LECTURE

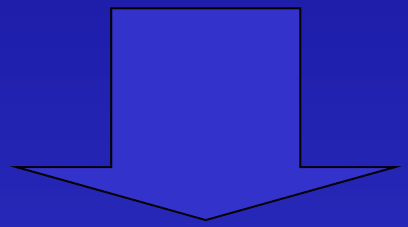
ORTHOPAEDICS AND TRAUMATOLOGY

CEREBRAL PALSY

Marek Synder

RIBERA (1591 - 1652)

The first who described this disease was an orthopaedic surgeon Wiliam John Little in 1860



Little’a disease

The term cerebral palsy was invented by Wiliam Osler in 1888

Zygmunt Freud investigated the etiology of brain disorders concluded, that the etiology of CP could be some factors which affected CNS just before delivery.

The today's definition of CP was formatted by Bax in 1964 as disturbances of motion and posture connected with the brain damage.

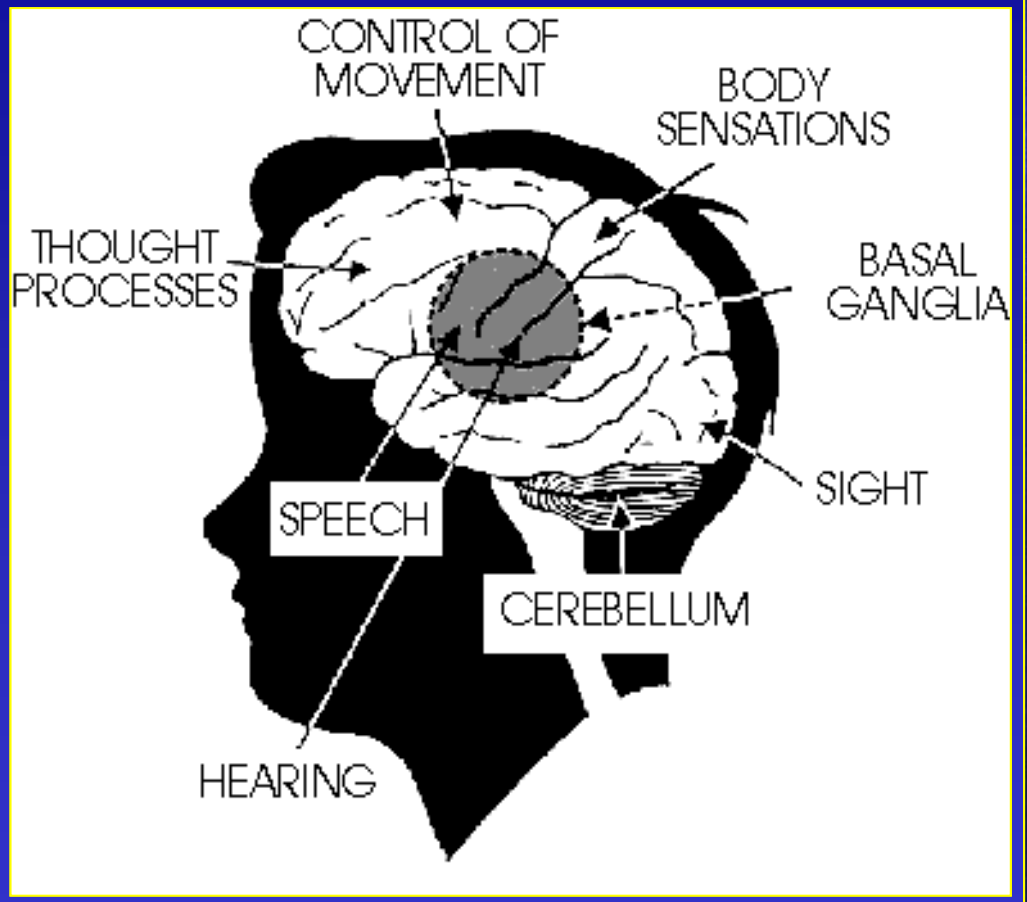
Defintion

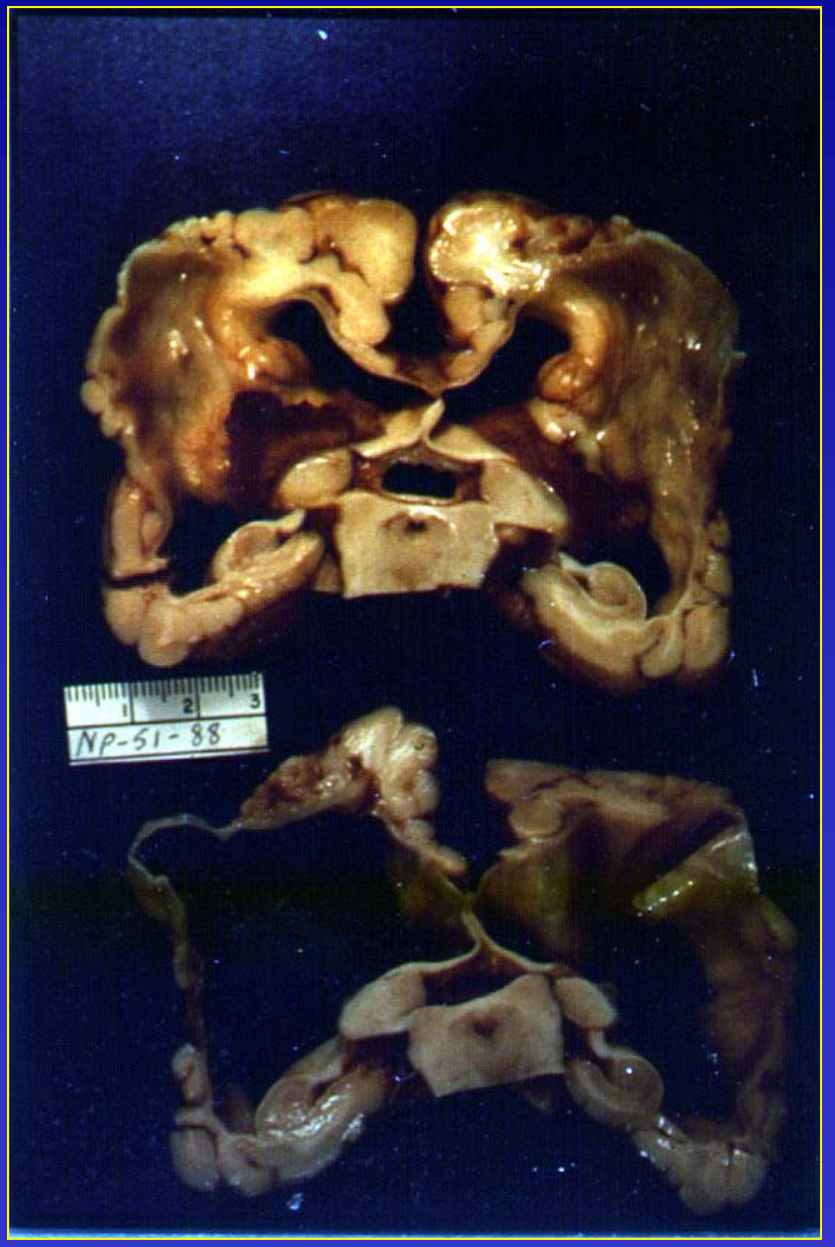
Non progressive damage of the CNS,
which leads to changing during the life period disturbances of motor function and posture and other sequels of brain damage in an early stage of brain development

WHAT IS CEREBRAL PALSY ?

- **This is no one disease**
- **This is a collection of motor function disorders as a cause of damage of CNS, before, during or after delivery**
- **This is non-progressive disease**
- **If motor disorders continue to progress or only are periodically seen it means that it is not CP**

CEREBRAL PARESIS





CEREBRAL PARESIS

CLASSIFICATION :

* TYPE OF MOTOR DISORDERS

* PARTS OF THE BODY INVOLVED IN PARESIS

CEREBRAL PARESIS

CLASSIFICATION :

TYPE OF MOTORIC DISORDERS

@ **ATETOTIC –** ***no muscle control***

@ **SPASTIC –** ↑ ***increase muscle tension***

@ **HYPOTONIC -** ↑ ***muscle weakness***

@ **ATACTIC –** ***unstable balance of the body***

@ **MIXED**

CEREBRAL PARESIS

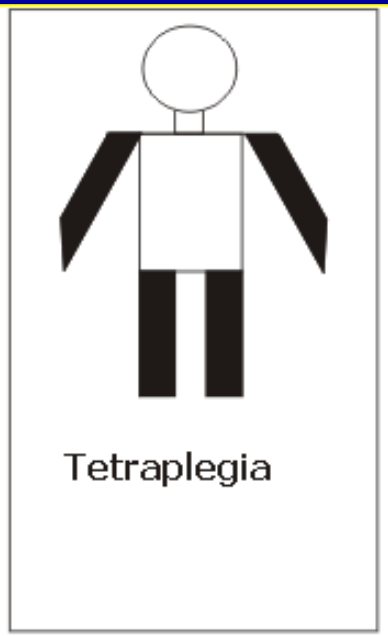
CLASSIFICATION :

PARTS OF THE BODY INVOLVED :

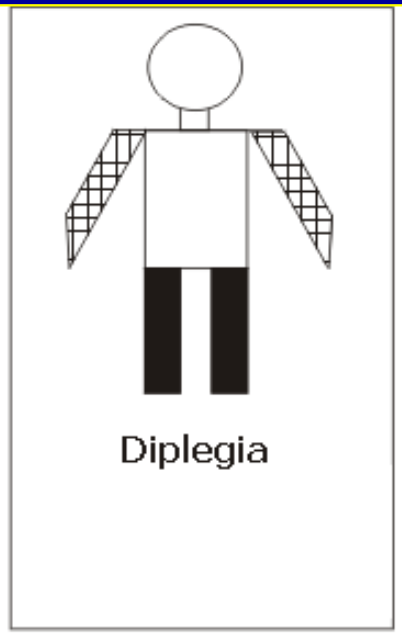
@ **HEMIPLEGIA** – ***paresis of the one side of the body***

@ **DIPLEGIA** – ***paresis mostly of the lower extremity and in less involvement of upper extremity***

@ **TETRAPLEGIA** – ***paresis of all extremities***



Tetraplegia



Diplegia

Hemiplegia

CEREBRAL PARESIS

Frequency :

5: 2000 birdths

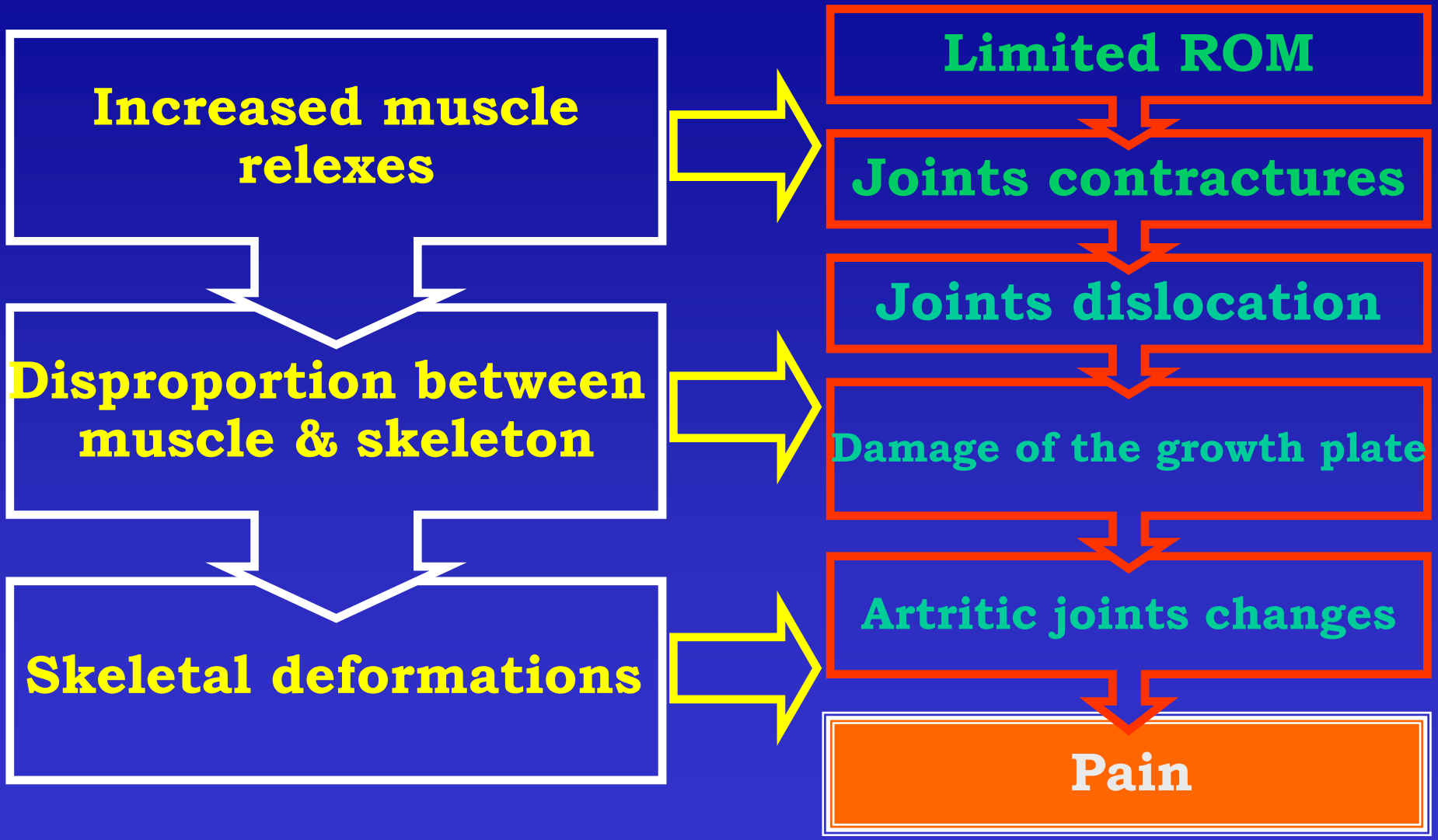
In the last 20 years the frequency of CP did not change !

?

number of patients with possible CP

number of patients who will not survive

SPASTICITY


Increased muscle relexes
Disproportion between muscle & skeleton
Skeletal deformations
Limited ROM
Joints contractures
Joints dislocation
Damage of the growth plate
Artritic joints changes
Pain

Reasons of dynamic and static deformation of limbs and body in CP patients

Neurologic (primary):

- Changes in muscle tonus
- Disorder of the muscle balance
- The lack of selective nerve control
- Dexreace of muscle tonus

Orthopedic (secondary):

- Dynamic contracture
- Static contracture
- Joints deformation
- Skeletal deformation

CEREBRAL PALSY

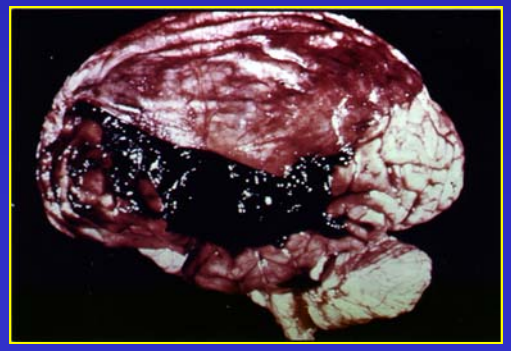
ETIOLOGY :

1. PRENATAL:

*** mother diseases during pregnancy –** *myocardial or respiratory insuffiency,anemia, diabetes, gestosis*

*** disorders of placenta –** *central placenta,arterial obliteration..*

*** uterine myoma, injury,infection,serologic incopatibility**



2. PERINATAL !!!

*** asphyxia**

*** prematurity**

*** birth injury**

3. AFTER DELIVERY :

*** meningitis**

*** injury of CNS**

From the literature we know that :

- **25 to 40% of all cases of CP is connected with low birth weight, below 2500 g**

*** 10 to 20% of all cases of CP is connected with intrauterine fetal anoxia**

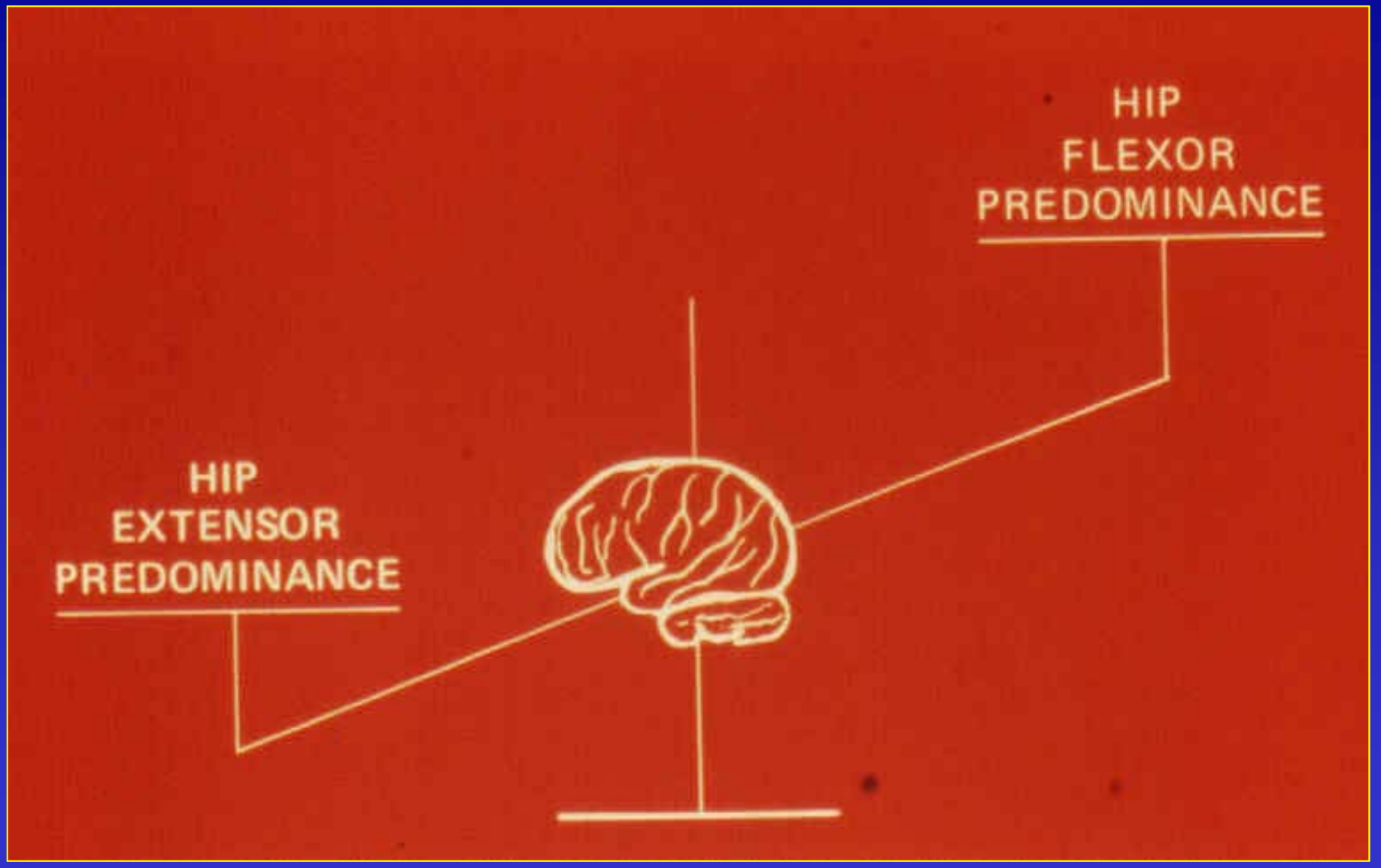
10% of all cases of CP is connected with injury of the CNS

CEREBRAL PALSY

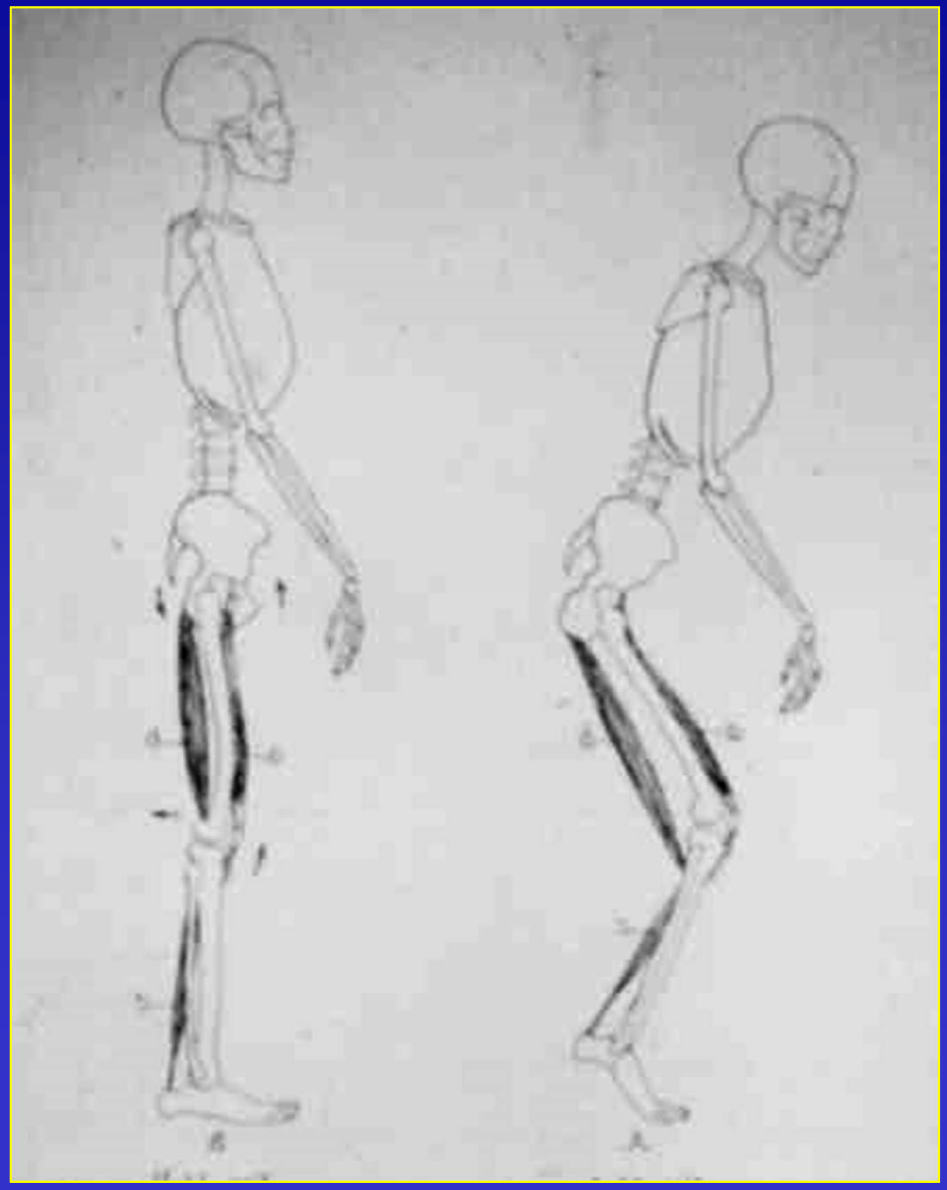
We never observe the same (identical) forms of CP

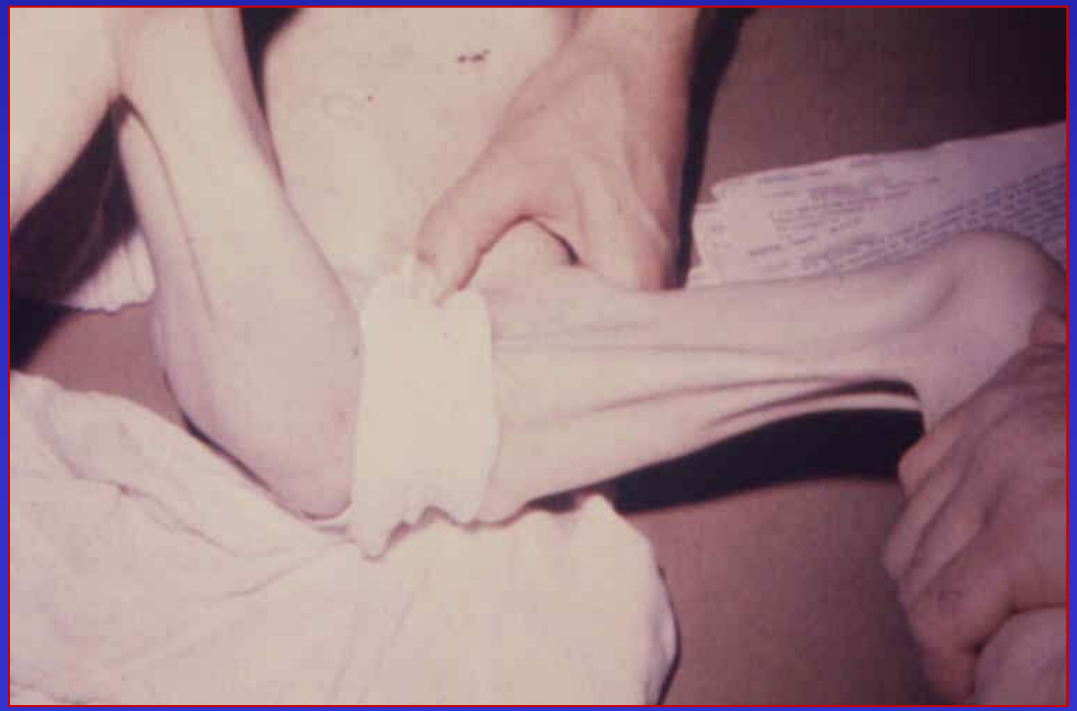
BECAUSE

We never observe identical injuries of the CNS


HIP
FLEXOR
PREDOMINANCE
HIP
EXTENSOR
PREDOMINANCE

Milestones		
	Average month	95 centyl
Head elevation	3	6
Seating	6	9
Crawl	8	*Sometimes absent*
Standing	8	12
Walking	12	18





DISORDERS OF THE MUSCLE BALANCE

* COXA MAGNA
* COXA VALGA
* COXA ANTETORTA
* ACETABULAR DYSPLASIA
* HIP SUBLUXATION
* HIP DISLOCATION

SPASTIC CLUBFOOT

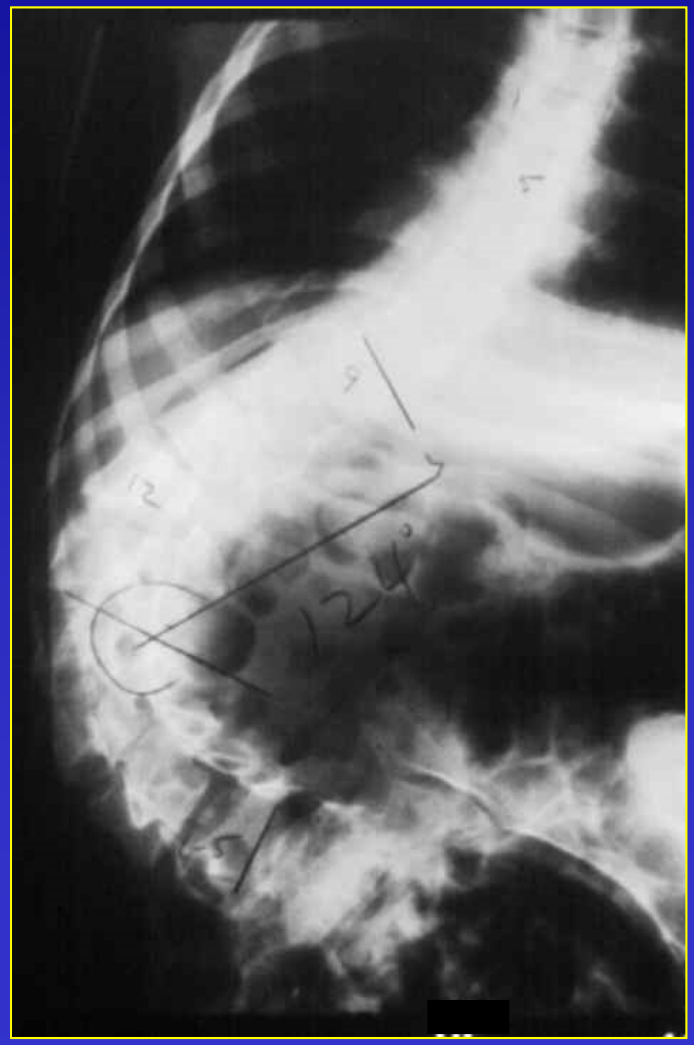
MOST COMMON DEFORMATION OBSERVED IN CHILDREN WITH CP

ETIOLOGY:
CONTRACTURE OF TENDO ACHILLES

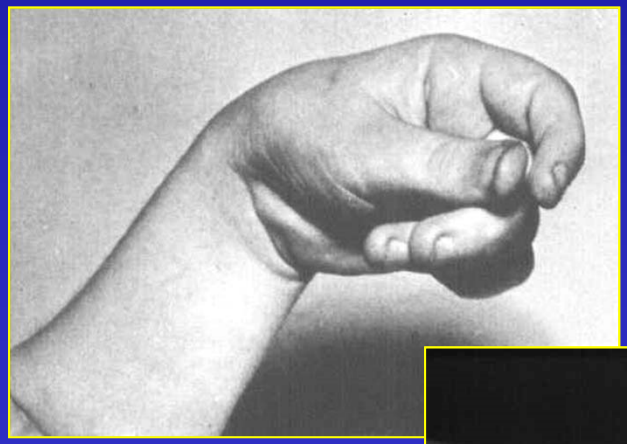
TREATMENT:
NON-OPERATIVE: ***PT, KINEZYTHERAPY, ORTHOSIS***

SERGICAL: **TAL – *open or percutaneous***

SPINE



HAND



HIP JOINT

The most common problem in children with CP is :

Postero-superior **subluxation or dislocation of the hip joint**

This type included of all disorders around the hip

98-99%

Etiology :

- **increased tonus of m. adductors**
- **coxa valga**
- **increased antetorsion angle**

If subluxation in the hip joint is observed (as a *MI %)*

It means that this process is always progressive

The subluxation progress 2% pro month, when MI < 50% !

And leads very fast to dislocation when MI > 60%

Age 8-18 years

When in the stage of accelerated growth the pelvic obiquidity and scoliosis is additionaly observed

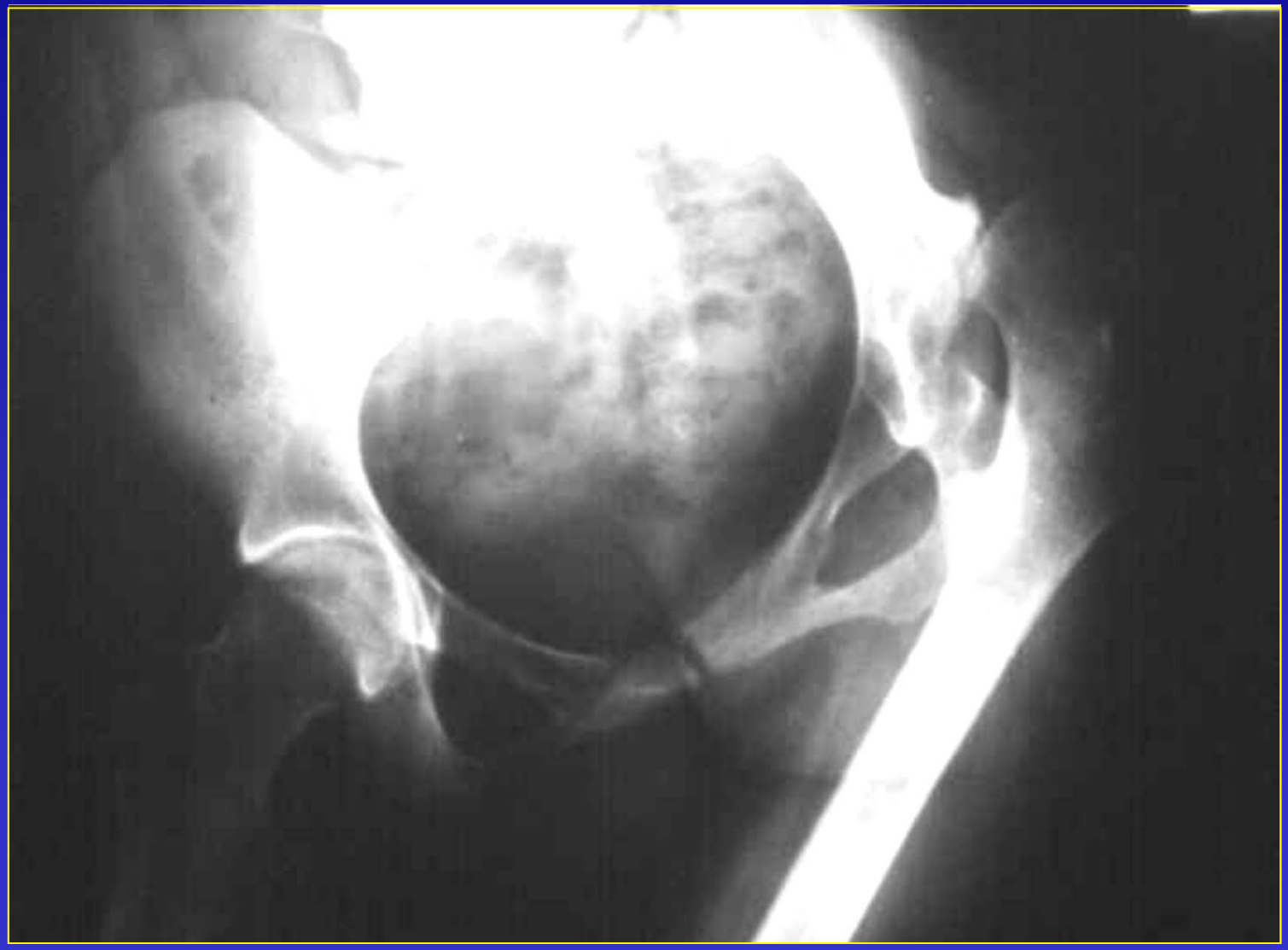
this factors could influenced further development of the hip joint

HIP JOINT

Windblown deformity

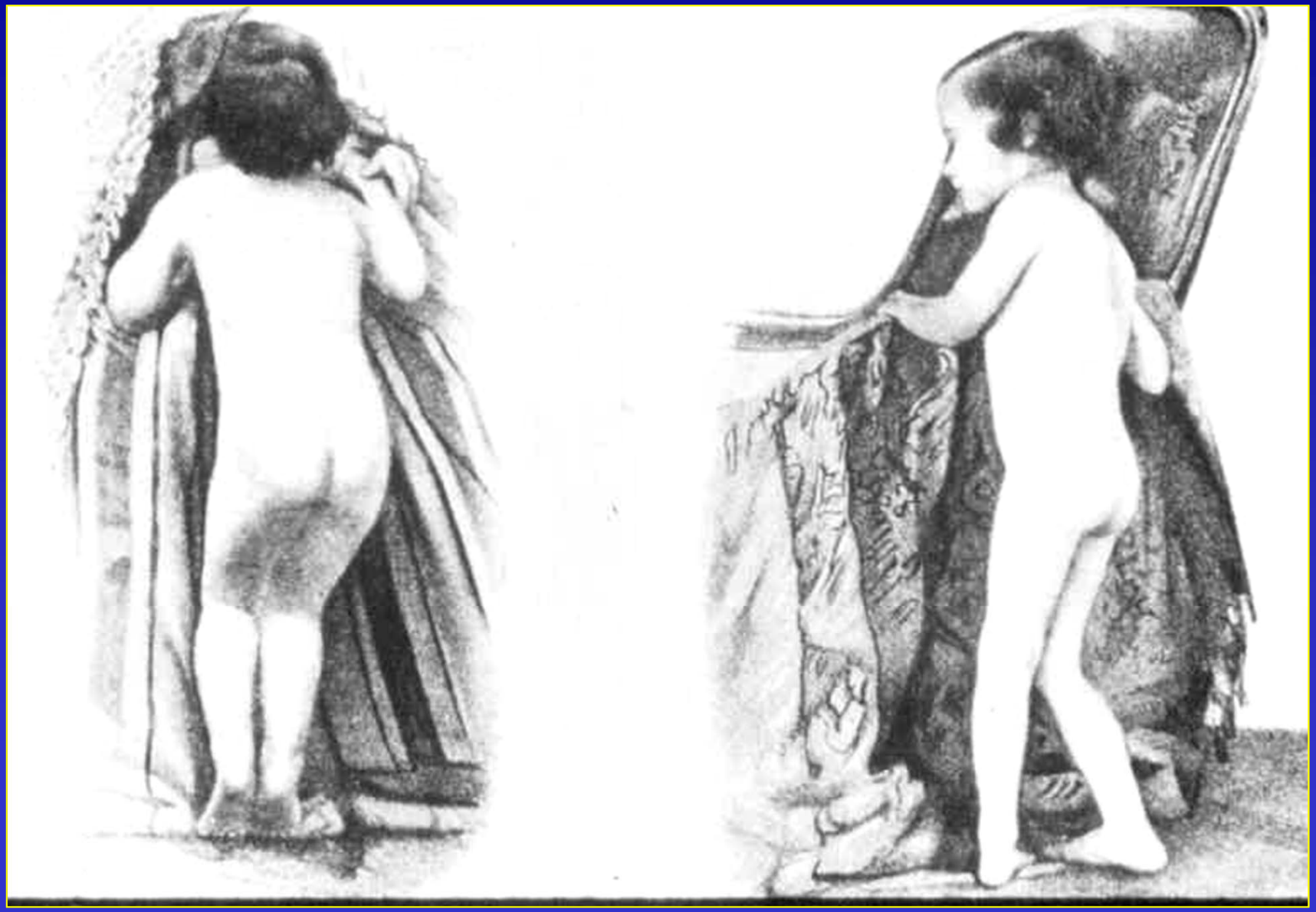
1. Scoliosis
2. Oblique pelvis position
3. Adduction of one hip and abduction of the second one

Windblown deformity



HIP JOINT

HIP JOINT



Clinical evaluation of child with CP

Goals:

- Evaluation of functional development
- Evaluation of functional position of joints
- Evaluation of dynamic and static deformation
- Planing of treatment

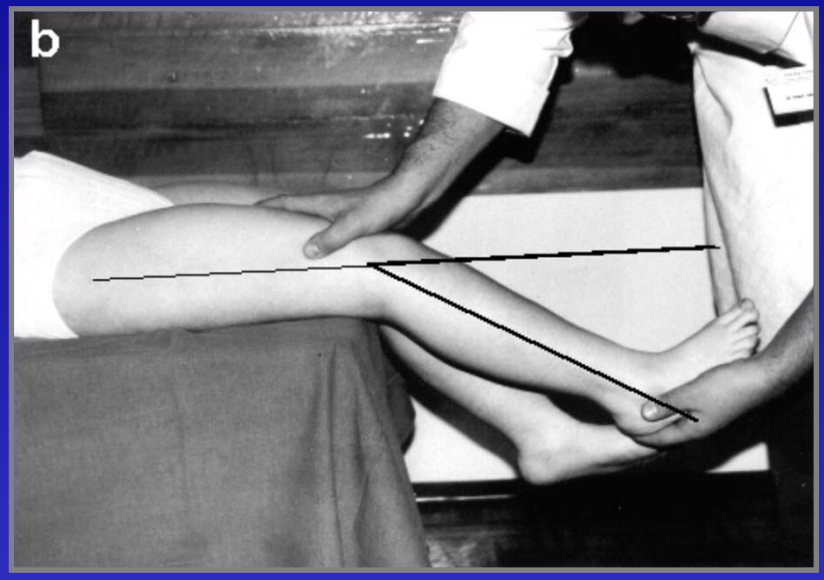
Methods:

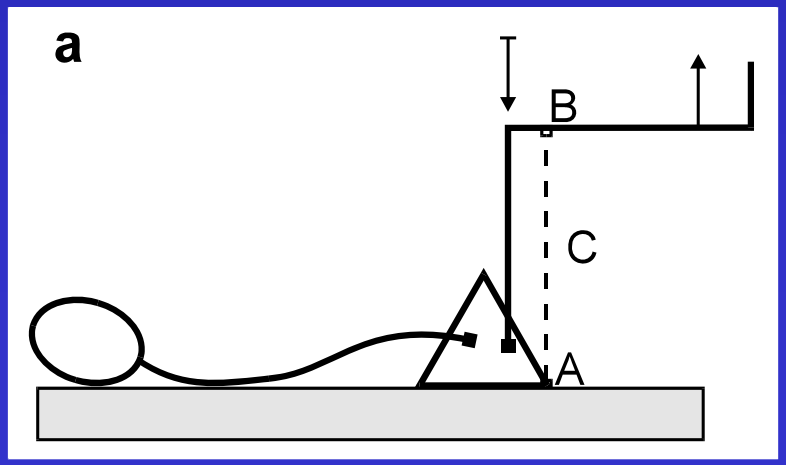
- Functional evaluation
- Clinical evaluation
- Radiological evaluation

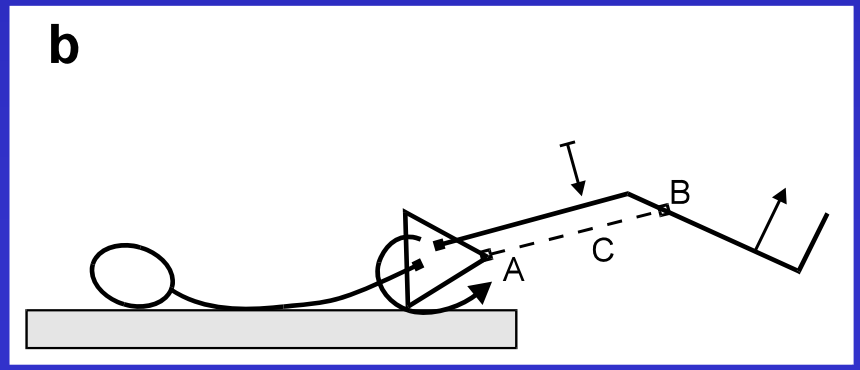
Orthopaedics examination

Dynamic evaluation of ROM

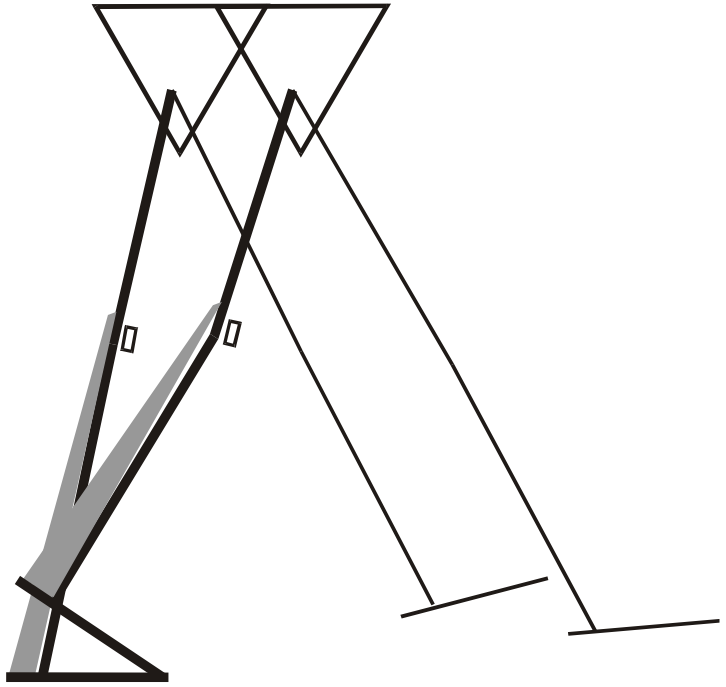
Dynamic evaluation of ROM



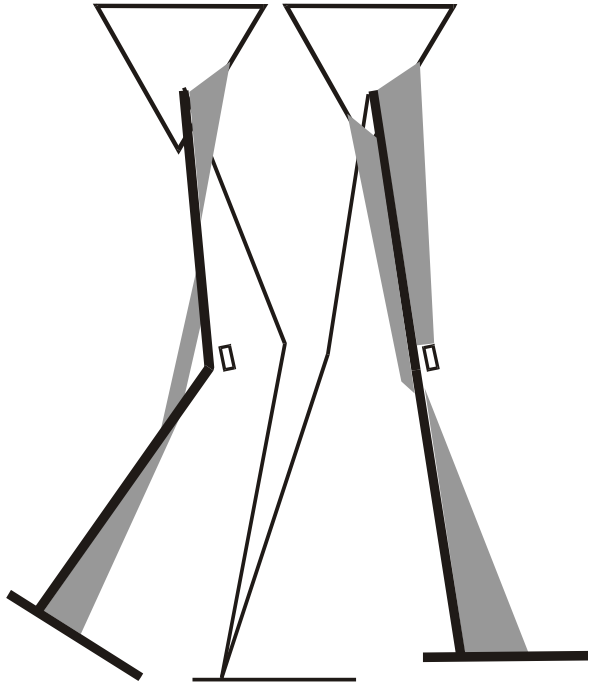




Gait analysis



Gait analysis

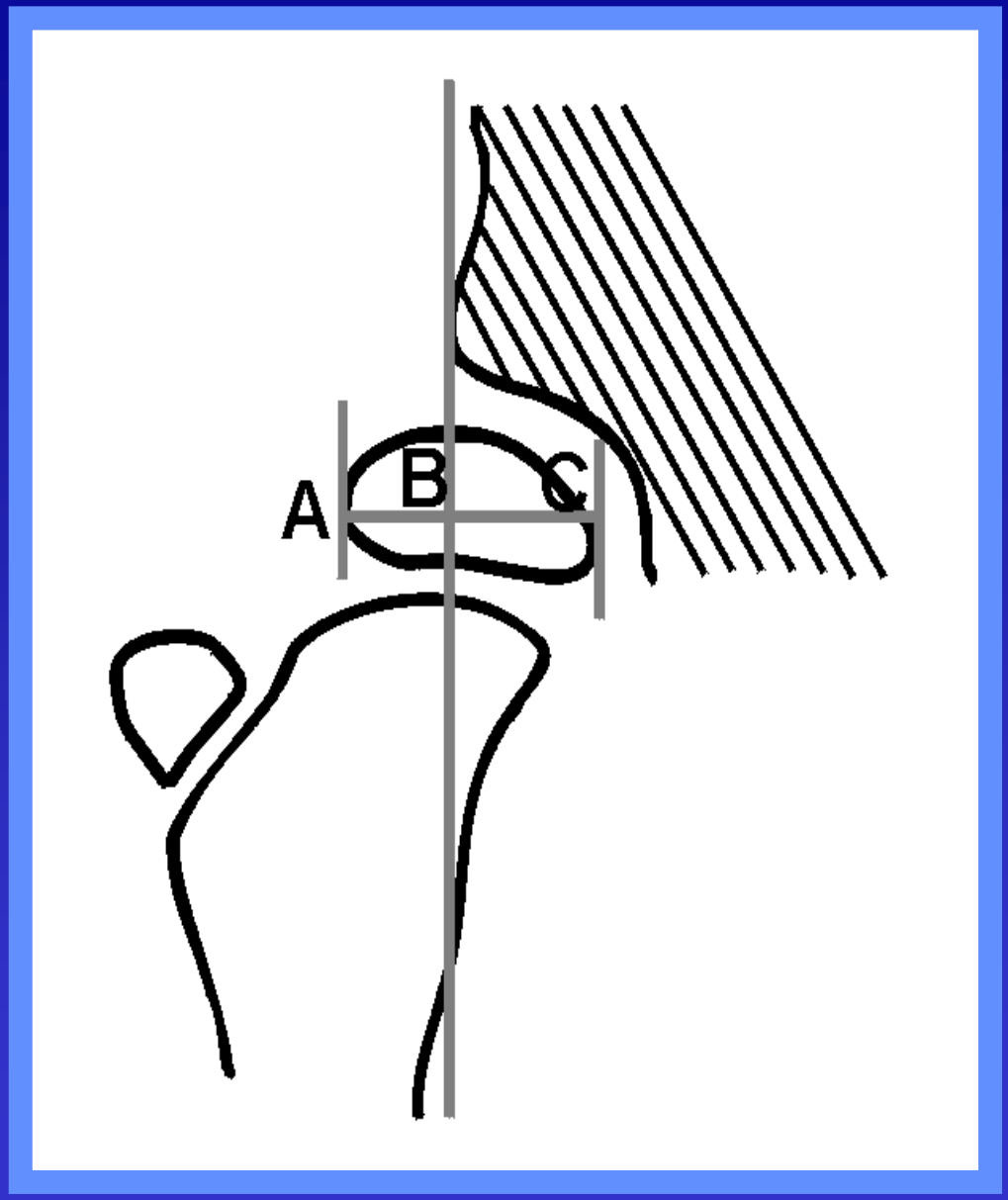


X-ray evaluation of the hip joint

(every 12 months)


8-26-68


9-5-67



Migratio Index (MI)

$$MI = \frac{AB}{AC} \times 100\%$$

Normal

$0\% \leq WM \leq 20\%$

Endengering

$20\% < WM \leq 33\%$

Subluxation

$33\% < WM < 100\%$

Adults

With MI 25-30%
hip remains stable

With MI 30 - 60%
very rare progresses

With MI > 60%
hip progress slowly
and leads to dislocation in
every case

Diagnosics

1. X-ray of the hips in AP position every 6-12 months when obduction < 45^0

2. CT – evaluation of direction of dislocation of the femoral head, evaluation of acetabulum and antetorsion angle

3. Ultrasound – rare indicated – evaluation of fluid in the hip joint and antetorsion angle

TREATMENT

1. PROPHILAXIS
2. RECONSTRUCTOVE SURGERY
3. PALIATIVE SURGERY

GOALS OF TREATMENT

- **Functional improvement**
- **Cosmetic imprevement**
- **Prophylaxis of hip dislocation**
- **Pain prophylaxis**

Methods of treatment

- Multilevel soft tissue release
- Tendons or muscle lengthening
- Corrective osteotomy
- Open reposition of the joint
- Arthrodesis & bone resection

SURGICAL TREATMENT

YOUNG PATIENT

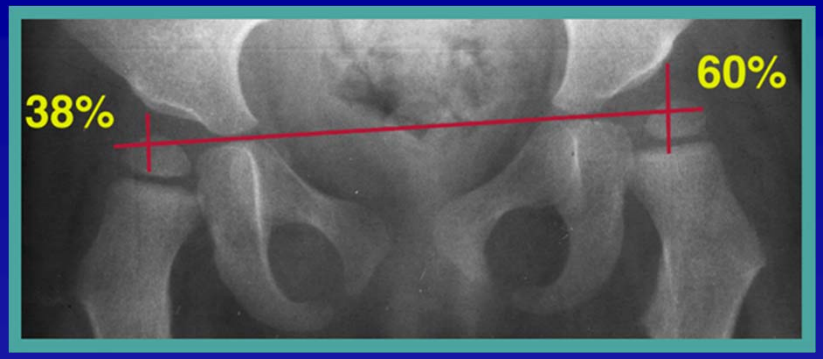
* SOFT TISSUE SURGERY
* OSTEOTOMIES OF PELVIC AND FEMUR
* MIXED SURGERY

TREATMENT

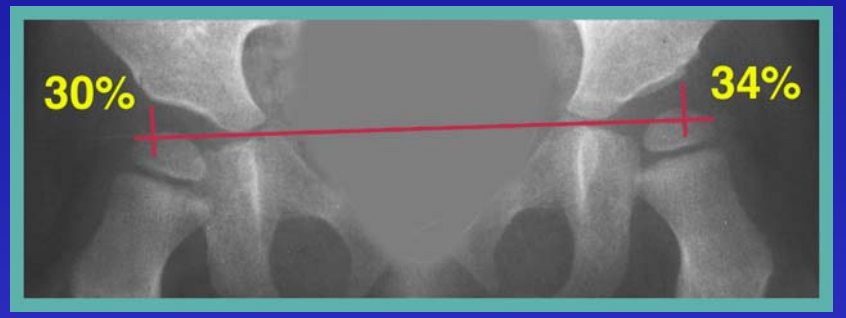
Children below 8 years:

*** MI >25% & <60%**
*** abduction < 30⁰**

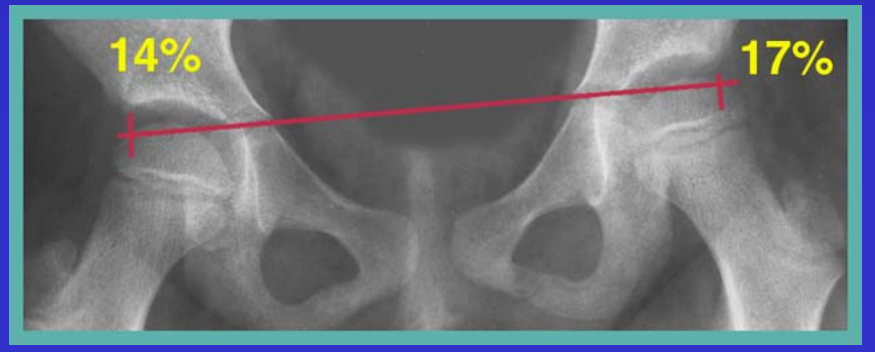
Should be treated by soft tissue release.



Age 4 years



8 m. after adduktors & m. iliopsoas lengthening



Age 12 years

TREATMENT

Soft tissue release
open or precutaneous

Better results – open.

* *dissection of adductor longus & gracilis*
* *lengthening of m. iliopsoas in walkers*
* *dissection of m. iliopsoas (non-ambultory)*
* *myotomy of adductor brevis (when hip abduction <45^0)*
* *hamstring lengthening when popliteal angle <45^0*
* *dissection of anterior branch of n. obturatorius when MI >60% in non-ambulatory patients*

FU after surgery, every 6 m., X-ray once a year

Treatment - problems

11% of children required additional surgery because of increasing of MI > 40%

Repeated soft tissue release

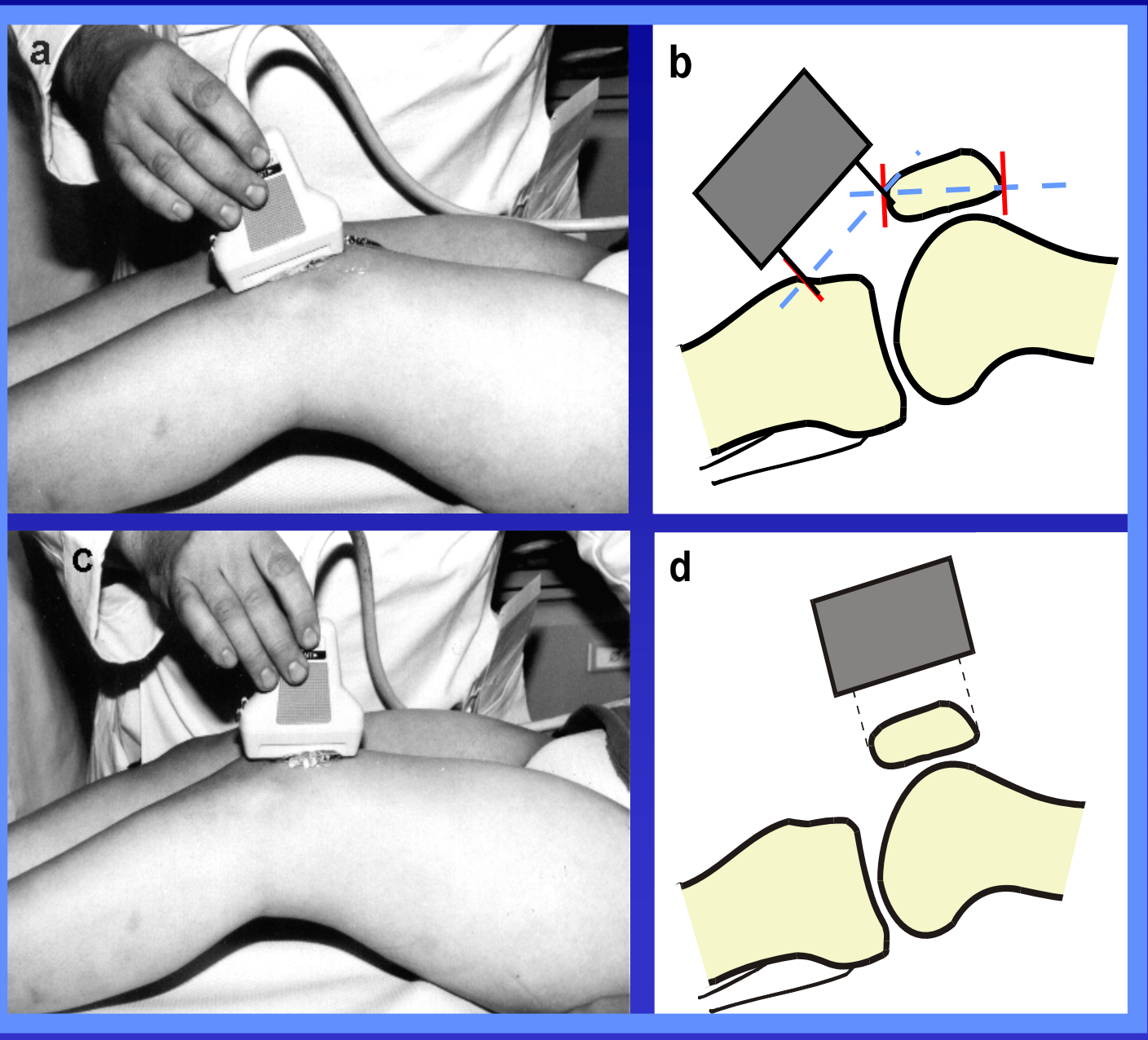
(only 50% improved)

Decision about reconstructive surgical procedure

Ultrasonografic evaluation of the knee joint

$$wwr = \frac{\text{Length of patella ligament}}{\text{Length of patella}}$$

Normal: $1 < wwr < 1{,}4$


a
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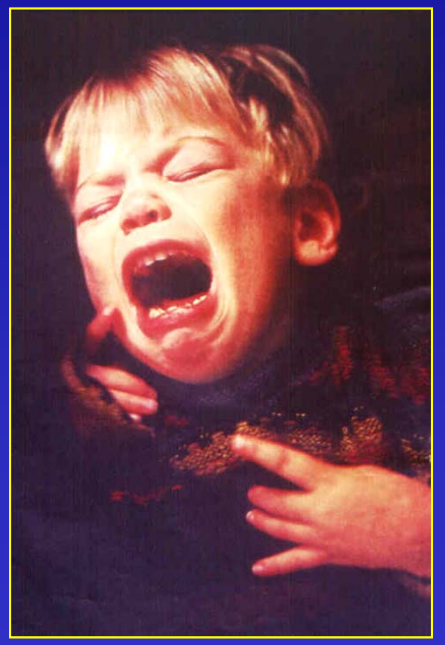
TREATMENT

* ORTOPEDIC SURGEON
* NEUROLOGIST
* PEDIATRITION
* REHABILITANT
    * LOGOPEDIST
    * PSYCHOLOGIST
    * OPHTHALMOLOGIST
    * LARYNGOLOGIST



Methods of treatment of spasticity:

- General paediatric treatment
- Rehabilitation
- Physiotherapy
- General farmacological treatment
- Local farmaceutical treatment :
  - botulin toxin
  - baclofen pump
- surgery
  - neurosurgery (STR)
  - orthopaedics

The goal of surgical treatment

- **Functional improvement**
- **Cosmetic improvement**
- **Prophylaxis of neurogenic joint dislocation**
- **Prophylaxis of pain**

SPASTIC FOOT

MOST COMMON DEFORMATION IN CHILDREN WITH CP

ETIOLOGY:
ACHILLES TENDON CONTRACTURE

TREATMENT:
NON-SURGICAL: **PT**, ***REHABILITATION, orthesis***

SURGICAL: **TAL**

open or closed

SPASTIC FOOT


8 4 2004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„The surgical tretament of child with CP is only the stage in the period of rehabilitation”

Prof. Wiktor Dega

Methods of orthopaedic treatment

- Multilevel release of soft tissue in the region of lover extremity
- Muscle and tendons lengthening
- Transposition of muscle
- Corrective osteotomy
- Reposition of joints
- Arthrodesis, resection or THR

Surgical treatment
of hip joint
YOUNG PATIENTS

* **SOFT TISSUE SURGERY**

* **OSTEOTOMY OF FEMUR AND PELVIS**

* **COMBINED TREATEMNT**

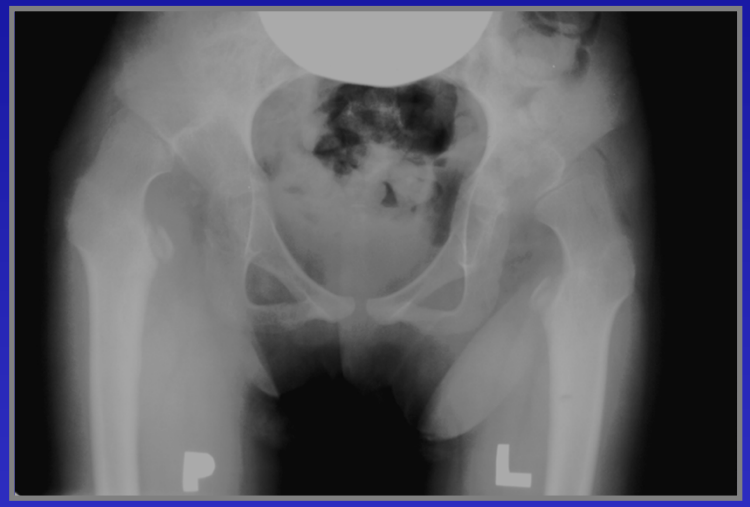
bone surgery + soft tissue suregry

i.e. osteotomy and muscle lengthening

Surgical treatment of hip joint

OLDER PATIENTS

* Hip joint arthrodesis
* THR
* Proximal femur resection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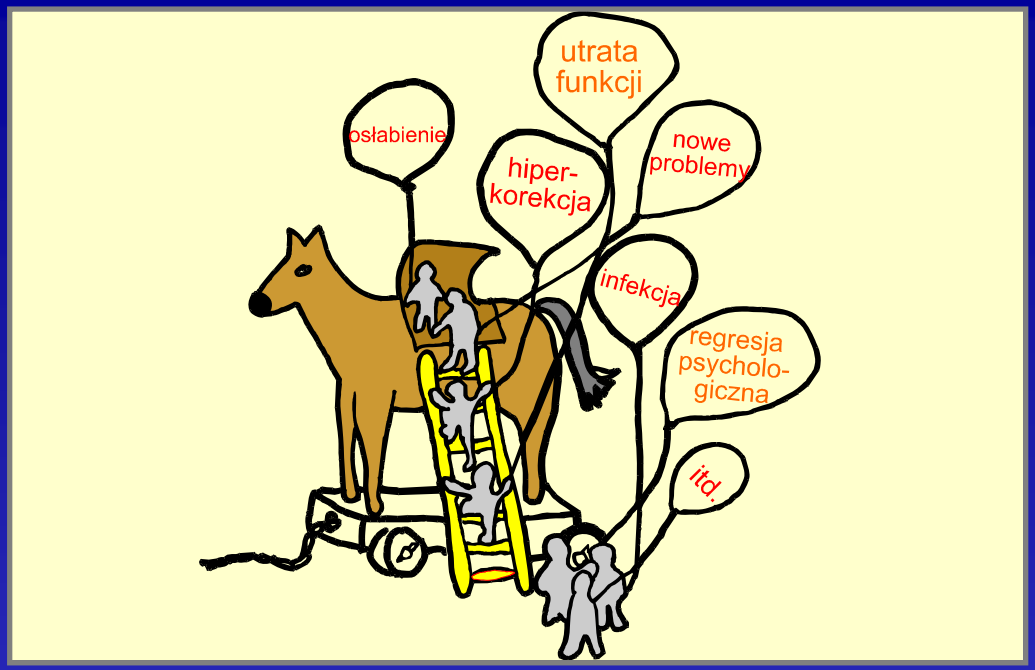
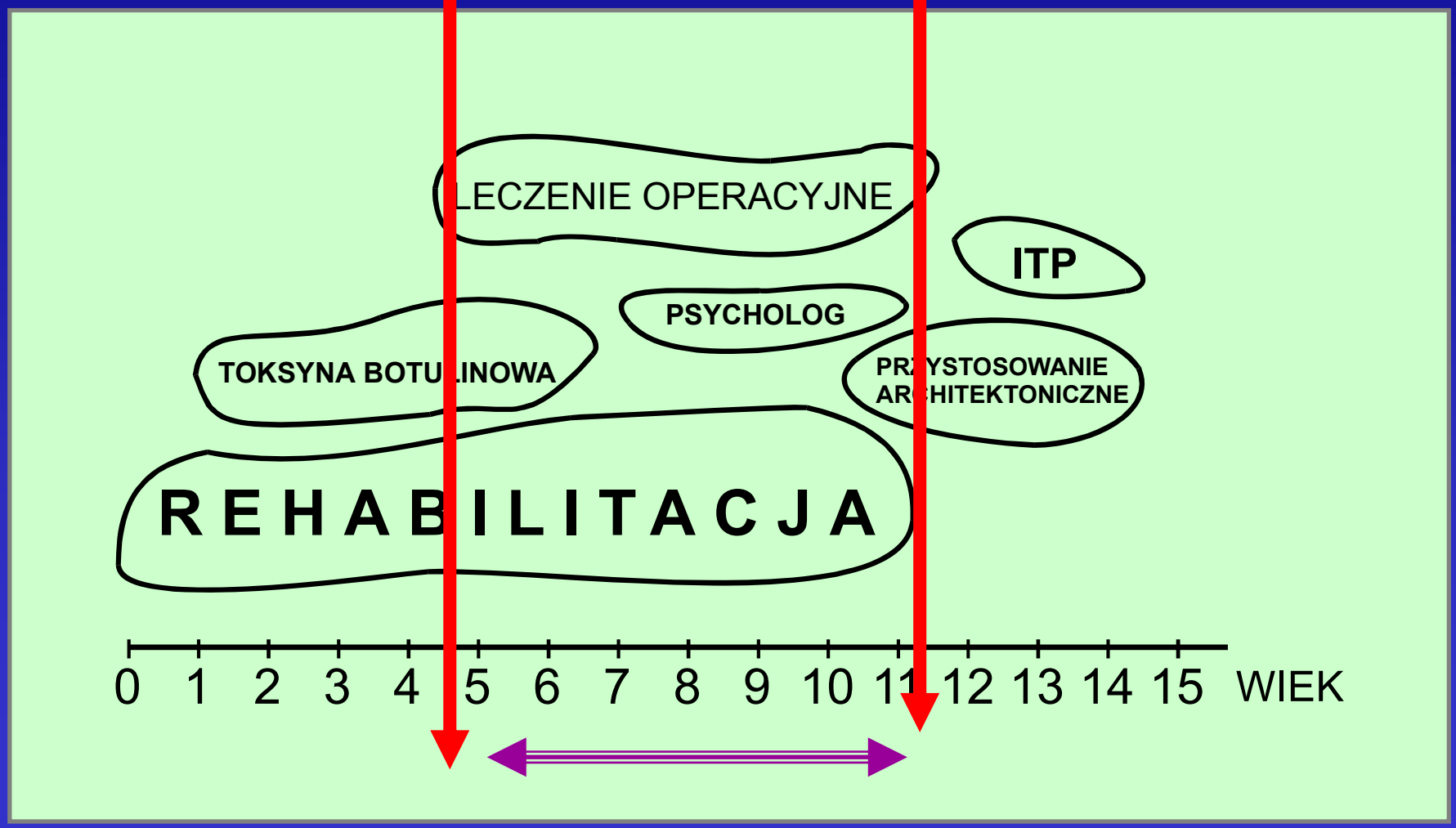
COMPLICATIONS



SURGICAL TREATMENT

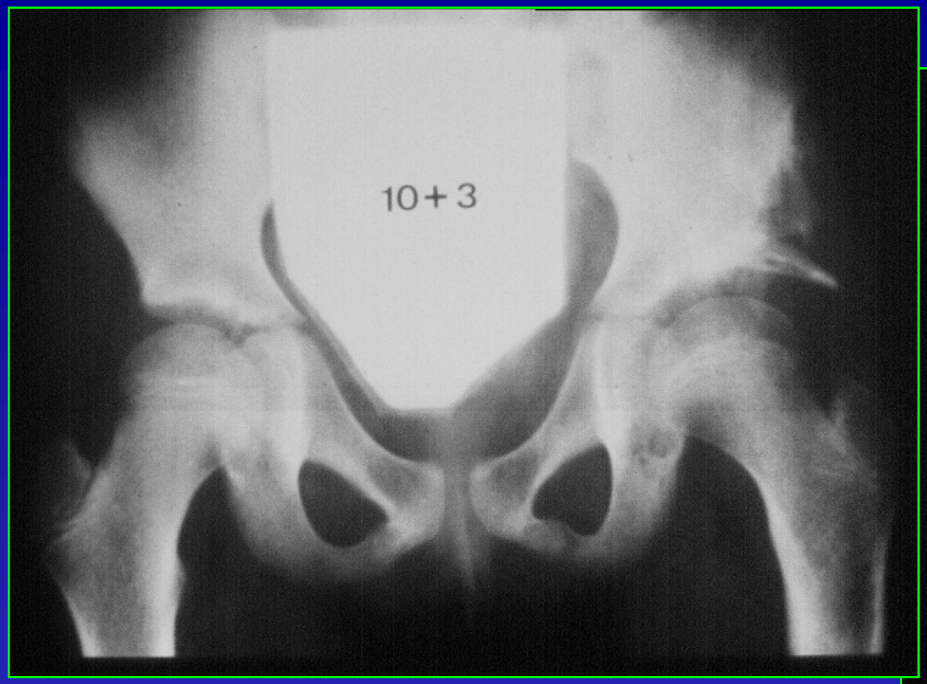


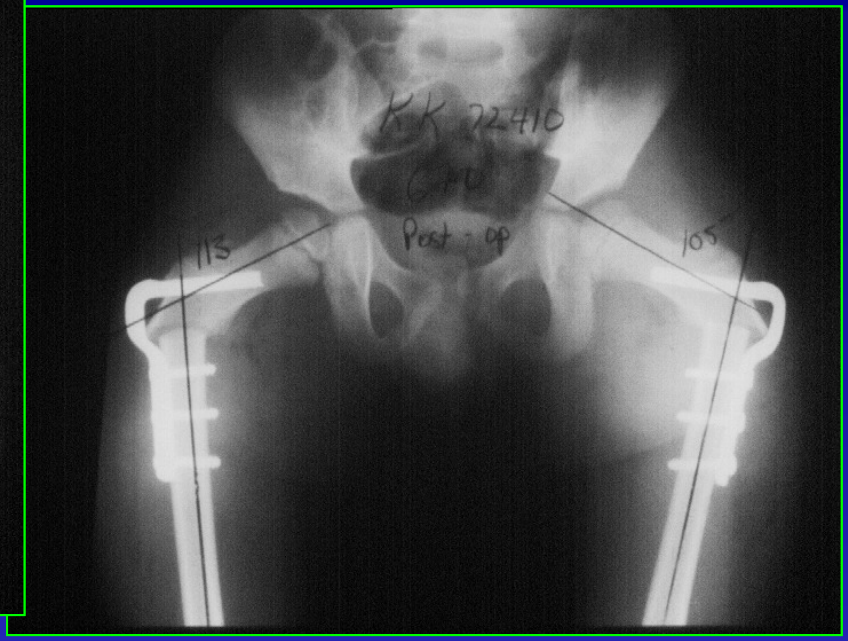
If child could seat independently before the 2 year of life – will walk without aid

If child could seat independently between 2 and 4 years of life the chance for independent walk is only 50%

If child could not seat independently after 4 year of life the independent walk is rather not possible.

If child before 8 year of age has no prone body position there is no chance for independent walk





Younger patient

HIP JOINT

Treatment – reconstructive surgery

Indication:

* severe subluxation MI >60%
* hip dislocation
* children >8 years with MI >40%

Treatment – reconstructive surgery

The best result when the surgery is performed at the age 6-12 years

- better rebuilding ability !

Treatment – reconstructive surgery

The reconstructive procedures gives 90% of good results in children with spasticity

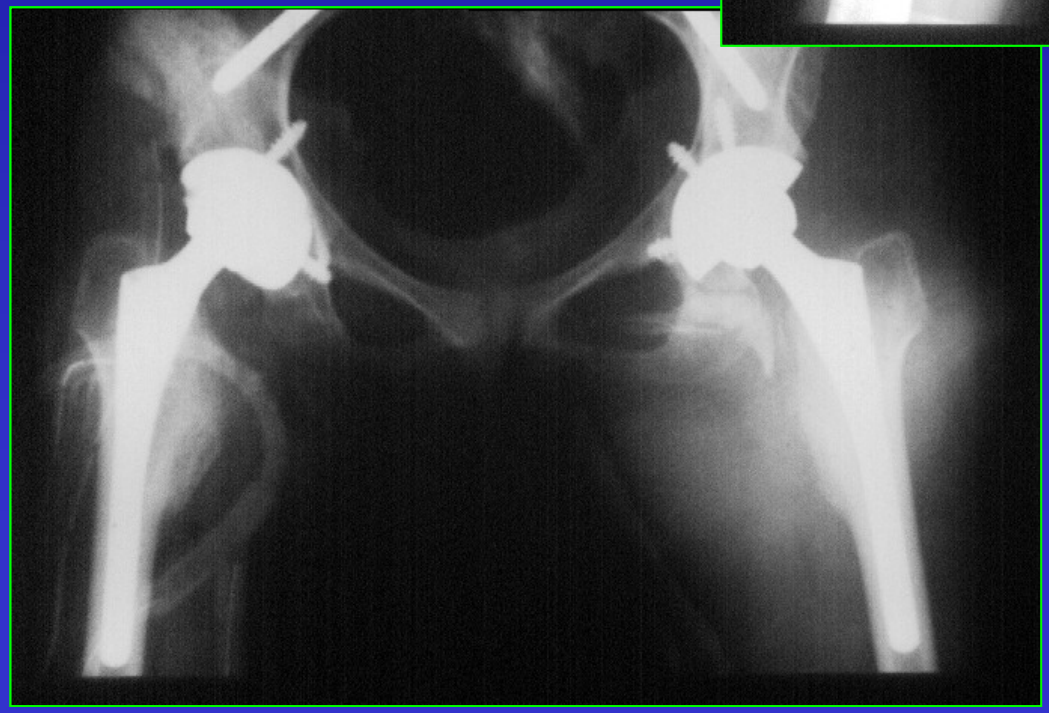
SURGICAL TREATMENT

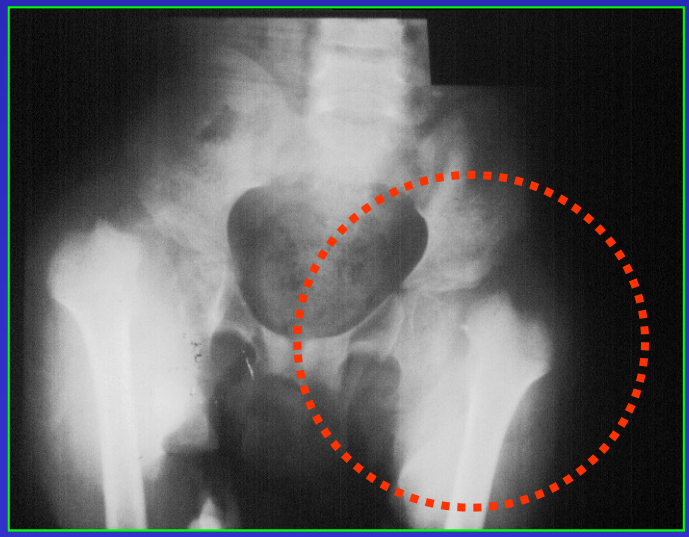
HIP JOINT

OLDER PATIENT

* HIP ARTHRODESIS
* THR
* PROXIMAL FEMUR RESECTION

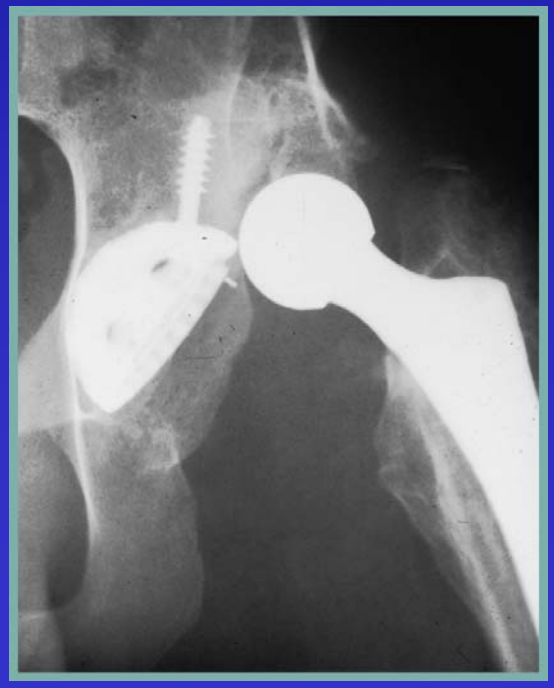
OLDER PATIENT





Treatment

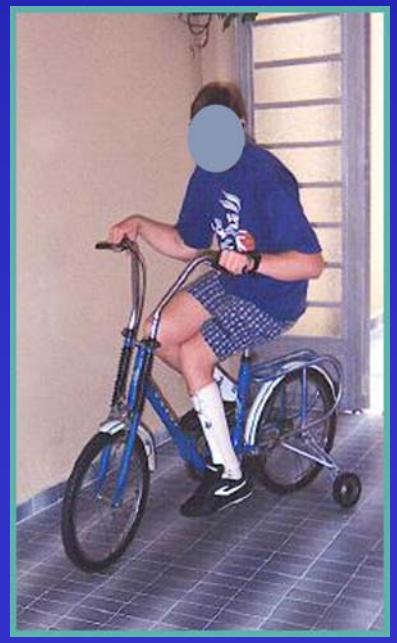
THR *95% of good results*



TREATMENT

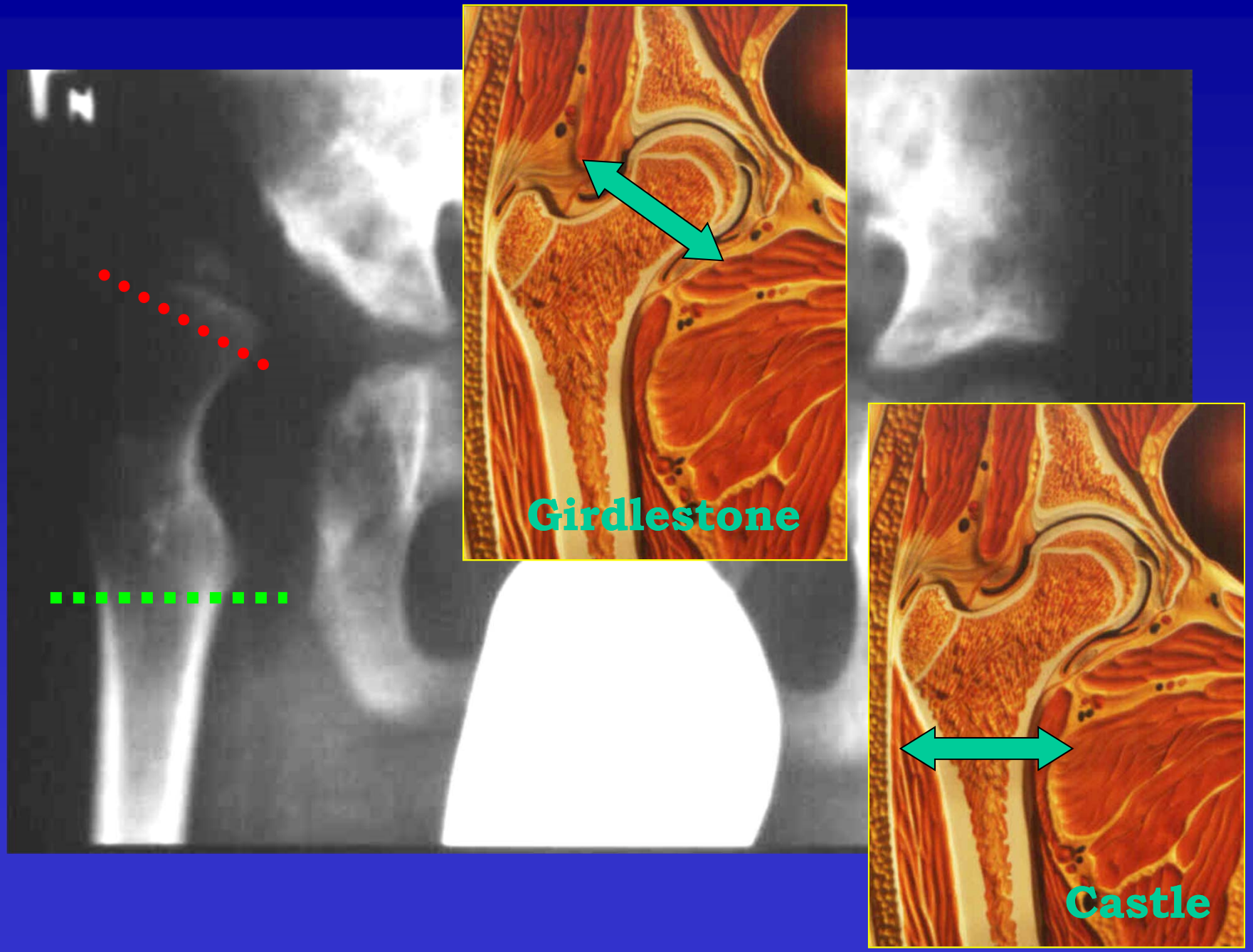
HIP Arthrodesis

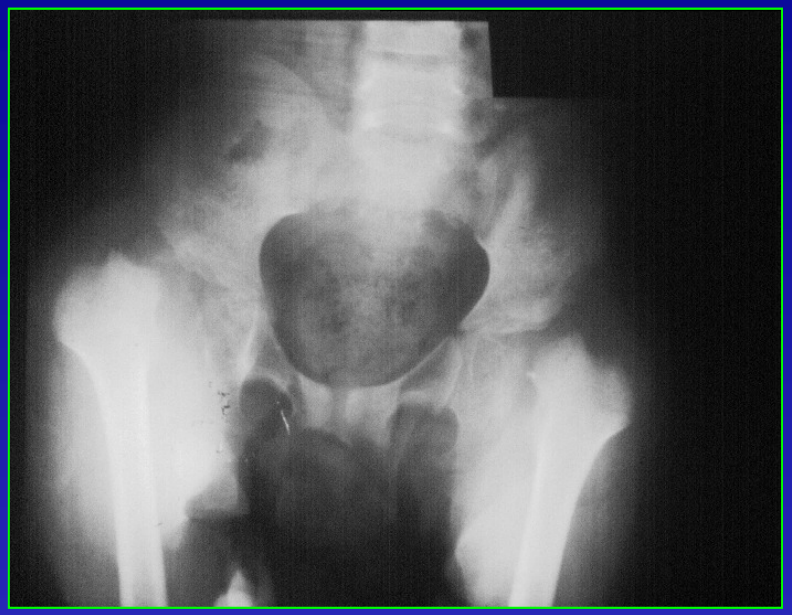
Indicated to young, walkers with no scoliosis and unilateral involvement



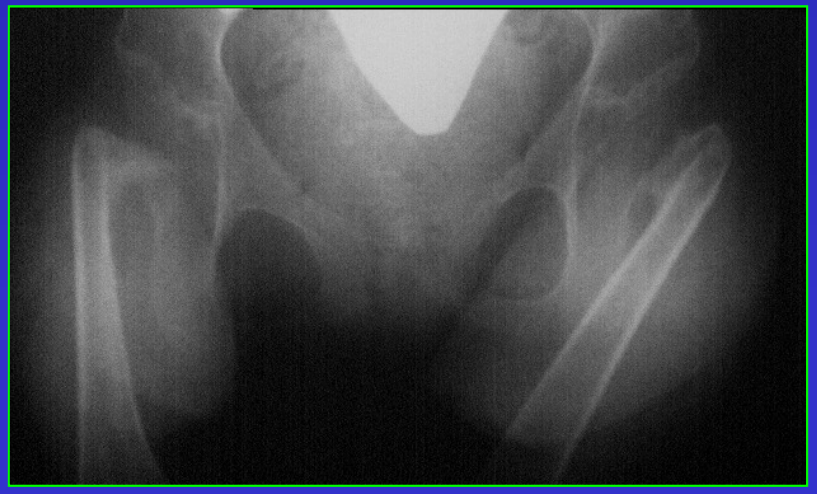
Alternative to THR

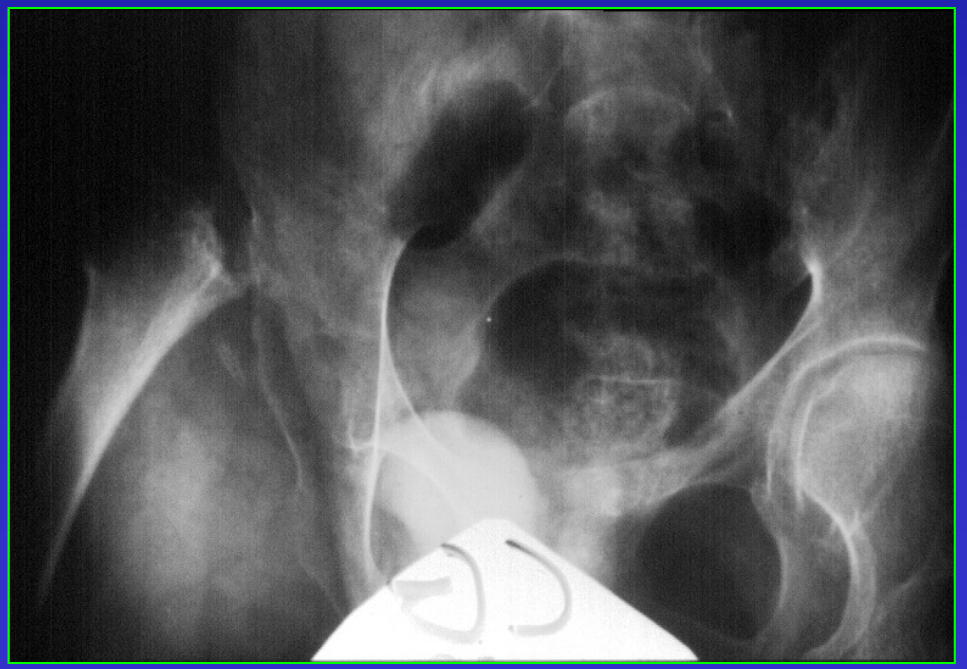
Severe cases of children with spasticity


Girdlestone
Castle



Proximal femur Girdlestone resection





Treatment

The principle of treatment is to prevent HIP DISLOCATION

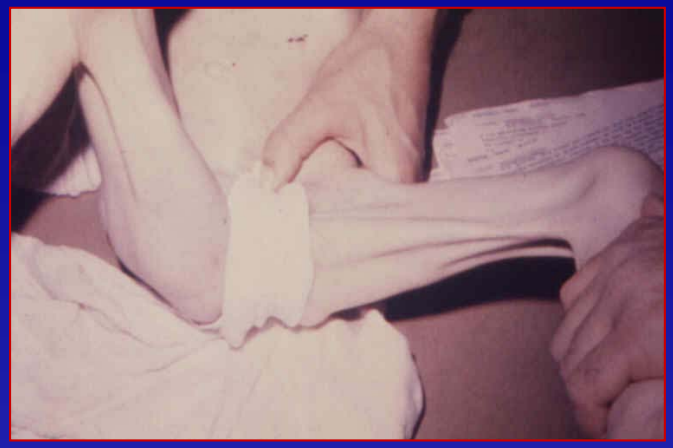
Dislocated hip cause :

Pain
Function disorders
Early degenerative changes

THE EVALUATION OF TREATMENT OF THE SPASTIC HIP IN CHILDREN

The aim of the study is to evaluate children with spastic hip disease who were treated in our Clinic because of hip problems

(*contracture, subluxation or dislocation*)



Severity of spasticity

MUSCLE BALANCE DISORDERS

* **DYSPLASTIC HIP**
* **HIP SUBLUXATION**
* **HIP DISLOCATION**

* **COXA MAGNA**
* **COXA VALGA**
* **COXA ANTETORTA**

This changes could lead to the degenerative changes of the hip joint

The most common problem in children with CP is :

Postero-superior **subluxation or dislocation of the hip joint**

This type included of all disorders around the hip

98-99%

Etiology :

- **increased tonus of m. adductors**
- **coxa valga**
- **increased antetorsion angle**

If subluxation in the hip joint is observed (as a *MI %)*

It means that this process is always progressive

The subluxation progress 2% pro month, when MI < 50% !

And leads very fast to dislocation when MI > 60%

Age 8-18 years

When in the stage of accelerated growth the pelvic obiquidity and scoliosis is additionaly observed

this factors could influenced further development of the hip joint

HIP JOINT

Windblown deformity

1. Scoliosis
2. Oblique pelvis position
3. Adduction of one hip and abduction of the second one

Adults

With MI 25-30%
hip remains stable

With MI 30 - 60%
very rare progresses

With MI > 60%
hip progress slowly
and leads to dislocation in
every case

Diagnosics

1. X-ray of the hips in AP position every 6-12 months when obduction < 45^0

2. CT – evaluation of direction of dislocation of the femoral head, evaluation of acetabulum and antetorsion angle

3. Ultrasound – rare indicated – evaluation of fluid in the hip joint and antetorsion angle

TREATMENT

1. PROPHILAXIS
2. RECONSTRUCTOVE SURGERY
3. PALIATIVE SURGERY

GOALS OF TREATMENT

- **Functional improvement**
- **Cosmetic imprevement**
- **Prophylaxis of hip dislocation**
- **Pain prophylaxis**

Methods of treatment

- Multilevel soft tissue release
- Tendons or muscle lengthening
- Corrective osteotomy
- Open reposition of the joint
- Arthrodesis & bone resection

SURGICAL TREATMENT

YOUNG PATIENT

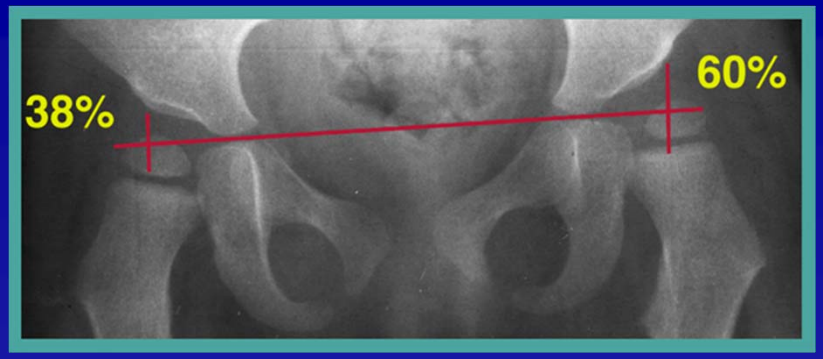
* SOFT TISSUE SURGERY
* OSTEOTOMIES OF PELVIC AND FEMUR
* MIXED SURGERY

TREATMENT

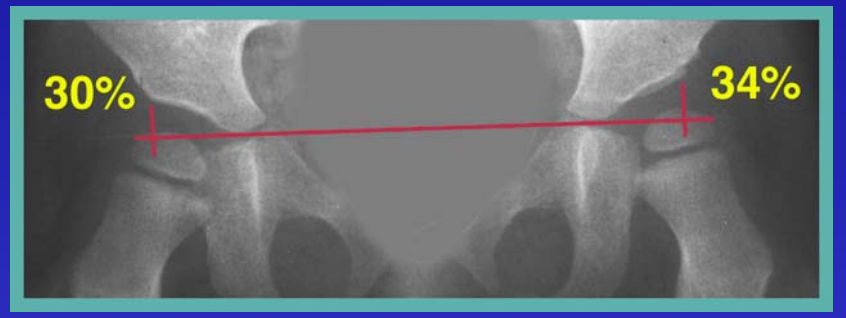
Children below 8 years:

*** MI >25% & <60%**
*** abduction < 30⁰**

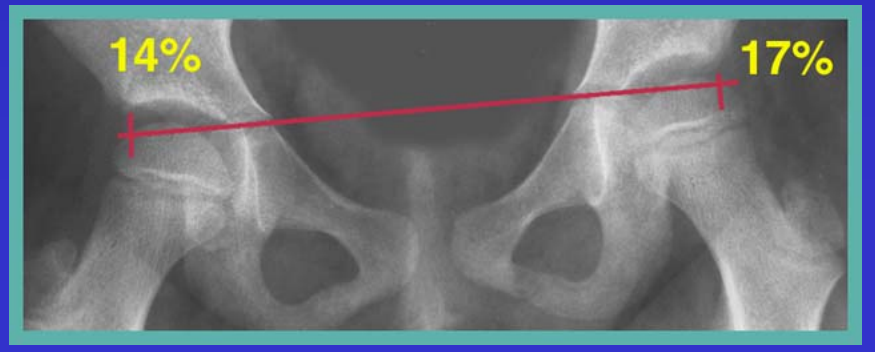
Should be treated by soft tissue release.



Age 4 years



8 m. after adduktors & m. iliopsoas lengthening



Age 12 years

TREATMENT

Soft tissue release
open or precutaneous

Better results – open.

* *dissection of adductor longus & gracilis*
* *lengthening of m. iliopsoas in walkers*
* *dissection of m. iliopsoas (non-ambultory)*
* *myotomy of adductor brevis (when hip abduction <45^0)*
* *hamstring lengthening when popliteal angle <45^0*
* *dissection of anterior branch of n. obturatorius when MI >60% in non-ambulatory patients*

FU after surgery, every 6 m., X-ray once a year

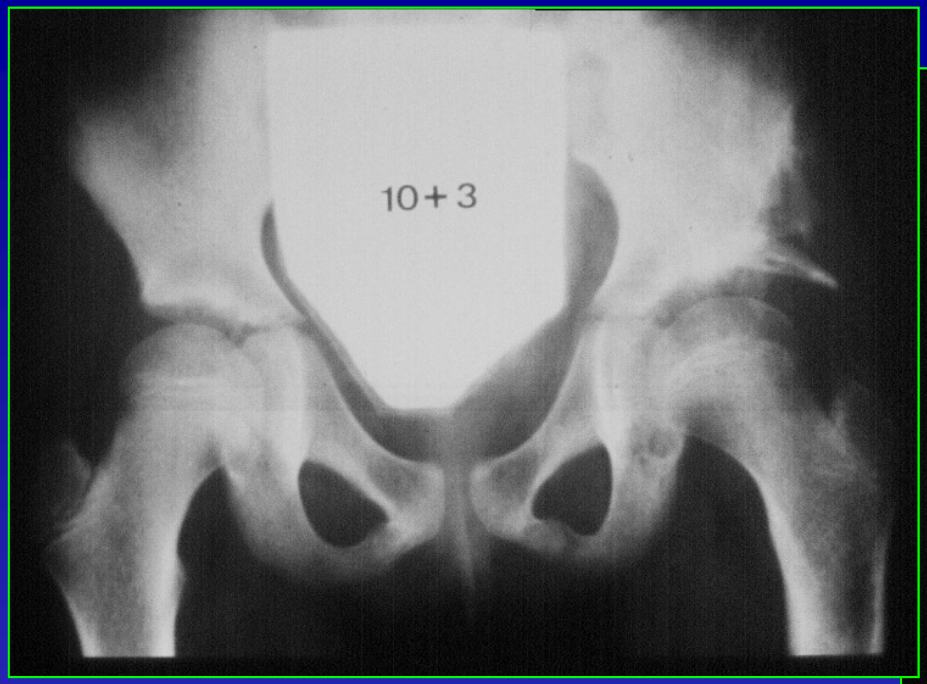
Treatment - problems

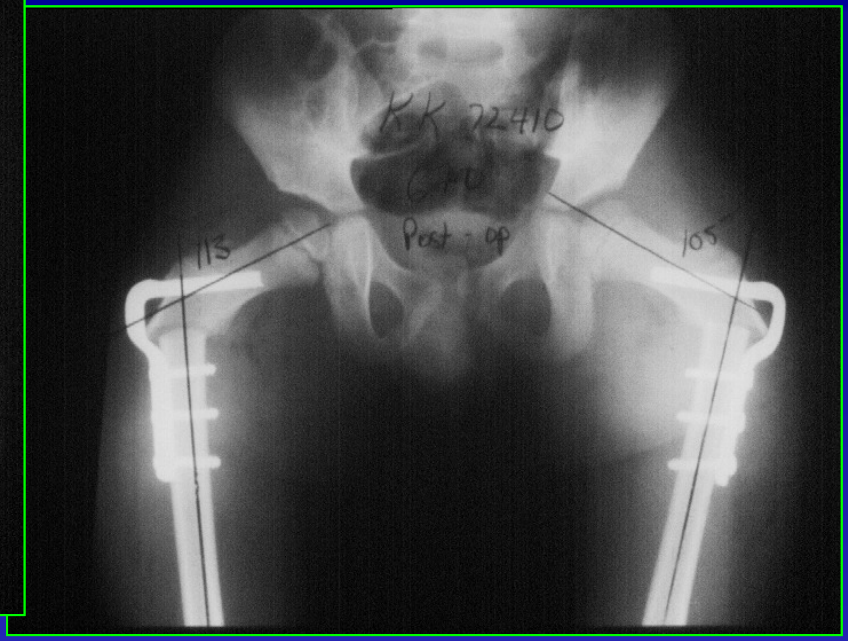
11% of children required additional surgery because of increasing of MI > 40%

Repeated soft tissue release

(only 50% improved)

Decision about reconstructive surgical procedure





Younger patient

Treatment – reconstructive surgery

Indication:

* severe subluxation MI >60%
* hip dislocation
* children >8 years with MI >40%

Treatment – reconstructive surgery

The best result when the surgery is performed at the age 6-12 years

- better rebuilding ability !

Treatment – reconstructive surgery

The reconstructive procedures gives 90% of good results in children with spasticity

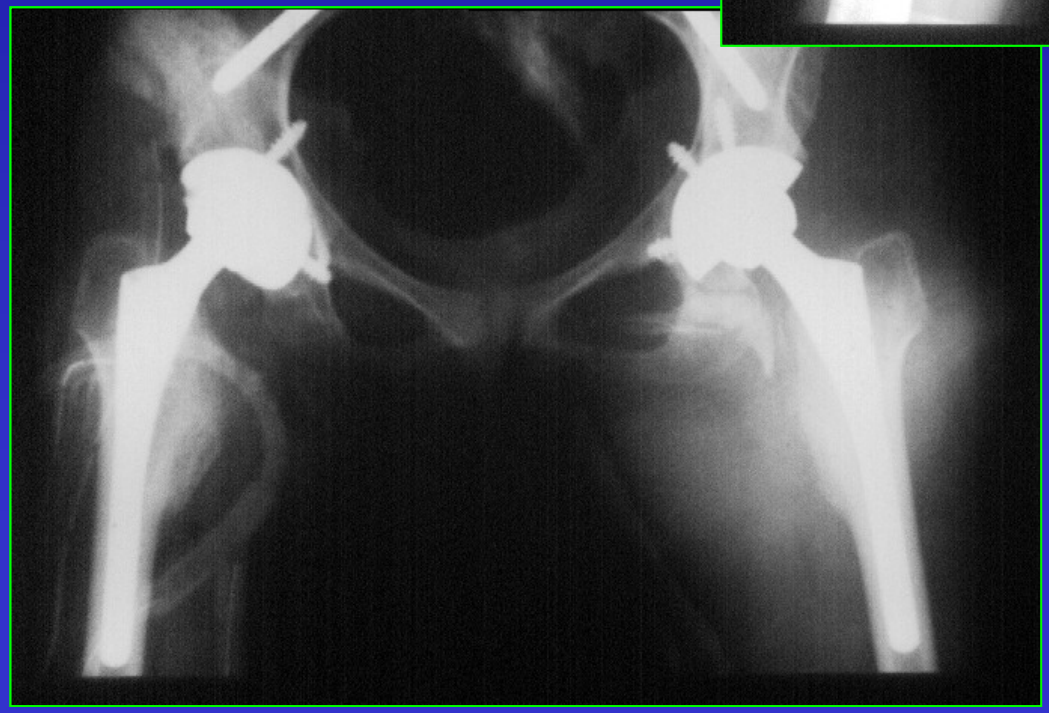
SURGICAL TREATMENT

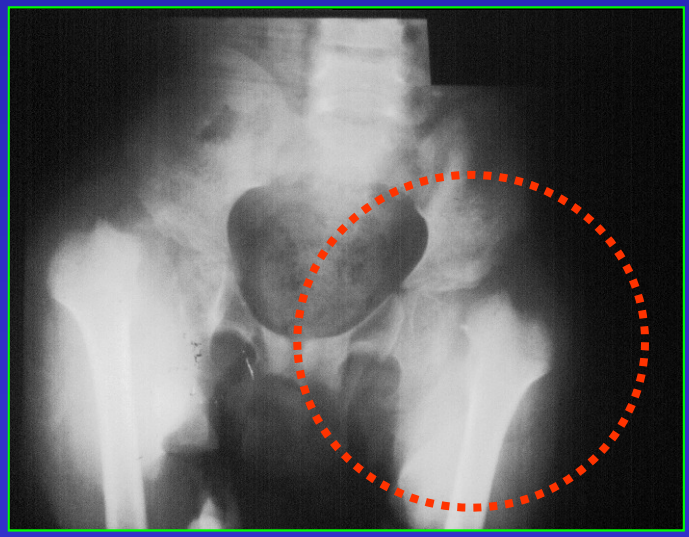
HIP JOINT

OLDER PATIENT

* HIP ARTHRODESIS
* THR
* PROXIMAL FEMUR RESECTION

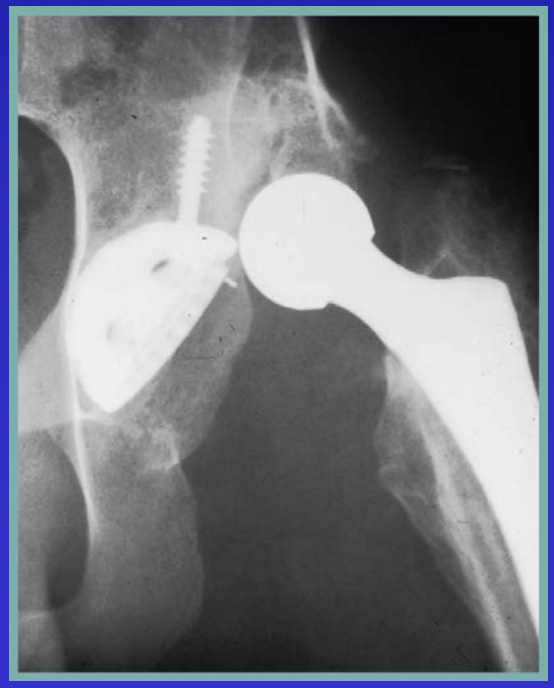
OLDER PATIENT





Treatment

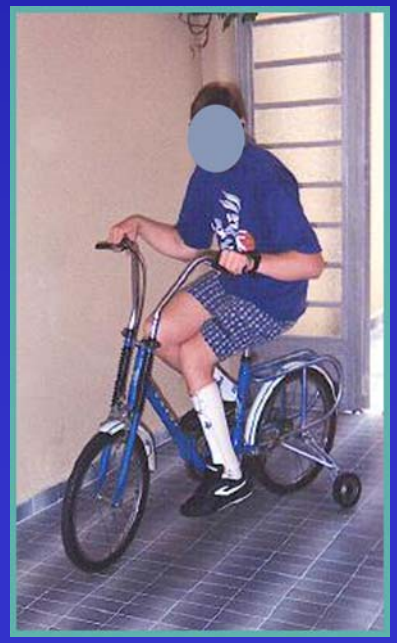
THR *95% of good results*



TREATMENT

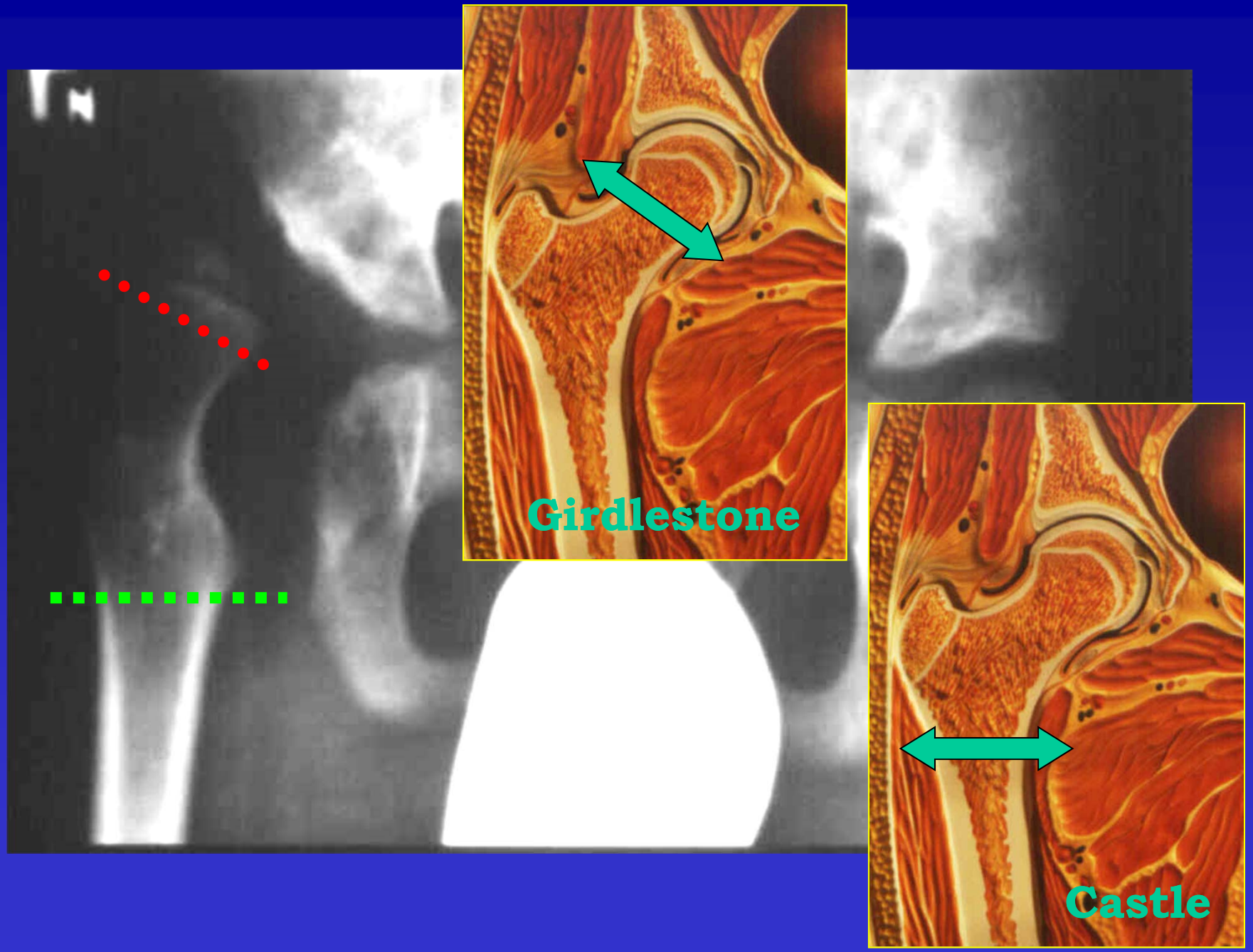
HIP Arthrodesis

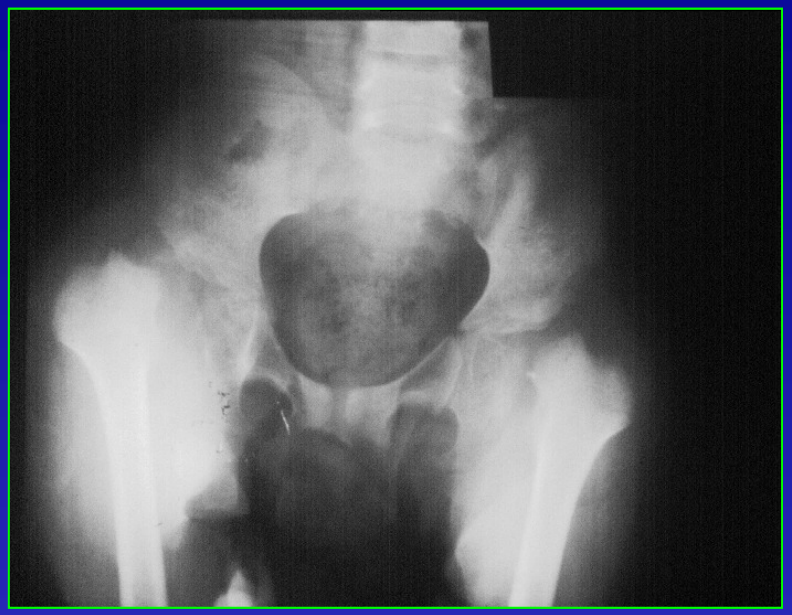
Indicated to young, walkers with no scoliosis and unilateral involvement



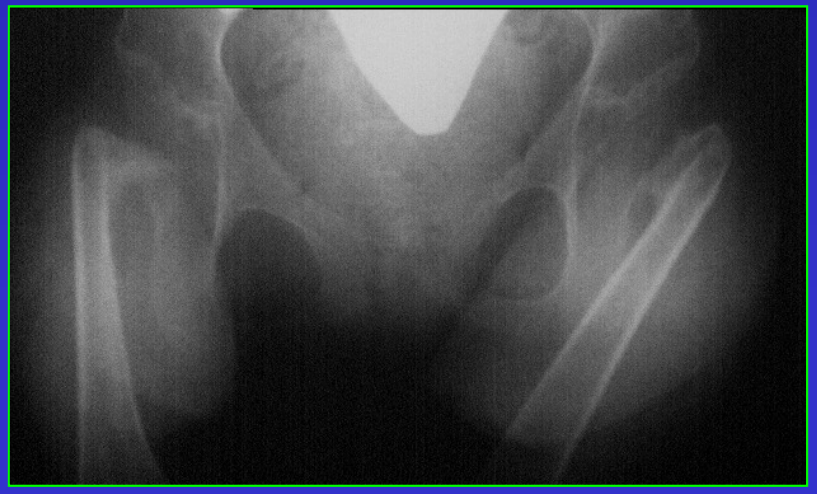
Alternative to THR

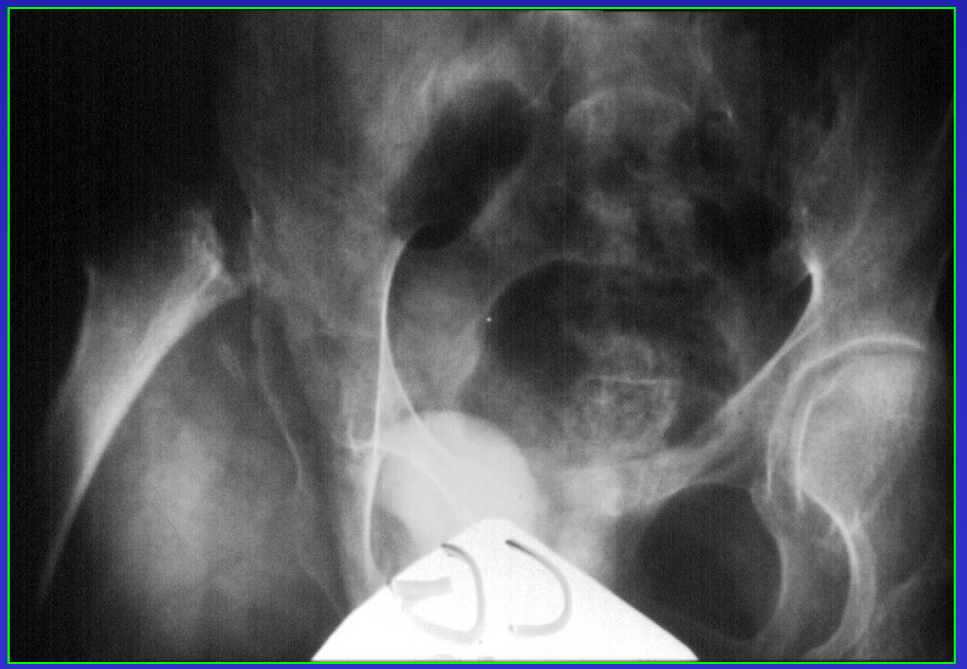
Severe cases of children with spasticity


Girdlestone
Castle



Proximal femur Girdlestone resection





Treatment

The principle of treatment is to prevent HIP DISLOCATION

Dislocated hip cause :

Pain
Function disorders
Early degenerative changes

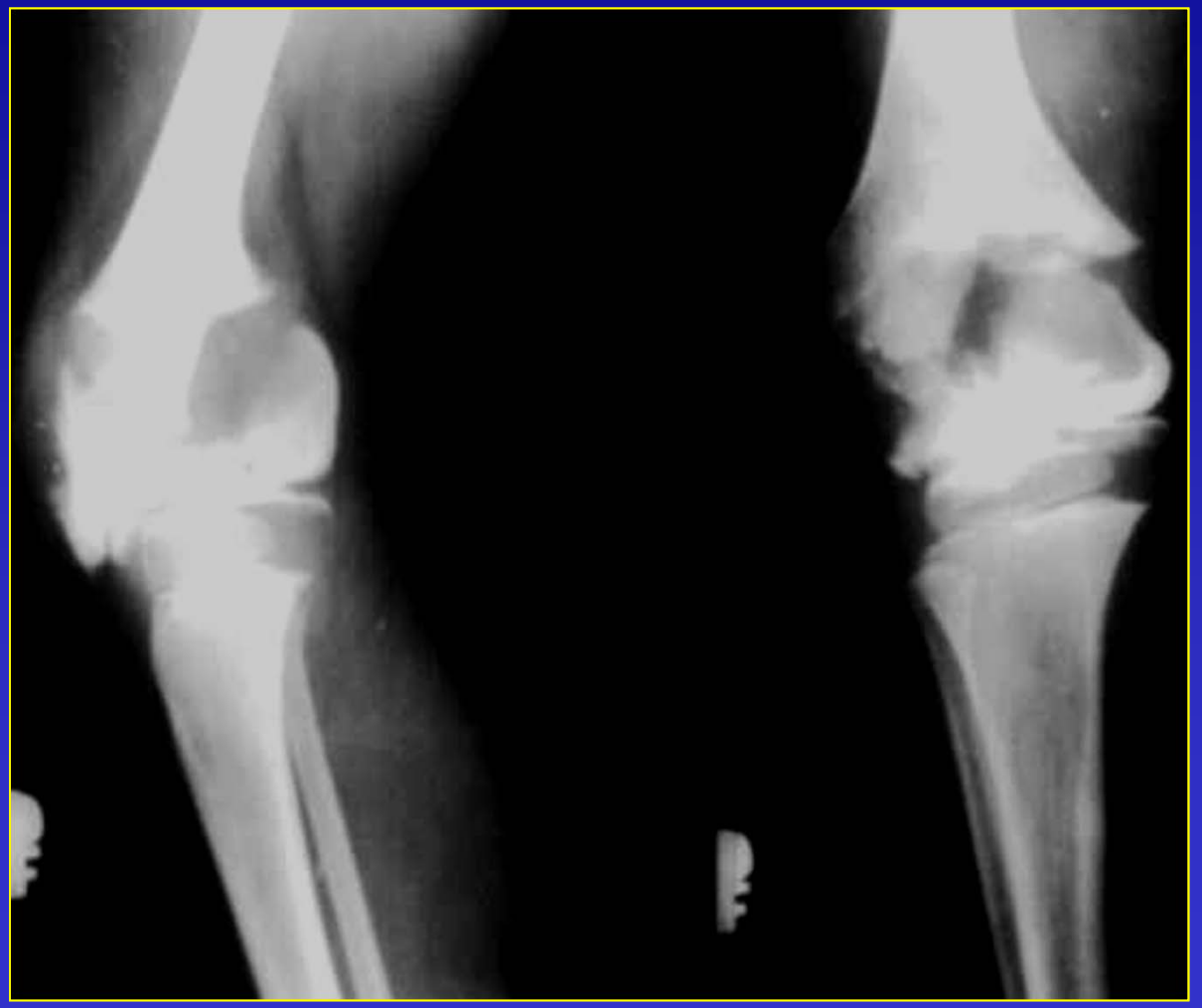
ACUTE HEMATOGENOUS OSTEOMYELITIS AND SEPTIC ARTHRITIS

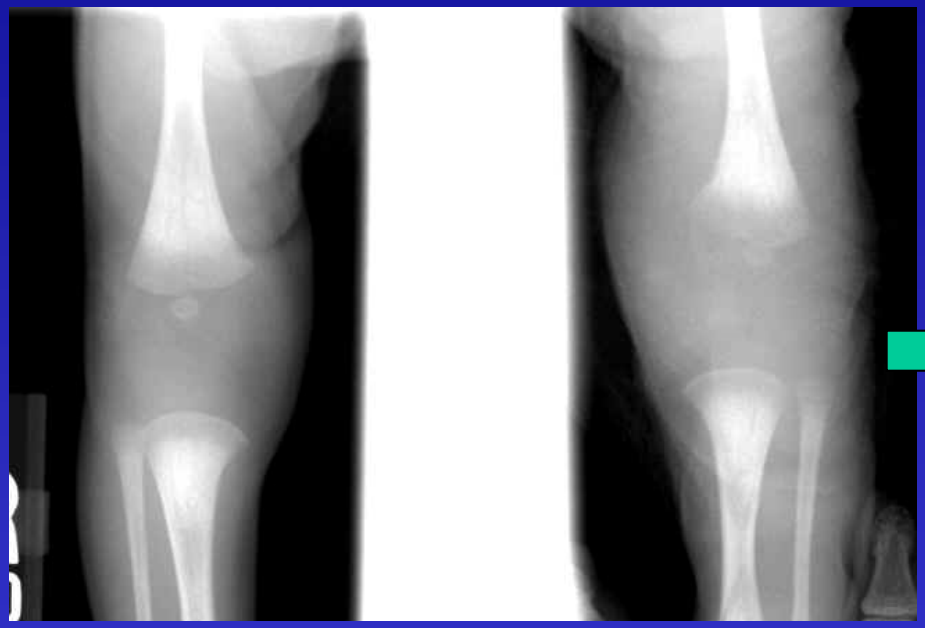
ACUTE HEMATOGENOUS OSTEOMYELITIS

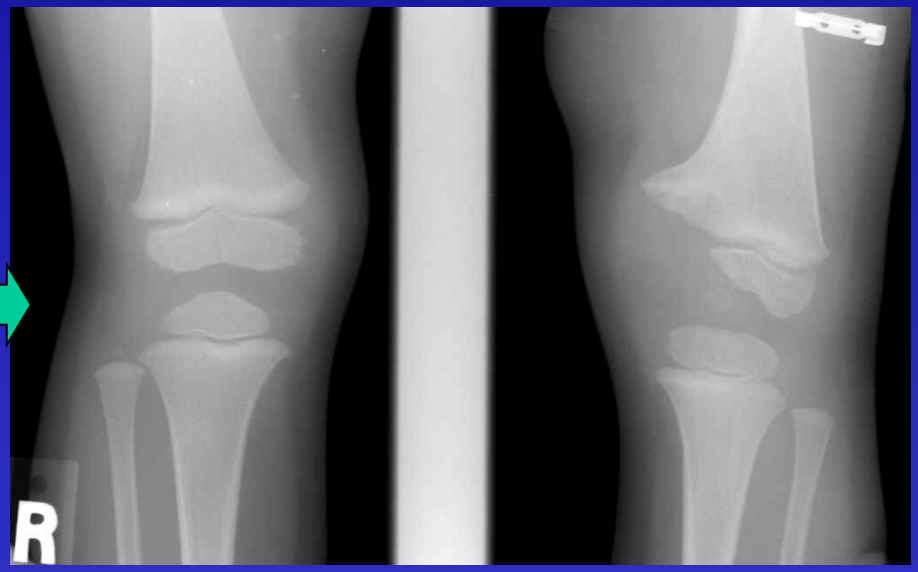
The most common seen in

*** NEWBORNS**

*** INFANTS**

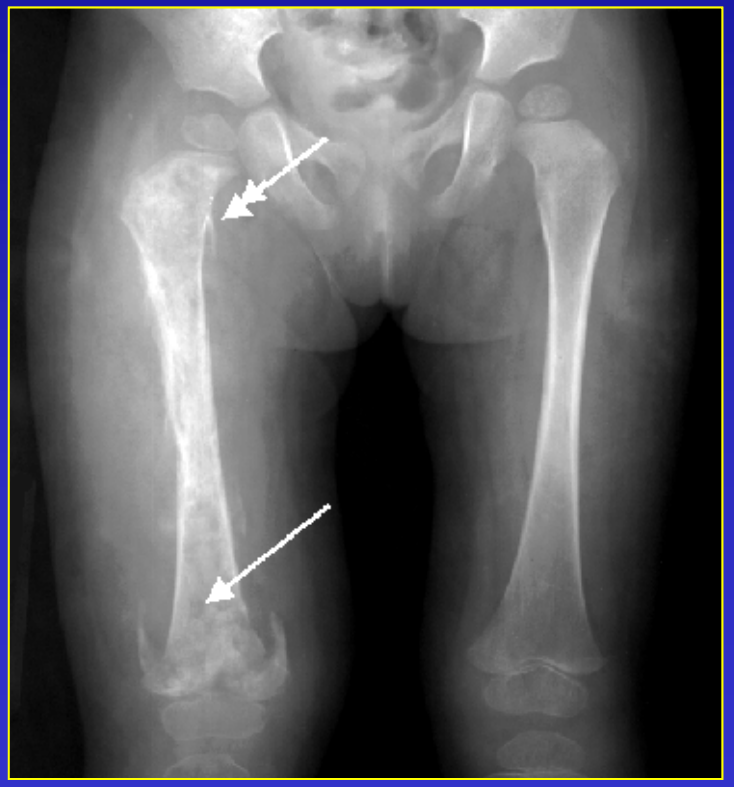




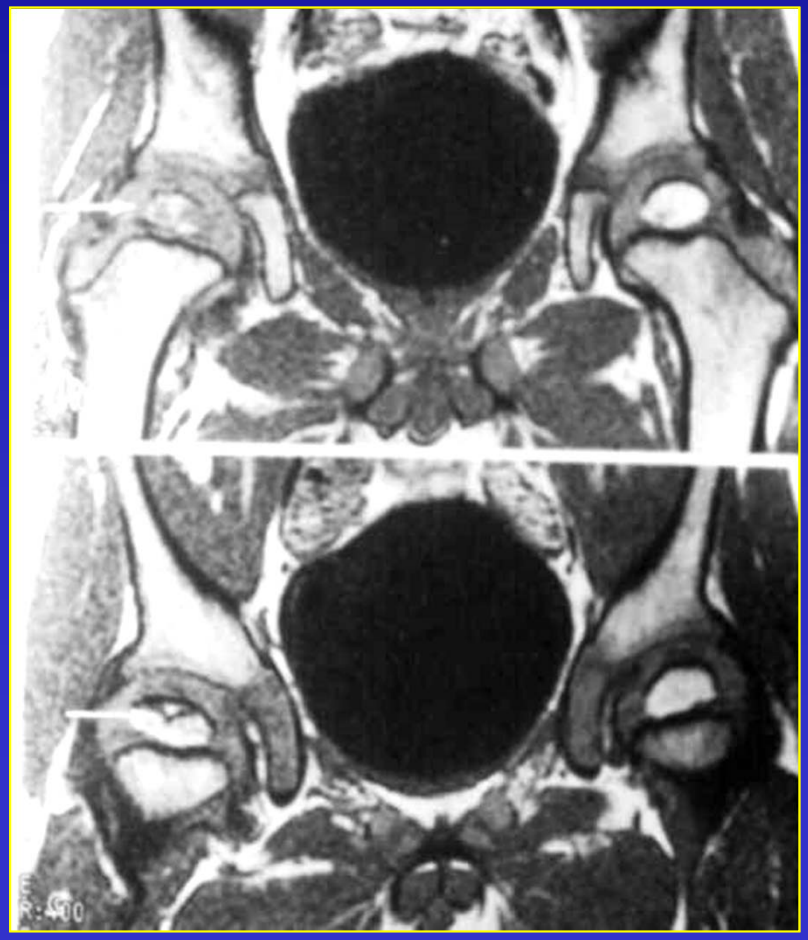


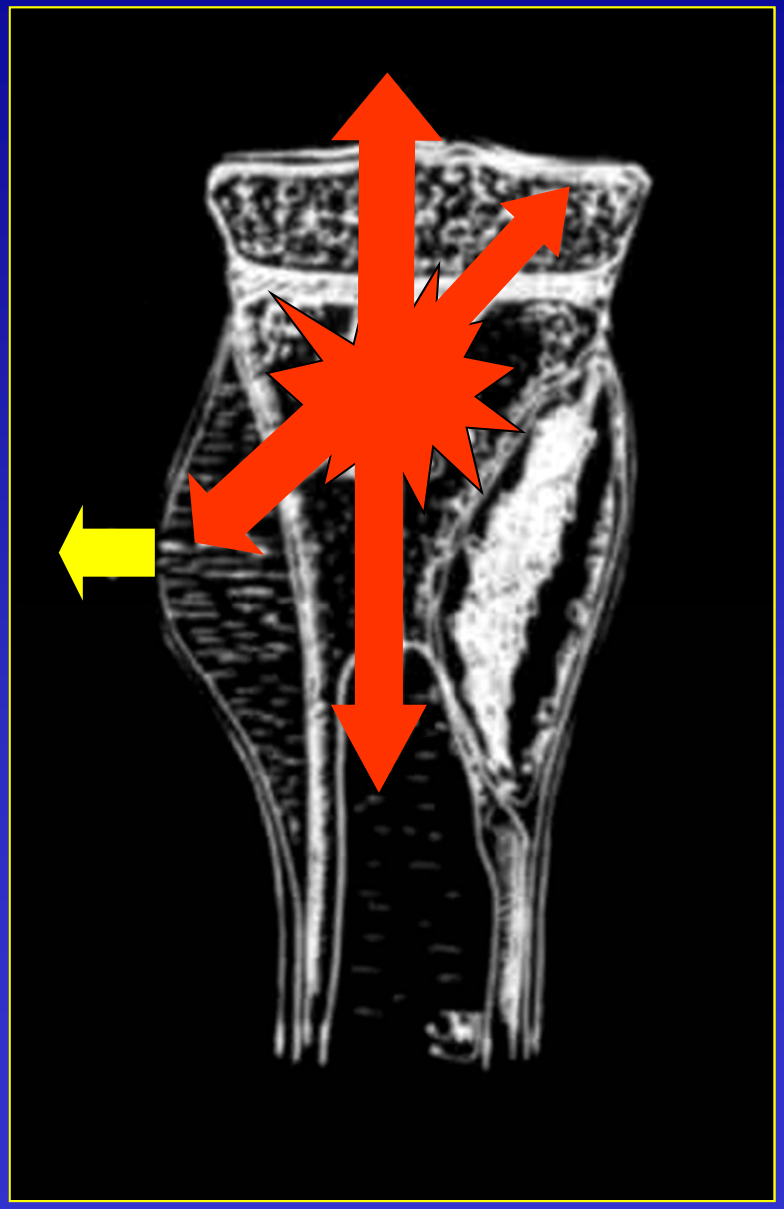
22days/ female

3 yrs old



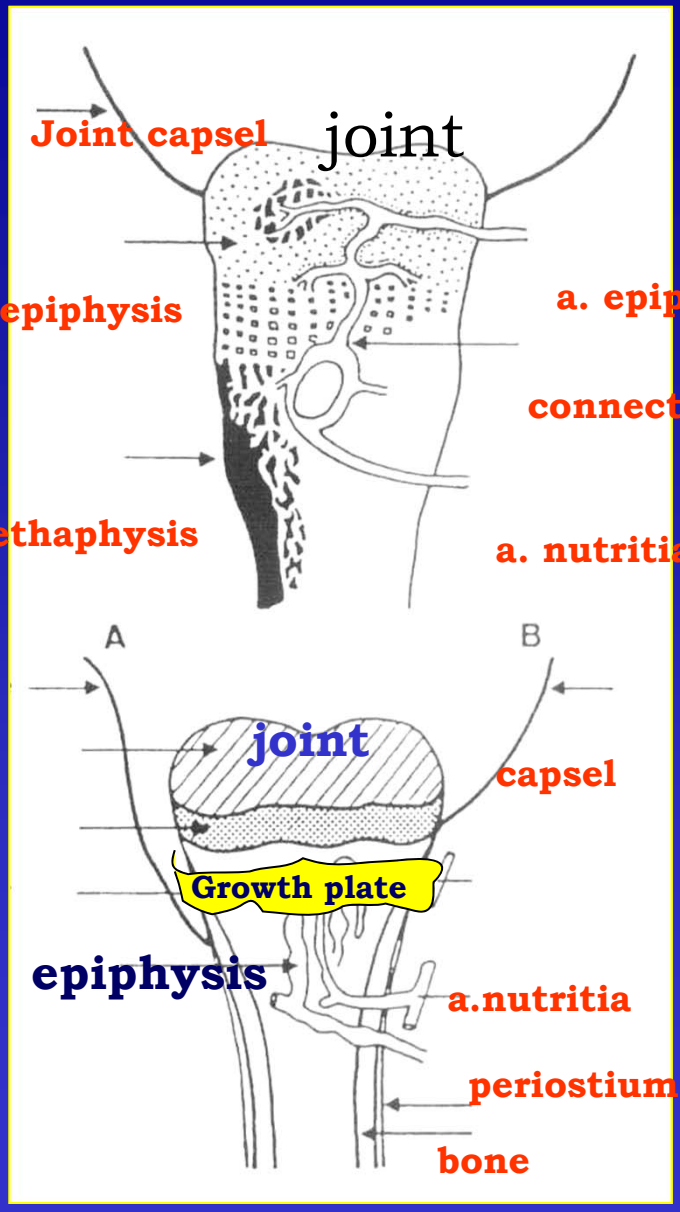
IMAGING DIAGNOSTIC PROCEDURES



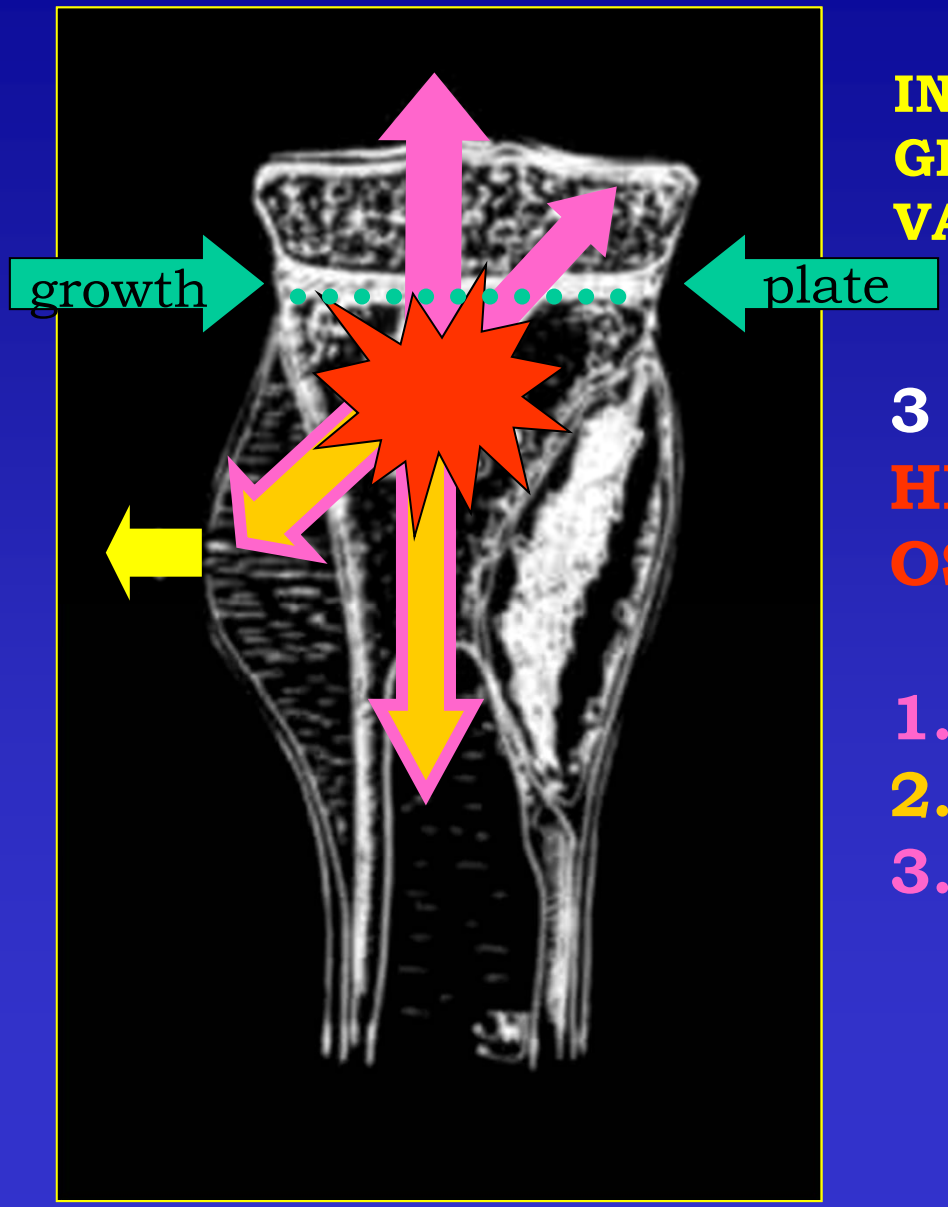


Originates in methaphysis of the long bones

1. Spongiosa
2. Slower blood flow
3. Anasthomoses vein-arteria


Joint capsel
joint
epiphysis
a. epiphys.
connecting aa
methaphysis
a. nutritia
A
B
joint
capsel
Growth plate
epiphysis
a.nutritia
periostium
bone

EXTENDING OF OSTEOMYELITIS

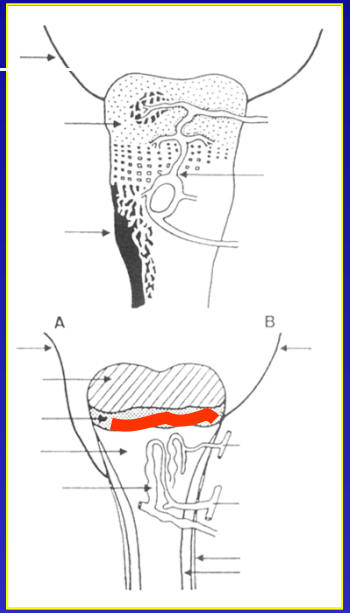


IN RELATION TO THE GROWTH PLATE AND VASCULARISATION

3 TYPES OF ACUTE HEMATOGENOUS OSTEOMYELITIS :

1. **Newborns & infants**
2. **2 y – skeletal maturity**
3. **adults**

TYPES OF ACUTE HEMATOGENOUS OSTEOMYELITIS :



1. NEWBORNS & INFANTS :

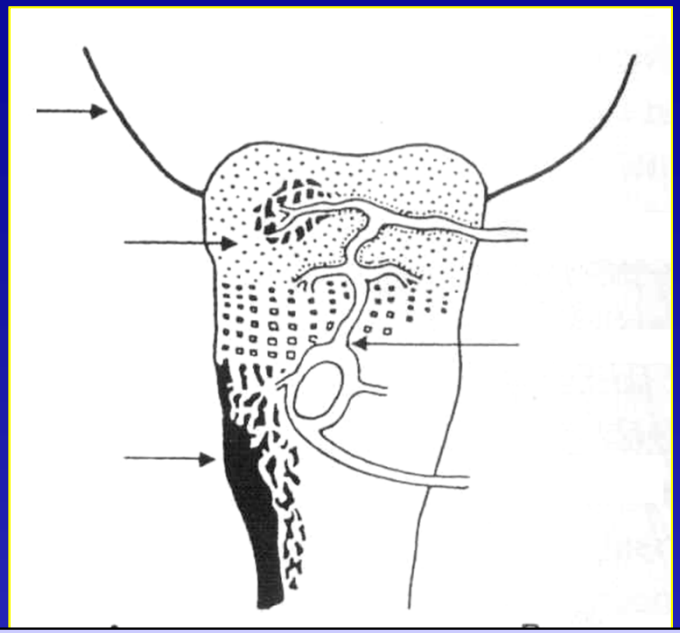
* No growth plate
* vascular connection between epiphysis and methaphysis
* osteomylitis often extend to the joint

2. 2 year – till skeletal maturity :

* 2 year of lige = growth plate is formated
* gp = barier betwenn two vascularisation systems epiphyseal and methaphysal
* osteomyelitis not extend to the joint

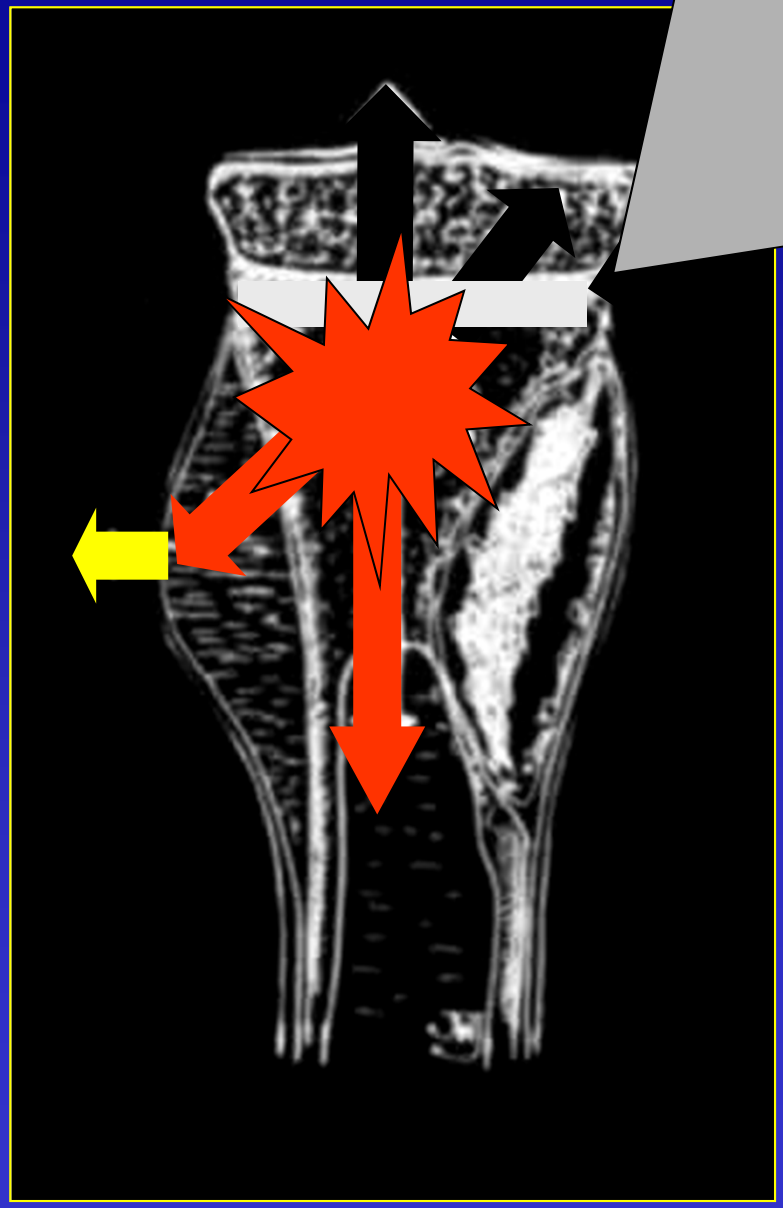
3. Adults :

* rare
* no growth plate
* vascular connection between epi- and methaphysis



1. NEWBORNS & INFANTS :

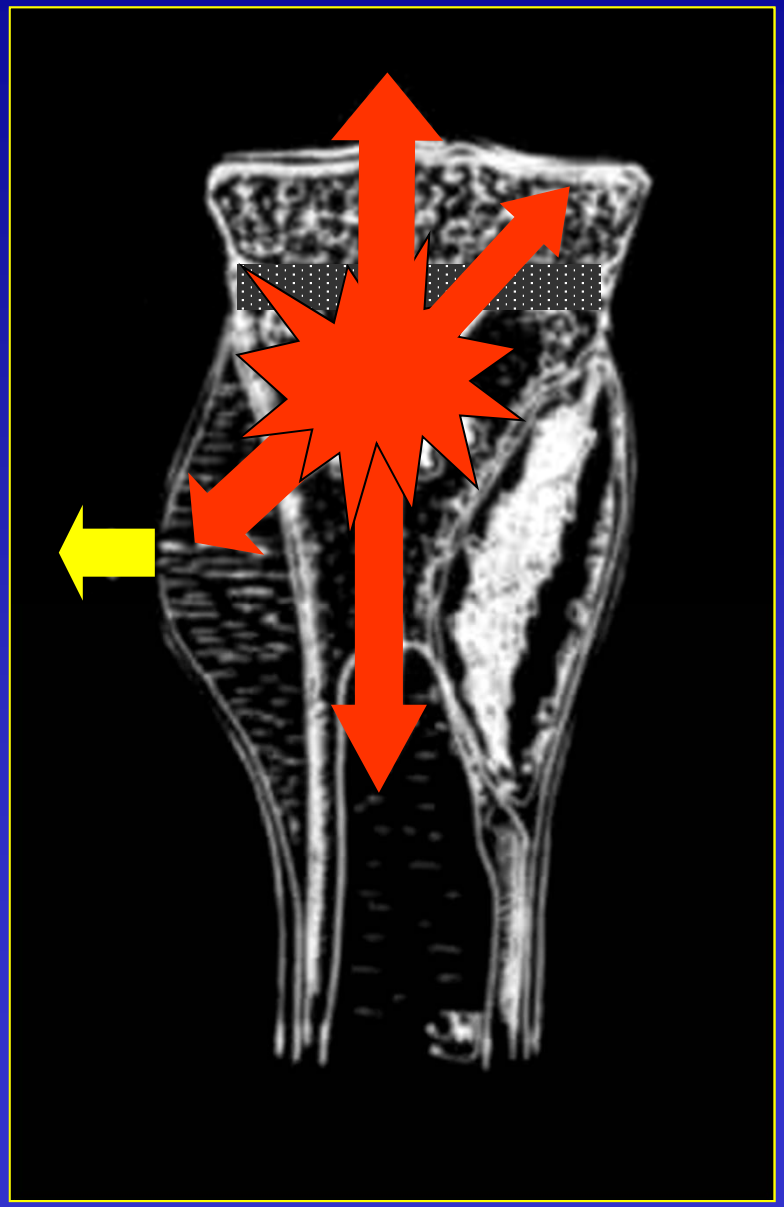
No growth plate
Vascular connection between epi- and methaphysis
Osteomylitis often extend to the joint



2.

2 year till skeletal maturity :

GROWTH PLATE

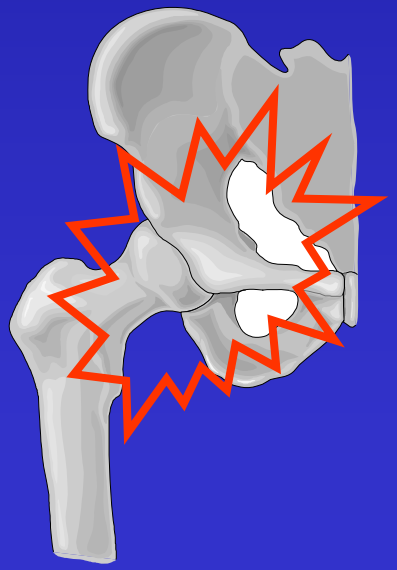


3.
Adults

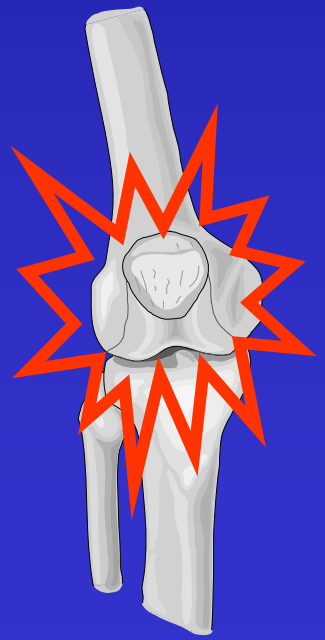

OSTEOMYELITIS
NOT PROPER TREATMENT
DEFORMATION
IN LIMBS REGIONS

ACUTE HEMATOGENOUS OSTEOMYELITIS

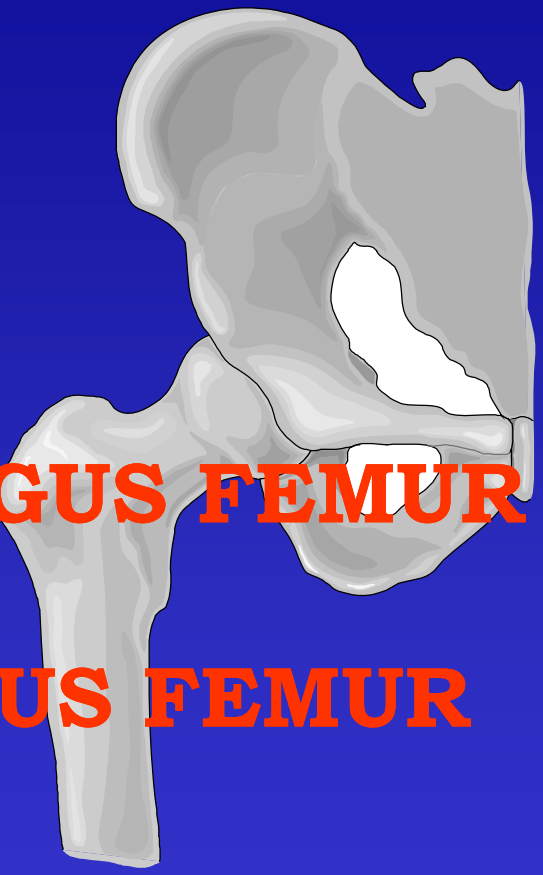
Most common seen in



Hip joint
Knee joint



HIP JOINT



LLD

VALGUS FEMUR

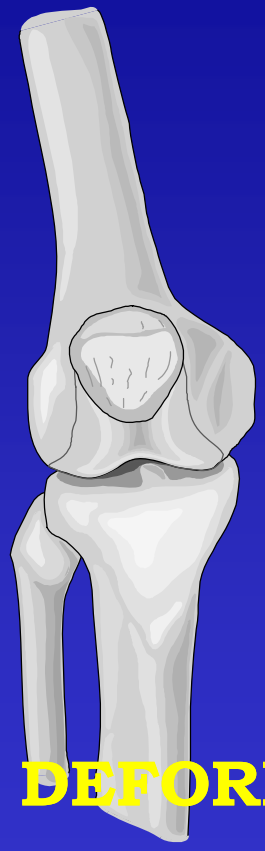
VARUS FEMUR

KNEE JOINT

LLD

VARUS KNEE

VALGUS KNEE



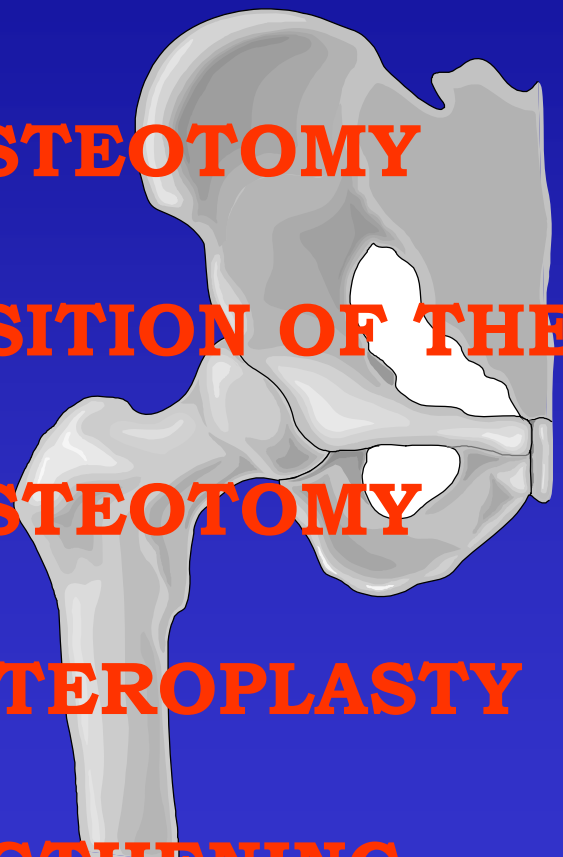
SIGNIFICANT KNEE DEFORMATION

KNEE JOINT

LLD

FROM 4 TO 9 CM

HIP JOINT
TREATMENT



FEMUR OSTEOTOMY

TRANSPOSITION OF THE TROCHANTER

PELVIC OSTEOTOMY

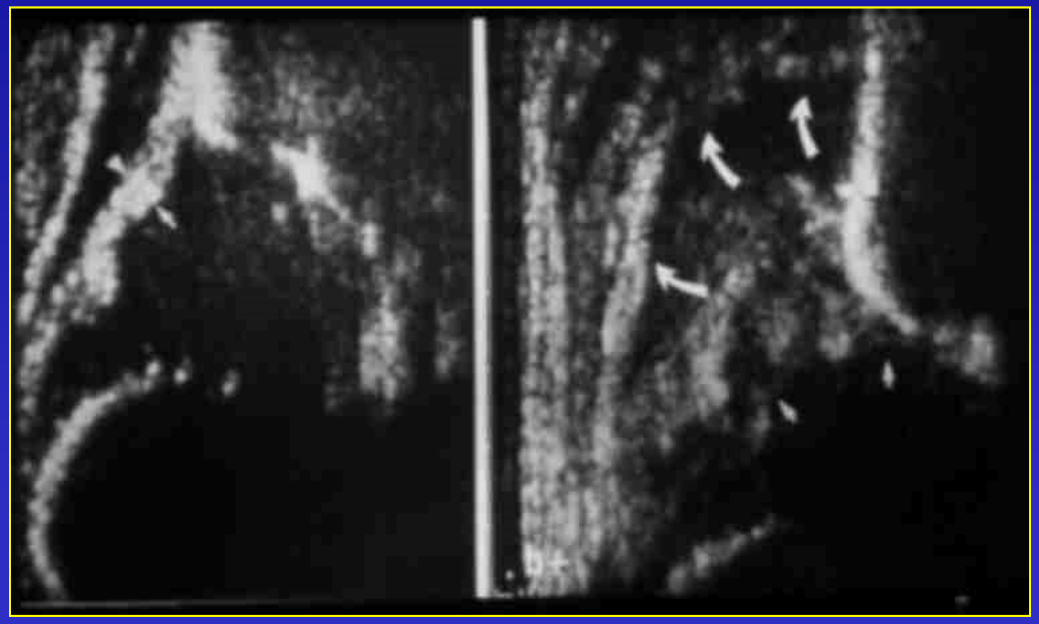
TROCHANTEROPLASTY

LIMB LENGTHENING

SEPTIC ARTHRITIS

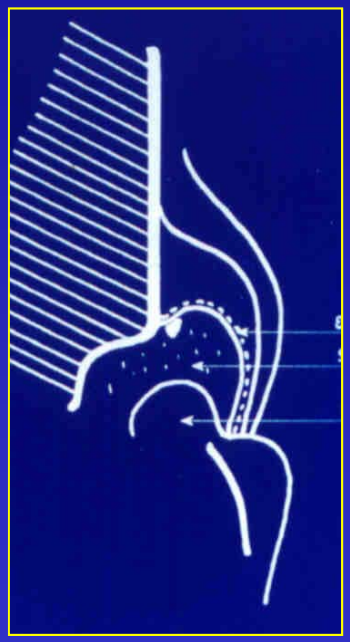
ARTHRITIS

NORMAL

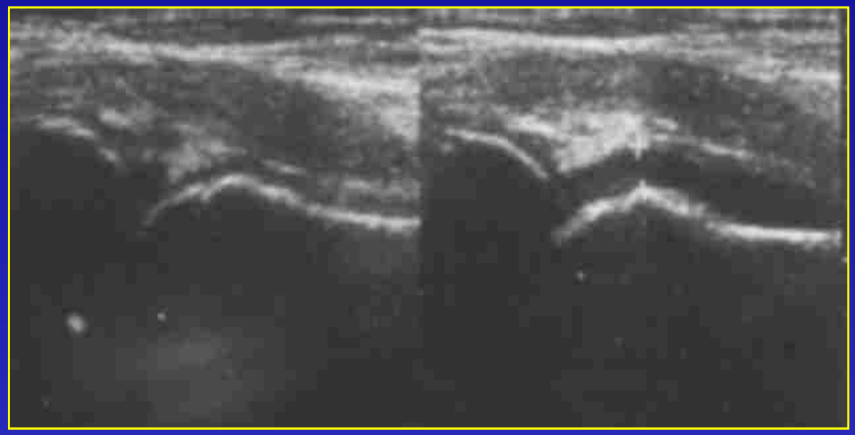


HIP EFFUSION

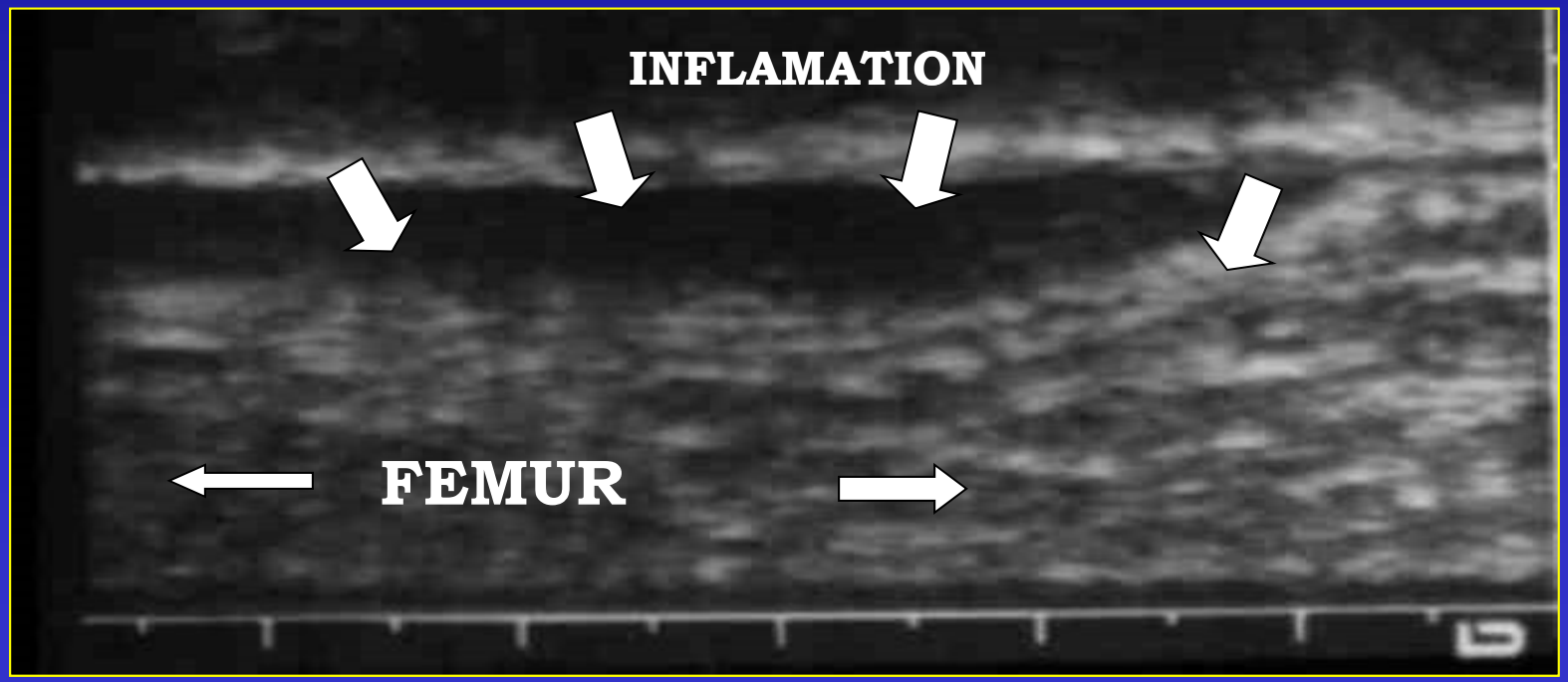
SEPTIC ARTHRITIS



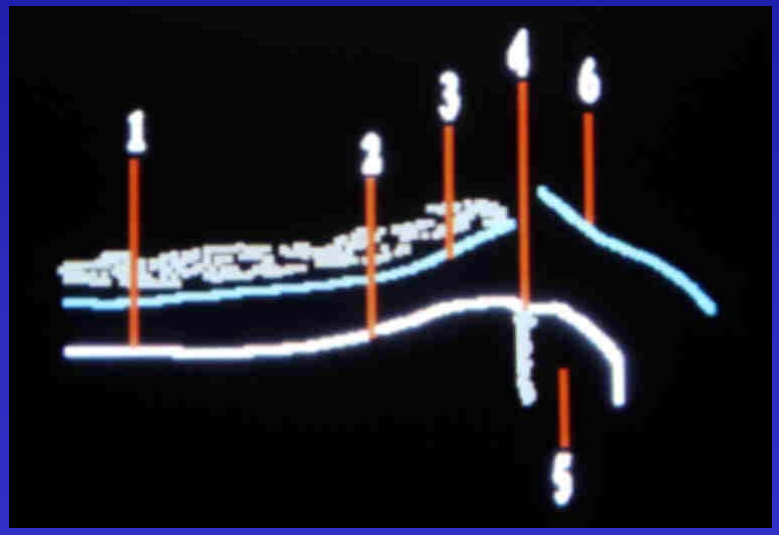
US presentation of effusion in the hip joint

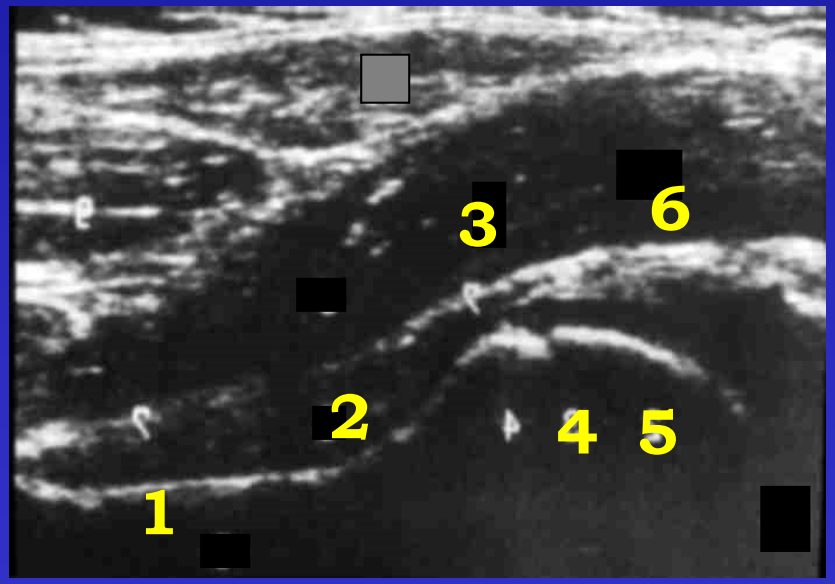


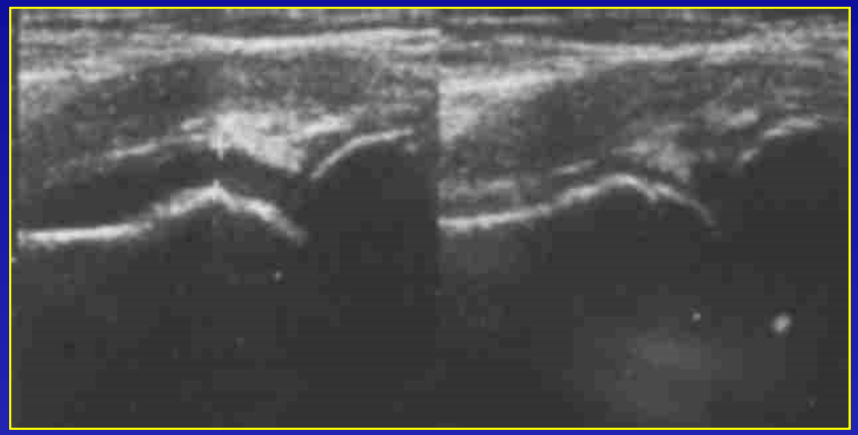
ACUTE HEMATOGENOUS OSTEOMYELITIS



EVALUATION OF EFFUSION IN THE HIP JOINT







KNEE JOINT

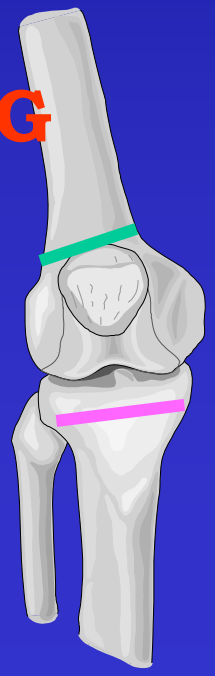
TREATMENT

* SUPRACONDYLAR FEMORAL OSTEOTOMY

* HIGH TIBIAL OSTEOTOMY

•CORRECTION OF DEFORMATION OF LEG USING ILIZAROV DEVICES

* LIMB LENGTHENING



THE ILIZAROV METHOD IN CORRECTION OF LOWER LEG DEFORMATION

CONCLUSIONS

- THE TREATMENT OF DEFORMATIONS WHICH OCCURRED AFTER OSTEOMYELITIS IS DIFFICULT
- DIFFICULT IS REHABILITATION AFTER SURGERY
- EARLY DEGENERATIVE CHANGES
- LONG LASTING TREATMENT

PATIENT 1

Newborn (33 weeks), ♂, 2 065 g

Elective cesarean (oligohydramnios and breech position)

Normal neurological evaluation at birth

Admitted to NICU: Transient tachypnea and feeding intolerance

Peripheral venous access: left hand and forearm

Bacille Calmette-Guérin and Hepatitis B vaccines administration and heel stick for metabolic screening

Discharge D6

D14
Mother noticed flacid left upper limb
No Moro reflex (left)
No trauma, no fever nor local inflammatory signs
Initial evaluation: brachial plexus palsy at C5 C6 C7
Planning: stimulating exercises

D23
fever + inflammatory signs right knee + distress during mobilization of the right leg and left arm

Laboratory
WBC 23 050 cell/mm^3; 60% PMN; CRP 9,4 mg/dl

Imaging:
X-ray
Knee ultrasound: subperiostal abcess distal femur
Shoulder ultrasound: ø

Surgical fenestration and drainage of the femur subperiostal abscess

Empiric ABtherapy:

flucloxacillin (6 weeks iv + 2 weeks po)+gentamicin (13 days iv)

Blood culture: negative

Pus culture: Methicilin-sensitive *S. aureus*

Progressive clinical and lab improvement

D6 pos-op: CRP 1,41

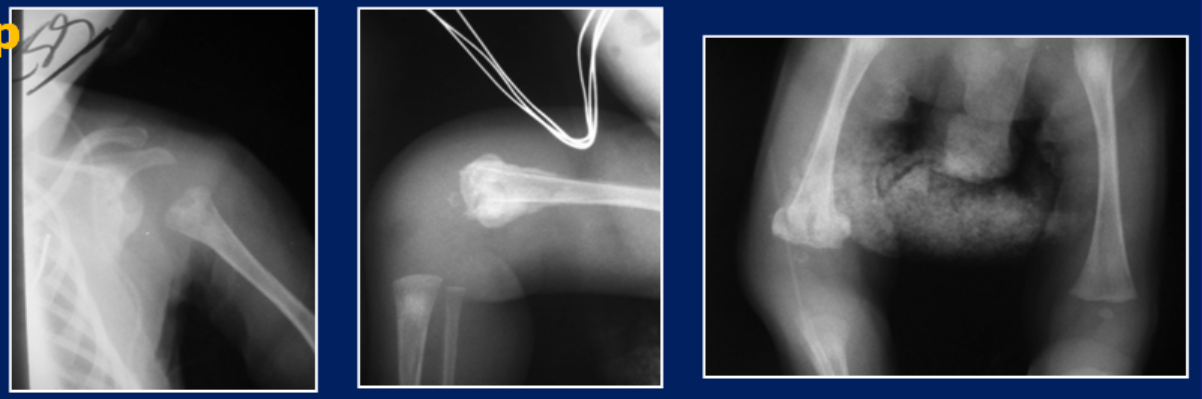
D17 pos-op: normal EMG

Syphillis serology: negative

Transfontanel and cardiac ultrasound: no additional septic focus

Today: normal neurological examination and normal bone growth as an evidence of growth plate cartilage integrity

D16 post-op



PATIENT 2

Newborn (term), ♀, 3010 g

Elective cesarean (pelvic presentation)

Normal neurological evaluation at birth

Bacille Calmette-Guérin and Hepatitis B vaccines administration and heel stick for metabolic screening

D21

Onphalitis

D30

Reduced use of right arm

No history of trauma, fever or decreased feeding

Admission: neonate alert, active and afebrile,

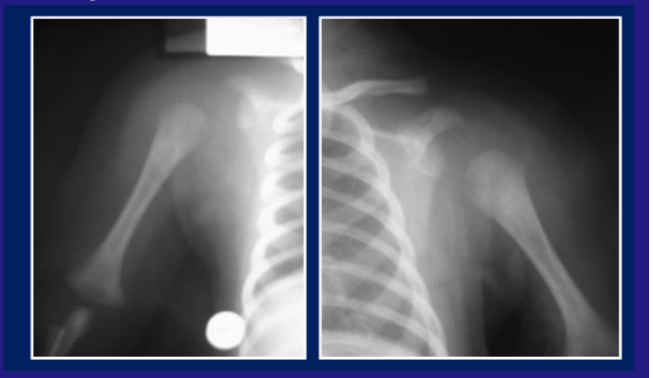
- no inflammatory signs over the shoulder
- distress with mobilization
- Moro reflex absent

Laboratory:

WBC 10 700 cell/mm^3; PMN 32,8 %; ESR 76 mm/h; CRP 0,7mg/dl

Imaging:

X-ray film and ultrasound scan of the right arm/shoulder - no abnormality



Admission to orthopaedic department for surveillance

D4
38,7ºC
WBC 20 960 cell/mm^3; PMN 52,6%; CRP 4,18mg/dl
Ultrasound: sinovial thickening, increasing intra articular effusion and periostal buldging
Radioisotope scan (99mTc): hot spot

OR
Arthrotomy of the shoulder joint
Pus drainage from the periostal buldging
Removal of sequestrum.

Cardiac and transfontanelar ultrasound: no additional septic focus

Blood cultures: negative
Pus culture: *Staphylococcus aureus*

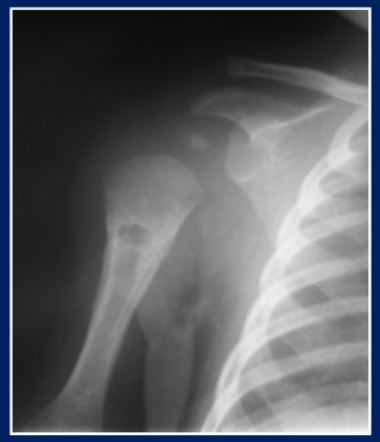
ABtherapy: gentamicin (iv 1 week)+flucloxacilin (iv 3 weeks + 3 weeks po)

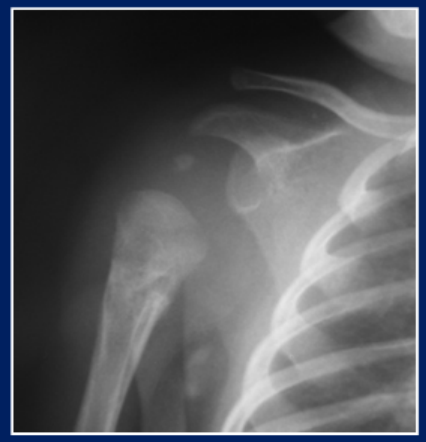
Progressive clinical and laboratory improvement

On the day of discharge

x-ray: osteolytic lesion of proximal humerus with exuberante periosteal reaction

Today: full recovery





Discussion/Conclusion

Neonatal osteomyelitis affecting the humerus can present as Erb palsy. It results from hematogenous spread and skin/umbilical sepsis are a predisposing factor.

The pathogenic mechanism could be nerve compression caused by soft tissue edema, or ischemic neuropathy arising from inflammatory involvement of the *vasa nervorum*.

Diagnosis is often difficult and delayed.

We suggest that such infection should be considered in every neonate with acute paralysis of the arm beyond the perinatal period. The most common microbial pathogens causing neonatal osteomyelitis are *S. aureus*, followed by group B Streptococcus and *E. coli*.

Septic Physeal Separation of Proximal femur in a Newborn

Case report: a 28-day newborn, female

28 days after birth

Admitted to paediatric surgery department for persistence of elevated temperature, chills, irritability and abdominal signs and symptoms. An inguinal hernia was reduced by a paediatric surgeon.

↓

After 3 days

For the persistence of clinical conditions abdominal X-Ray and Ultrasonography (US) were performed with evidence of abdominal occlusion: two surgical explorative laparoscopies was performed by a paediatric surgeon with no evidence of intestinal lesions and without clinical regression.

↓

After 6 days

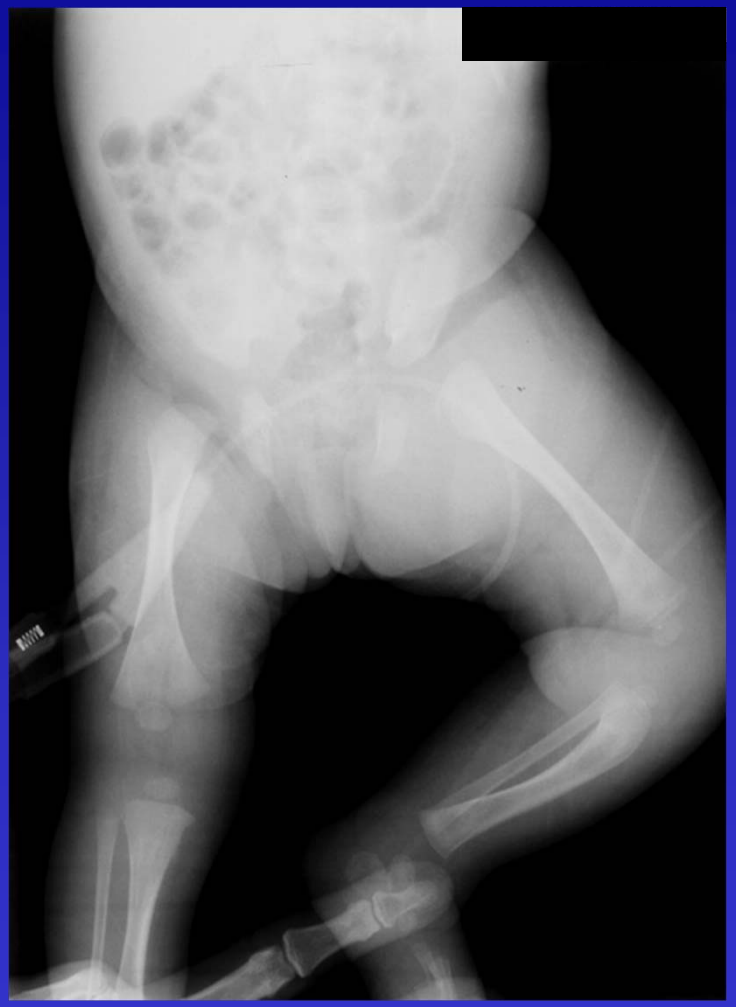
Persistence of elevated temperature. Left groin plica: onset of visible swelling extending to the posterior proximal thigh. On US evidence of hip endoarticular and periarticular liquid collection.

↓

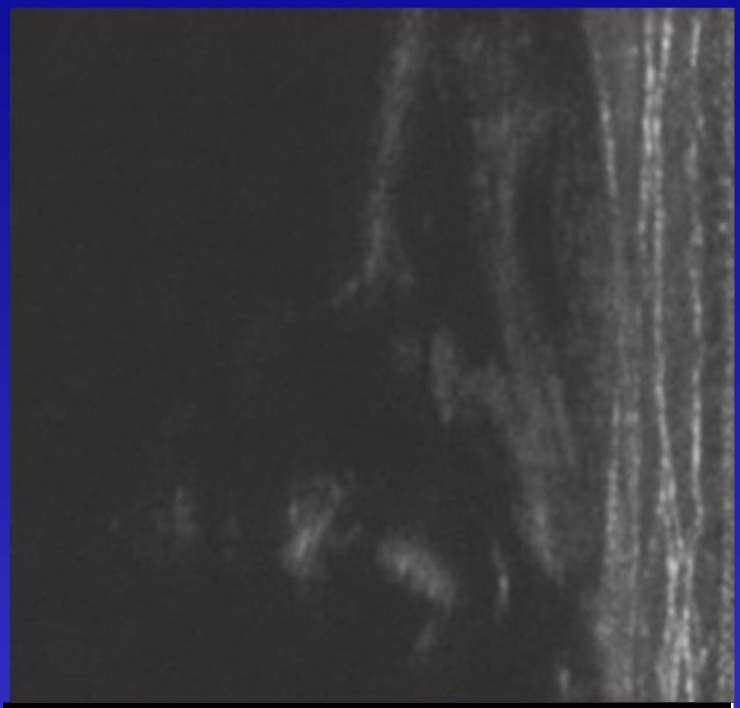
After 8 days

Persistence of elevated temperature: a needle drainage performed by a paediatric surgeon evidenced the presence of pus. After drainage a partial remission of symptoms was seen. Antibiotic therapy for S.Aureus was started.

First X-Ray and Ultrasonography



3 days after admission X-Ray



Both imagines not correctly done

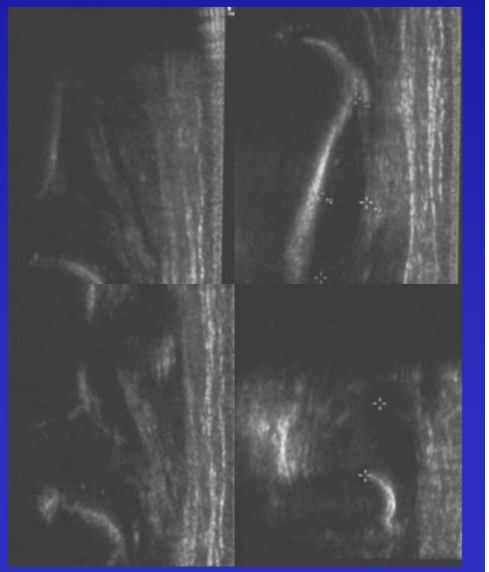
6 days after admission Ultrasonography

Orthopaedic evaluation:

New X-Ray and US with proper pelvis position under direct orthopaedic supervision

Proper Pelvis position X-Ray:
(position held by an orthopaedic surgeon)
dislocation of the femoral head

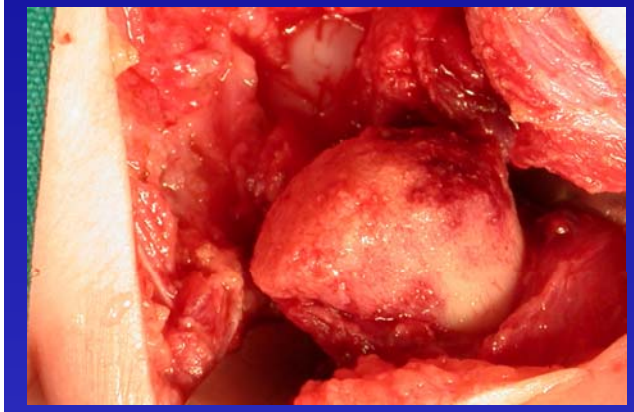
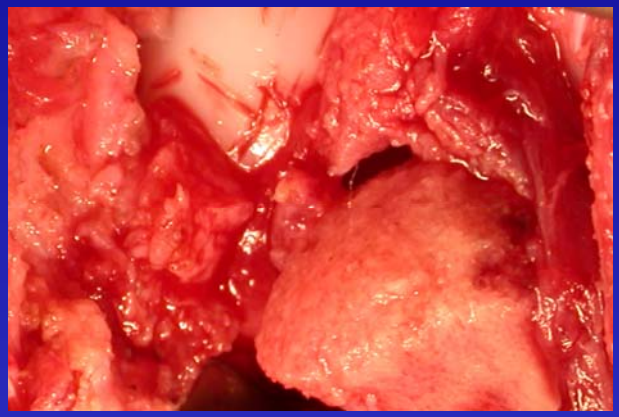
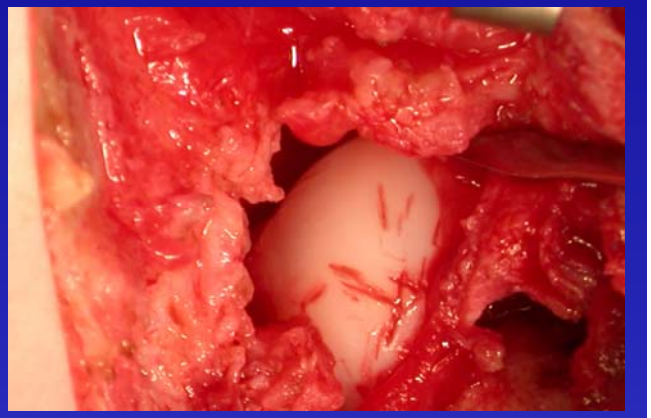
Proper US scanning:
(US performed by an orthopaedic surgeon)
periarticular and proximal parostal femoral shaft liquid collection, indefinable morphology of the hip



After Orthopaedic evaluation and new imaging in correct position a diagnosis of septic arthritis with consequent hip dislocation was formulated (as represented) and surgical open drainage was indicated. Imaging was thought to be sufficient.

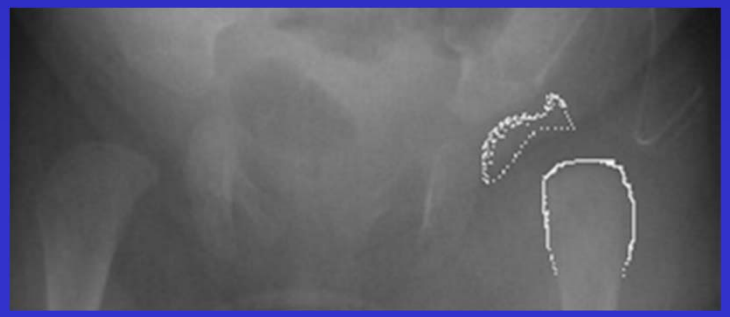
Open surgical drainage

Performed by an orthopaedic surgeon 10 days after admission

Only at the time of surgery was it possible to achieve the correct diagnosis: a physeal separation between the epiphysio-trochanteric nucleus and the femoral shaft was discovered. Hip joint, on the contrary, was clear.

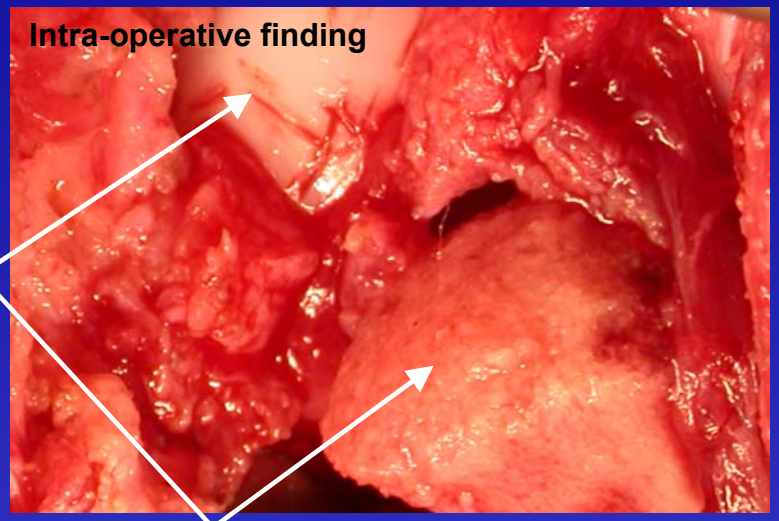
Supposed diagnosis

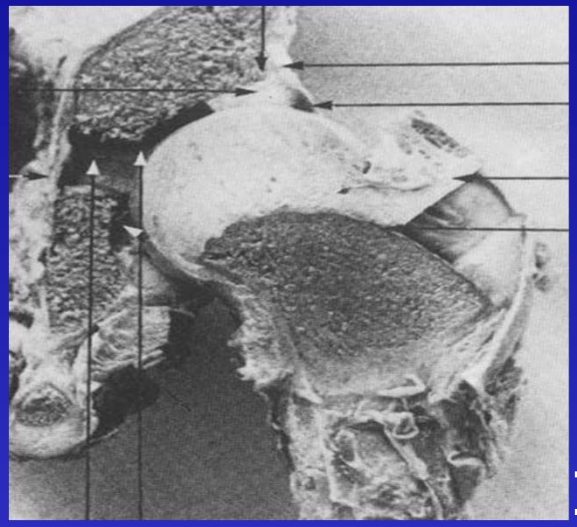


Intra-operative correct diagnosis

Septic physeal separation

Between the epiphysio-trochanteric nucleus and the femoral shaft

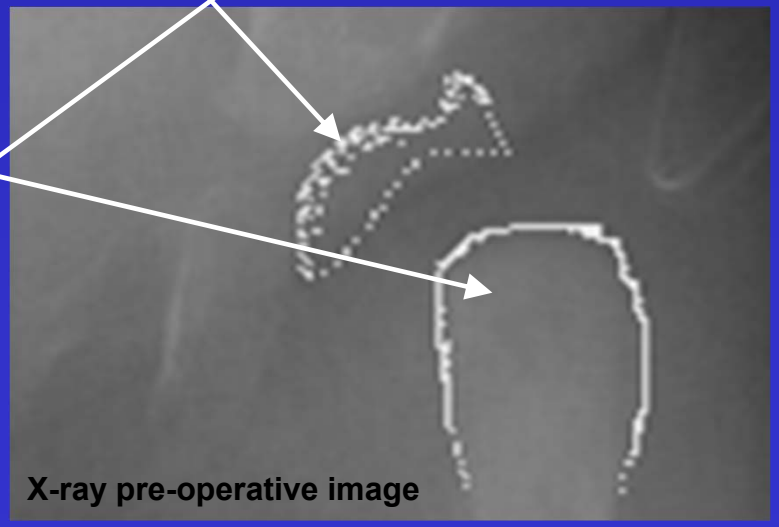


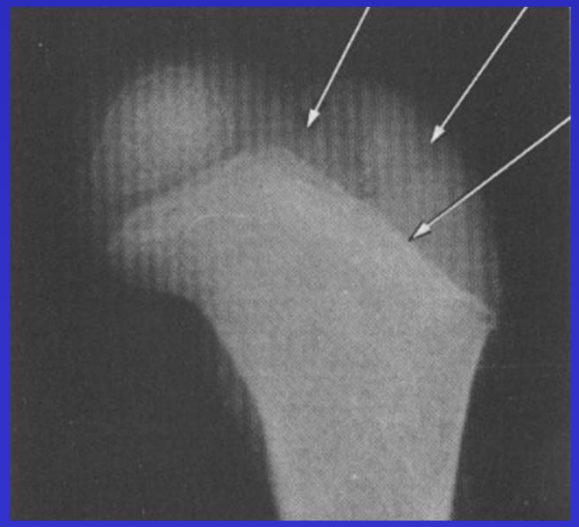


Normal

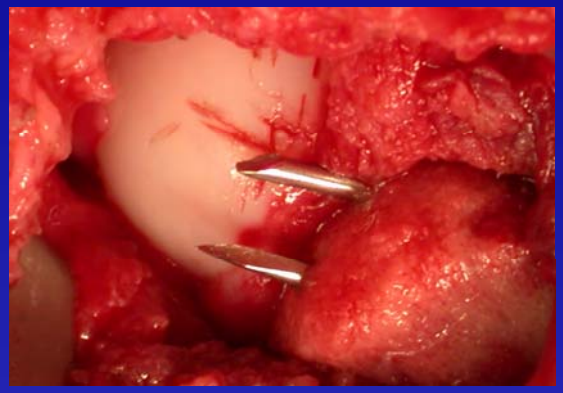
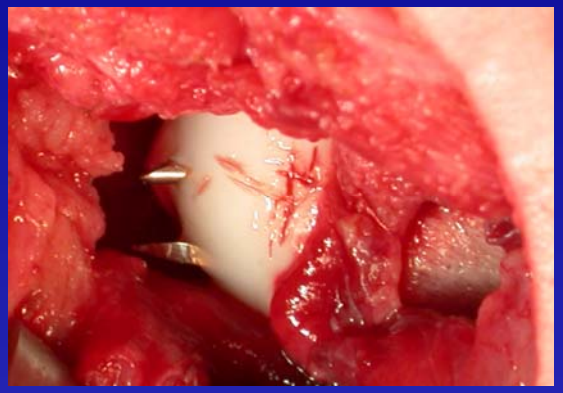
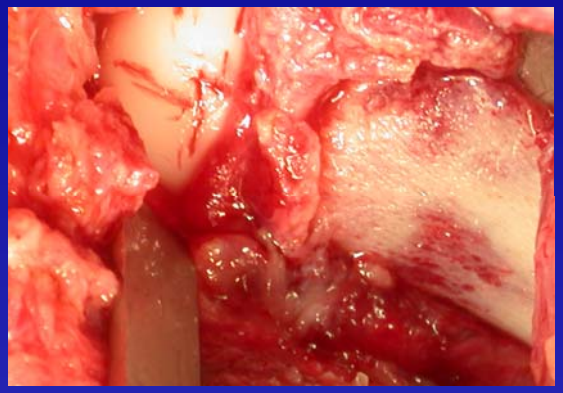
Epiphysio-trochanteric nucleus

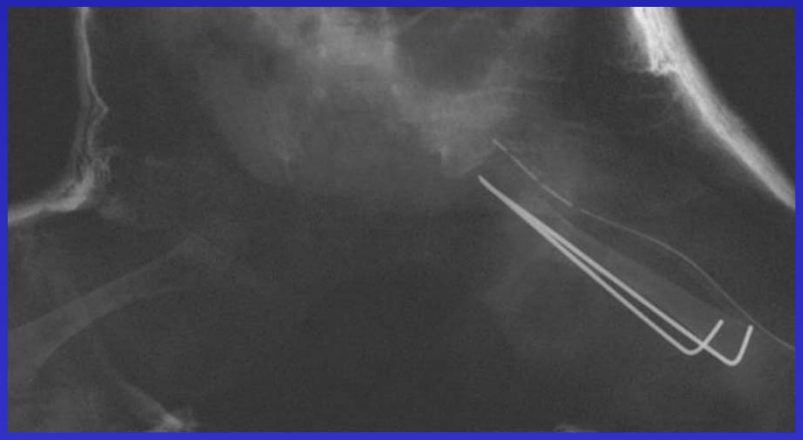
Femoral shaft





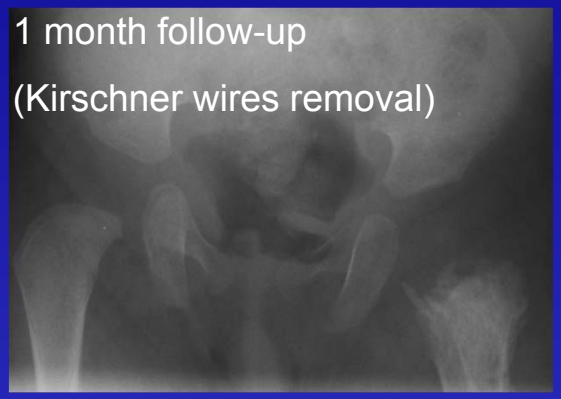
Surgery

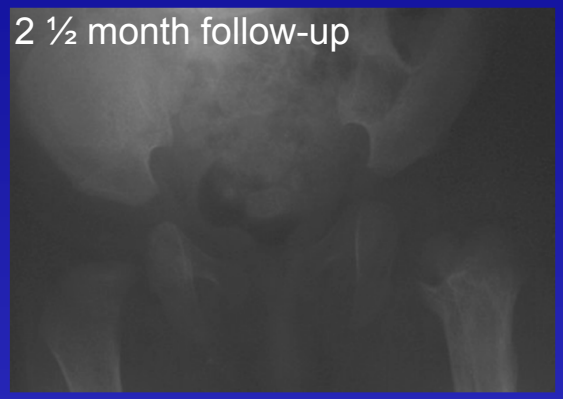




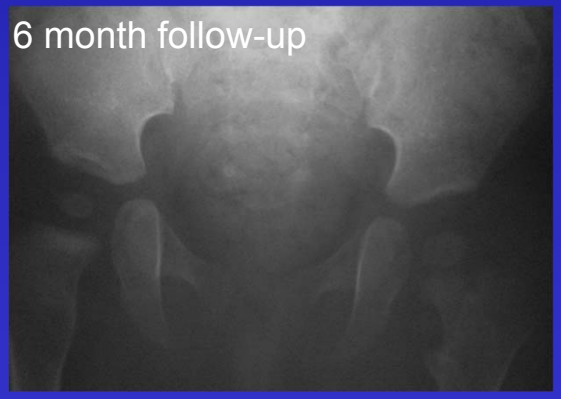


Surgical procedure: open drainage; reduction between the epiphysio-trochanteric nucleus and the femoral shaft; stabilization with Kirschner wires.

Follow-up







A F/U at 4 years of age, showed an asymptomatic patient who was able to walk and run. The two hip joint were symmetric with respect to both X-ray imaging and range of motion.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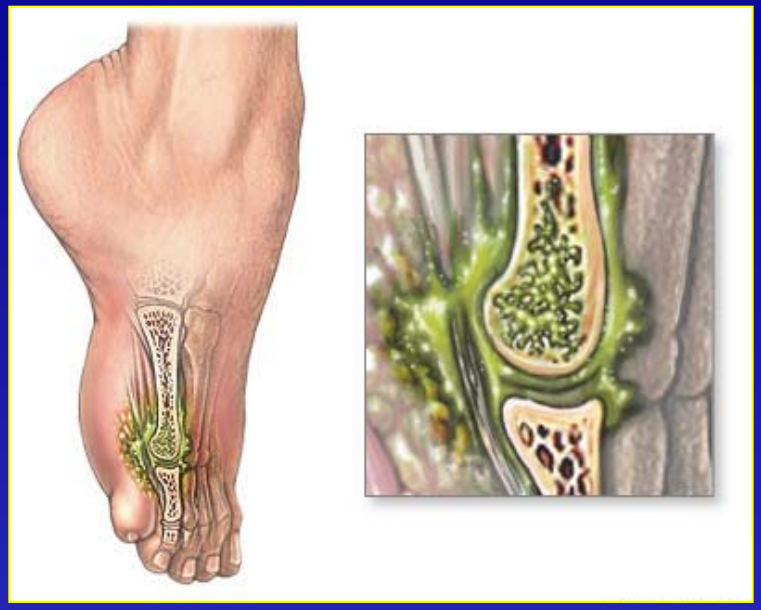


THANKS