The Limping Child

Future of Pediatrics
June 15, 2016

Benjamin D. Martin
Division of Orthopaedic Surgery

The Limping Child

- DDX
- Normal Gait
- Abnormal Gait Patterns
- Common causes

HOW OLD IS THE CHILD?

IS THE CHILD IN PAIN?

PAINLESS

Coxa vara
DDH
Leg length difference
Cerebral palsy
Muscular dystrophy

PAINFUL

Perthes
SCFE
Discoid meniscus
Transient synovitis
Septic arthritis
Osteomyelitis
JRA

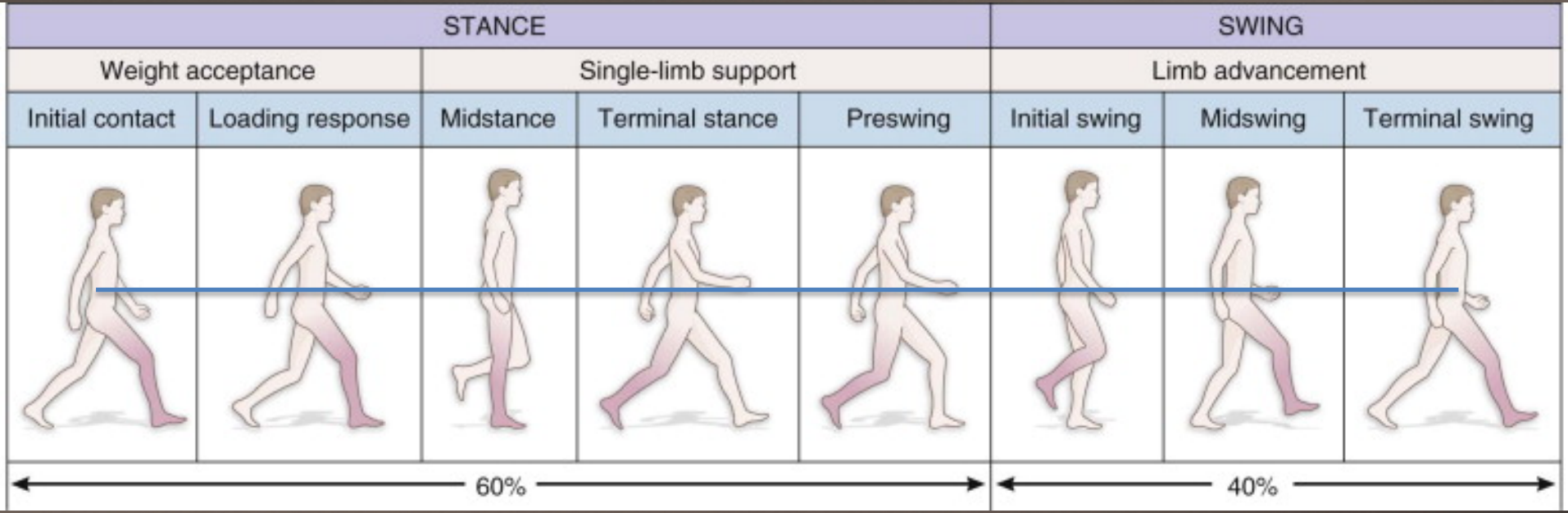
DON'T FORGET TO LOOK AT HIP FOR KNEE PAIN!!

Children's National

Toddler **(1-3)**	**Child** **(4-10)**	**Adolescent** **(11-15)**
Transient synovitis Septic Arthritis Toddler's fx CP DDH Coxa vara JRA	Transient synovitis Septic Arthritis Perthes Leg length difference	SCFE Dysplasia Tarsal coalition

Children's National

Normal Gait



Efficient ??

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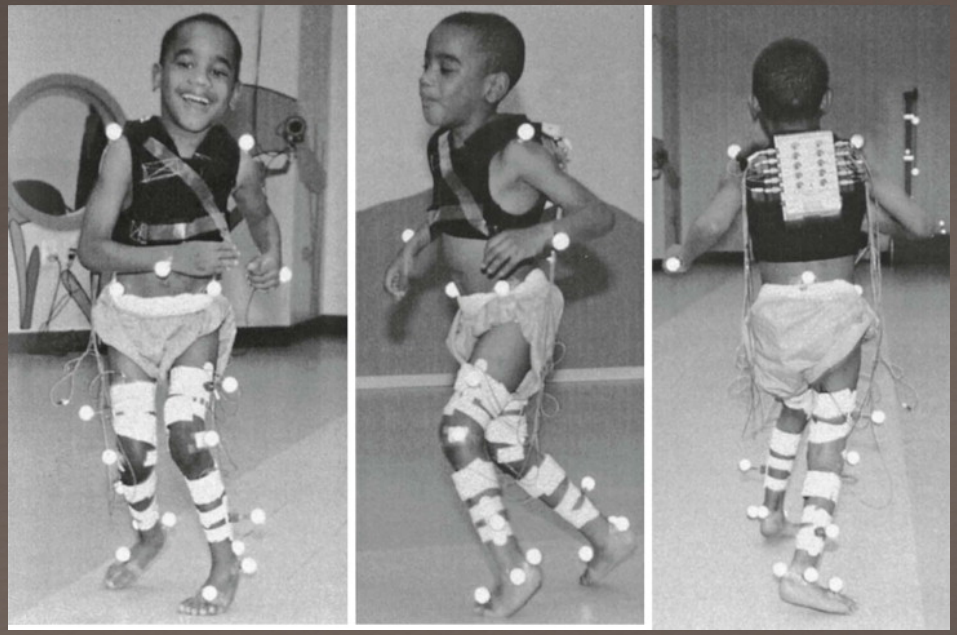
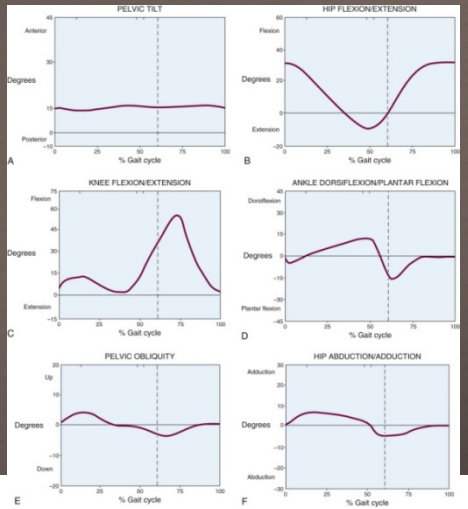
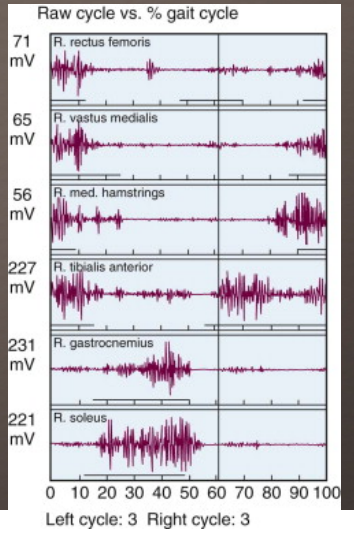
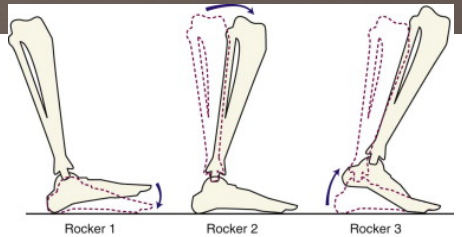
Gait Analysis









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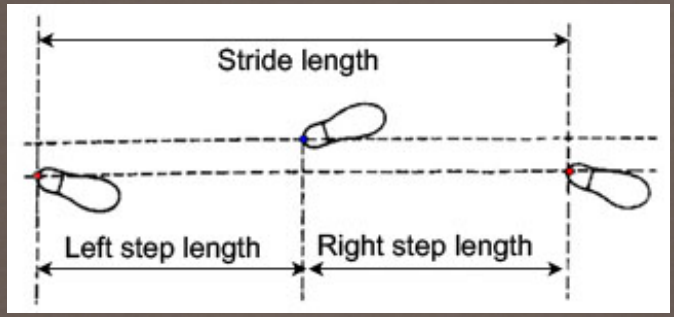
Toddler vs. Mature Gait



step time
cadence
walking velocity

Children's National

COMMON GAIT PATTERNS

Children's National

Abnormal Gait

Patterns

- Antalgic
- Trendeleburg
- Proximal weakness
- Spastic
- Short limb

Antalgic Gait

Antalgic gait = shorten stance phase
(amount of time affected limp on the ground)
PAINFUL

quick, soft steps

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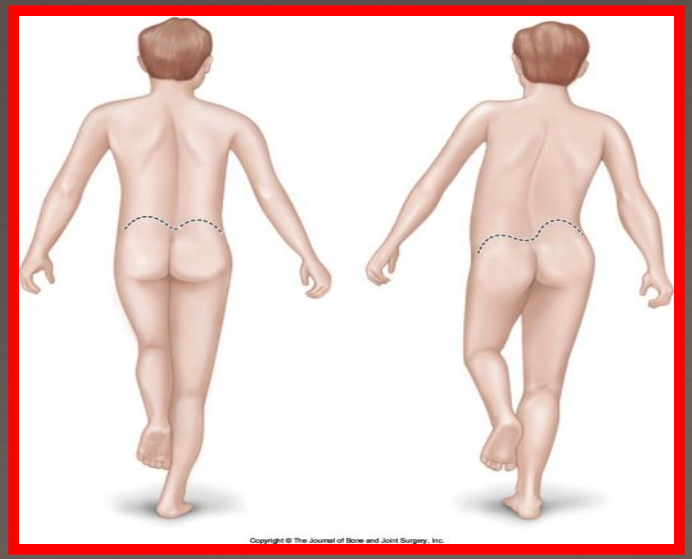
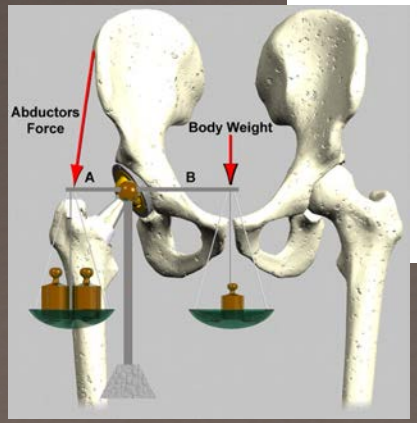
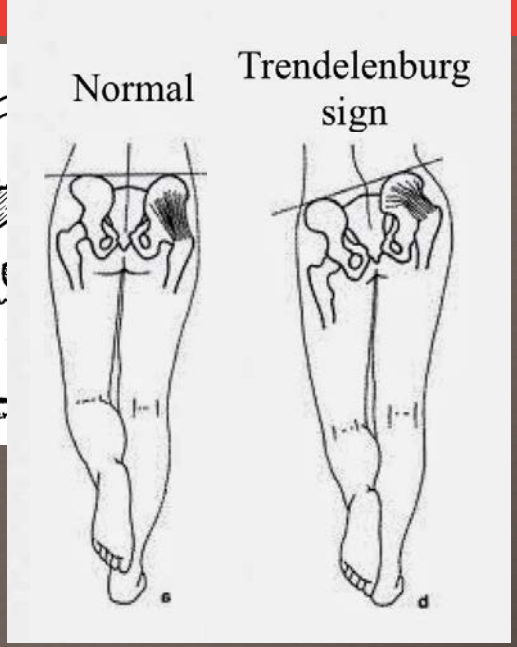
Trendelenburg Gait







Trendelenburg gait =
body leans over weak abductors
NOT PAINFUL*

*** Trendelenburg + pain = coxalgic gait**

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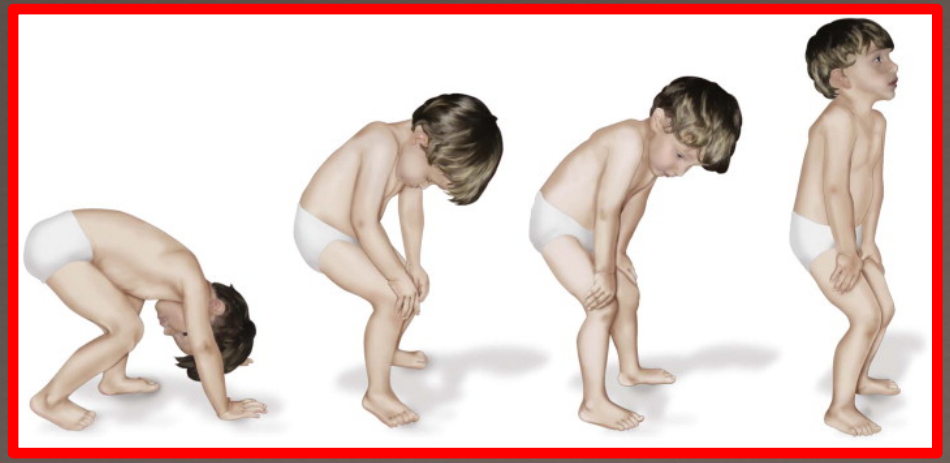
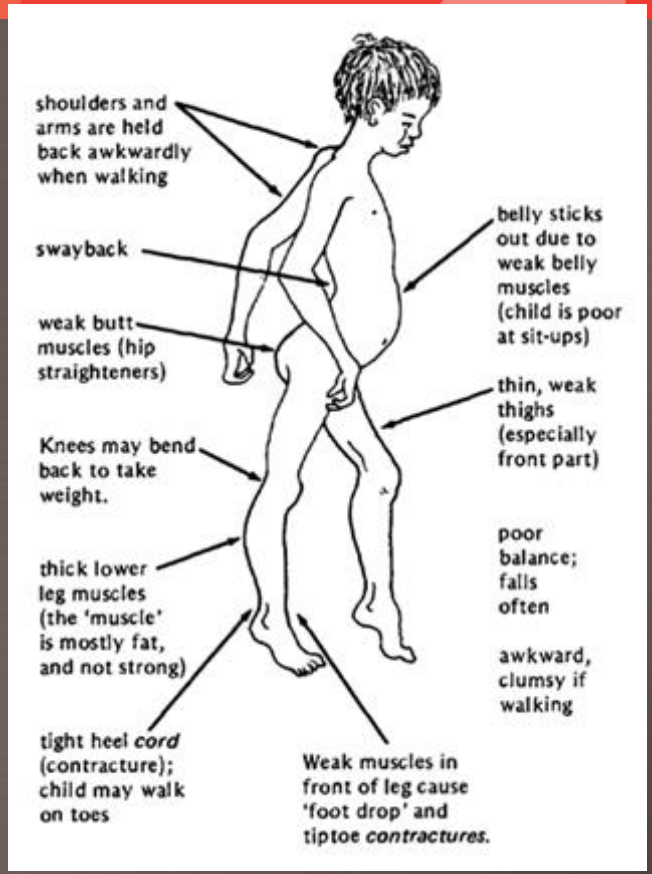
Proximal Weakness Gait





Weak hamstrings = lordosis
Weak abductors = Trendelenburg

1st symptom might be toe walking!

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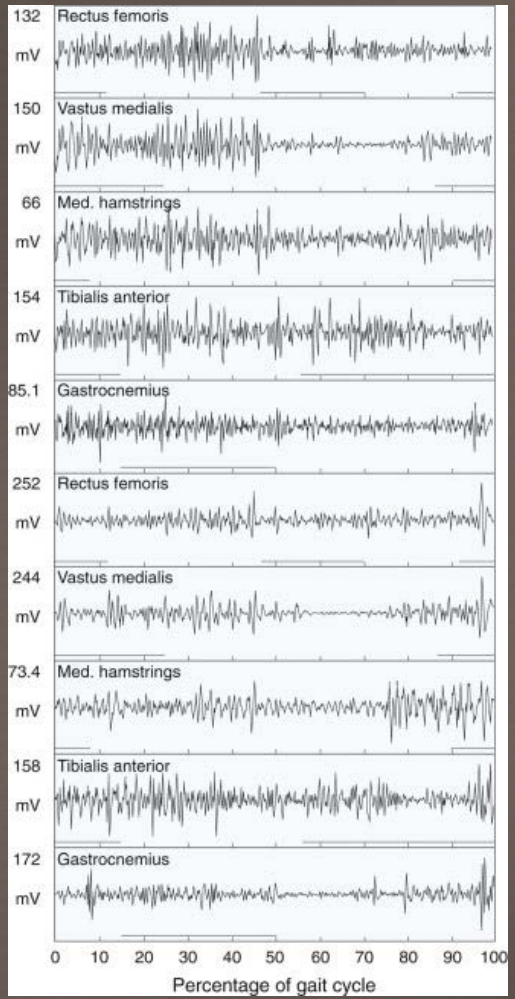
Spastic Gait

Gross Motor & Functional Classification

Delayed walkers?



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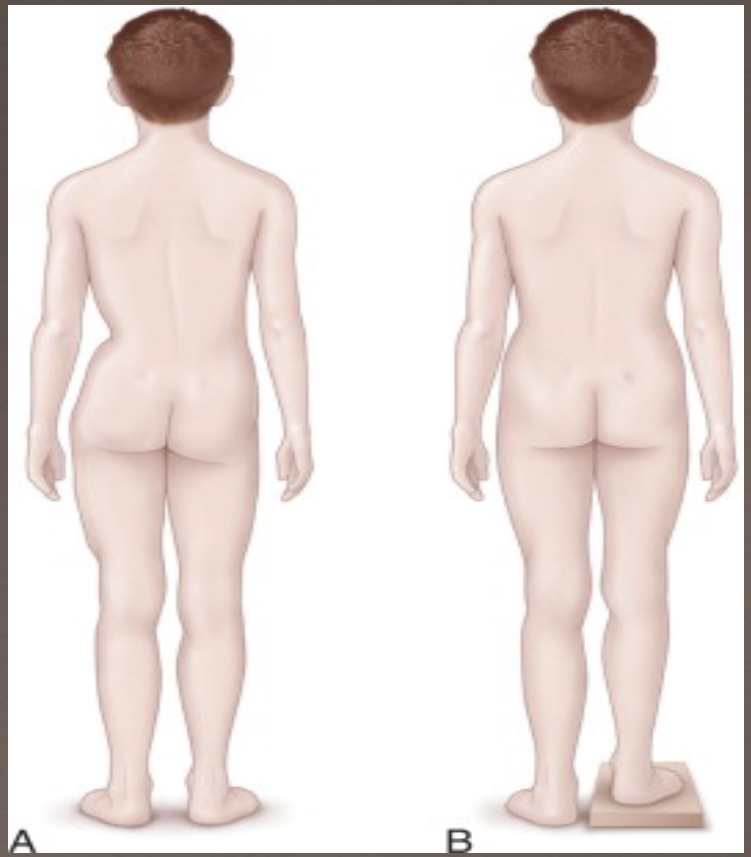
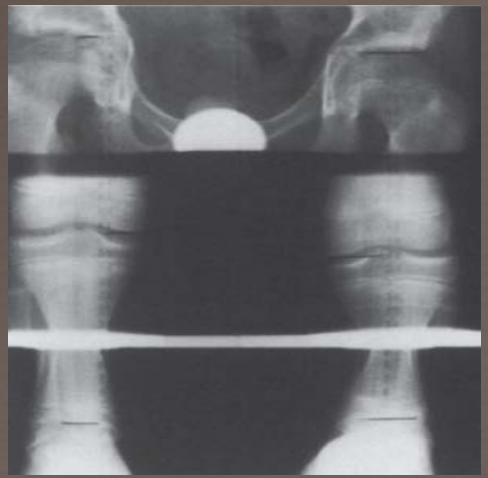
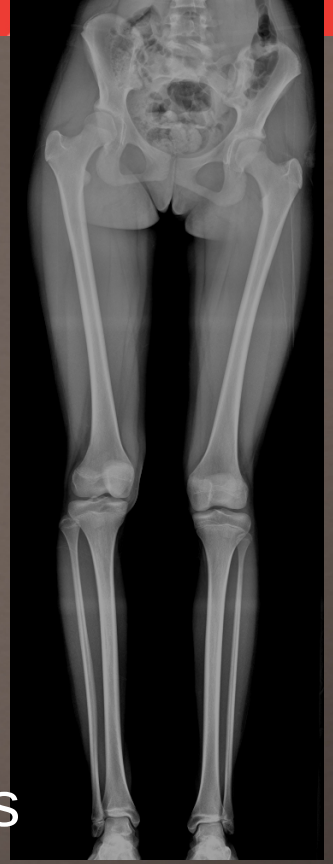
Short Limb Gait







- Oblique pelvis
- ASIS to medial malleolus
- Femur vs. tibia vs. both

Children's National

COMMON CONDITIONS

Children's National™

Toxic Synovitis vs. Septic Arthritis

Toxic Synovitis

- 4 – 10 yo
- Hip pain, limp
- Recent illness (URI)
- Low grade temps
- Slightly elevated labs
- NSAIDs
- Symptoms 1-2 weeks

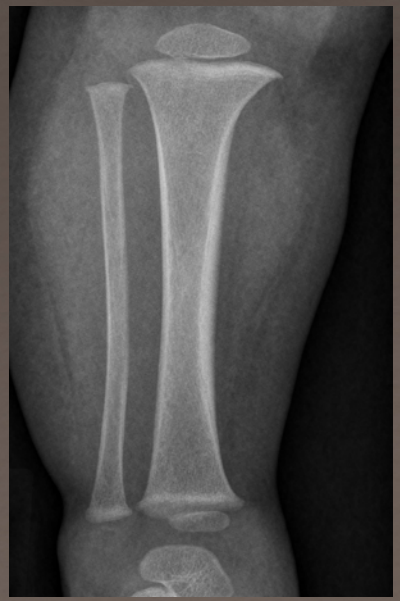
Septic Arthritis

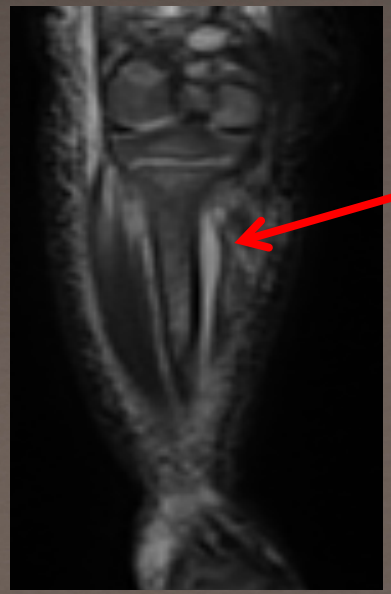
- Refusal to bear weight
- NOT ALLOW MOTION
- Fevers (>38.5°)
- ↑ **WBC (>12K)**
- ↑ **ESR (>40)**
- ↑ **CRP (>2)**
- Hematogenous spread
- Aspirate
  - Gram Stain, WBC>50K
- Surgical emergency!!

MOTRIN CHALLENGE
ULTRASOUND (both have effusion)
ASPIRATION

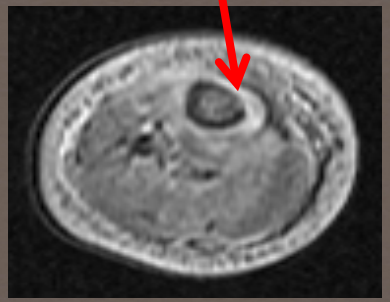
Children's National

Osteomyelitis

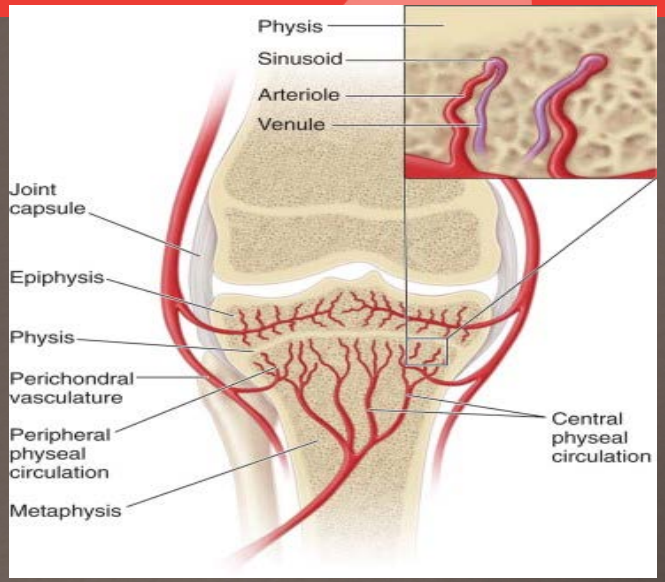




subperiosteal abscess



X-ray changes 10-14 days



- Bone infection
- Hematogenous
- S. aureus
- MRI vs. bone scan

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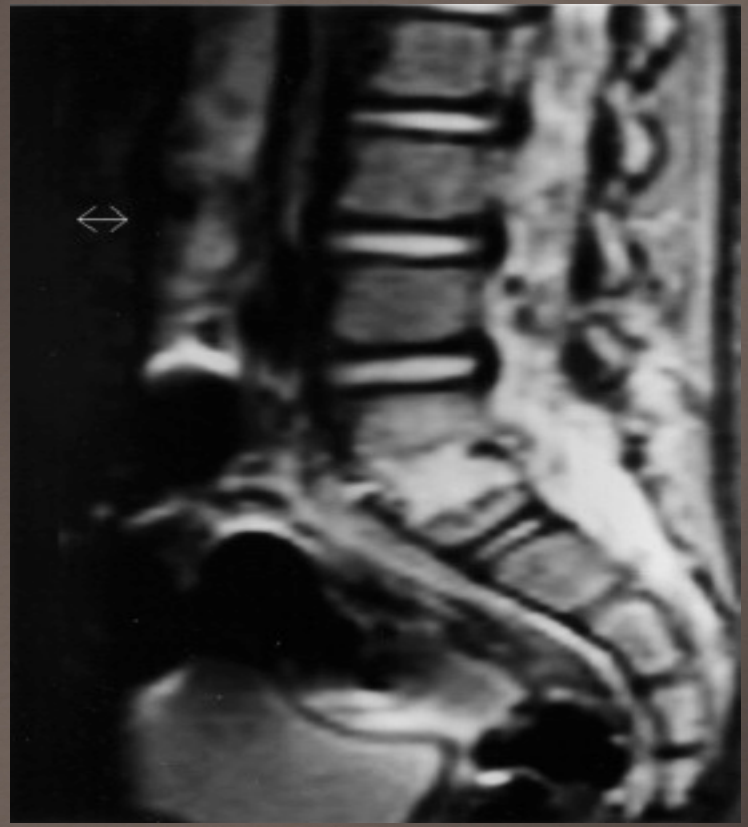
Diskitis

- 1-5 yo
- back/abdominal pain
- refusal to bear weight
- X-ray usually normal
- S. aureus
- IR vs. surgery for abscess



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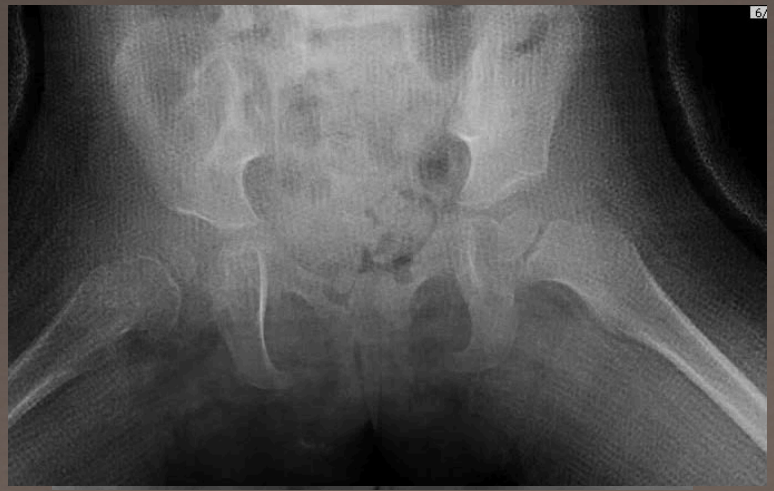
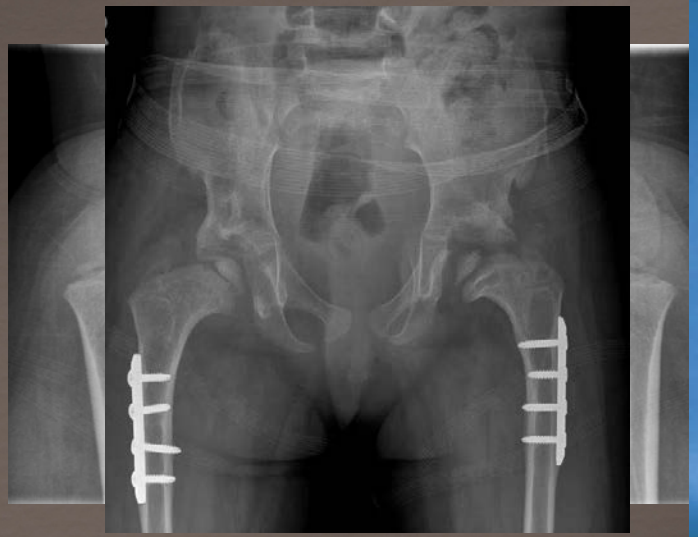
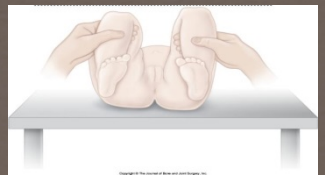
DDH – dislocated hip

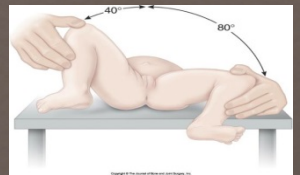
painless
Trendelenburg





Unilateral ≠ **bilateral**

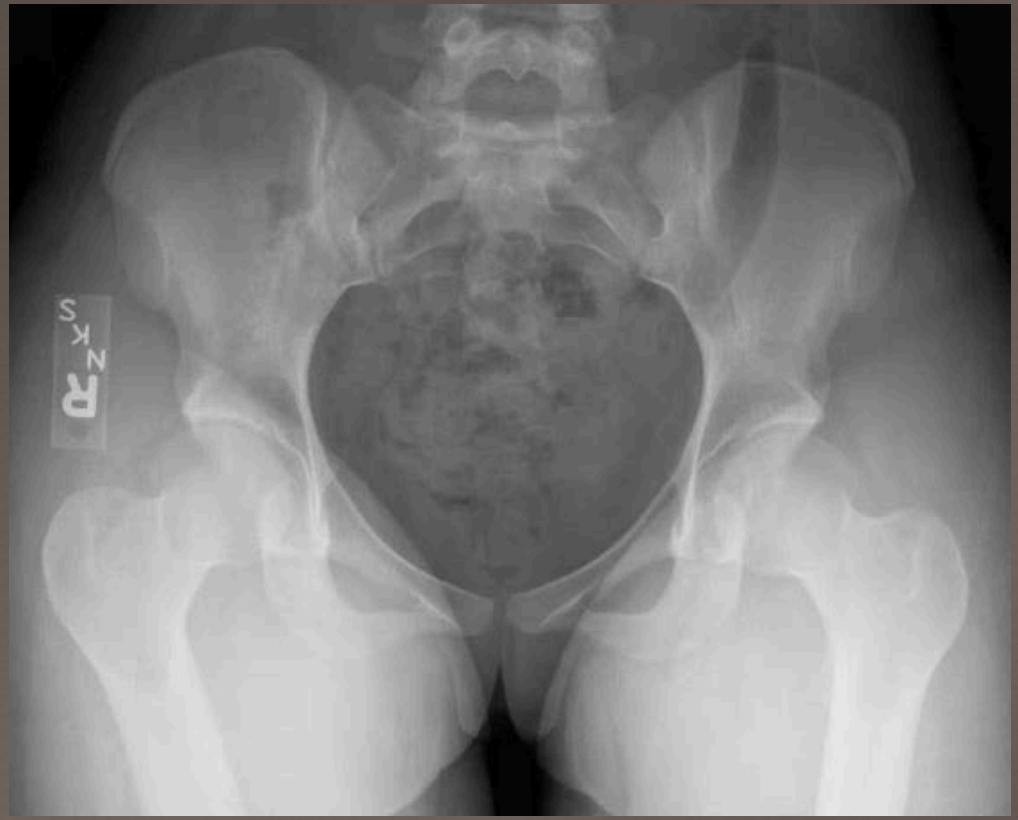


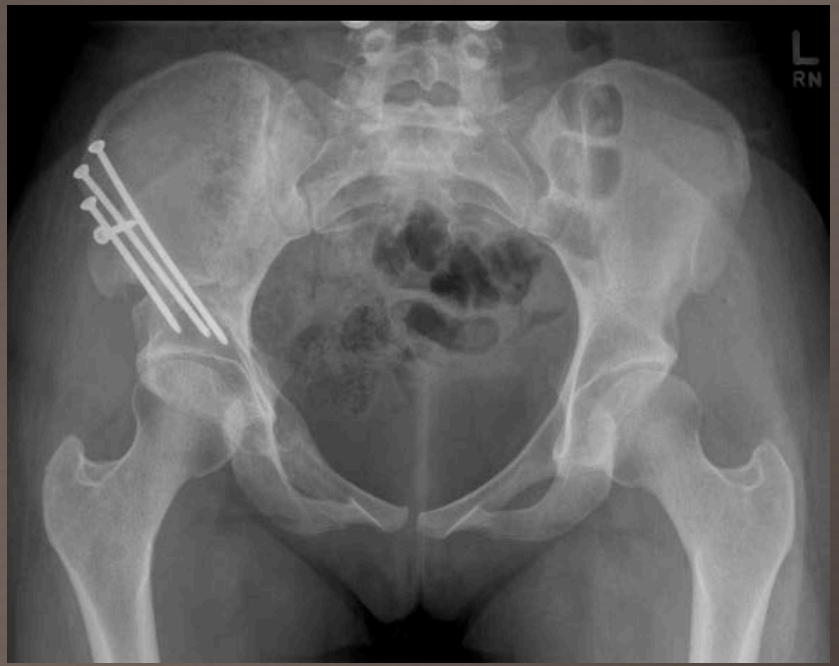


Children's National

painful

Acetabular Dysplasia

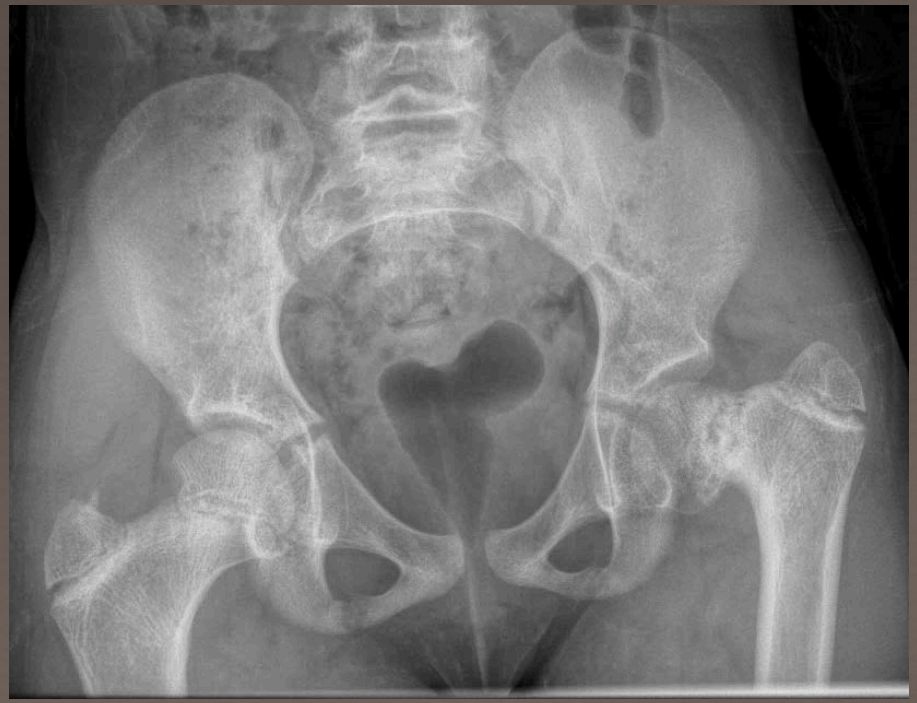


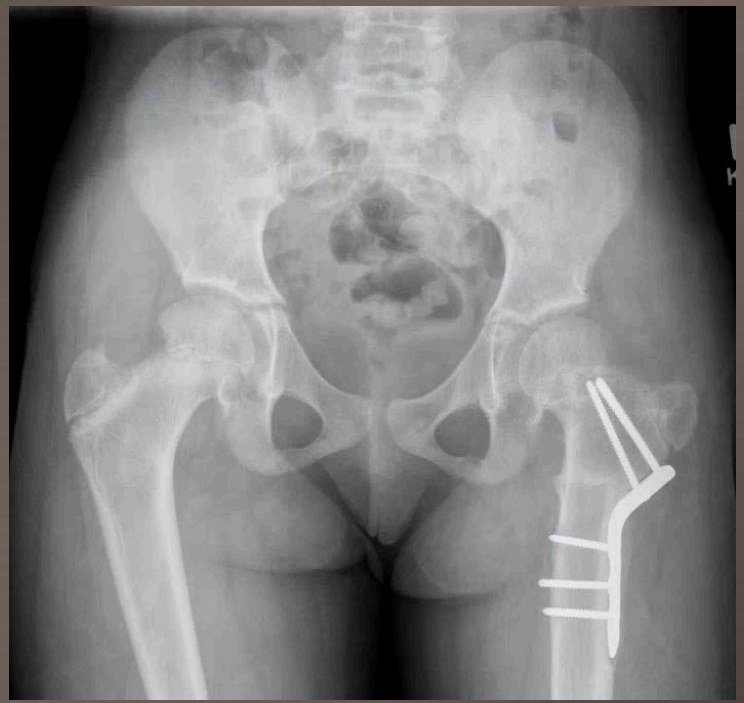


Children's National

Coxa Vara

painless
Trendeleburg





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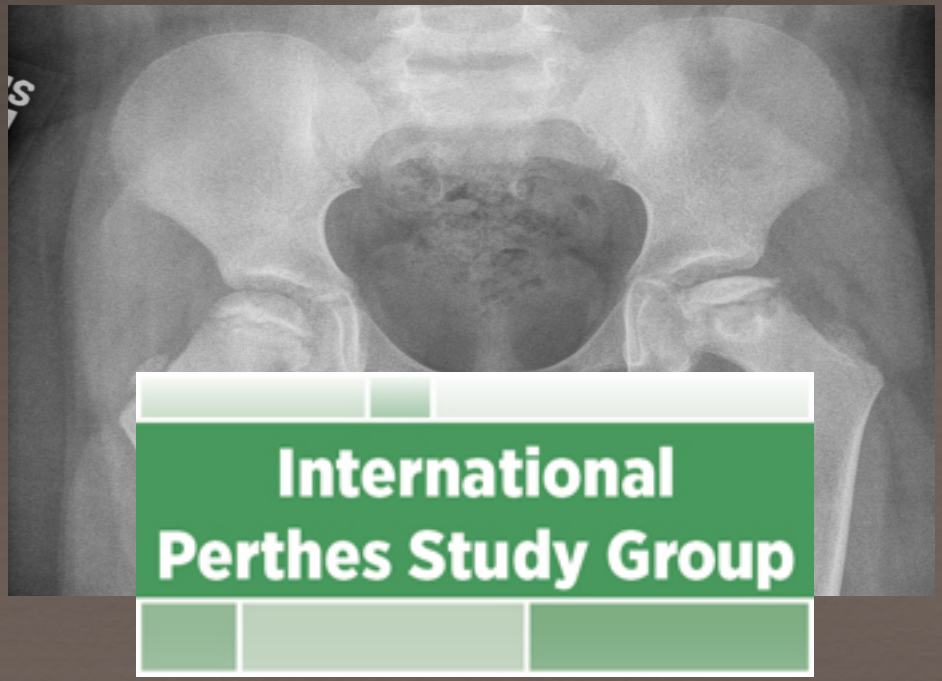
Legg-Calvé-Perthes

+/- pain
Trendelenburg

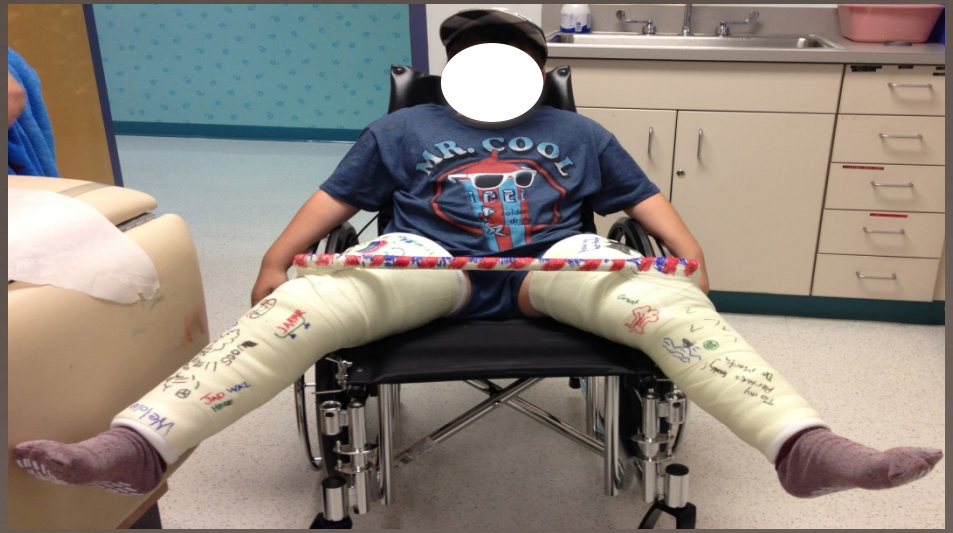


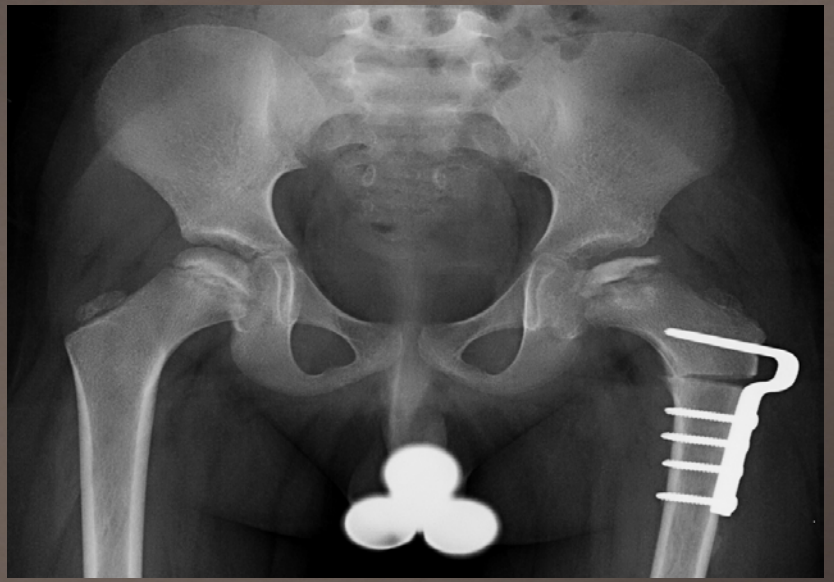
www.perthesdisease.org

- Boys > girls
- 4 – 11 years old
- Loss of abduction and internal rotation
- < 6 yo do well
- > 8 yo do poor

Children's National

Legg-Calvé-Perthes





WHAT IS THE FUTURE OF PERTHES TREATMENT??

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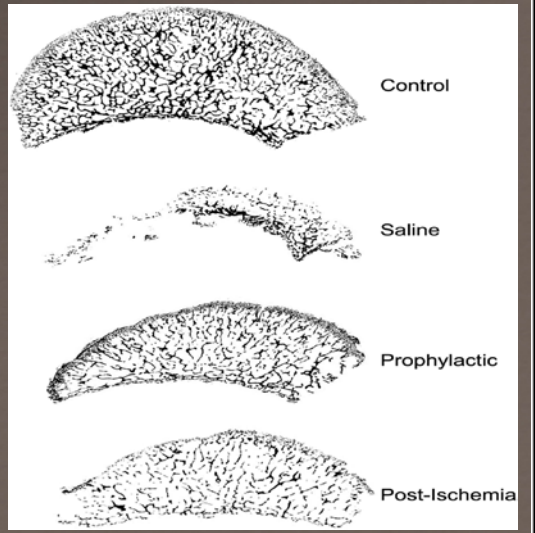
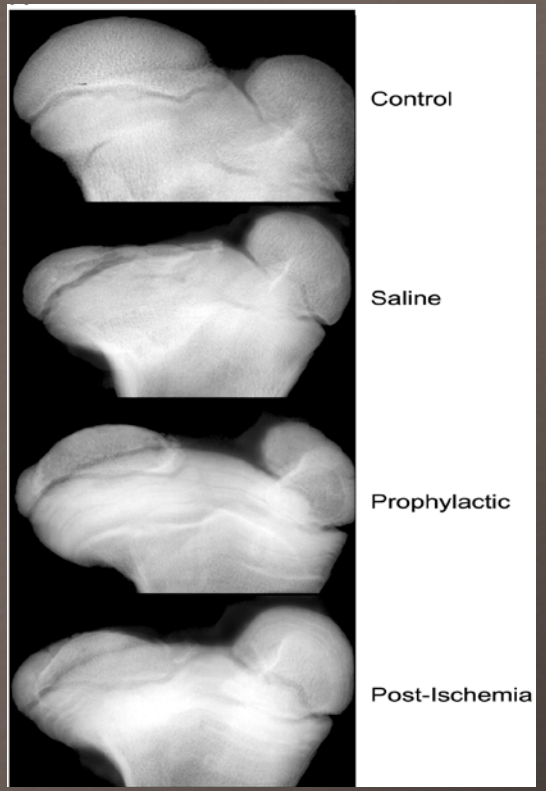
Bisphosphonates



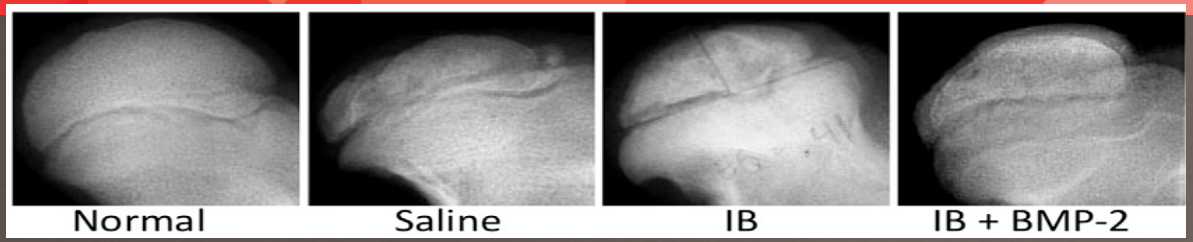


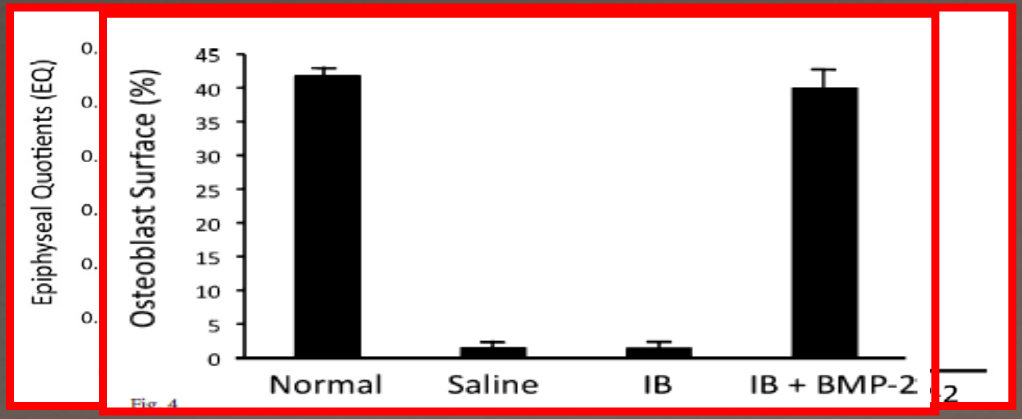
Preserves integrity but no new bone formation

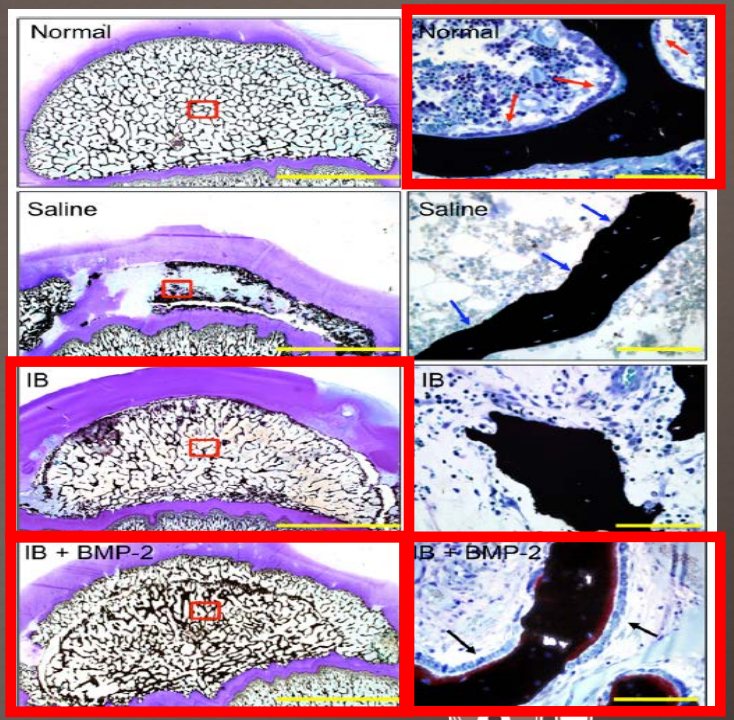
(Kim 2005)

Children's National

BMP







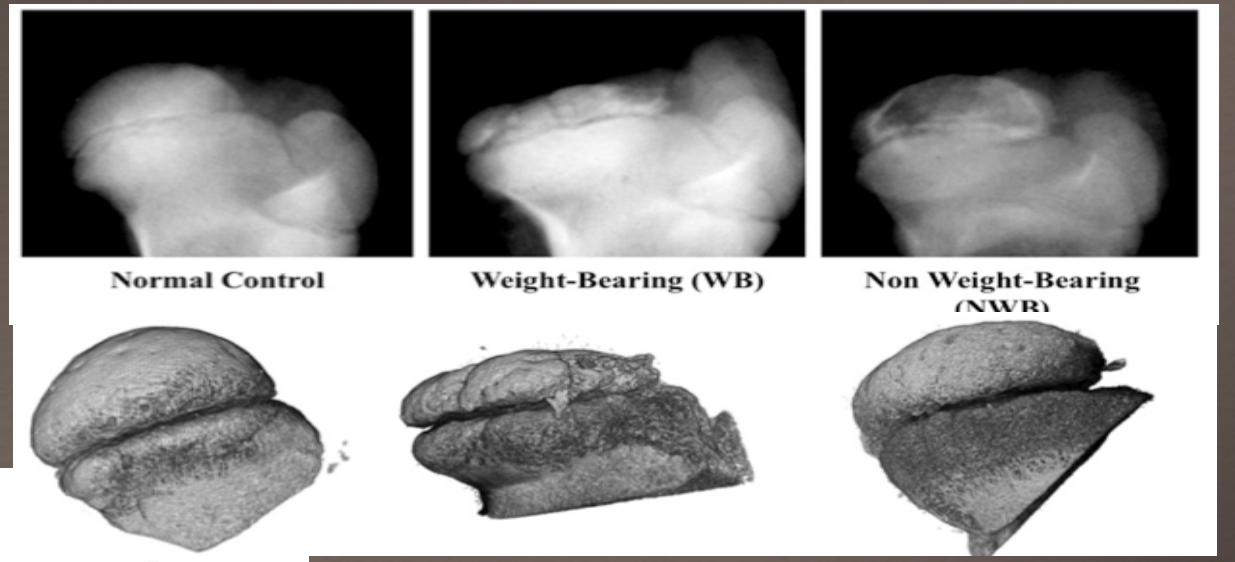
Trabecular bone preserved

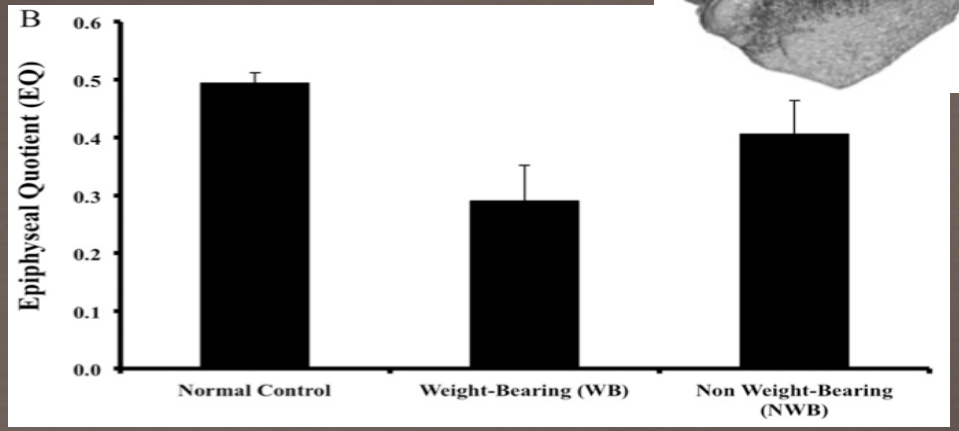
Osteoblasts lining trabeculae

(Kim 2011)

Children's National

Non weight-bearing

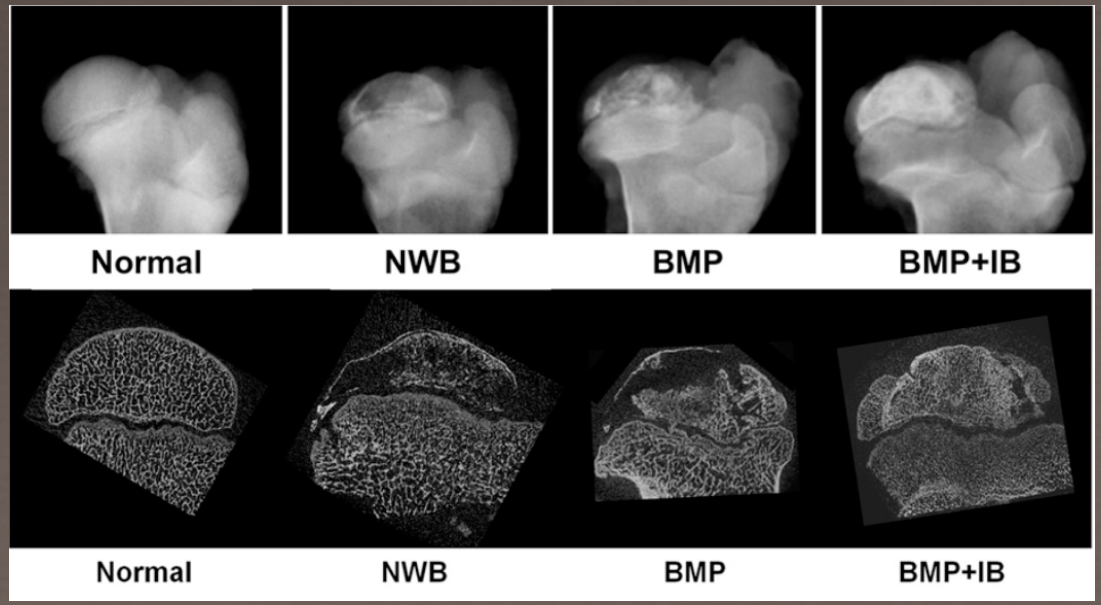


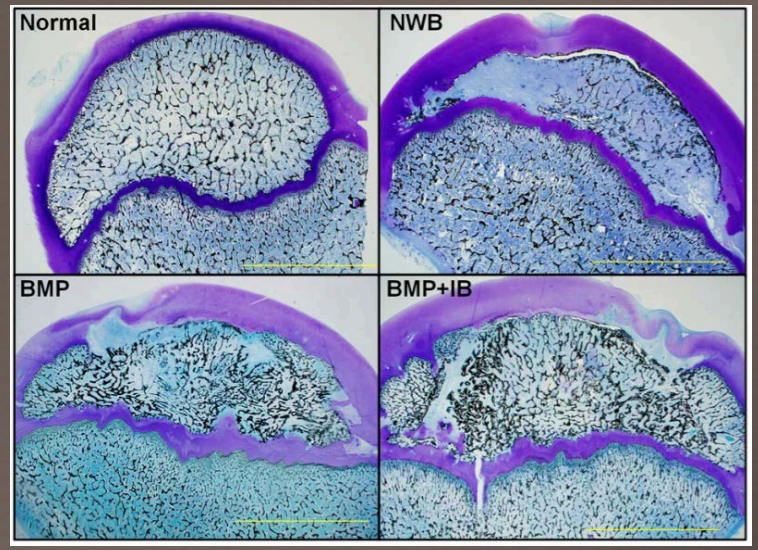


(Kim 2012)

Children's National

NWB + BMP + IB





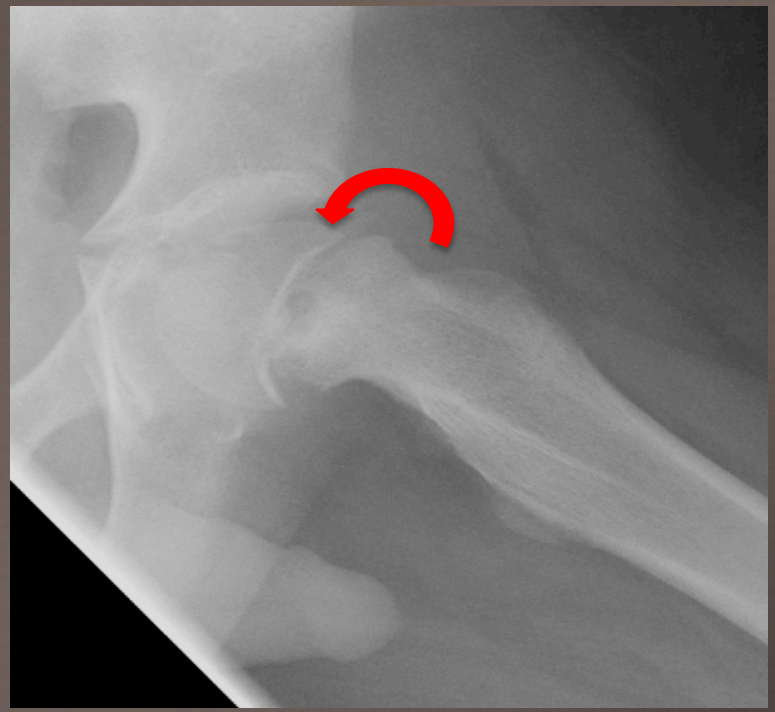
(Kim 2014)

Children's National

painful
Trendelenburg

Slipped Capital Femoral Epiphysis

- Movement thru physis
- Hip/thigh/**knee pain**
- Obese
- Obligate ER
- AP & frog x-rays
- Admit!! → surgery
- < 10 yo → work-up
  - Renal, hypothyroid, GH



Children's National

SCFE – Epidemiology

- Database review
- 10.8/100,000
- **Males 1.65x**

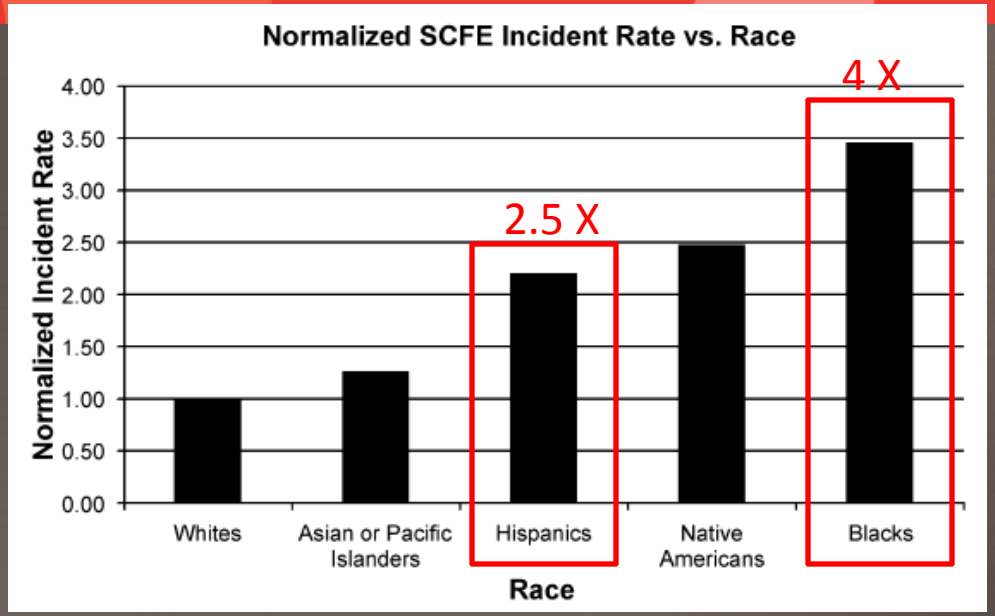


TABLE 3. Regional Incident Rates

	Combined
Northeast	17.15
Midwest	7.69
South	8.12
West	12.70

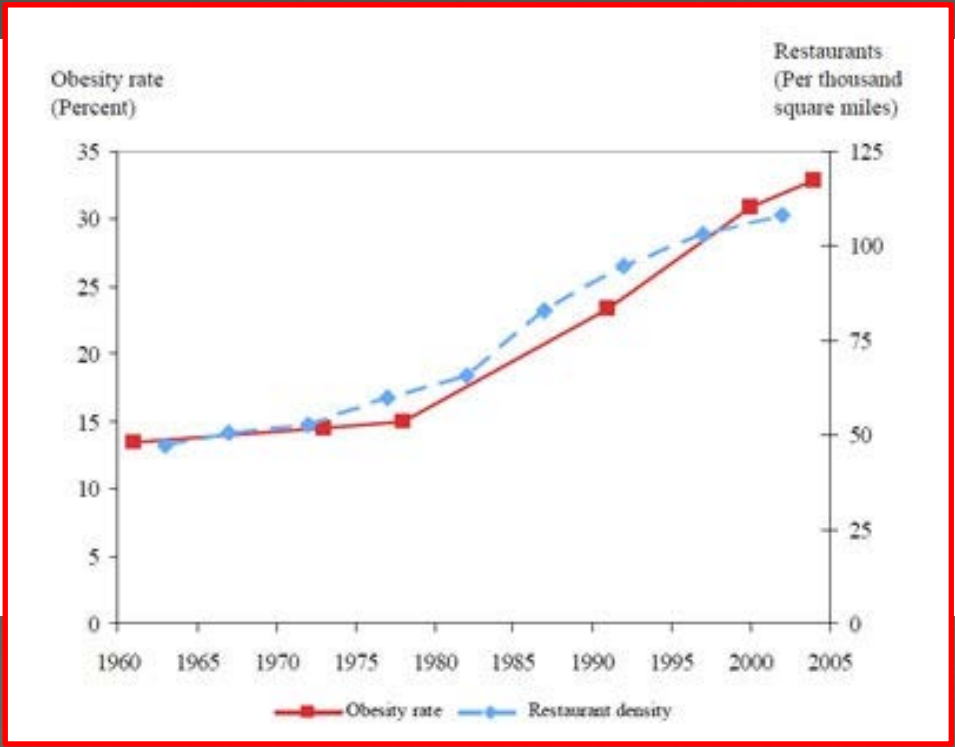
All incident rates are number of cases per 100,000 kids. Significant differences exist between all regions except between the Midwest and the South for combined data ($P < 0.001$). Incident rates were adjusted to account for outpatient SCFEs.

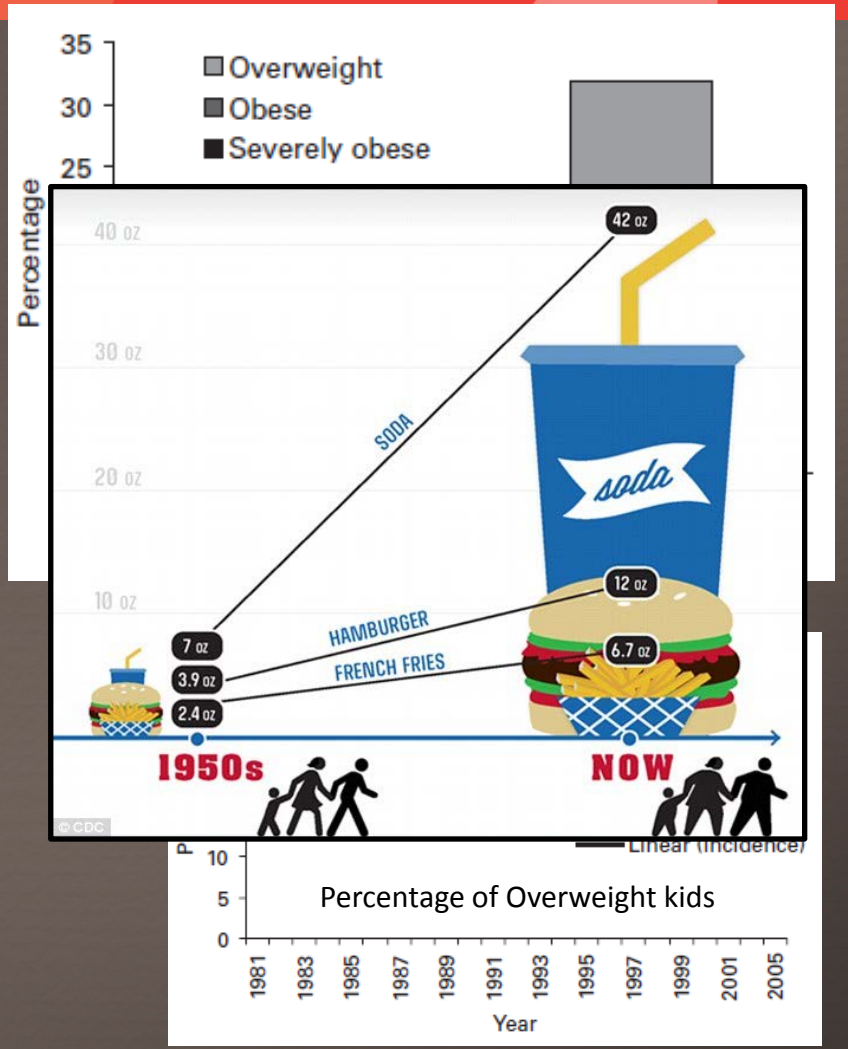
OBESITY PLAY A ROLE?

80% >95th percentile in weight

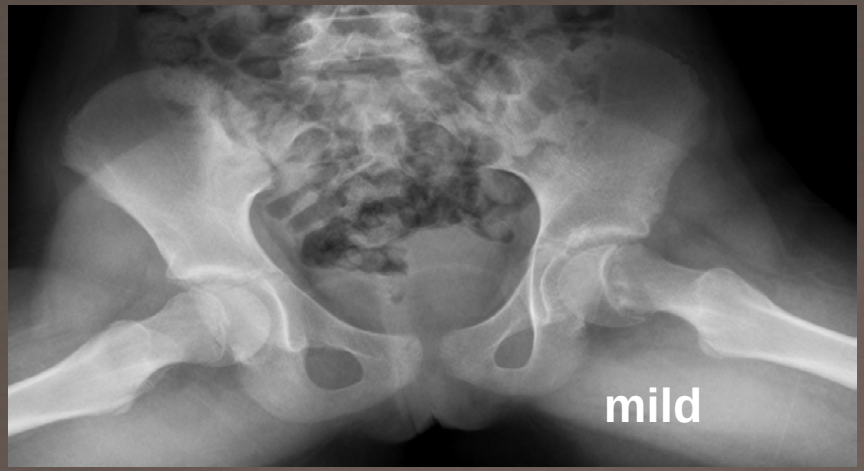
Children's National

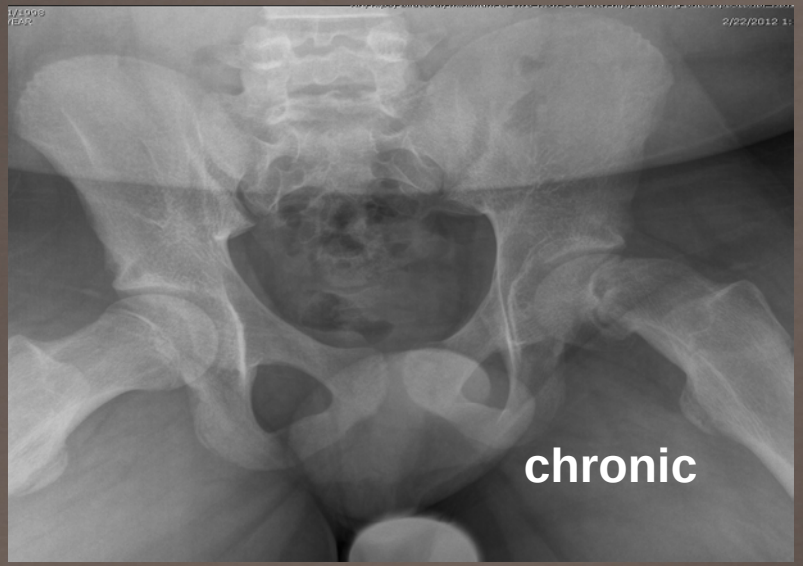
SCFE

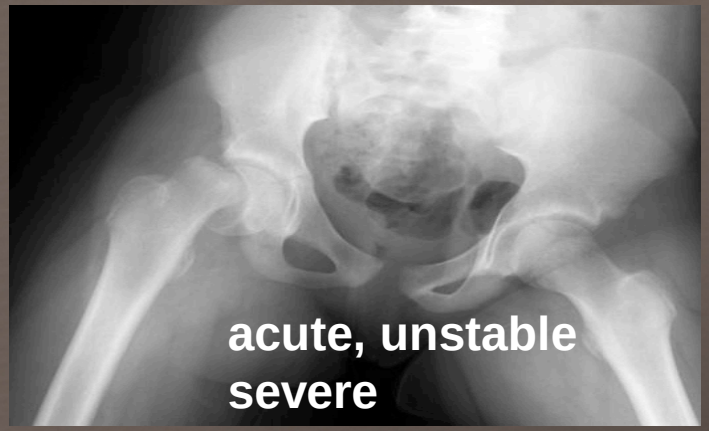

Obesity rate
(Percent)
Restaurants
(Per thousand
square miles)
35
30
25
20
15
10
5
0
125
100
75
50
25
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Obesity rate
Restaurant density


35
30
25
Overweight
Obese
Severely obese
Percentage
40 oz
30 oz
20 oz
10 oz
42 oz
SODA
soda
12 oz
HAMBURGER
FRENCH FRIES
7 oz
3.9 oz
2.4 oz
6.7 oz
1950s
NOW
© CDC
Linear (Incidence)
10
5
0
Percentage of Overweight kids
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2005
Year

SCFE

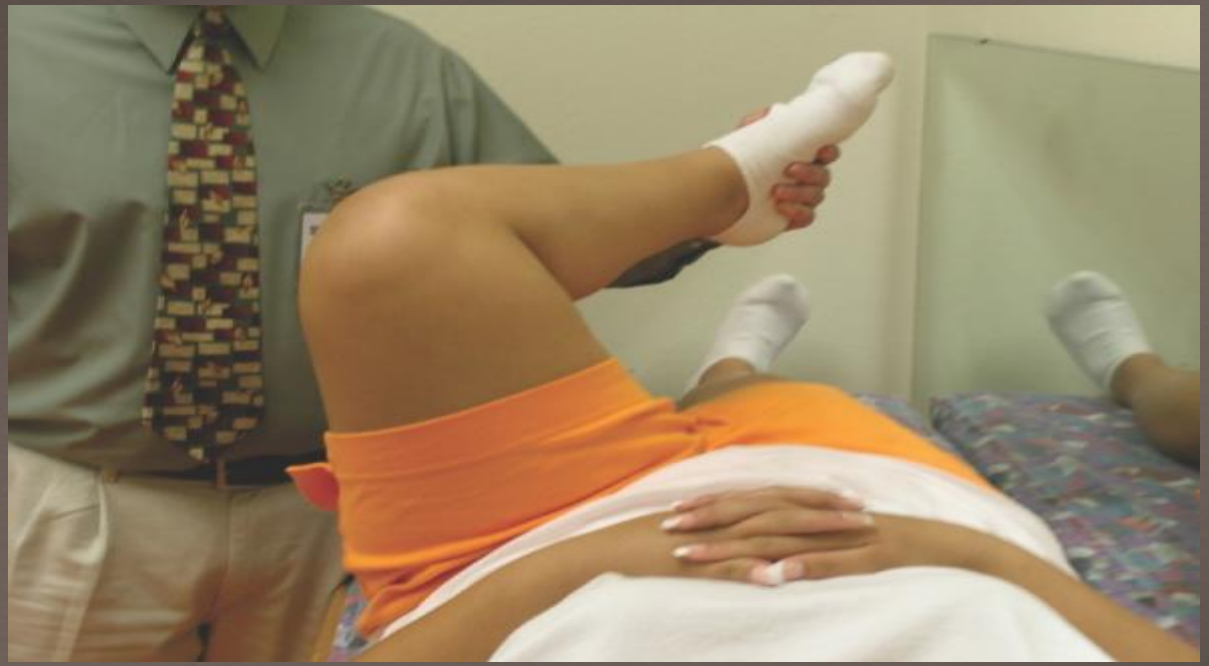






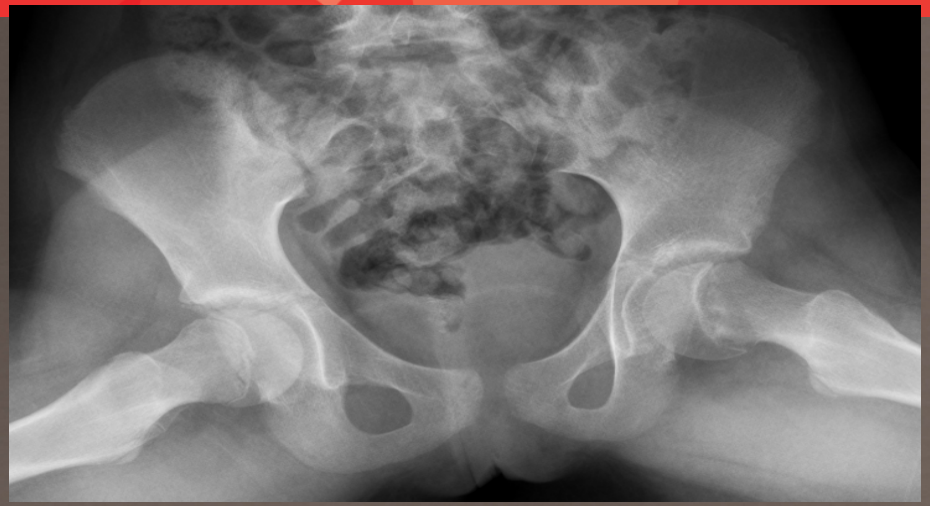
Children's National

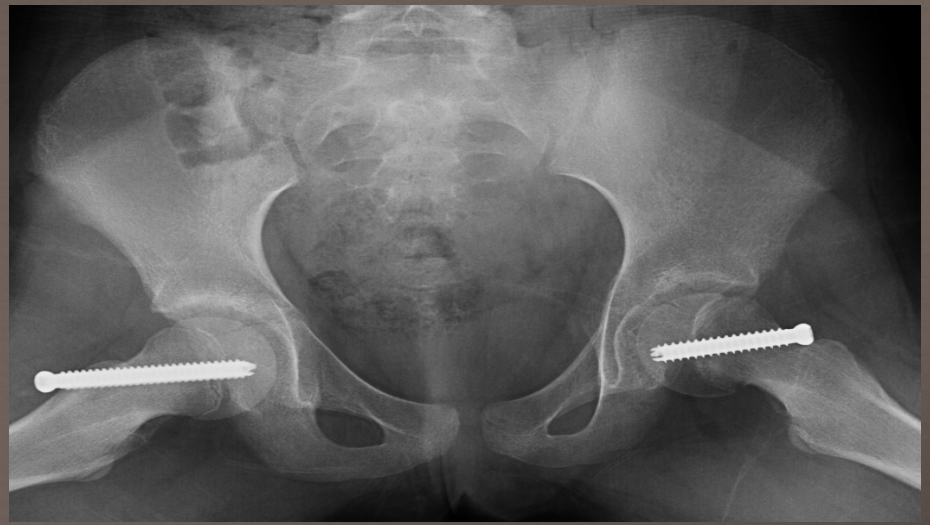
SCFE



Children's National

SCFE





Is there a newer way??
But is it better?

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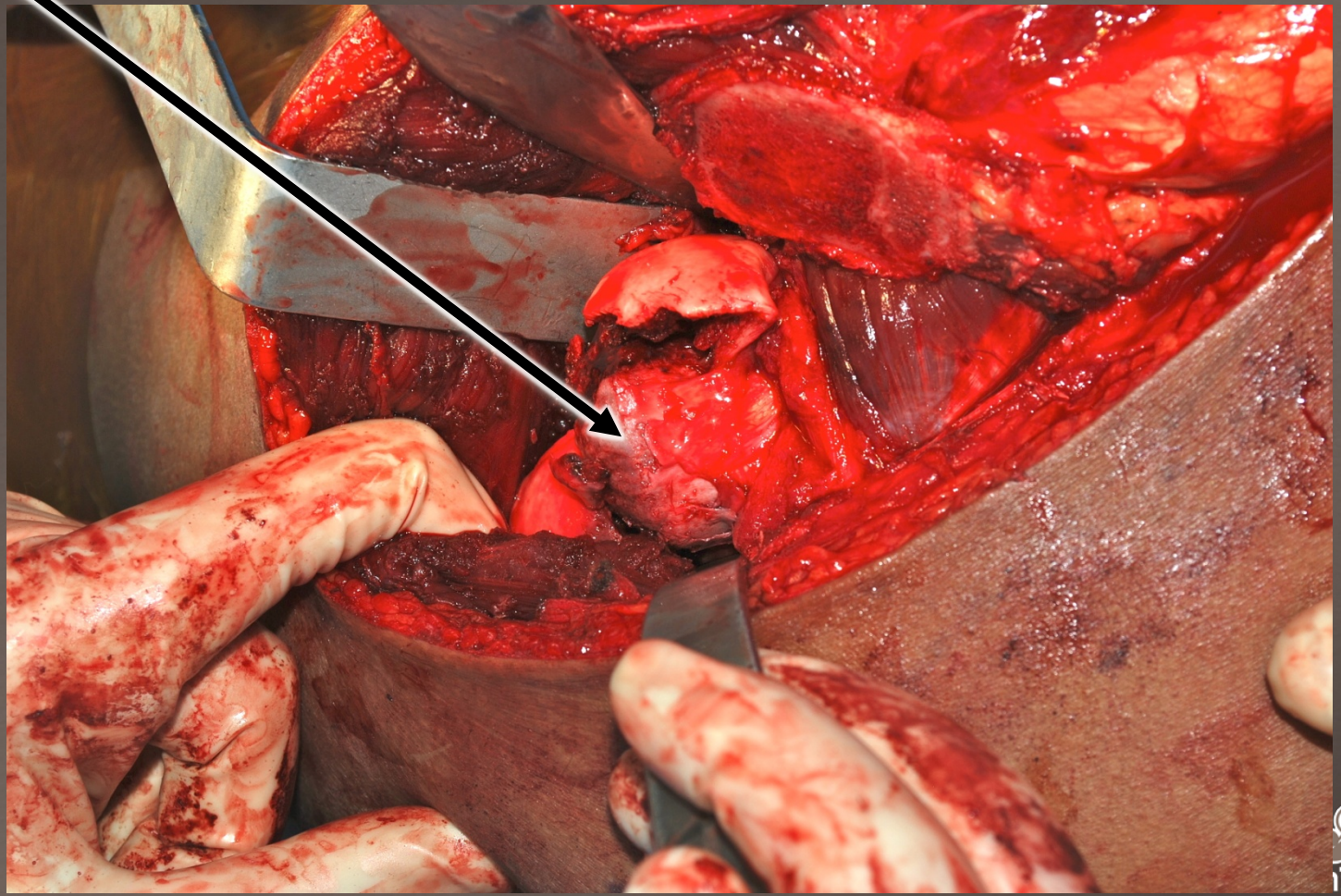
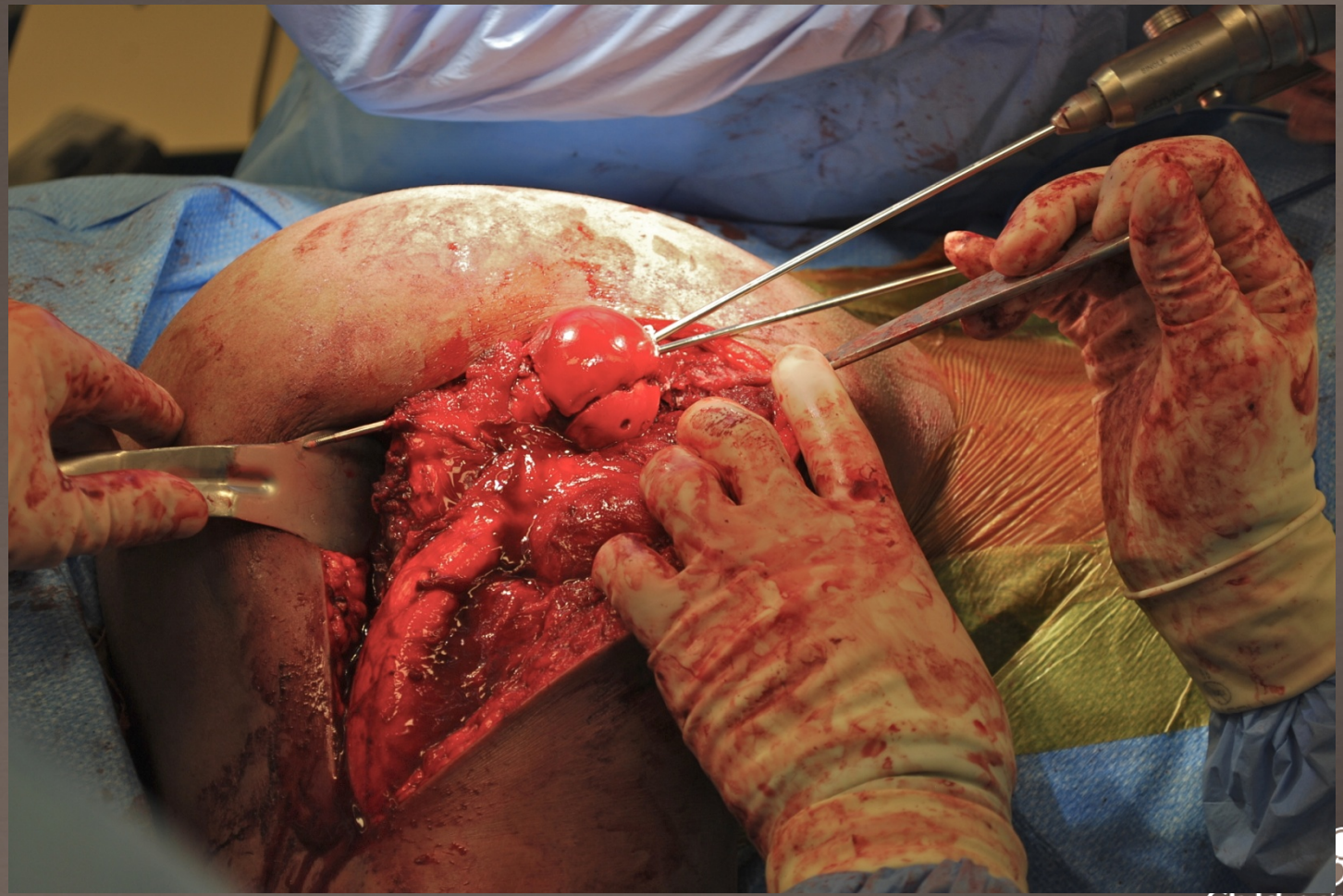
femoral neck

anterior



head

foot



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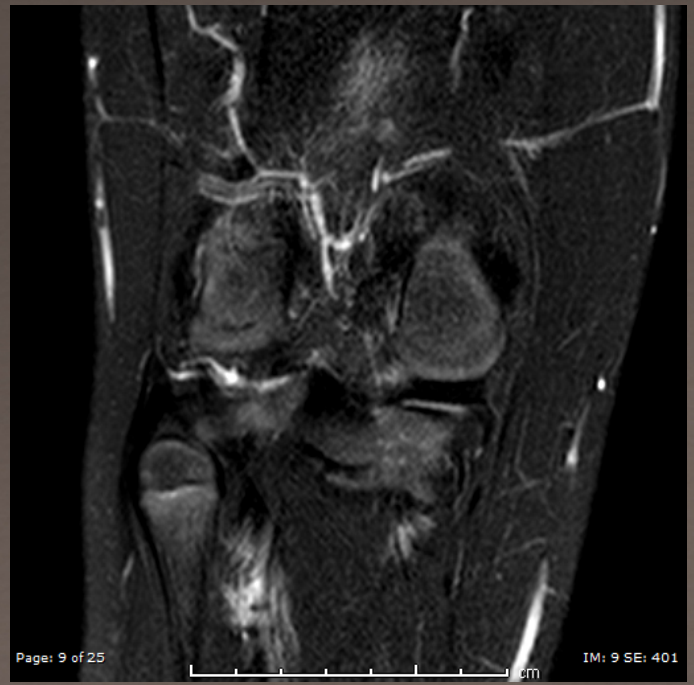
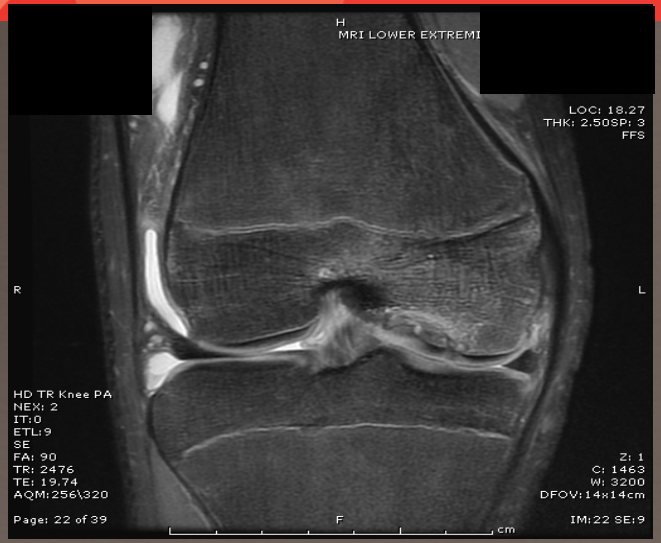
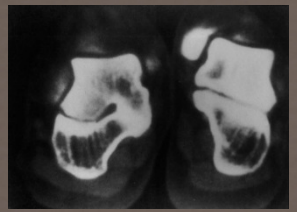
Long list…

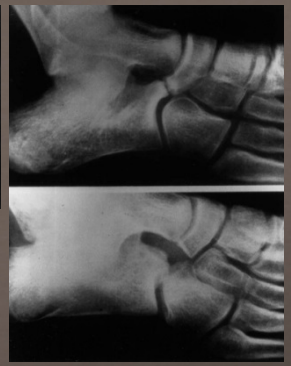


discoid meniscus

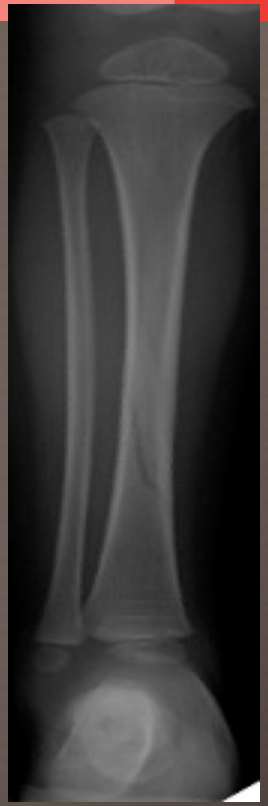


OCD





tarsal coalition



toddler fx

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PAINLESS

Coxa vara
DDH
Leg length difference
Cerebral palsy
Muscular dystrophy

PAINFUL

Perthes
SCFE
Discoid meniscus
Transient synovitis
Septic arthritis
Osteomyelitis
JRA

Toddler (1-3)	**Child** (4-10)	**Adolescent** (11-15)
Transient synovitis Septic Arthritis Toddler's fx CP DDH Coxa vara JRA	Transient synovitis Septic Arthritis Perthes Leg length difference	SCFE Dysplasia Tarsal coalition

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Thank you!

bdmartin@childrensnational.org

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