Leg length difference

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LEG length difference

Children ⇔ Adults

Growth
Remodelation capability Congenital anomalies

Children- Etiology

Primary **Congenital**:

- Proximal focal femoral deficiency
- Fibular hemimelia, congenital tummycle
- Tibial aplasia
- Hypoplasia in PEC
- Coxa vara congenita
- VDK
- Anisomelia- hemihypertrophy, hyper/hypotrophy of one limb
- Myelomeningocele

Children- etiology

Secondary **Acquired**:

- Septic inflammation
- Rheumatoid arthritis
- Aseptic Necrosis (M. Perthes)
- Coxa vara adolescentium
- Trauma
- DMO, poliomyelitis
- Hemartros in haemophilia

Children- etiology

- **Tumours:** malignant and benign + consequences of treatment- irradiation, surgery
- **Exostosis, bone cysts**- damage to the epiphysis, consequences of therapy
- Fibrous dysplasia, neurofibromatosis, enchondromatosis
- **Metabolic osteopathy:** chronic renal insufficiency, D-resistant rachitis

Examination

- standing examination, DKK axis, pelvic sloping, scoliosis, condition with calibrated ruler, knee position (abbreviation position)

- femoral shoretning - examination in hip and knee flexion in 90°flexion
-
- UM distance
- SM distance

X-ray DKK long format, integrated scale (orthoradiography, telerentgenography)

Examination

- **X- ray of pelvis**
- **Examination of movement - detection of contractors**
-
- **Functional abbreviation:**

Adductor contracture ➡ shortening of the limb
Contracture of abductors ➡ limb prolongetion
Flexion contracture ➡ shortening of the limb

Taillard's Orthorentgenograph

Length Prediction

- **Prediction of further growth-** prediction of total height of the figure, prediction of growth of the affected limb

Shapiro- divides defects according to the following development, **Moseley direct graph**

Knowledge of the growth of individual growth plates, changes during evolution

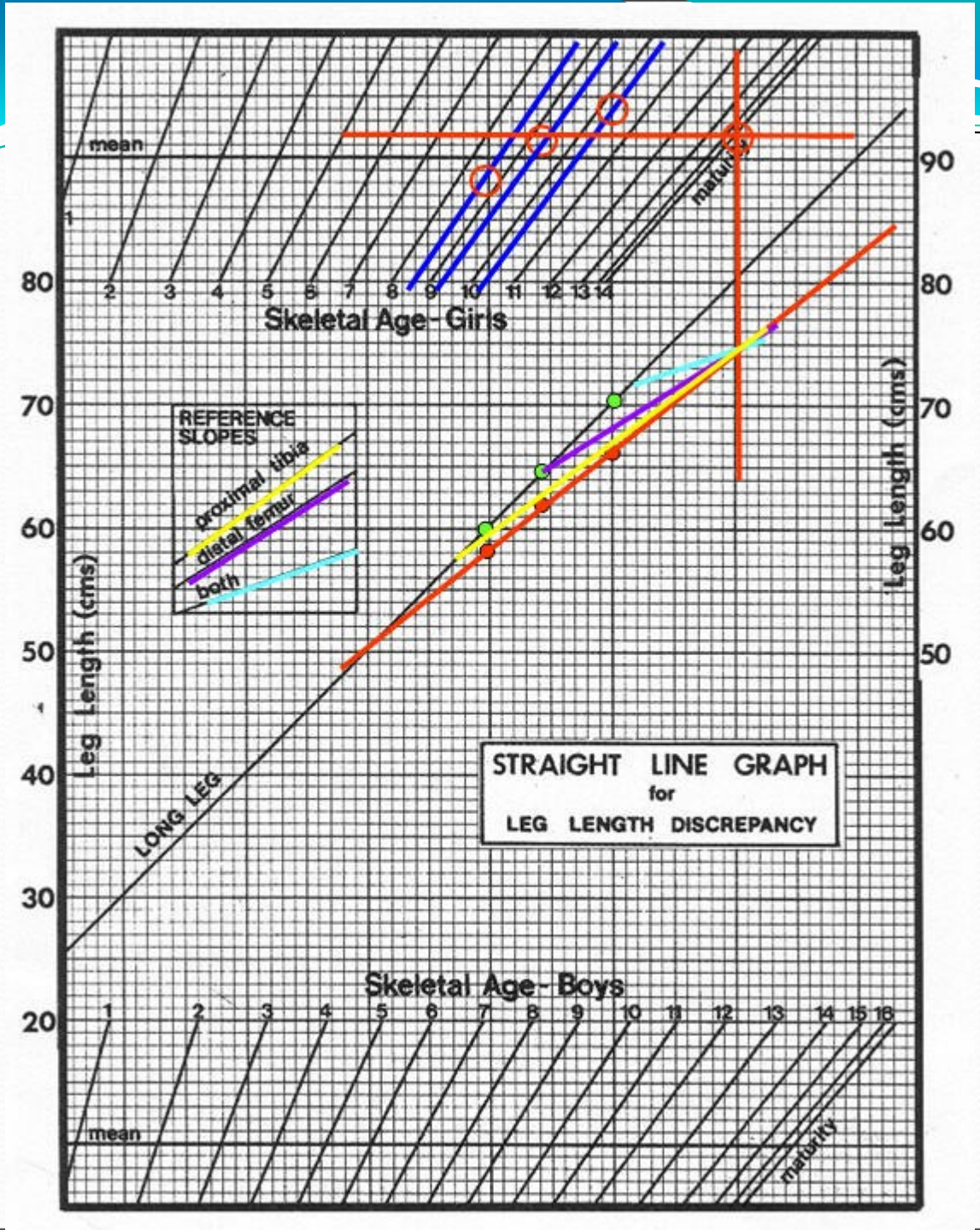
Femur: tibie 52:48

Greater growth rate of the physis around the knee

- Adolescent growth spurt

(limbs grow faster than the torso/thorax, then torso grows faster, thorax grows even more two years after the end of the limb growth)

- Bone age - X-ray wrists and hands



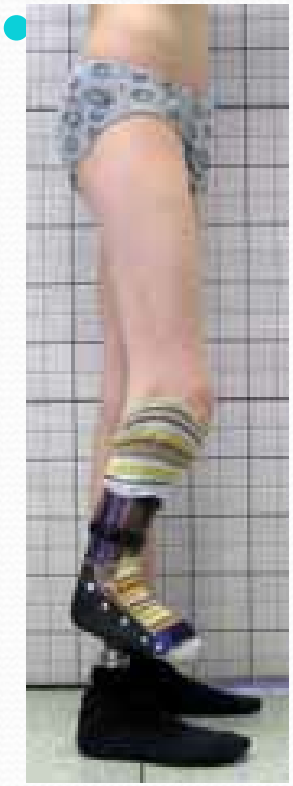
Moseley straight line graph

Conservative treatment

- No need for correction up to 2cm
- Serious violation of the stereotype of walking over 4cm
- Correction by half shoretning for shortening up to 4cm
- Correction over half abbreviation at abbreviation above 4 cm
- complete correction?
- < 1cm insert, > 1cm heel or full sole
- >7/ 8 cm is not possible to correct by adjusting shoes

Orthotic solution

- Individual prosthesis with artificial foot, KAFO (for large abbreviations)



- In severe congenital deformities- amputation and prosthesis

Surgical solutions

- Prolongation
- Gradual
- Demanding postoperative care - necessary cooperating patient
- Best before adolescence

- Shortening
- epiphyseasis (temporary/permanent)
- Less time-consuming postoperative care

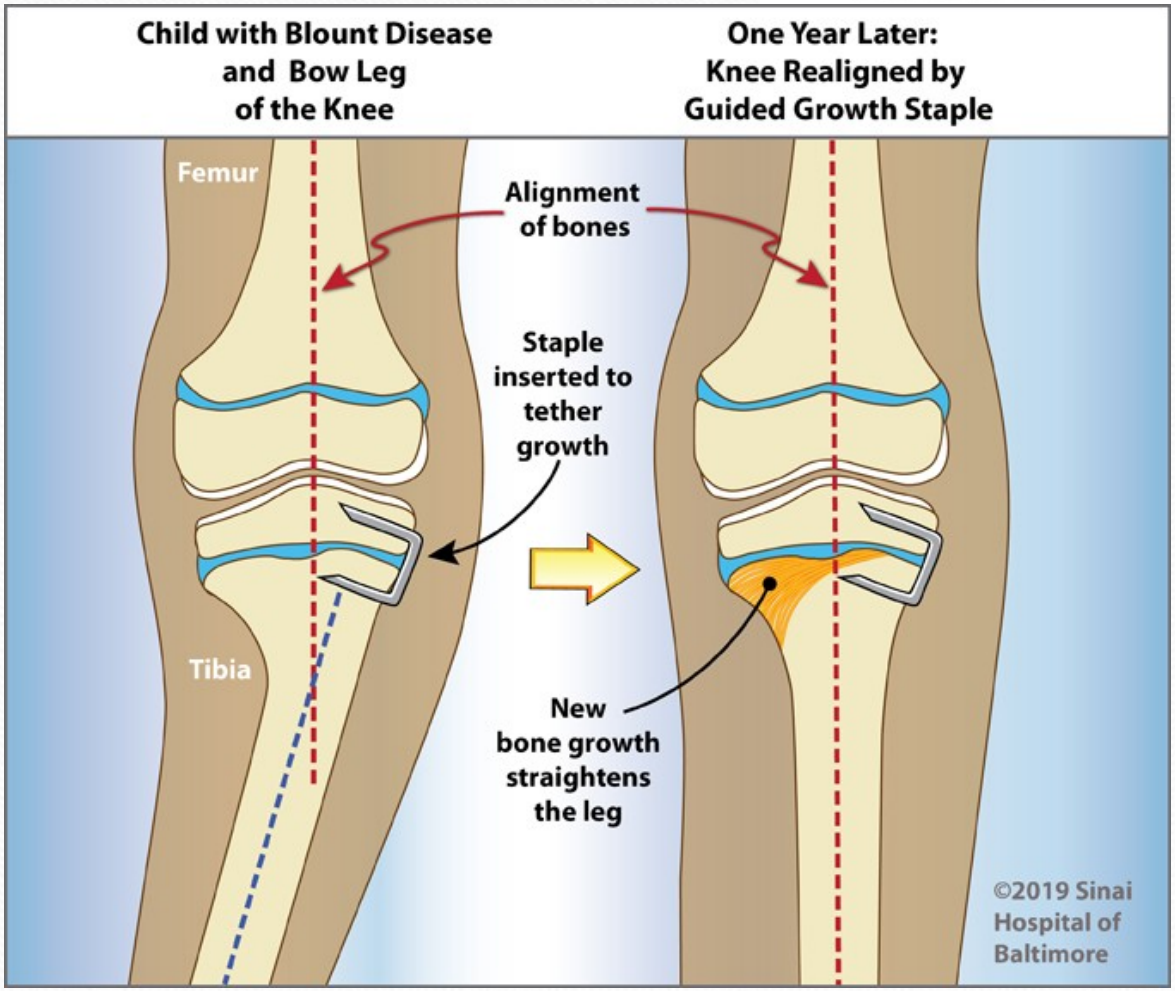
- **Combination of both for shortening over 15cm**

1. Shortening of the longer limb

- **Permanent epiphyseasis- Canale-** percutaneous epiphyseosis- drill 3.5-4.5 , so-called drilling epiphyseodesis
- **Temporal epiphyseasis- Blount-** using of **staples** through the physis (risk of asymmetric stop of growng, growth continues about 3-5mm)
- **One-time shortening,** shortening of femor according to Wagner, **Z** ostetomyof the shin

Most of the time, the distal physis of femor or proximal of tibia is treated. or both, if there are more than 3 years of growth left, prox should also be treated. fibula physis

Epiphyseodesis- Blount staples



One-time shortening of femor according to Wagner

2. Shorter leg prolongation

- Ilizarev-kalotaxis / **distraction ostegenesis**- autoregenerate in slow distraction to External Fixator

Distraction epiphyseolysis - distraction of the physis to EF- suitable only before the end of growth, there is a risk of physis grow

One-time prolongation - using an autologous graft from the iliac crist, extension up to 3 cm, numerous complications

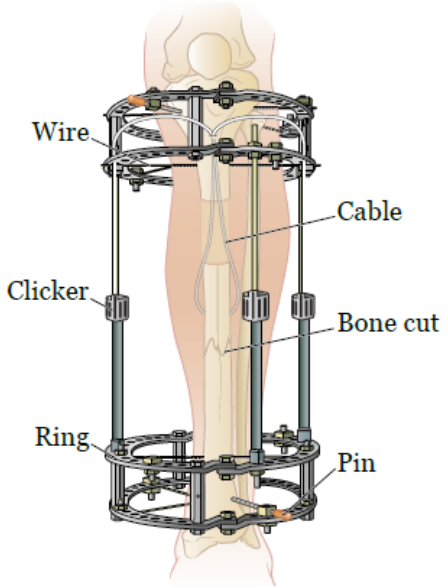
Prolongation by pelvic osteotomies, disadvantage is hip distalization

Bone interruption+ Distracton Osteogenesis

- Method of choice for shoretning over 4 cm
- **Corticotomy (compactomy)-** preservation of the central artery of the bone marrow, as little trauma as possible of periosteum, cold techniques- open x percutaneous

- Distractation using the External Fixator

- Starting callus distraction after 5-12 days

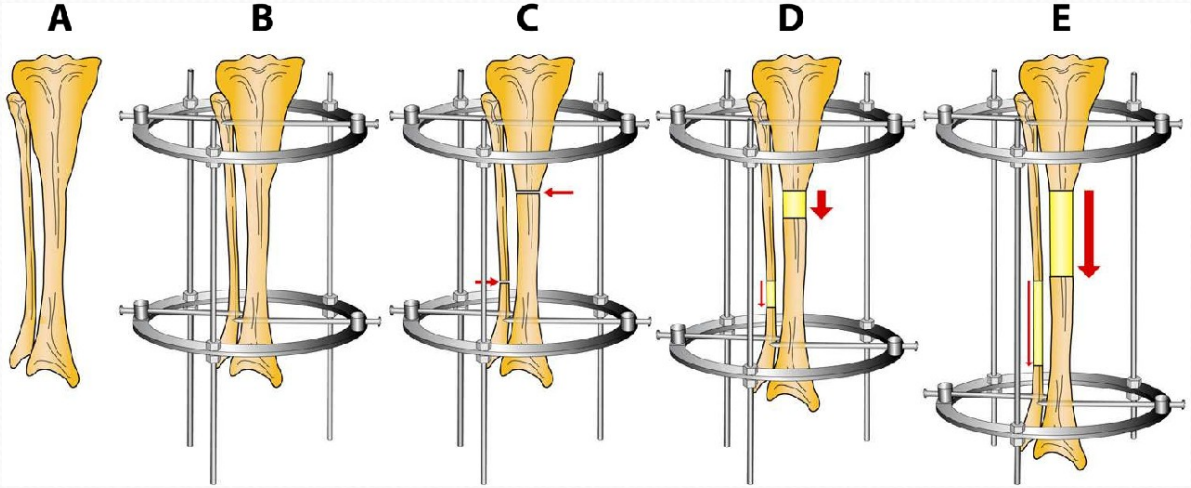


Distracton Osteogenesis

- Lenghtening speed 1 mm/24 hours (4x 0.25mm)

Healing index – bone consolidation time, twice the lengthening time, 30 days/cm,

then it is possible to remove the external fixator

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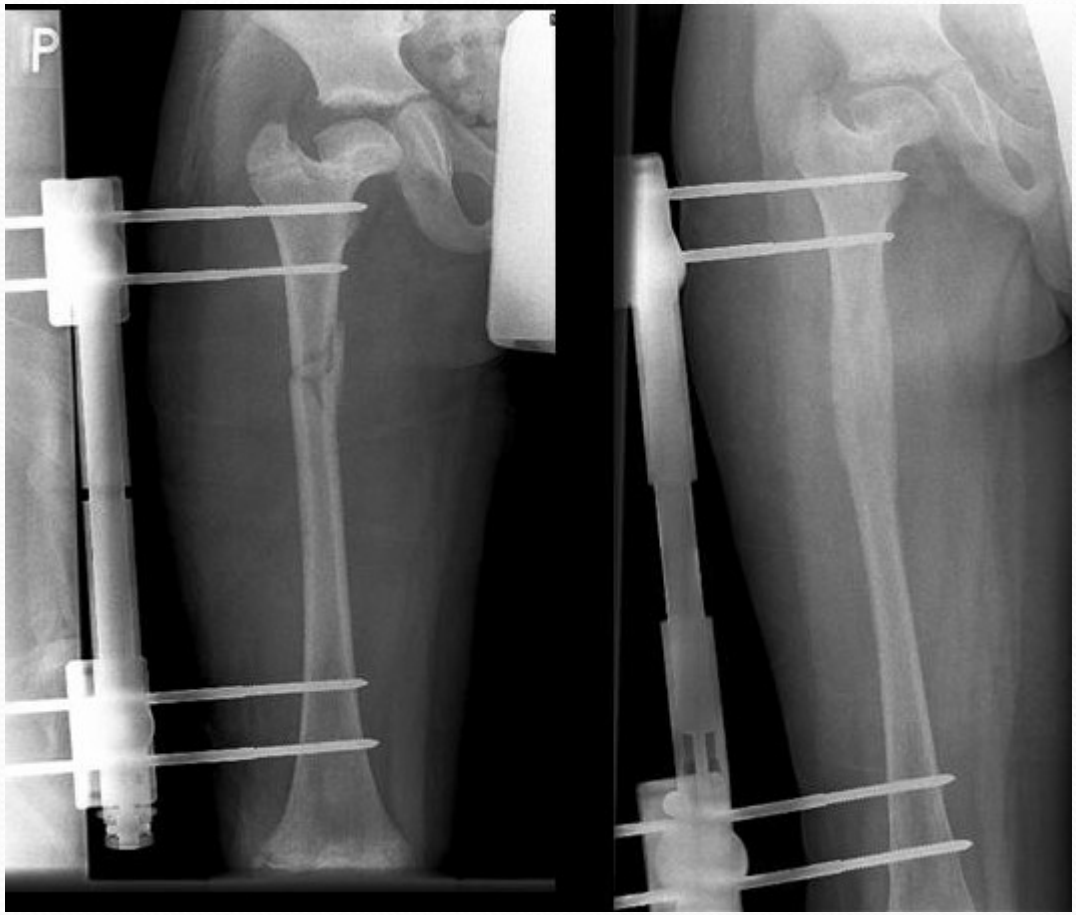
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Specific complications

- **Incomplete corticotomy**
- **Early consolidation** of the regenerate
- **Poor regenerate formation** (it is harder to form a regenerate in a place with a smaller soft tissue cover- typically the anterior edge of the tibia)

- **Subluxation of joints** (in the case of dysplatic hip it is necessary to solve the roofing of the acetabulum before prolongation)

- **Neurological disorders**- nerve dragging

- **Pin track infection**

- **Fracture,** bending of the regenerate after removing of External Fixator

- **Premature closure of the growth** of otherwise normal growth plates (increased pressure, hyperemia)

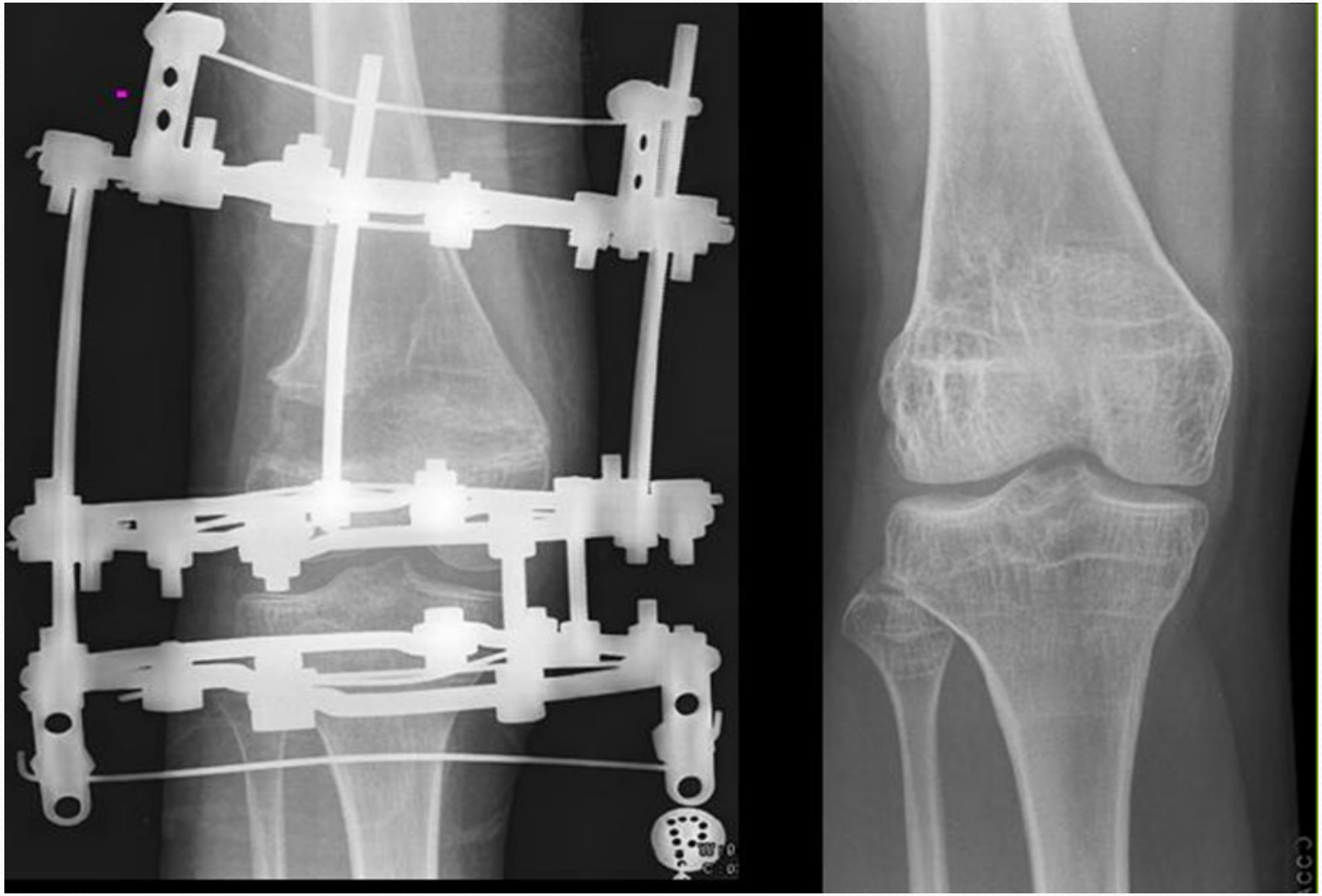
- **Psychological problems** - long duration of therapy, pain, hardship

Shortening due to the bone bridge of the epiphysis after trauma

- Peripheral x Central bony bridge
- Therapy according to the extent of the bridge

1. Distraction epiphyseolysis with the assumption of disruption of the bridge
2. Removing the bridge by the surgery

Distraction epiphyseolysis asymmetrical with bone bridge disruption



Adult leg lenght dyscrepancy- etiology

- Persistent from childhood
- Trauma - healing in shoretning
- Tumours and oncological therapy
- Artrosis - coxartrosis
- Aseptic hip necrosis
- St.p. TJR

Conservative therapy

- **No correction up to 2 cm required**

  < 1cm insert, > 1cm heel or full sole
- (levelling 1/2 - 3/4 difference, body torso compensation check)
- **>7/ 8 cm is not possible to correct by adjusting shoes**

Surgical therapy

Two main options:

- **One-time shortening OT**

- **Limb prolongation –** single stage surgery / gradual

Single stage shortening osteotomy

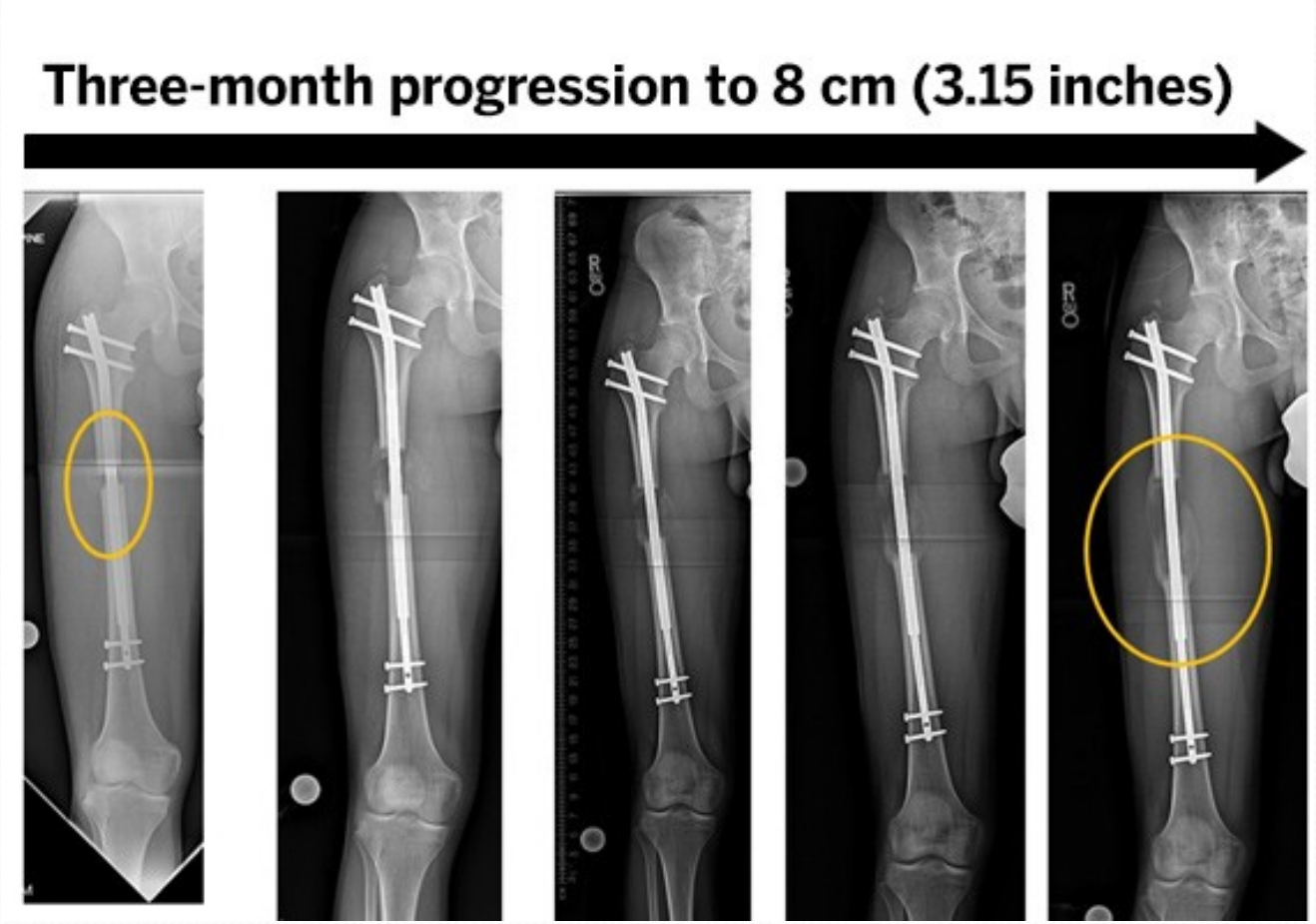
- Correction of shortening of 6-8cm

- Resection of a segment in full bone width
- Metaphysis part of long bones

- **Resected segment < 3cm, splint fixation**
- Full weight bearing after 6 weeks
- Resected bone can be used for single lenghtening the contralateral lower limb

Limb prolongation –

single stage surgery / gradual



Thank you for the attention