

Angular Deformities of the limb

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Angular deformities

- Angular deformities of LL:
 - Bowlegs.
 - Knock knees
 - Coxa Vara
 - Congenital Pseudoarthrosis

Knee Angular Deformities: Nomenclature

Bowlegs



Genu Varus

Knock knees



Genu Valgus

Normal Angular development of the knee



Knee Angular Deformities Evaluation

Should differentiate between
“physiologic” and **“pathologic”**
deformities

Knee Angular Deformities Evaluation

Physiologic

- Symmetrical
- Mild – moderate
- Not progressive
- Generalized
- Expected for age

Pathologic

- Asymmetrical
- Severe
- Progressive
- Localized
- Not expected for age

Knee Angular Deformities

Causes

Physiologic

- Normal – for age
- Exaggerated :
 - Overweight
 - Early wt. bearing
 - Use of walker?

Pathologic

- Rickets
- Endocrine disturbance
- Metabolic diseases
- Injury to Epiphysis. Plate Infection / Trauma
- Idiopathic

Angular Deformities Evaluation

Symmetrical deformity



Angular Deformities Evaluation

Asymmetrical Deformity



Knee Angular Deformities Evaluation

Generalized deformity



Knee Angular Deformities Evaluation

Localized deformity



Blount's



Knee Angular Deformities Evaluation

Localized deformity



Rickets



Knee Angular Deformities Evaluation

Indirect Measurement of Angulation

In Genu Varum:
Measure the
intercondylar distance
(Double headed arrow)



Knee Angular Deformities Evaluation

Indirect Measurement of Angulation

In Genu Valgum:

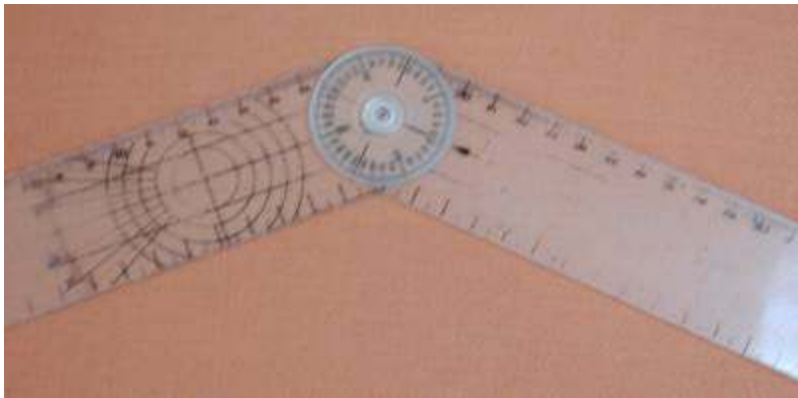
Measure the inter-Malleolar distance (Double headed arrow)



Knee Angular Deformities Evaluation

Direct Measurement of Angulation

Use goniometer to measure the tibiofemoral angle



Knee Angular Deformities Evaluation

Investigations

- X-rays (Knees, Wrists)
- Serum Calcium / Phosphorous
- Serum Alkaline Phosphatase
- Serum Creatinine / Urea – Renal function

Knee Angular Deformities Evaluation

X-ray when severe or possibly pathologic

- **Standing AP film**
 - long film (hips to ankles) with patellae directed forwards
- **Look for signs of diseases :**
 - Rickets / Tibia vara (Blount's) / Epiphyseal injury..
 - Measure angles.

Coxa Vara

- Defined as any neck-shaft angle below 120 degrees
- Three major types:
 - i. congenital,
 - ii. acquired
 - iii. developmental

Congenital Coxa Vara

- Present at birth
- assumed to be caused by an embryonic limb bud abnormality
- significant varus deformity at birth but minimum progression during growth
- A common cause is proximal femoral focal deficiency

Developmental Coxa Vara

- Also called cervical or infantile coxa vara
- Coxa vara not present at birth but develops in early childhood, producing a progressive deterioration of neck-shaft angle during growth.
- No significant associated musculo-skeletal anomalies

Acquired Coxa Vara

- Secondary to an underlying metabolic disease, tumors, or trauma like:
 - i. rickets,
 - ii. fibrous dysplasia, or early
 - iii. traumatic proximal femoral epiphyseal plate closure



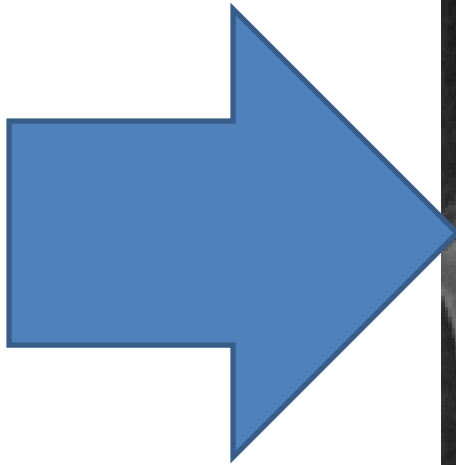
Clinical Presentation

- Usually less than 6 years old
- Most frequent complaint is progressive gait abnormality
- Abductor muscles weaknesses lead to positive Trendelenburg test
- Bilateral involvement: Waddling gait & increased lumbar lordosis
- Pain is rare

Clinical Presentation (contd)

- Examination reveals a prominent & elevated greater trochanter.
- Weak abductor muscles: positive Trendelenburg test
- limb length inequality in unilateral cases
- Range of hip motion restricted in all planes of motion

Coxa vara



Radiographic Findings

- Neck-shaft angle < 90 degree.
- More vertical position of physeal plate as measured by:
- Hilgenreiner - physeal angle is between 40 and 70 degrees
- Normally < 25 degrees



Natural History

- The determining factor for progression of the varus deformity is the Hilgenreiner-physeal angle
- if greater than 45 deg. -> It progresses

Treatment

- Correction of varus angulation
- change shear loading to compression
- correction of limb length inequality
- reestablishment of proper abductor length-tension relation

Non-operative Treatments

Includes

- Hip spica cast
- Skeletal traction & bed rest.
- All are associated with poor results

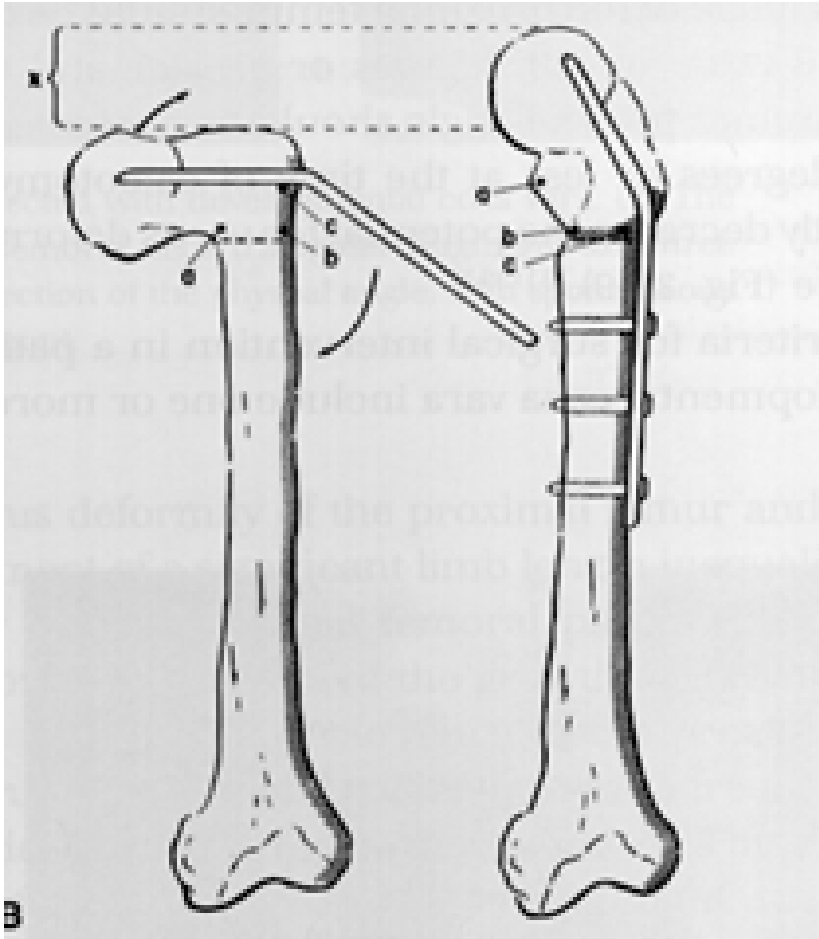
Criteria for surgery

- Hilgenreiner physeal angle is >45 deg.
- Neck-shaft angle <90 deg.
- Patient developed a Trendelenburg gait
- Corrective osteotomy is best performed not at a particular age, but as soon as the criteria for surgical intervention are apparent

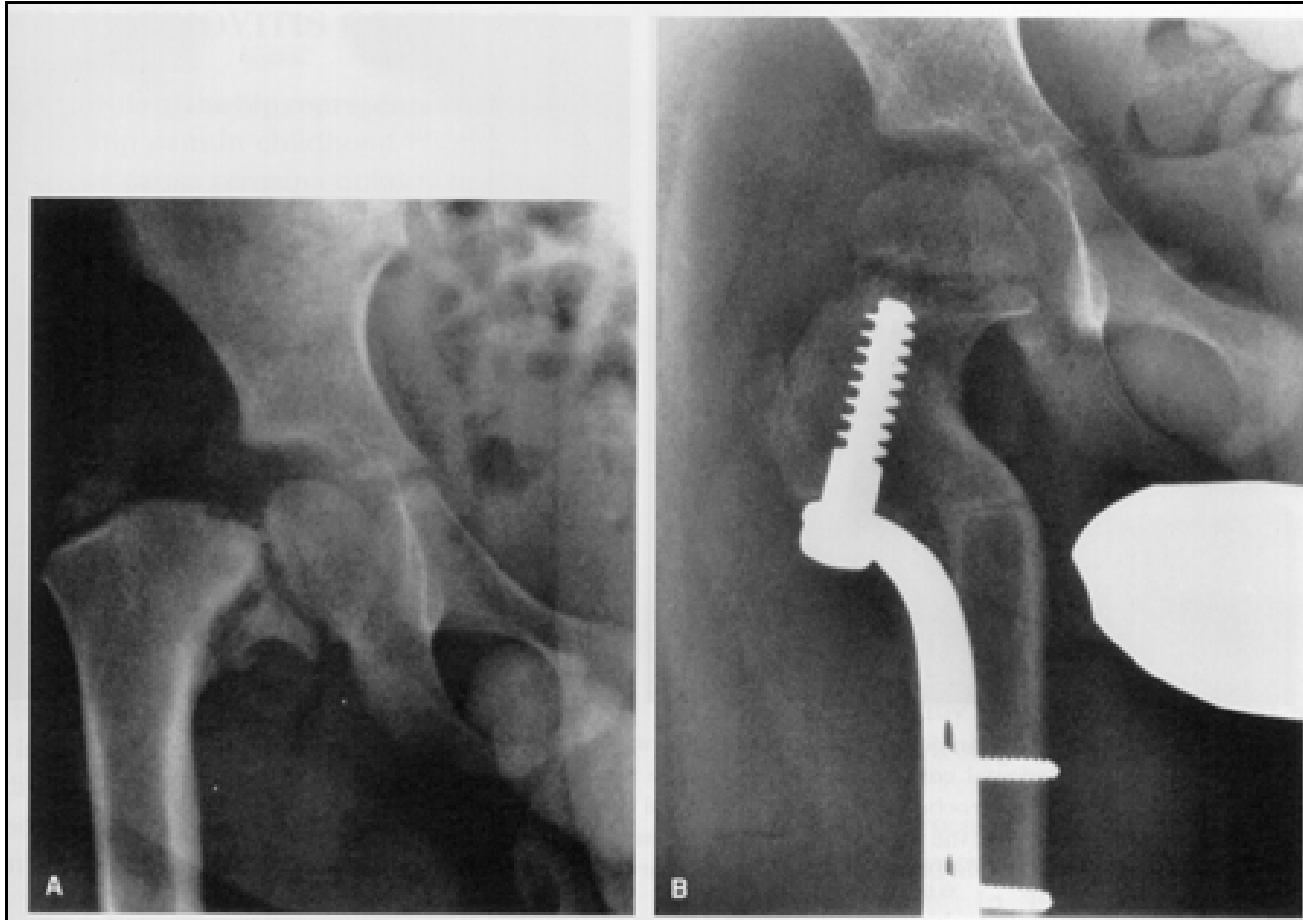
Surgical Treatment

- Derotational osteotomy to restore normal neck-shaft angle is the most effective treatment.
- It restores hip joint mechanics
- Site is either the intertrochanteric or subtrochanteric regions

Derotational osteotomy



Derotational osteotomy 2



Congenital Pseudoarthrosis: Overview

- Congenital Pseudoarthrosis: Common sites
 - Tibial
 - Fibular
 - Clavicular

Pseudarthroses: General

- Definition: neoarthrosis with synovial-like lining and sometimes joint fluid
- Movement present across pseudoarthrosis
- Wide gap on x-ray
- Surgery is only treatment



Congenital Pseudarthrosis of the Tibia (CPT)

- Most common congenital pseudoarthrosis
- But (fortunately rare) : 1/190,000 of population.
- Has been called one of the greatest challenges of orthopedics
- Abnormal tibia at birth
 - Anterolateral bowing clinically
 - Sclerosis, cysts, tapering bone on x-ray
- Pseudarthrosis may not be present at birth



Congenital Pseudarthrosis of the Tibia : General

- 55% associated with Neurofibromatosis
- Also associated with:
 - Fibrous dysplasia
 - Ehlers Danlos syndrome
 - Constriction banding syndrome
- 45% have no underlying disorder

Congenital Pseudarthrosis of the Tibia : General

- Equal incidence in males and females
- Right=Left
- Bilateral= rare
- Differs from genu varum:
 - Unilateral
 - Apex of bow is distal to the knee

Congenital Pseudarthrosis of the Tibia : General

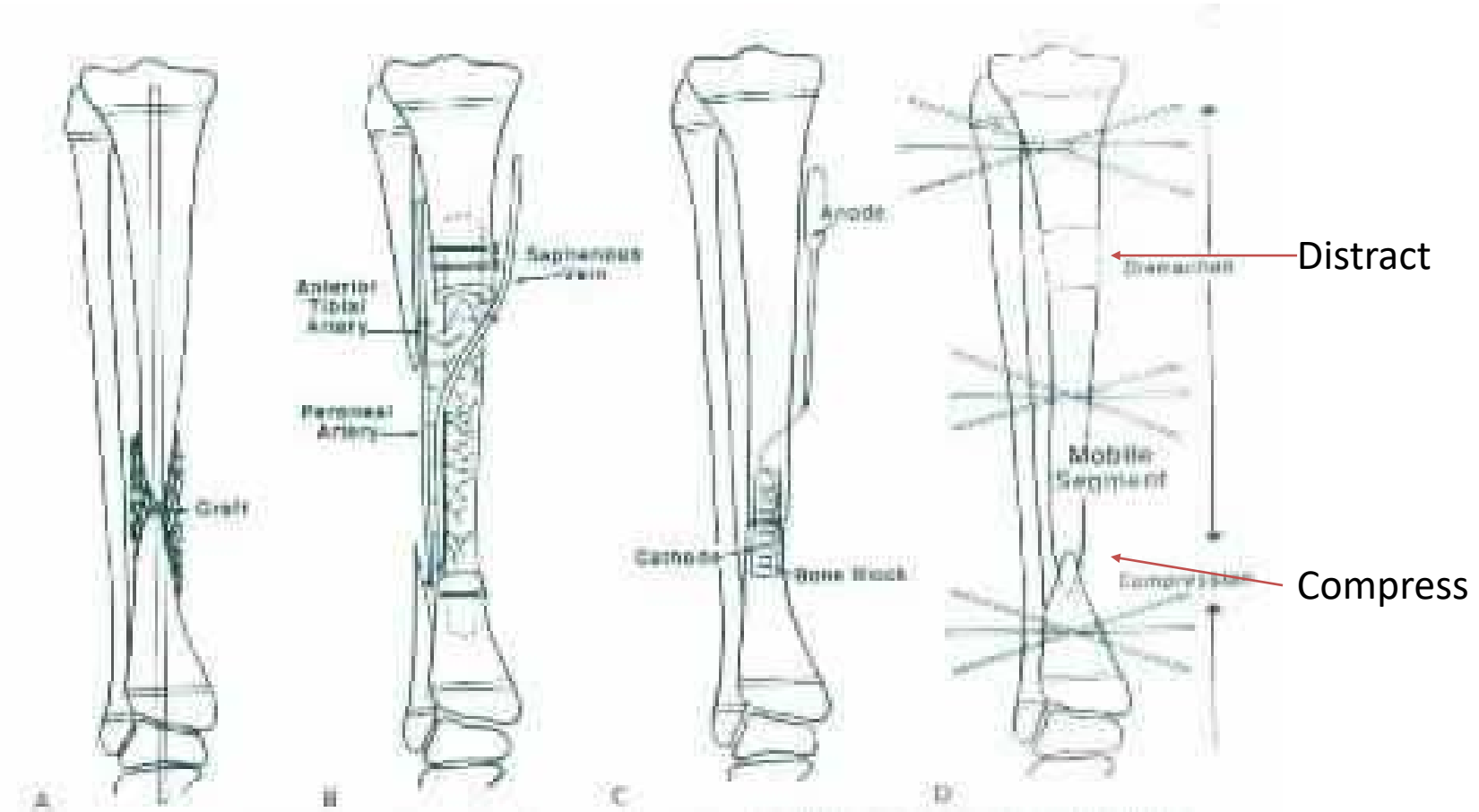


- Abnormal bone leads to pathologic fracture
- Usually fractures by 2-3 years old
- **Fractures do not unite**, rather, they lead to pseudarthroses

Congenital Pseudarthrosis of the Tibia : Natural History

- Will not heal spontaneously
- Treatment response improves near puberty
- Goals of Treatment:
 - 1) achieve union 3) correct angulation
 - 2) prevent refracture 4) equalize leg lengths
- Tend to recur
- Only at skeletal maturity can result be considered final

CPT: Fracture Treatment



Coleman
Osteosynthesis

Free fibular
graft

Electrical
Stimulation

Ilizarov

CPT: Treatment

- Amputation
 - Consider as an option if surgical techniques fail to consolidate fracture
 - Consider in consolidation with unsatisfactory outcome

CPT: Outcome

- Amputation in 5% of all series
- Often multiple surgeries required
- Complications: severe angulation, shortening, ankle stiffness
- After union, bracing and sports restriction until maturity
- Treat limb length discrepancy $>2\text{cm}$

The End



Thank You