

# Cong. Tibial angulation

Freih Odeh Abu Hassan

F.R.C.S.(Eng.), F.R.C.S.(Tr.&Orth.)

Professor of Orthopaedics

# University of Jordan



Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

1/9/2011

2

WEB SHOTS



1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

# 1 - Associated with other anomalies



## Rickets

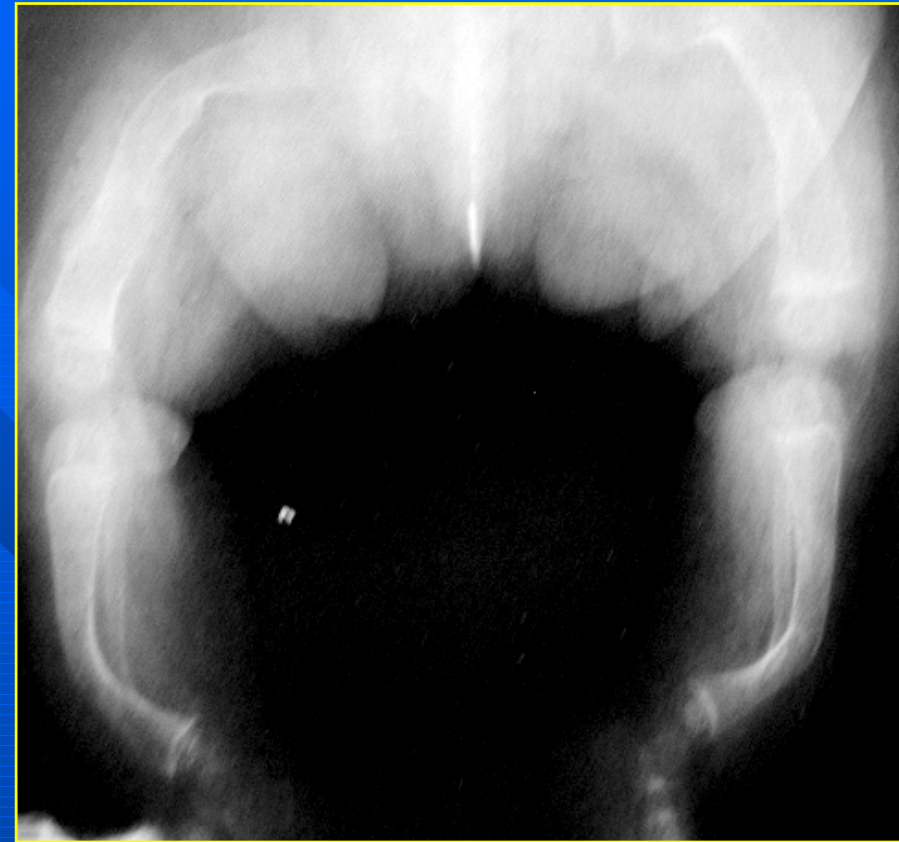
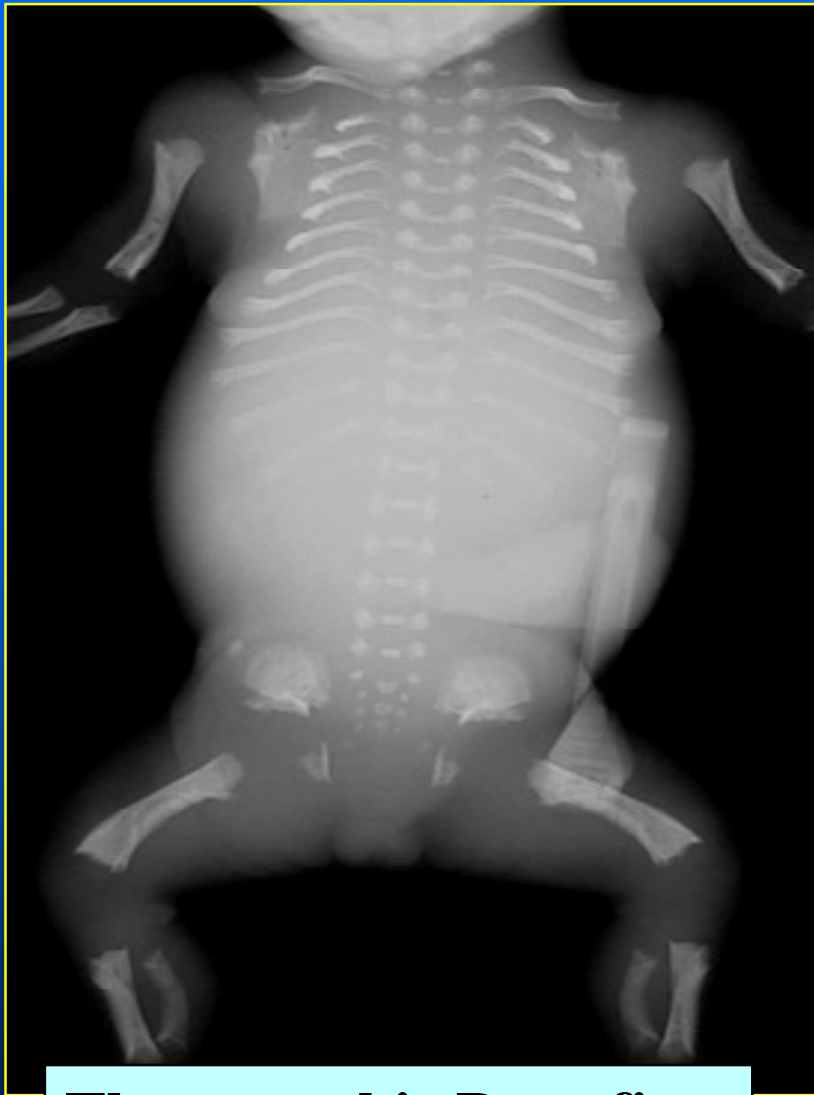
Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

1/9/2011

4



# O. imperfecta



**Thanatrophic Dwarfism**



# Campomelic syndrome

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

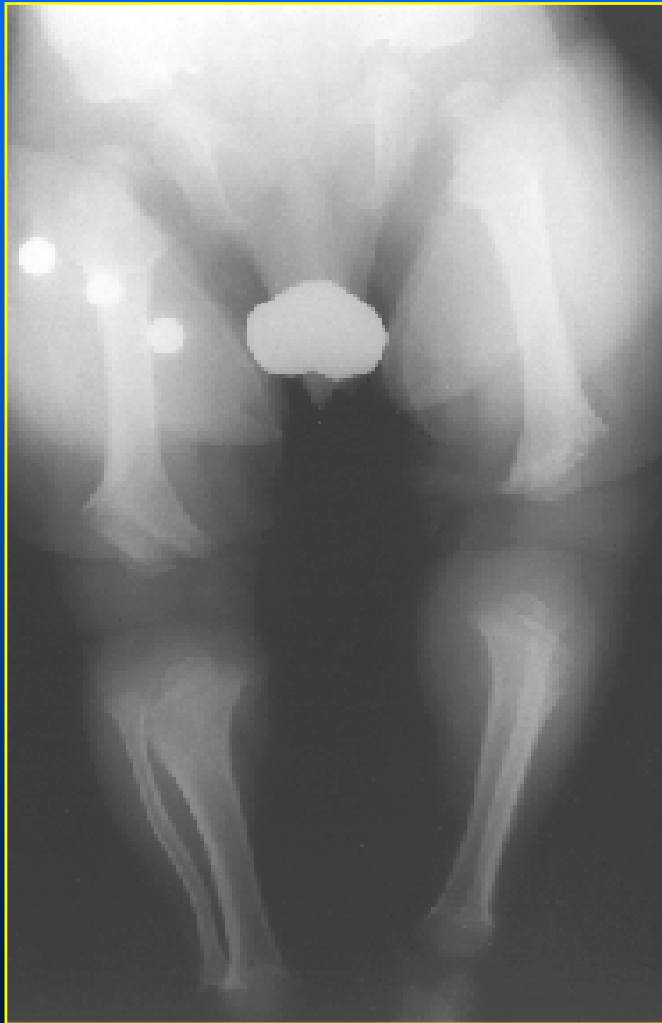
1/9/2011

6

# Metaphyseal dysplasia



# Achondroplasia







1/9/2011

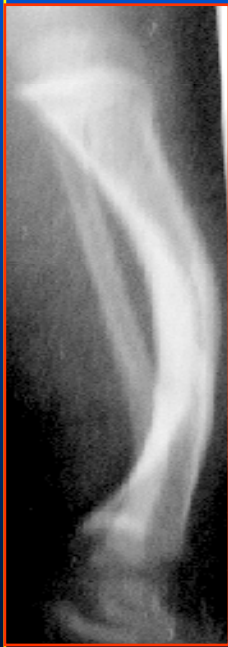
Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

# 2- Isolated Cong. tibial angulation

**A-Cong. Posteromedial angulation**

**of the T&F - Kyphosis**

*Calcaneo valgus foot.*



**B-Cong. Anteriolateral**

**ang. of the T&F - Lordosis.**

*Calcaneo varus foot*

**C- Cong. Anteriolateral  
angul. of the tibia alone**

**D- Cong. Pseudoarthrosis**

**E- FFC dysplasia.**

**F- Fibular hemimelia**

# A- Posteromedial ang. of T & F

Post. & medial angulation between  
middle and distal 1/3 of T& F

**1= !! Unknown intrauterine #.**

**2= Developing failure in embryonic  
period in distal tibial physis.**

**3= Intrauterine malposition.**

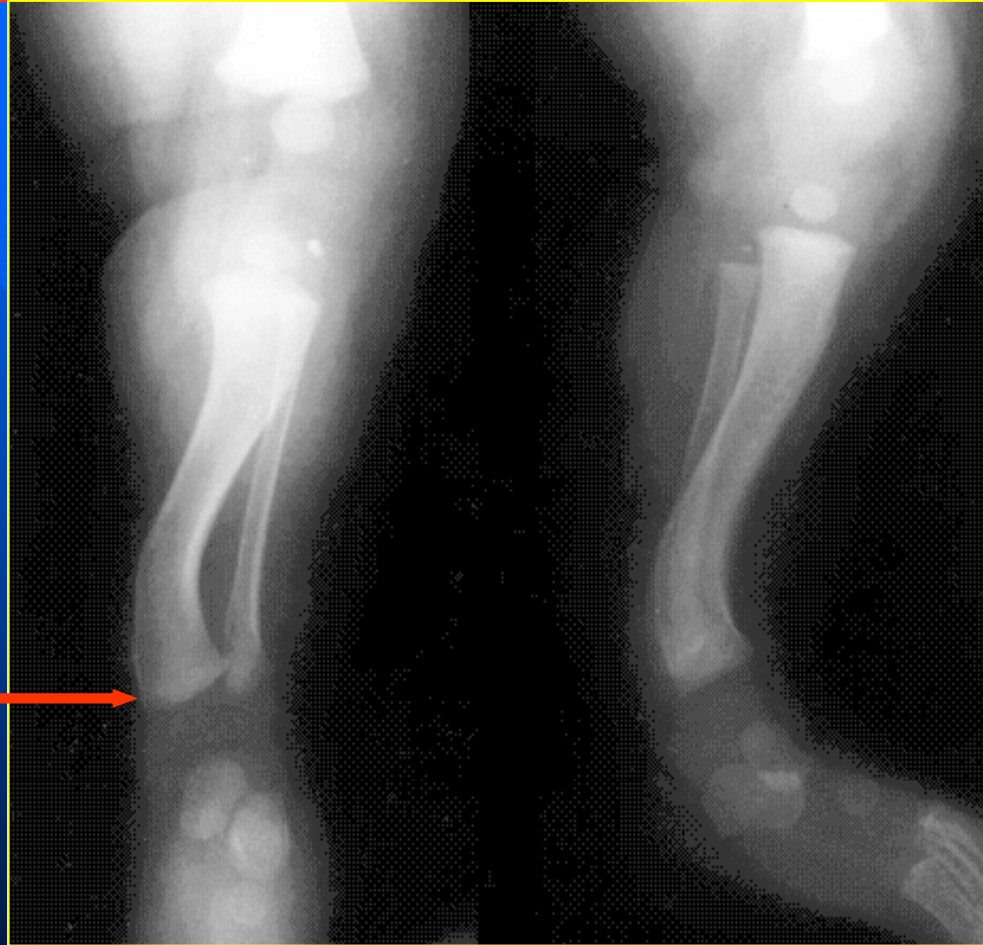


= Angulation → 25-65 degrees.

= Tibial and fibular shortening,

= 12% LLD at maturity: 4.1cm  
( 2-7cm).

## Shortening due to inhibition of growth & development at distal tibial epiphysis



# At birth



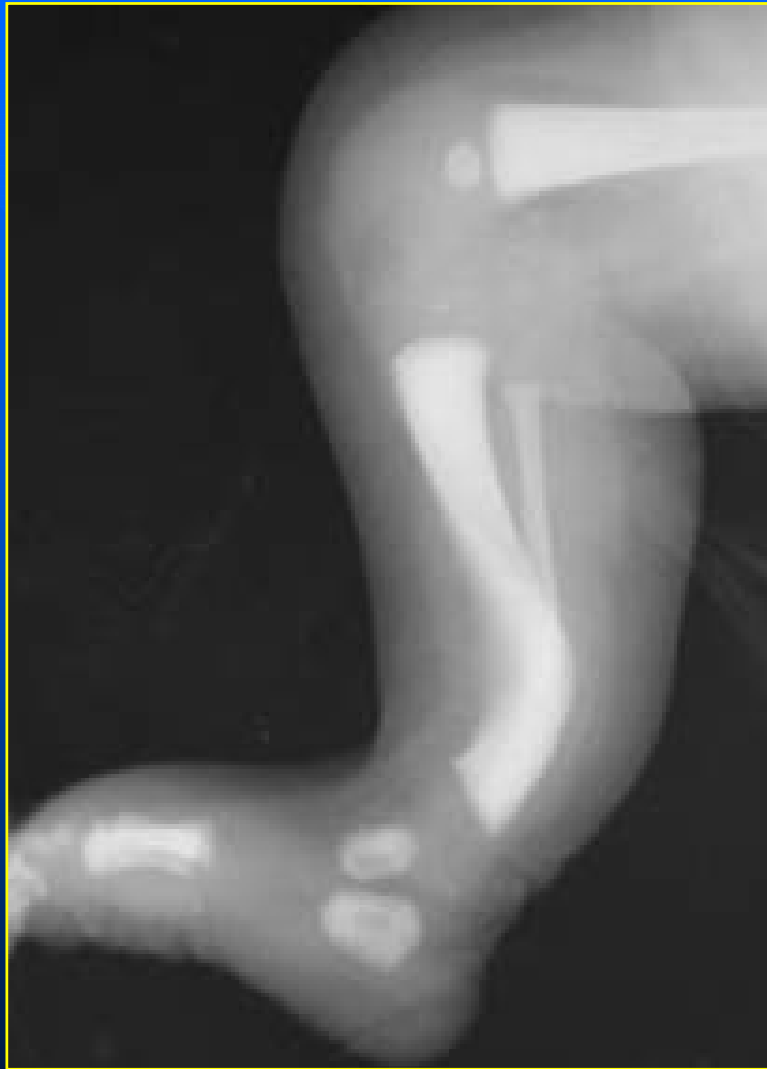
- = Calcaneus position of the foot,
- = Dorsiflexion contracture of the ankle,
- = Calcaneo valgus foot,
- Limited plantar flexion of foot,
- = Small Calf.

# Clinical Features



## Recurvatum (Kyphosis) of tibia





1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

18

# X-ray findings

Normal looking medulla.

= Narrow, may be obliterated

= Cortical thickening on concave surface, a response to stress.





# Natural History

## No increased risk of fracture

- = With growth → bowing decrease.
- = By age of 3y → 50% of angular deformity is corrected
- = LLD stays proportional, 12%.
- = Cal.valgus deformity improves.



# Case-1



**One year**



2.5 years

**2.5 Y**



5Years



9Years

# Management

- = Gentle passive stretching from the neonatal period.
- = If severe → serial casting & night splints.
- = Percut. osteotomy if severe angulation persists at > 3-4 yrs.
- = limb length equalisation later.
- = Yearly follow up.

## **B- Anterolateral ang. of T & F**

**Benign Type !!!!**

= Comparable to cong. posteromedial  
Angul., but in the opposite direction.

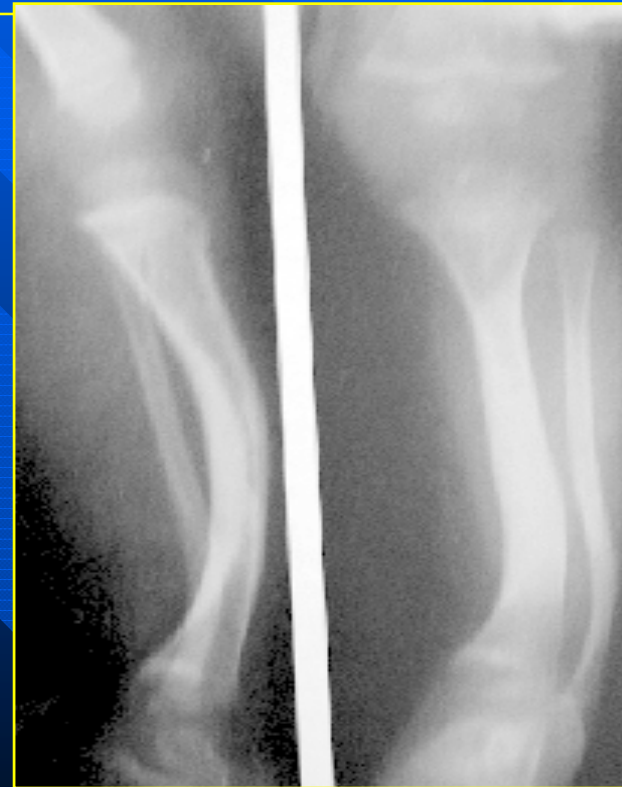
*Calcaneo varus foot*

= Remember the sinister variety

= Uncommon

# X-ray findings

- = Bowing at middle- Lower 1/3 junction.
- = Narrow medulla, with normal bone texture



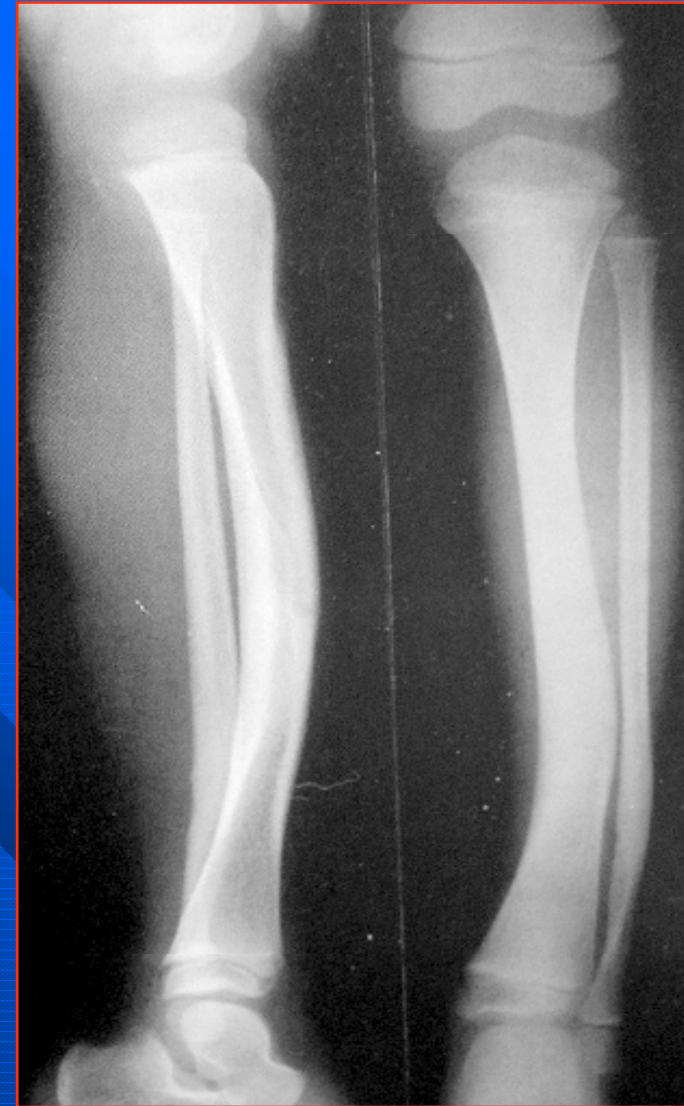
# Natural history

- = Spontaneous correction
- = Minimal LLD
- = No need for bracing
- = If no progressive correction  
by 4 y  $\rightarrow$  percut. corticotomy

# Case-2



1Y



7Y

1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo



12Y



1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo



# C- Anterolateral ang. of the tibia alone

## Benign Type

- = Less common
- = Normal fibula
- = Marked tibial medial sclerosis
- = Heel varus

# Natural history

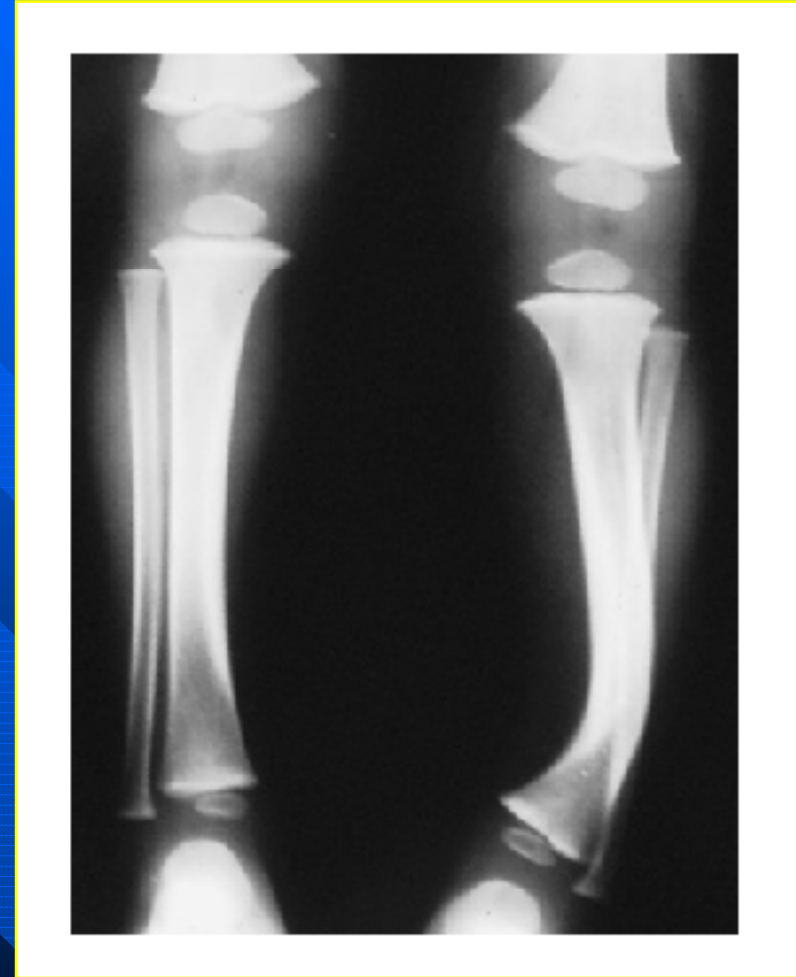
–incomplete spontaneous  
correction  
= No healing problems .

# X-ray findings

- = Ant.lat. Angulation
- = Thickening post. and medial cortices.
- = Subperiosteal new bone in the concavity of the tibia
- = Long straight fibula
- = Narrow or obliterated medulla.
- = **No cyst or dysplasia**



# Case-3





1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo





1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

35

# Sinester angulation of tibia

Cyst or F.dysplasia

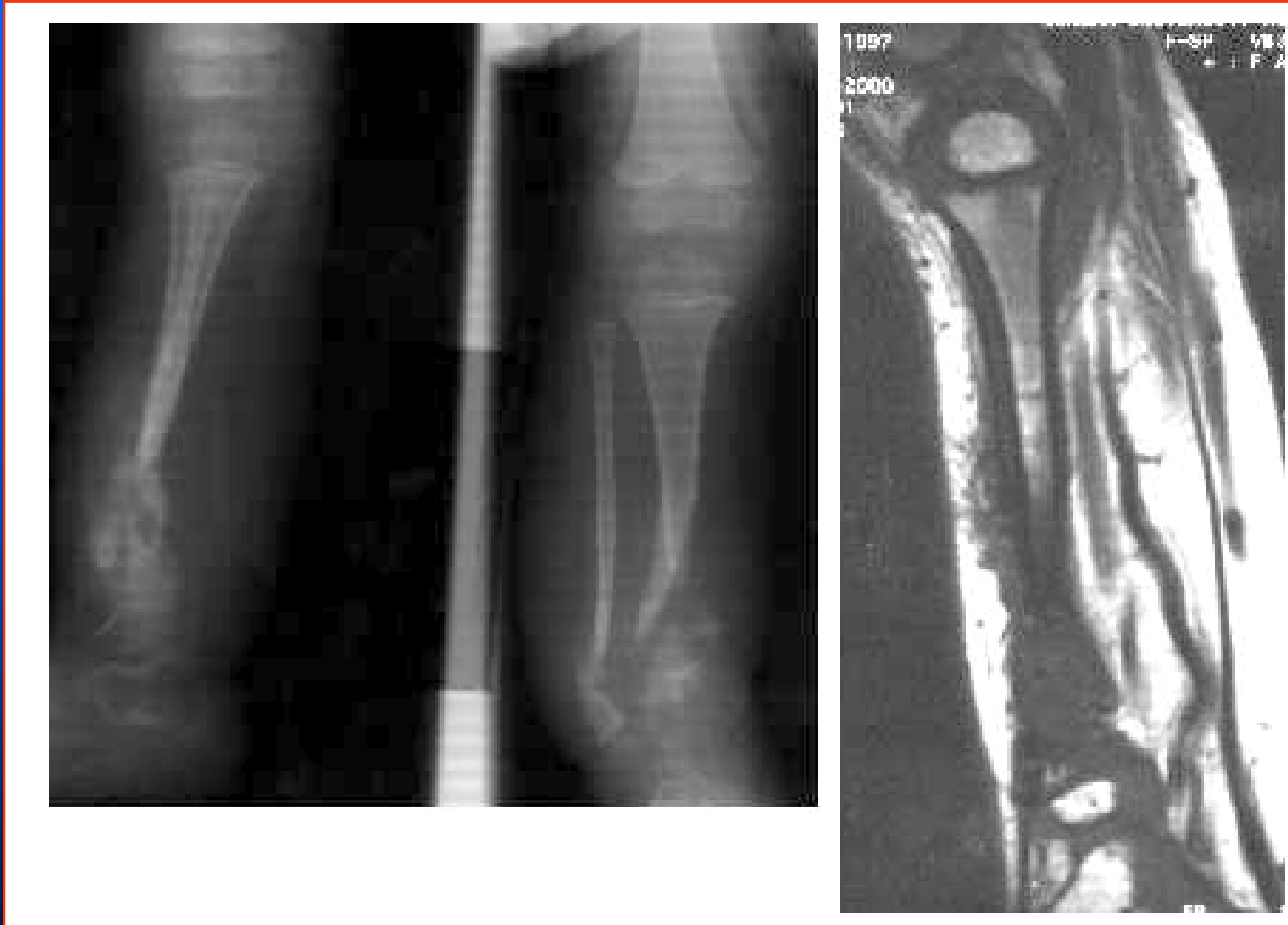


# Pseudoarthrosis



# D- Cong. pseudoarthrosis of tibia

**Discontinuity of the bone at the junction of the middle & distal 1/3 or beyond, present at birth or develops during the growth period.**



# Incidence

= 1 in 250,000 live births.

= 4 : million

= Left > right.

= Bilateral very rare

# Aetiology

1= Not known

2= Definite association with

Neurofibromatosis

- Sofield 40%

- Hardinge 55%

- Anderson 80%

**7.1% congenital tibial dysplasia**

## **3= Constriction theory,**

**=Tautly adherent fibrous ring of tissue**

**→Constricts bone and blood supply.**

**=Possible association with congenital ring syndrome !!!**

# Pathology

- 1) **Neuro fibromatosis**
- 2) **Bone dysplasia**
- 3) **Fibrous dysplasia**
- 4) **Hamartoma of fib. tissue**

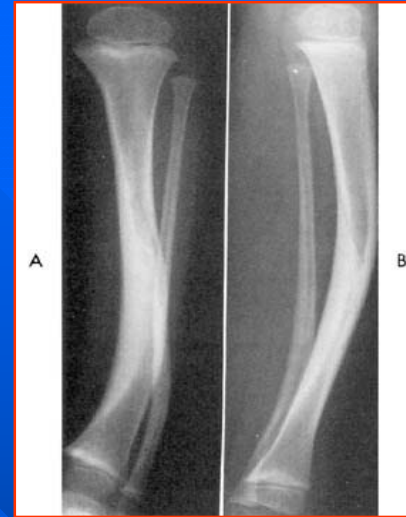


# Classifications

**Boyd's classification.**

**= No guide to R/**

**= Non prognostic**



**Hour glass**



**Stress fracture**



# Crawford's Classification ( Radiological )

- 1- Angulation + Dense medulla
- 2-**A-** Angulation + Wide abn.  
Medulla
- B-** Angulation + Cyst
- C-** Angulation + fracture or  
Pseudoarthrosis

## Functional results at the end of skeletal growth

A multicentric study on Congenital Pseudoarthrosis

**30 patients (age  $<$  or  $=$  16 years).**

- **Type 2A + 2C** have a worse prognosis with a lower % fusion at the site of pseudoarthr.
- = **Type 2C** have the worst functional results.

**Tudisco etal, J Pediatr Orthop B. 2000**

# Management Aims

## Coleman 1982

- = Bone and joint alignment.
- = Effective Osteogenesis of the bone
- = Promote and enhance normal longitudinal growth.

# The benign anterolat.angulation

**= Observation**

**= No Orthosis**

# Type IIA

- = Infants → Education of the parents
- = Walking → circumferential KAFO
- = Late childhood → keep ankle free

## How long?

- = Until fracture occurs
- = Skeletal maturity



# Type IIB

Curettage and cancellous bone graft of cyst, then  
posterior bypass bone grafting

**Mc Farland's bypass bone grafting**

**RESULTS .**

**Mc Farland success 9/11**

**Morrissey 4/7 came to amputation**



# Mc Farland's bypass bone grafting

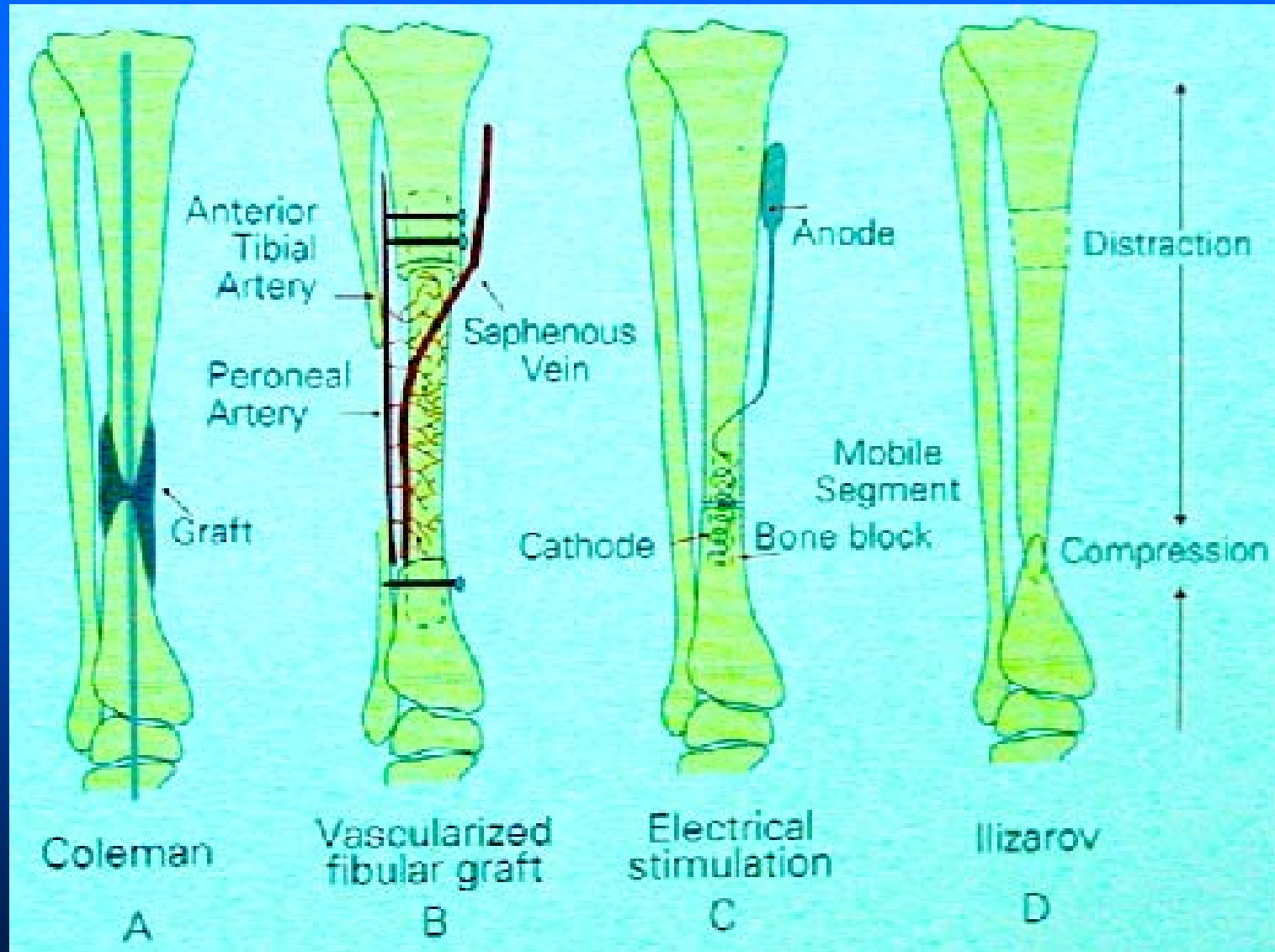
# Established Pseudoarthrosis

= **Surgery the only option**

\* **Timing of surgery**

@ **The older the patient, the better the chances of union**

@ **The earlier union is achieved, the better the end result in terms of deformity and shortening**



**= Boyd dual onlay bone graft**  
**= Amputation**  
**= B.M injection**

# 1-IM Rod and Bone grafting

**= 90-100% Union rate  
if done initially**

**Keep the rod for indefinite period**



# Case-4





1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

56



1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

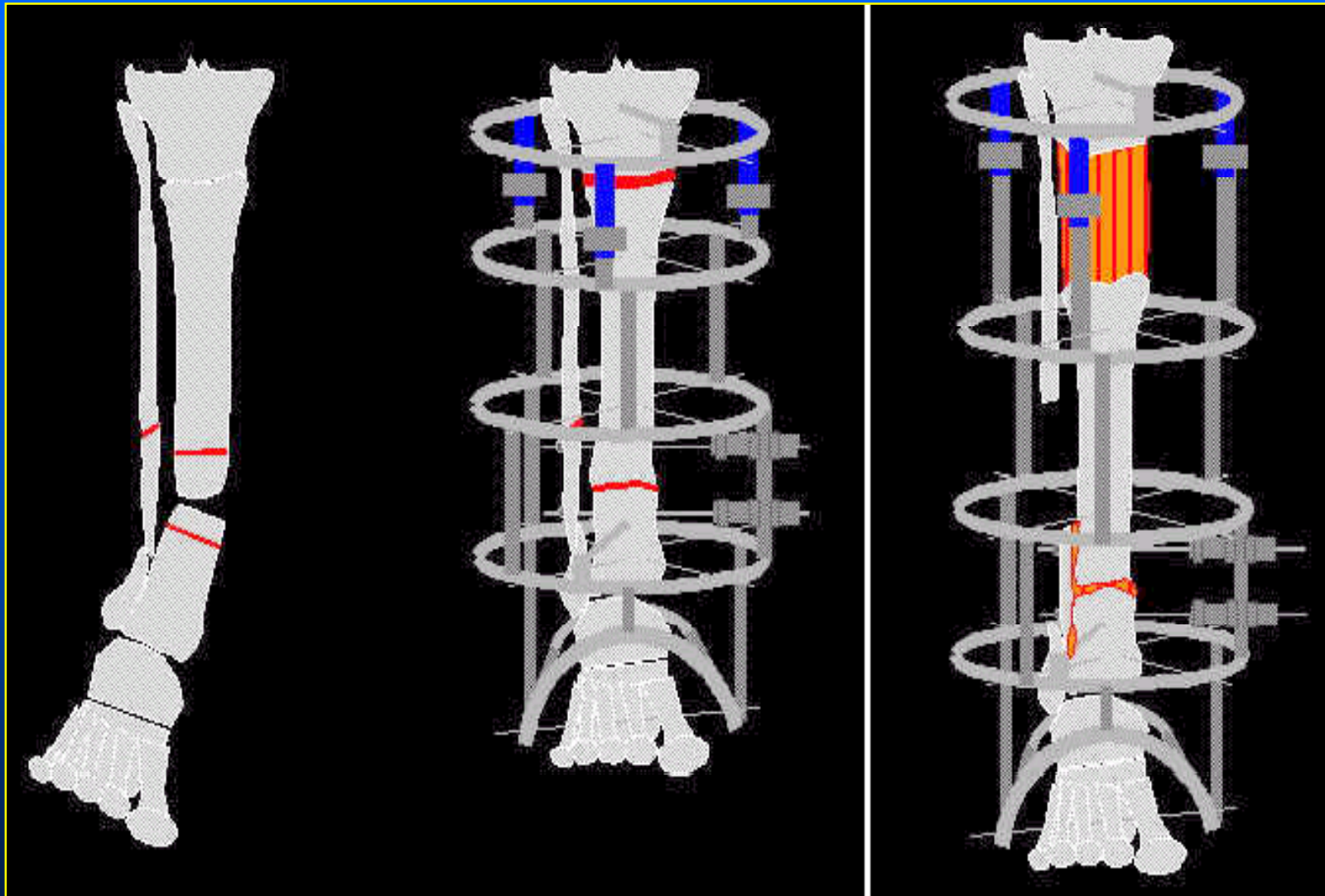
# 2- Ilizarov Ext. Fixator

- = > 5 Years old
- Failure of other procedures

Paley, 13/14 successes, 2 refractured

Nearly 100% union rate





1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

59

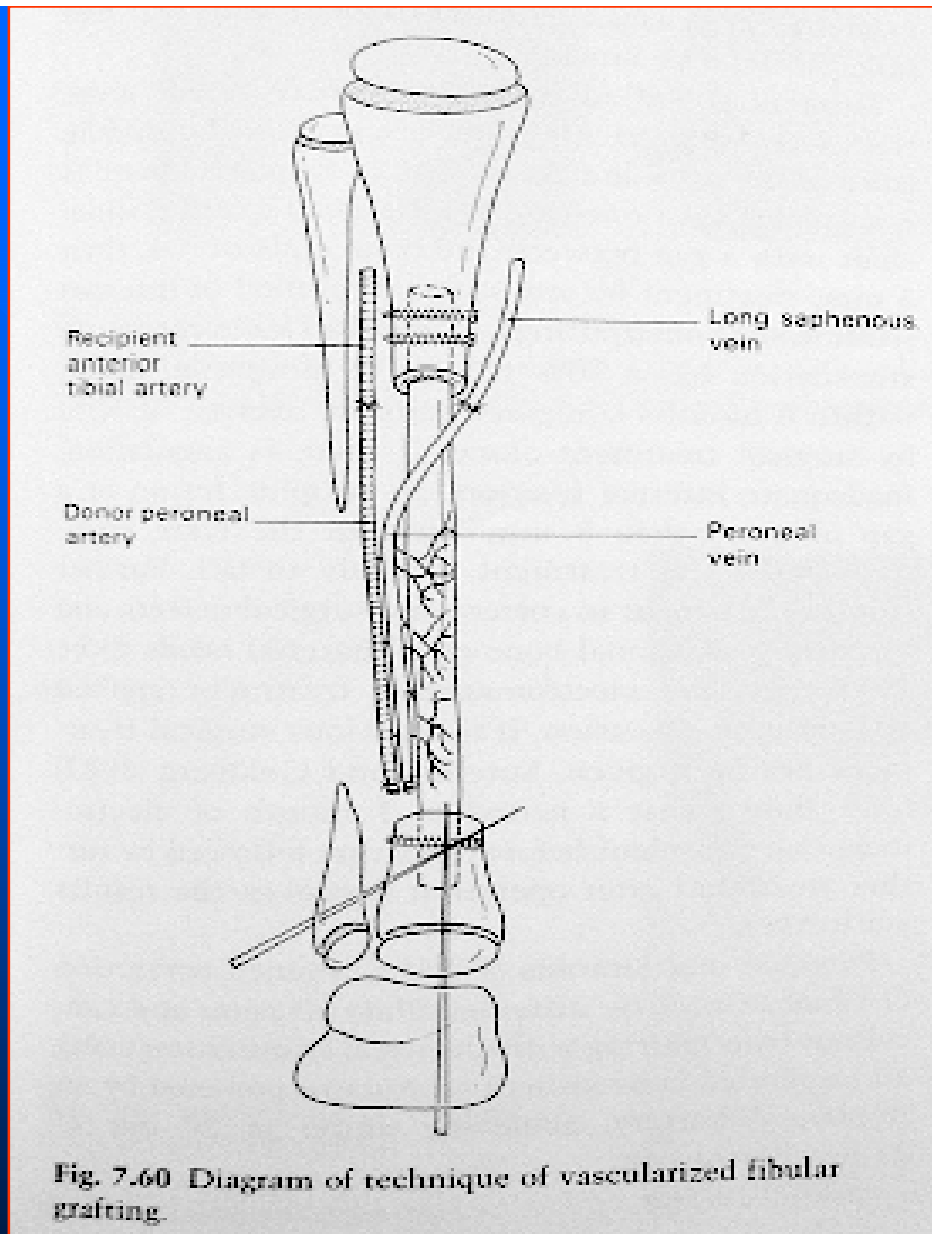
# 3-Free vascularized fibular transplant

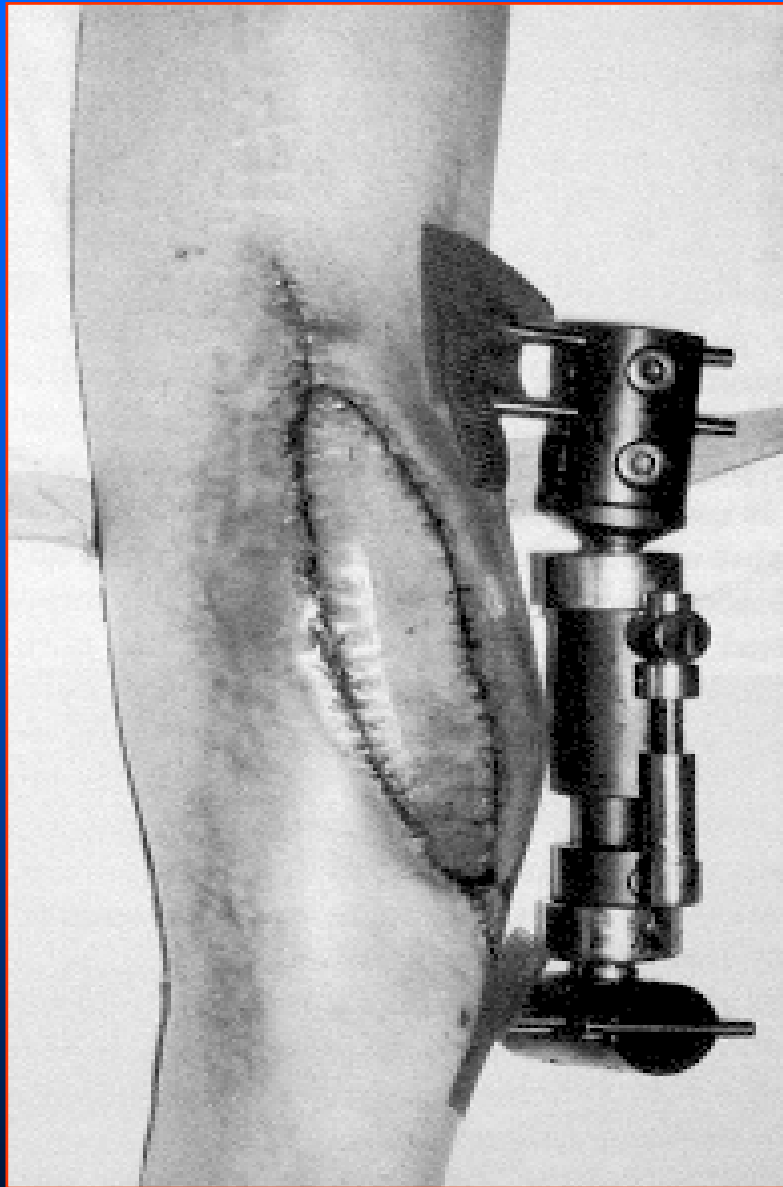
=18 of 19 achieved eventual union.

= But 5 non union after 1<sup>st</sup> op,  
needed 9 further bone grafts.

**Weland et-al**



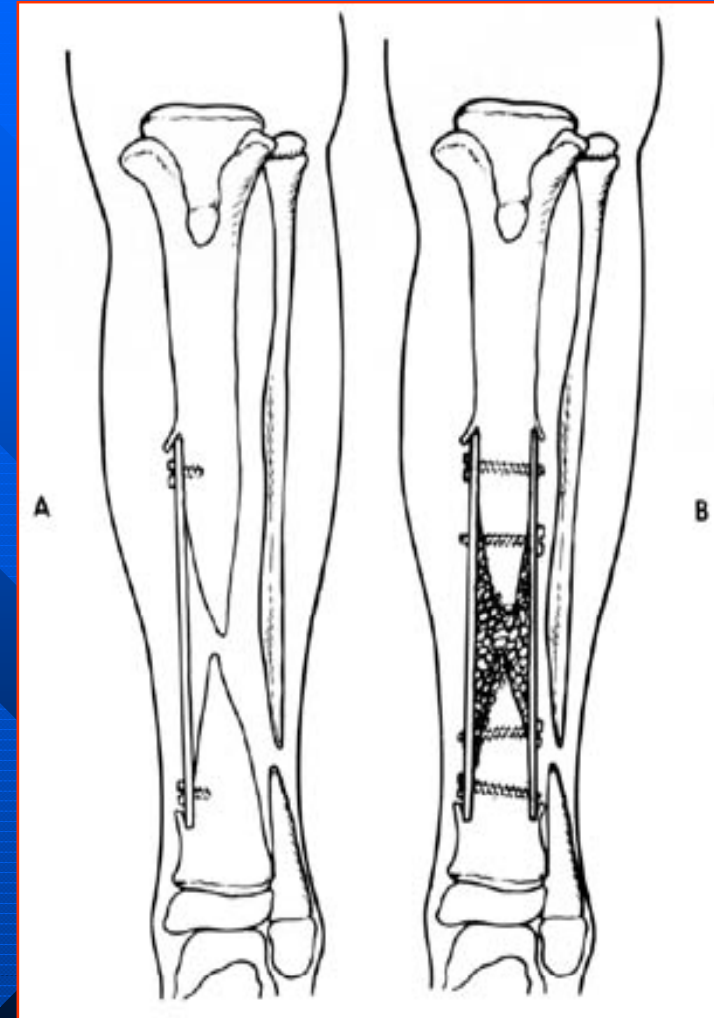




1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

# 4- Boyd dual onlay bone graft



# 5- Electrical stimulation

!!!! ?????

# 6- Amputation

= Difficult to predict which cases → amput.

23%-39%

*Sofield, Andersen, Morrissey*

= > 2-3 failed attempts at union

# 7- B. M. Injection





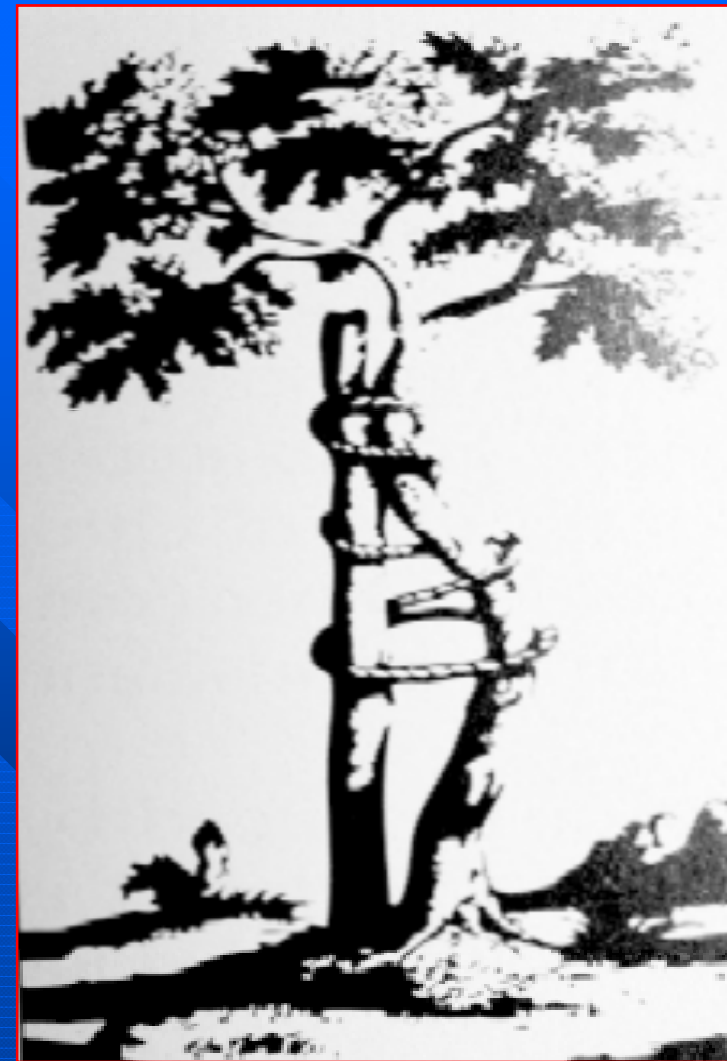
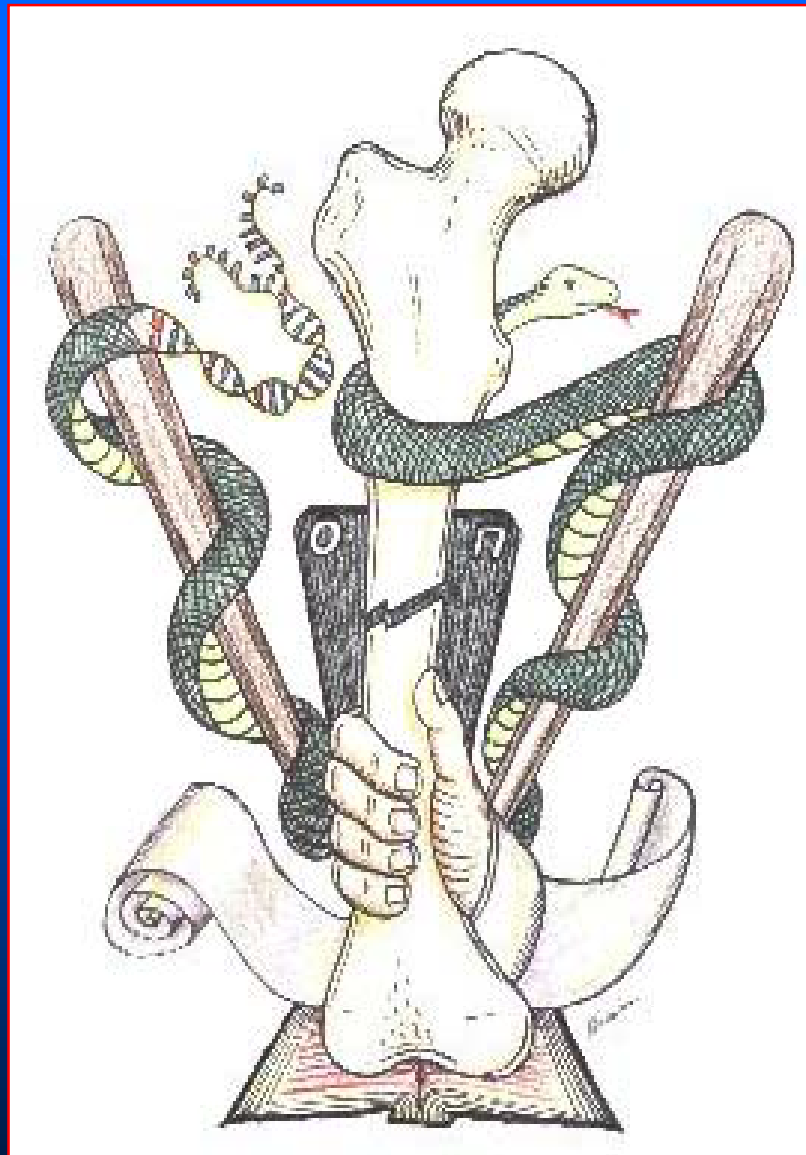
# E- FFC dysplasia.





# Conclusion

- = **Posteromedial bowing self limited.**
- = **In Anterolateral bowing be careful.**
- = ***Always* be sure that ant. bowing is not “Cong. Pseudoarthrosis” and check patient for signs of N.F**
- = **Amp. Should be the least & the last.**



1/9/2011

Professor Freih Abuhassan -  
University of Jordan -  
freih@ju.edu.jo

# Thank You

