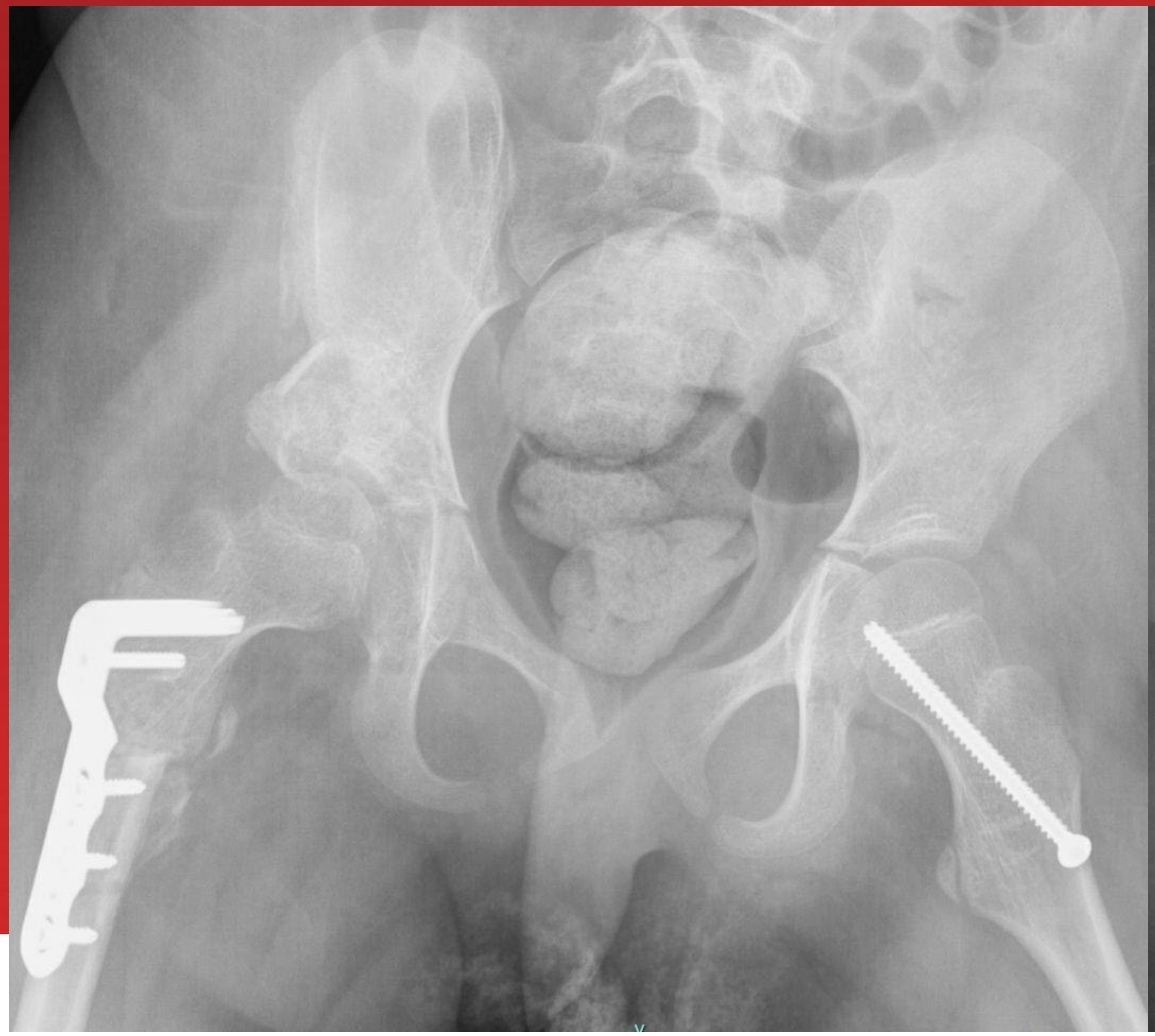



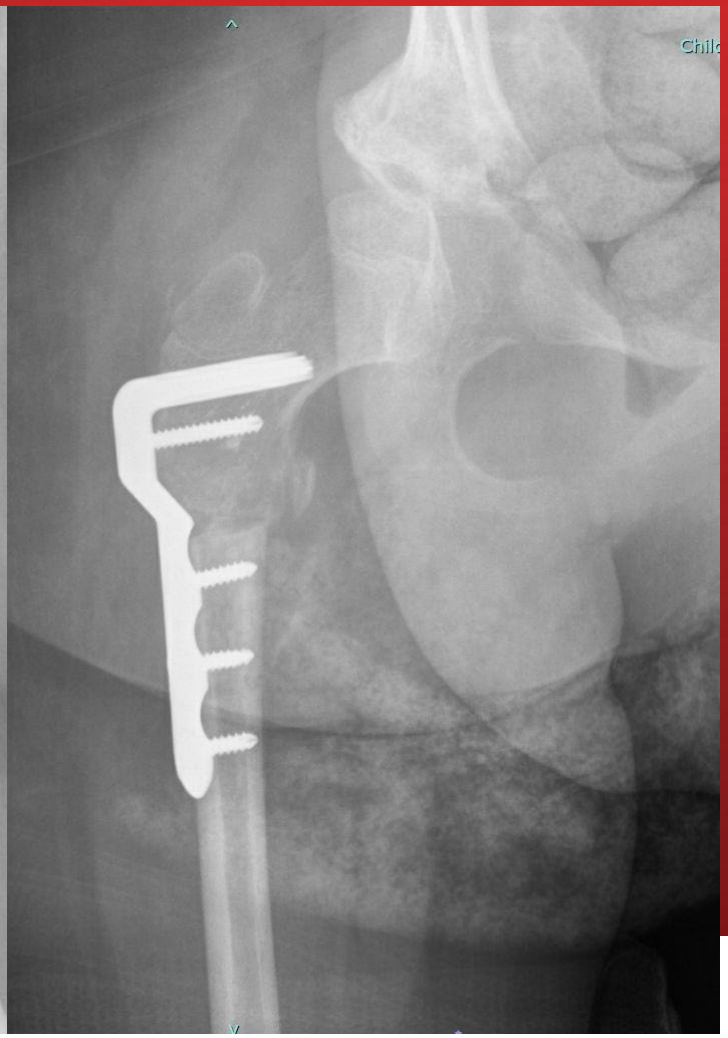
Children's National



Children's National

4 Week Follow-up



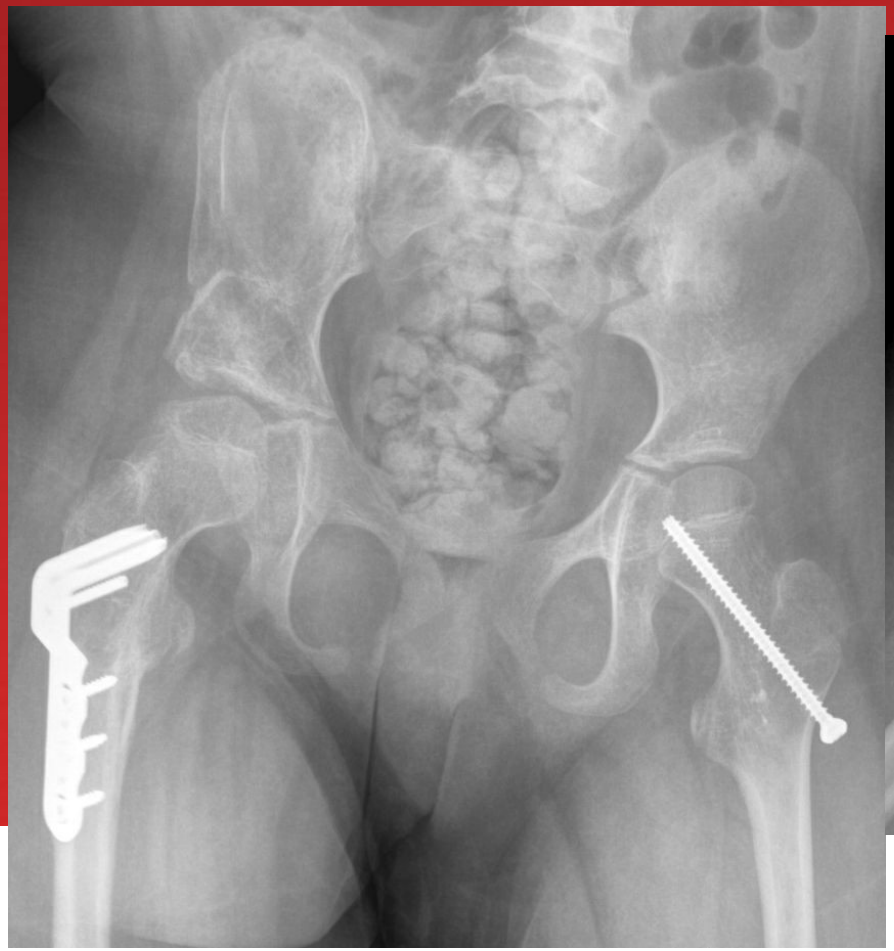


Children's National

8 week Follow-up

Children's National

11 Month Follow-up

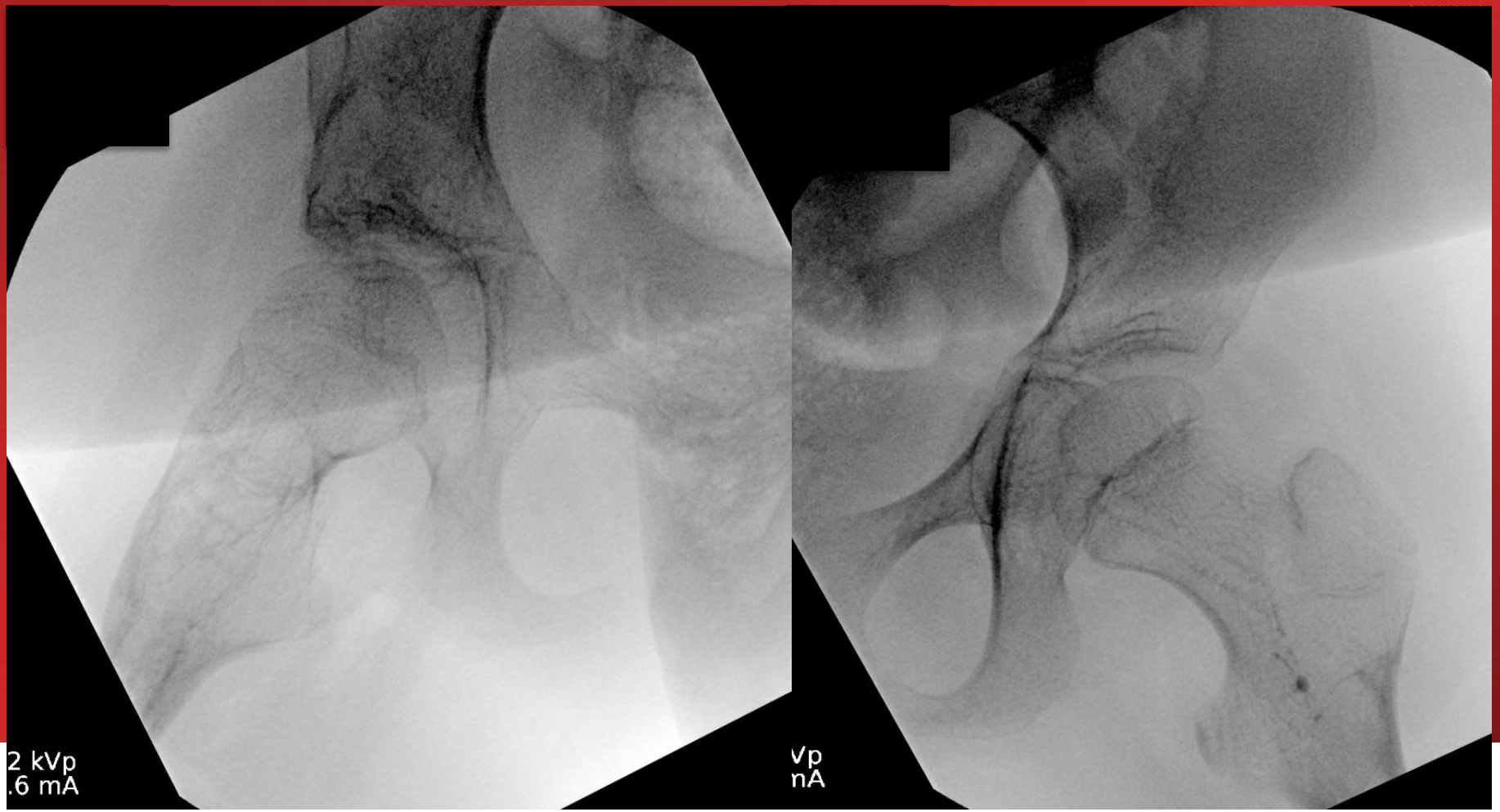


Children's National

2 Year Follow-up

Children's National

Removal Of Hardware 2.5 Years Post-Op



Children's National

3 Years Post-Op

Children's National

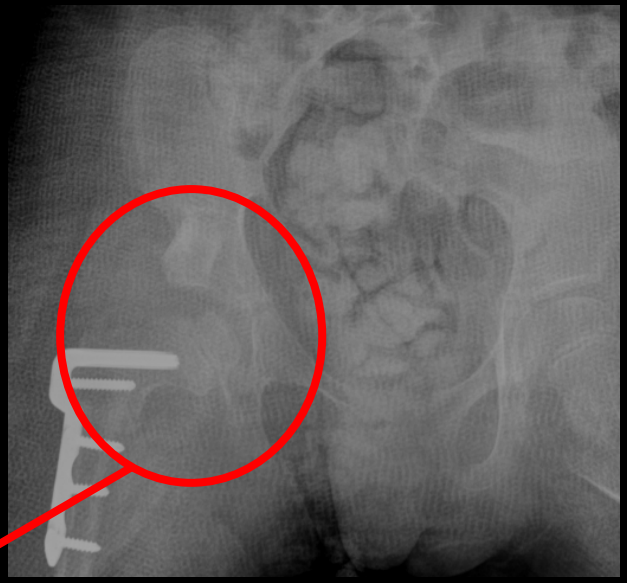
The Importance of Hip Surveillance in Cerebral Palsy!

Growing Up
With Dr. Sean Tabaie

Early detection and surveillance…

Clinical Presentation

1. 4yo female GMFCS 5 – referred for hip surveillance, XR at 1st visit with me
2. No pain or hygiene care issues per family
3. No issue with positioning in her chair



Hip reduced, acetabular coverage obtained

"NORMAL" ANATOMY RESTORED

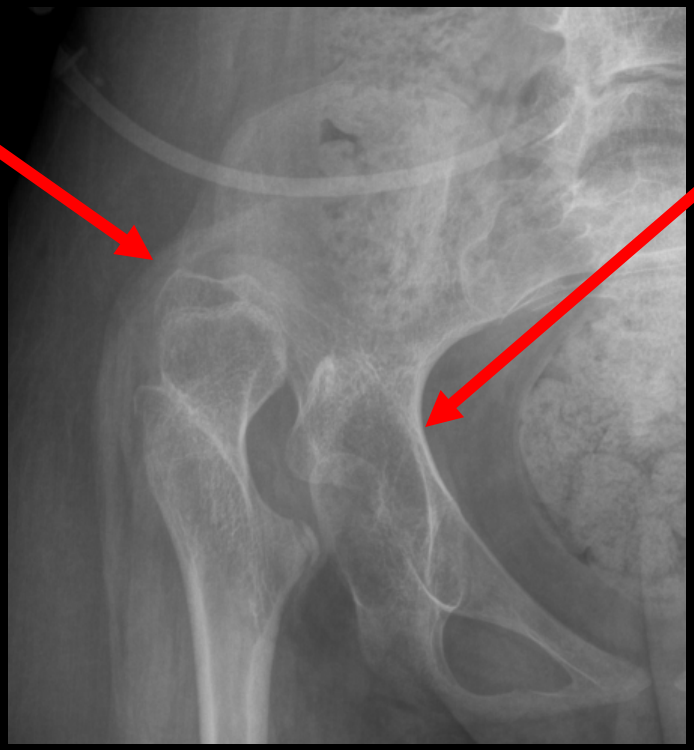
GOOD RESULTS!

Growing Up
With Dr. Sean Tabaie

Lack of surveillance…

Severe degenerative changes to the femoral head

Severely dysplastic acetabulum



At this point the "normal" anatomy cannot be restored

BAD RESULTS!

Clinical Presentation

1. 11yo male GMFCS 5 who was first referred to ortho at age 10 (1st time seen by me)
2. Severe right hip pain with any movement, difficulty of family to perform hygiene care
3. Difficulty to sit in his wheelchair for more than 15 minutes

Growing Up
With Dr. Sean Tabaie

Palliative/salvage surgical procedures with delayed treatment of hip dislocations…

Goals:

1. **Improve PAIN**
2. **Improve range of motion for ADLs/hygiene care**

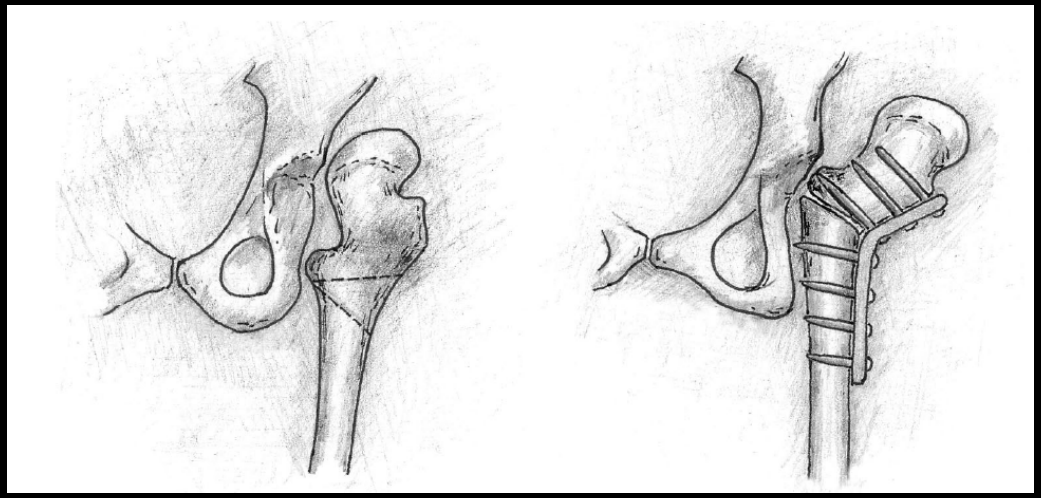
Procedures:

1. **Proximal femoral valgus osteotomy**
2. **Femoral head resection**

Not ideal but sometimes necessary!

Growing Up
With Dr. Sean Tabaie

Valgus osteotomy w/femoral head resection…



Goals:

1. **Improve PAIN**
2. **Improve range of motion for ADLs/hygiene care**

See clinical pics in following slides →

Growing Up
With Dr. Sean Tabaie

Hip Surveillance Protocol...

Curr Rev Musculoskelet Med (2012) 5:126–134
DOI 10.1007/s12178-012-9120-4

PEDIATRICS (M GLOTZBECKER, SECTION EDITOR)

The role for hip surveillance in children with cerebral palsy

Benjamin Shore · David Spence · HK Graham


GMFCS I

GMFCS 1:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical and radiographic review at 3 years†
  - If GMFCS level has changed - alter surveillance accordingly
- Repeat clinical & radiographic review at 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If remains GMFCS level 1 – discharge from hip surveillance


GMFCS II

GMFCS 2:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review via yearly surveillance until MP stability
  - If MP unstable/abnormal – continue yearly surveillance
  - If MP stability established – review at 4-5 years
- Repeat clinical & radiographic review at 4- 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable – review at 8-10 years
  - If MP unstable – continue yearly surveillance until stability
- Repeat clinical & radiographic review at 8-10 years†
  - If MP stable – discharge


GMFCS III

GMFCS 3:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review 6 months later†
  - If MP unstable/abnormal – continue yearly surveillance
  - If MP stability established – review at 4-5 years
- Repeat clinical & radiographic review at 4- 5 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable – review at 8-10 years
  - If MP unstable – continue yearly surveillance until stability
- Repeat clinical & radiographic review at 8-10 years†
  - If MP stable – discharge
  - If MP unstable – continue yearly surveillance until stability established


GMFCS IV

GMFCS 4:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Repeat clinical & radiographic review every 6 months†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP unstable/abnormal – continue 6 month surveillance until stability
  - If MP stability established – continue yearly surveillance
- Repeat clinical & radiographic review at 7 years†
  - If MP stable (<30%) & GMFCS stable – review at pre-puberty
  - Continue yearly surveillance from pre-puberty to skeletal maturity
- Independent of MP, if evidence of pelvic obliquity, scoliosis continue 6 month surveillance until skeletal maturity


GMFCS V

GMFCS 5:

- Initial AP Pelvis at 12-24 months (or at age of identification)
- Continue 6 monthly surveillance until 7 years†
  - If GMFCS level has changed - alter surveillance accordingly
  - If MP stable (<30%) & GMFCS stable – review yearly until maturity
- Independent of MP, if evidence of pelvic obliquity, scoliosis continue 6 month surveillance until skeletal maturity

Legend:

†Verify GMFCS Level
AP = Anteroposterior
GMFCS = Gross Motor Functional Classification Level
MP = Migration Percentage

Growing Up
With Dr. Sean Tabaie

Surveillance Guidelines for Children with Cerebral Palsy

2021

Sean Tabaie, MD

Pediatric Orthopaedic Surgeon

Department of Orthopaedic Surgery and Sports Medicine

Children's National Hospital, Washington D.C.

What did we learn…

GW

Children's National ™

QUESTIONS??

GW

Children's National ™


THANK YOU
stabaie@childrensnational.org
@cporthopod

References

1. Herring J. A. Tachdjian M. O. & Texas Scottish Rite Hospital for Children. (2008). Tachdjian's pediatric orthopaedics (4th ed.). Saunders/Elsevier. Chapter 25.
2. Graham, H. K., Boyd, R., Carlin, J. B., Dobson, F., Lowe, K., Nattrass, G., ... & Reddihough, D. (2008). Does botulinum toxin A combined with bracing prevent hip displacement in children with cerebral palsy and “hips at risk”?: A randomized, controlled trial. JBJS, 90(1), 23-33.
3. Freeman Miller; Mark R. Bagg (1995). AGE AND MIGRATION PERCENTAGE AS RISK FACTORS FOR PROGRESSION IN SPASTIC HIP DISEASE. , 37(5), 449–455. doi:10.1111/j.1469-8749.1995.tb12028.x
4. Shore, B., Spence, D., & Graham, H. K. (2012). The role for hip surveillance in children with cerebral palsy. Current reviews in musculoskeletal medicine, 5(2), 126-134.
5. Huh, K., Rethlefsen, S. A., Wren, T. A., & Kay, R. M. (2011). Surgical management of hip subluxation and dislocation in children with cerebral palsy: isolated VDRO or combined surgery?. Journal of Pediatric Orthopaedics, 31(8), 858-863.

GW

Children's National