CONGENITAL DISEASES

Clinic of Orthopaedics and
Paediatric Orthopaedics

Clubfoot - General

- 1 per 1,000 live births
- 65% male, 35% female
- 30 - 50% bilateral
- cause unknown:
  - genetic
  - neurogenic
  - viral infection

Physical examination

- Associated anomalies
- Abnormal reflexes
- Clubfoot examination

  Knee flexion and extension

  Equinus assesment

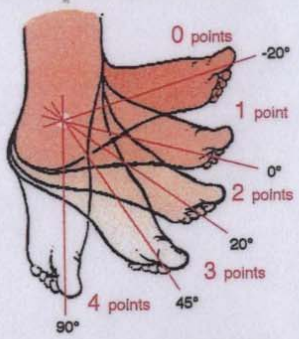
Congenital talipes equinovarus

- Forefoot adduction & supination
- Hindfoot equinus & varus
- Talar neck deformity
- Medial rotation of calcaneus
- Shortened muscles, capsule, ligaments, fascia

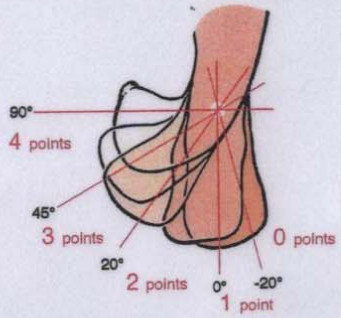
classification

French Classification (Dimeglio / Bensahel)

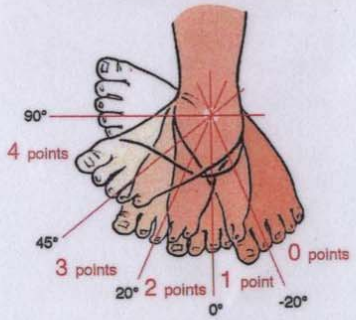
1. Equinus - (Sagittal Plane)



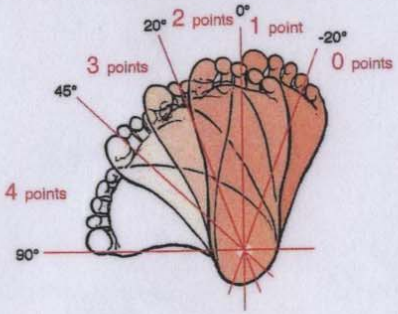
2. Varus Deviation - (Frontal Plane)



3. Derotation around the Talus - Calcaneo-forefoot (CFF)



4. Adduction forefoot on hindfoot in horizontal plane



Scoring:

Scale: 0 - 20 points

Total 16 points:

Reducibility:

90° - 45°	=	4 points
45° - 20°	=	3 points
20° - 0°	=	2 points
0° - -20°	=	1 point
less than -20°	=	0 points

+ 4 points

- 1 point - Post. crease marked
- 1 point - Medial crease marked
- 1 point - Cavus
- 1 point - Muscle condition:
  - Contracted peroneal
  - Atrophic - T.A., gastroc.

Grading:

Grade I Type I (Lehman Type 1)	Benign 20% of all club feet *Soft - soft feet* 0 - 5 points > 90° reducible Postural clubfeet
Grade II Type IIa (Lehman Type 2)	Moderate feet 33% of all clubfeet *Soft - stiff* 6 -10 points Partially reducible
Grade III Type IIb (Lehman Type 2)	Severe feet 35% of all clubfeet *Stiff - soft* 11 - 15 points More resistant than reducible
Grade IV Type III (Lehman Type 3)	Very severe 12% of all clubfeet *Stiff - stiff* 16 - 20 points Irreducible (Arthrogrypotic)

classification

English Classification
(Catterall / Pirani)

LOOK

Curvature of Lateral Border | **Medial Crease** | **Posterior Crease**

0 = Normal

0.5 = Moderate

1 = Severe

FEEL

Lateral Part of Head of Talus

0 = Complete reduction

0.5 = Partial reduction

1 = Fixed subluxed

Emptiness of the Heel

0 = Tuberosity

1 = Tuberosity not palpable

MOVE

Rigidity of Equinous

0 0.5 1

Catterall / Pirani (Normal: 0 points; Most abnormal: 1.0 points)

Hindfoot contracture (HFCS)	Points	Midfoot contracture (MFCS)	Points
a. Posterior crease: 0, 0.5 or 1.0 points		a. Curvature of lateral border: 0, 0.5 or 1.0 points	
b. Empty heel: 0 or 1.0 points		b. Medial crease: 0, 0.5 or 1.0 points	
c. Rigid equinus: 0, 0.5 or 1.0 points		c. Lateral head of talus: 0, 0.5 or 1.0 points	

HFCS Sub-total		MFCS Sub-total		Total Score (HFCS and MFCS)	

Treatment objectives

- Primary – correct deformity while retaining mobility and strength
- Secondary – wear normal shoes & satisfactory appearance

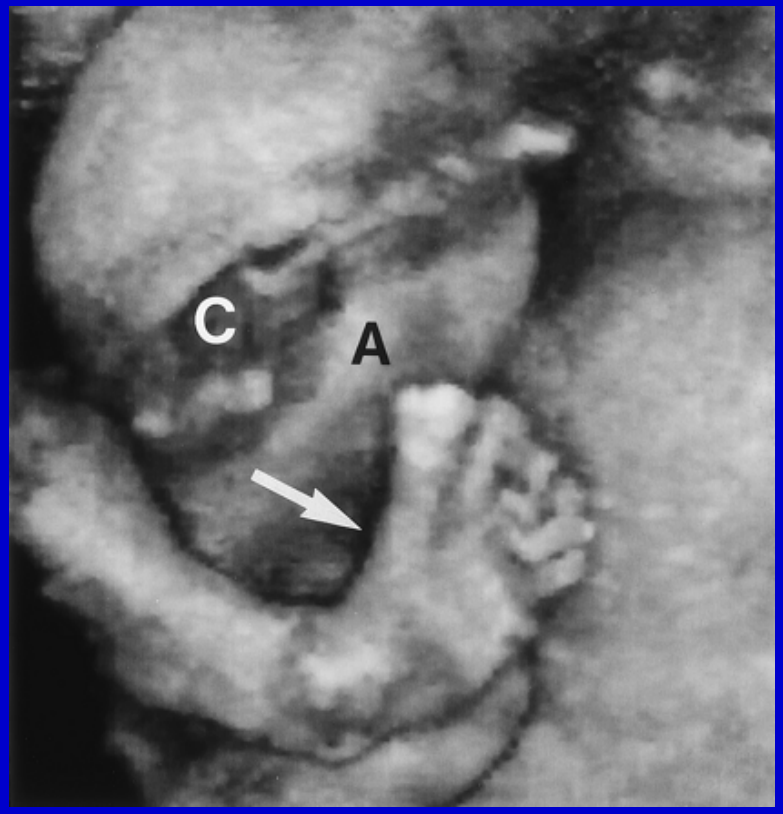
untreated clubfoot (Nicaragua)

Neglected clubfeet (Uganda)

Prenatal Diagnosis

2-D Ultrasound

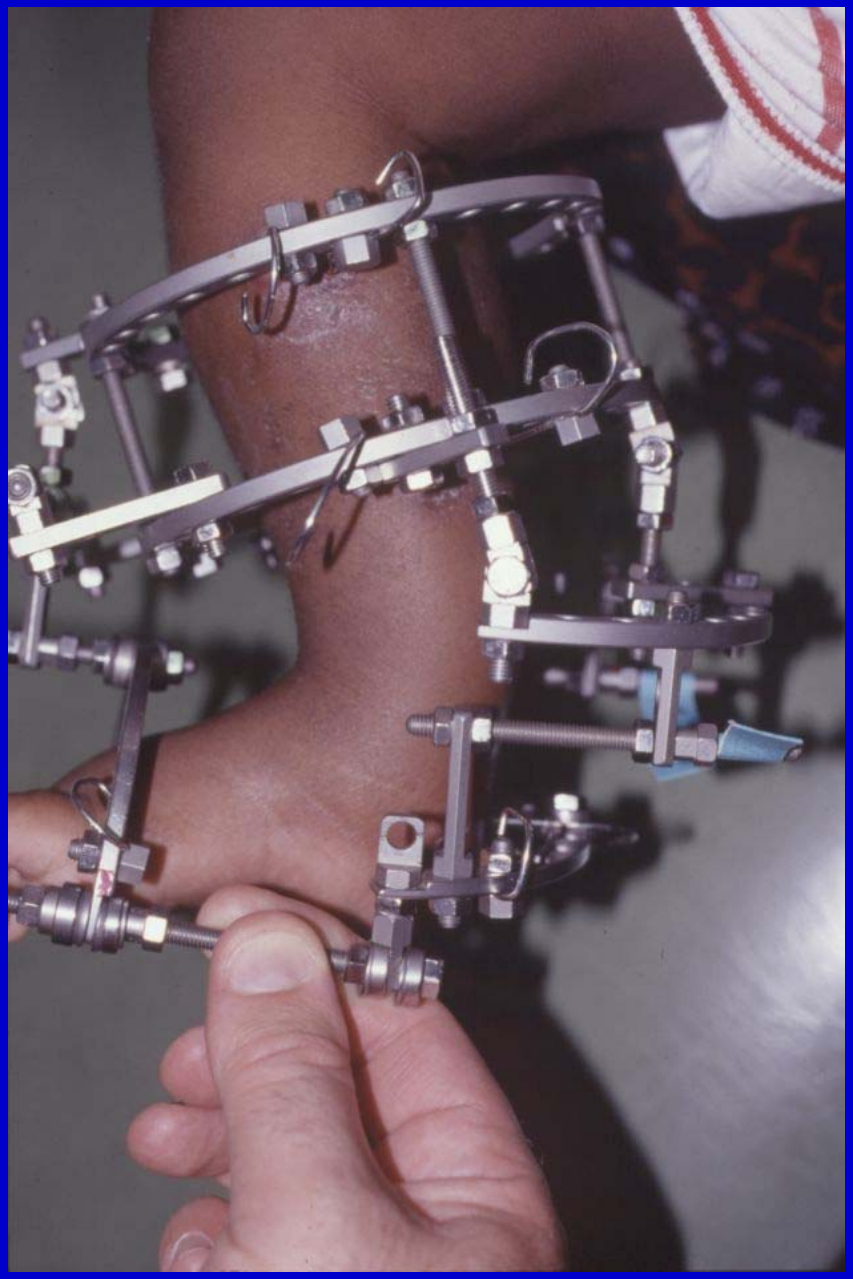
3-D Ultrasound



Prenatal diagnosis

Clubfoot Treatment Options

- serial casting
- surgical release
- gradual distraction - external fixator



gradual distraction with external fixator

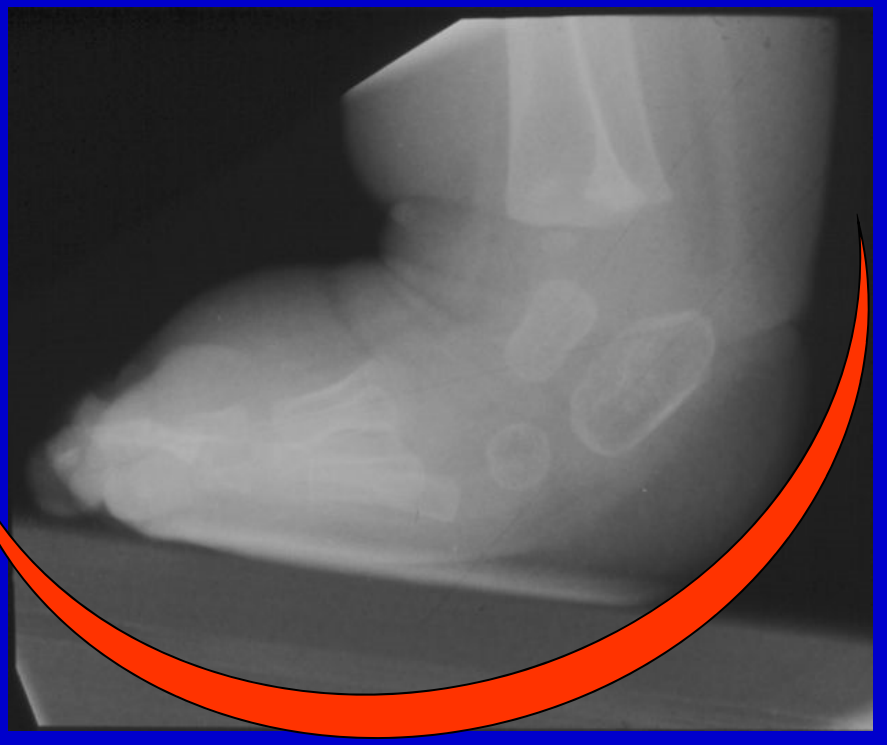
External fixator

- Fixed deformity
- Older children
- Salvage procedure

Serial casting

Dangers of manipulation and casting….

rocker bottom foot
Pressure ulcer

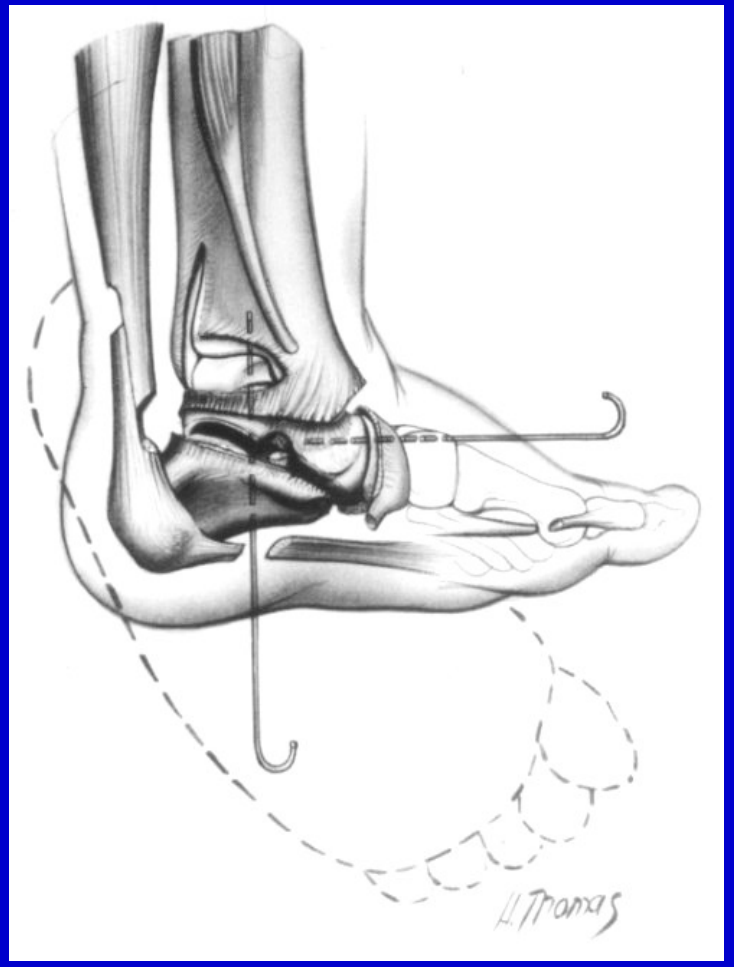


Conventional Serial Casting

- multiple techniques
- serial casting for 3 months
- “resistant” feet undergo posteromedial release
- kite & lovell – 22m

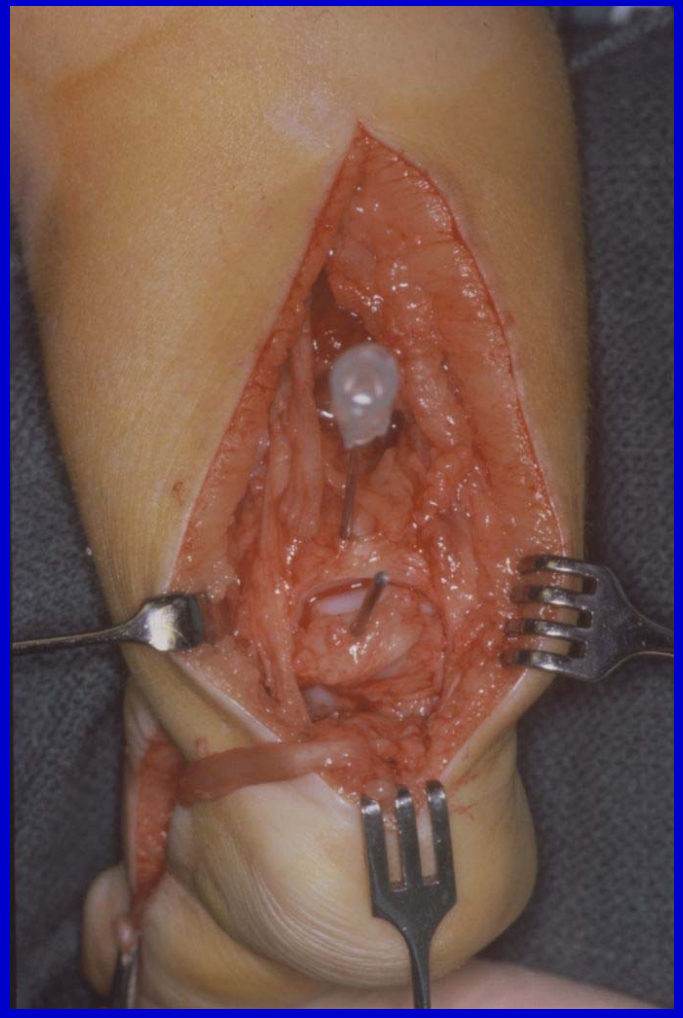
Posteromedial Release

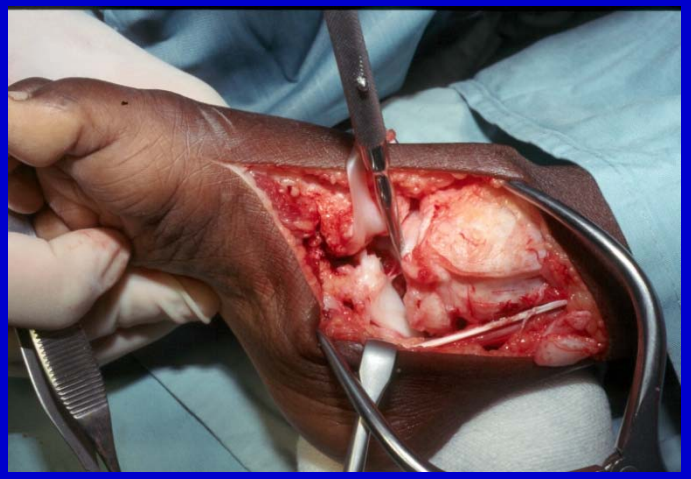
- Achilles tendon
- CFL
- Post TaloFibular ligament
- Tibialis posterior tendon
- FDL tendon
- FHL tendon
- Superficial deltoid
- capsule



Posteromedial Release (PMR)

Standard of Care





Posteromedial Release

scarring of the feet after posteromedial release leads to pain and disability in adult life

disappointing results in long-term studies
(Green, Aronson, Hutchins)

Bilateral skin slough after PMR

Club Foot Treatment by the

Ponseti Method

Ponseti's method

Ignacio V. Ponseti

University of Iowa

Ponseti's Protocol

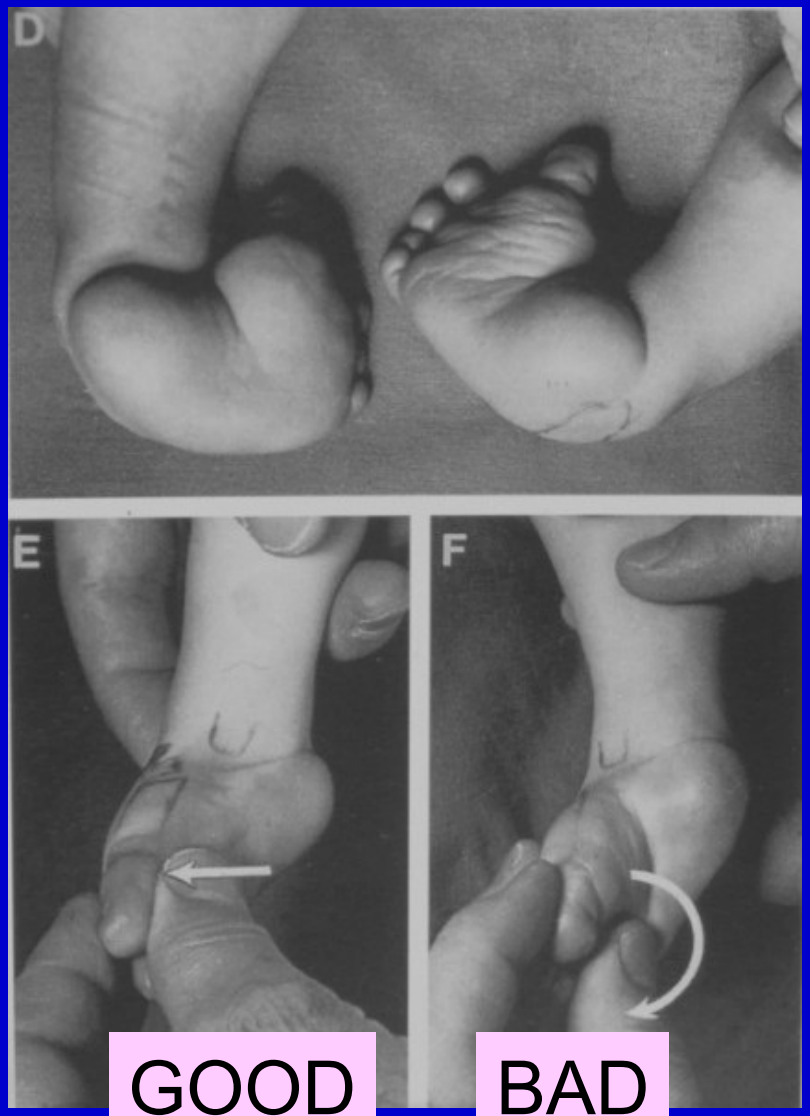
- manipulate, then cast
- first cast: raise first metatarsus
- never pronate the foot, pure abduction
- counter pressure on neck of talus, not calcaneus
- long leg cast, externally rotated
- weekly cast for 4-7 weeks
- Achilles tenotomy (90%)
- Foot Abduction Orthosis (DB bar)
- ≈20% need Tib. Ant. transfer ± repeat TAL at 2–4 years

Ponseti's Technique

first cast:
raise first metatarsal up to align forefoot with hindfoot and to diminish cavus

First cast

Ponseti's Technique



Never pronate the foot.

(Pronation increases the cavus)

Ponseti's Maneuver

pure abduction (external rotation)

- Thumb on talar neck
- Abduct forefoot

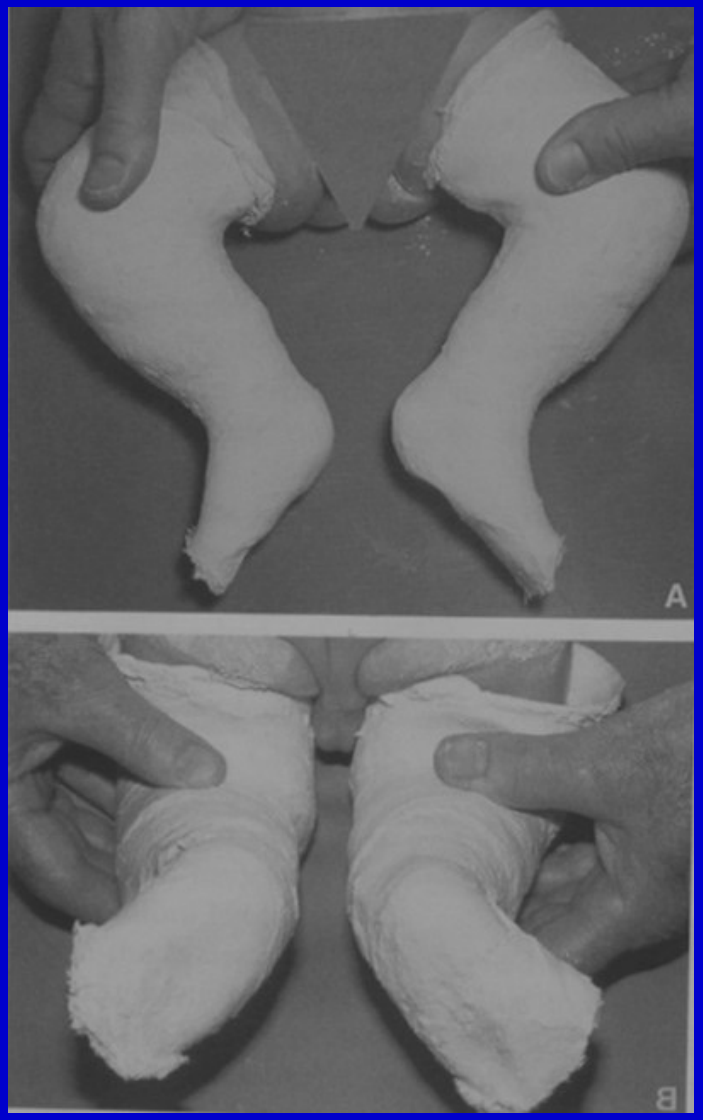
Ponseti's Technique

Manipulate for about one minute, then cast.

Ponseti Manipulation

Never pronate!

Ponseti's Technique



long leg cast, externally rotated

Ponseti's Technique

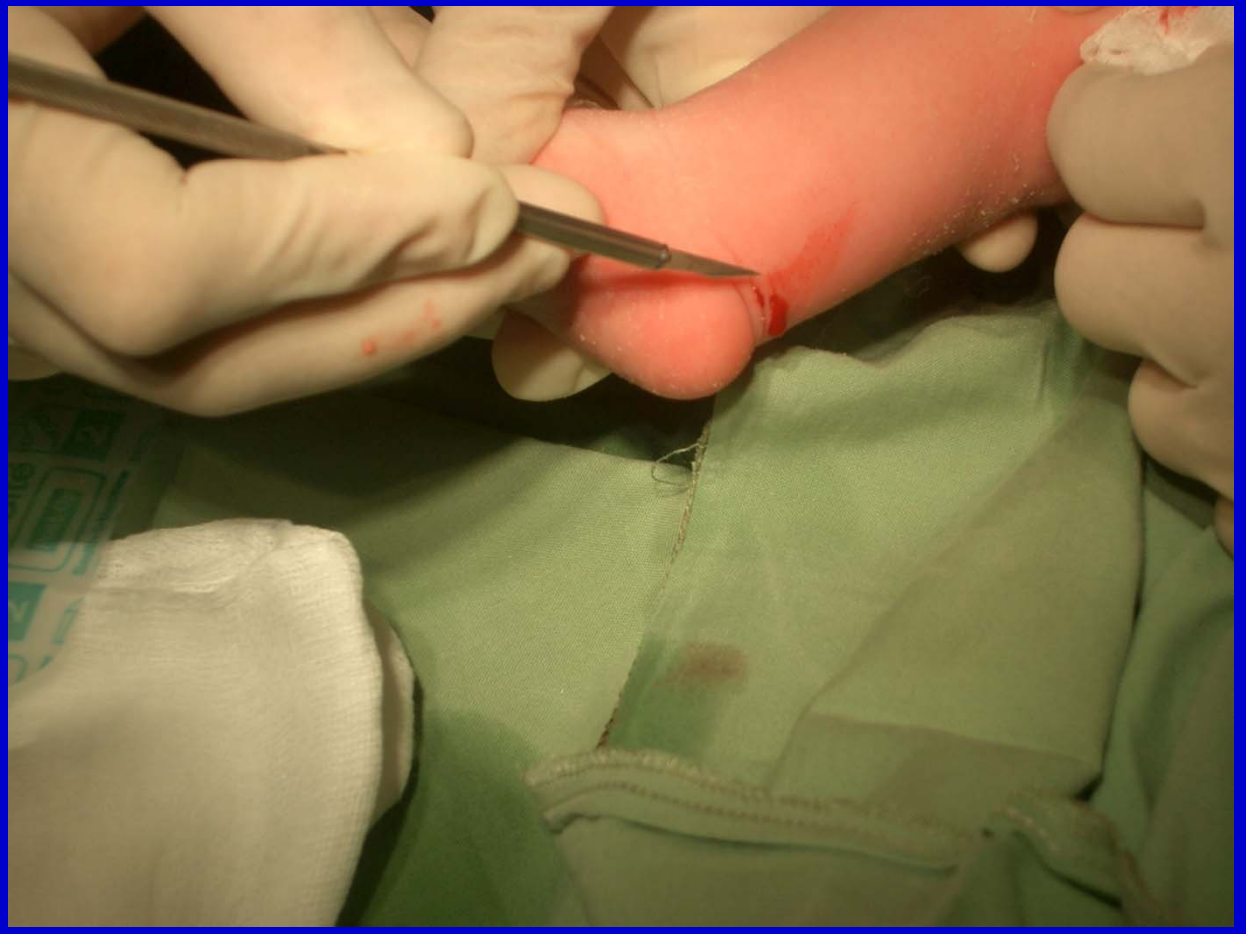
Short leg casts are ineffective, and may fall off.


TEV
#1
JH
12.4


Paediatric
URINE
COLLECTOR
100ml
90
80
70
60
50ml
40
30
20

Ponseti's Technique

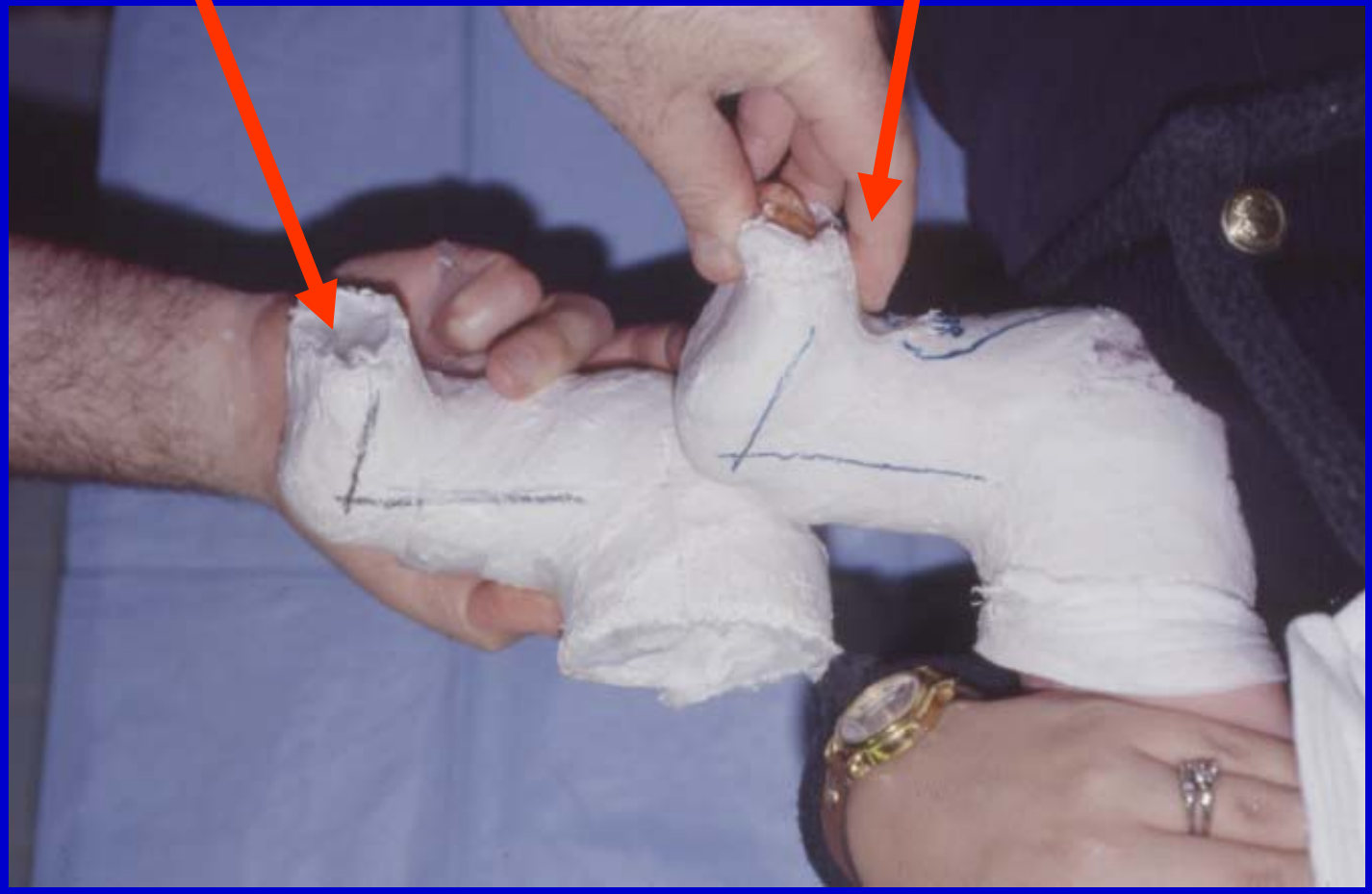
weekly cast for 4–8 weeks, then Achilles tenotomy, then cast for 3 more weeks



Percutaneous tenotomy (not TAL)

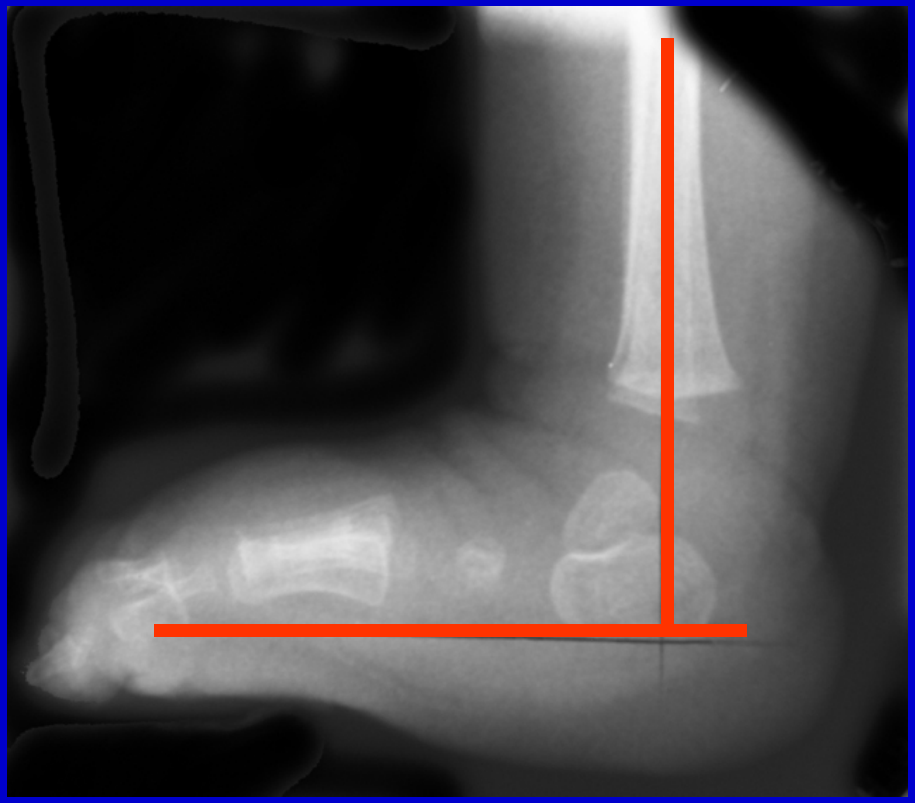
maximum dorsiflexion before and after tenotomy

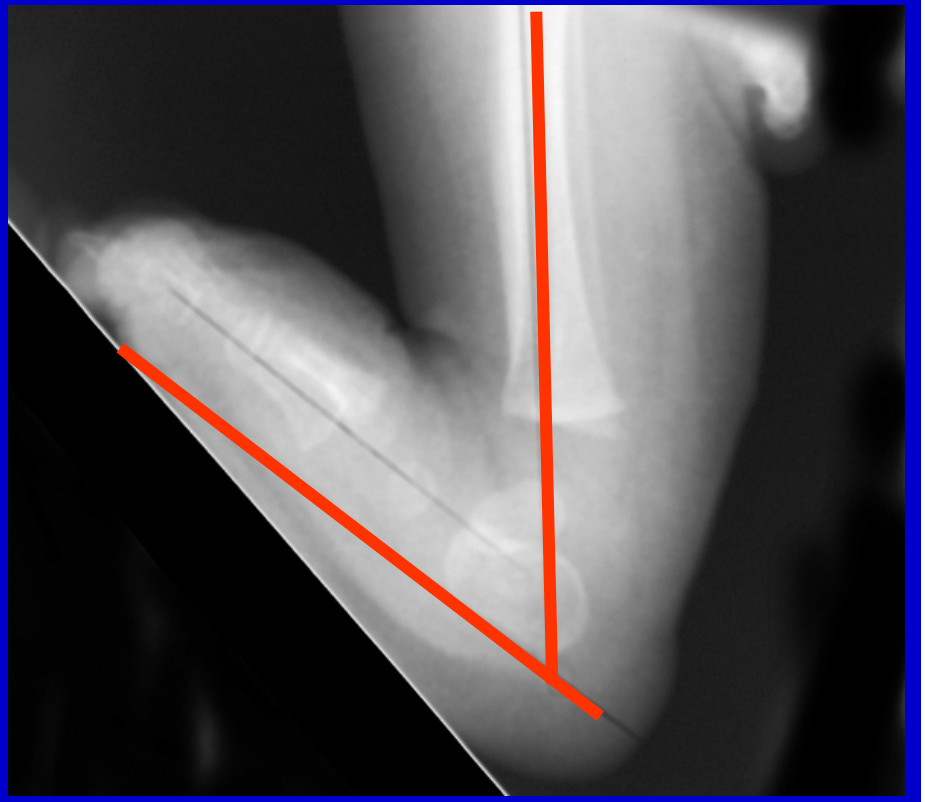
Before tenotomy **After tenotomy**



After tenotomy, cast for 3 weeks in dorsiflexion.

X-rays before and after tenotomy



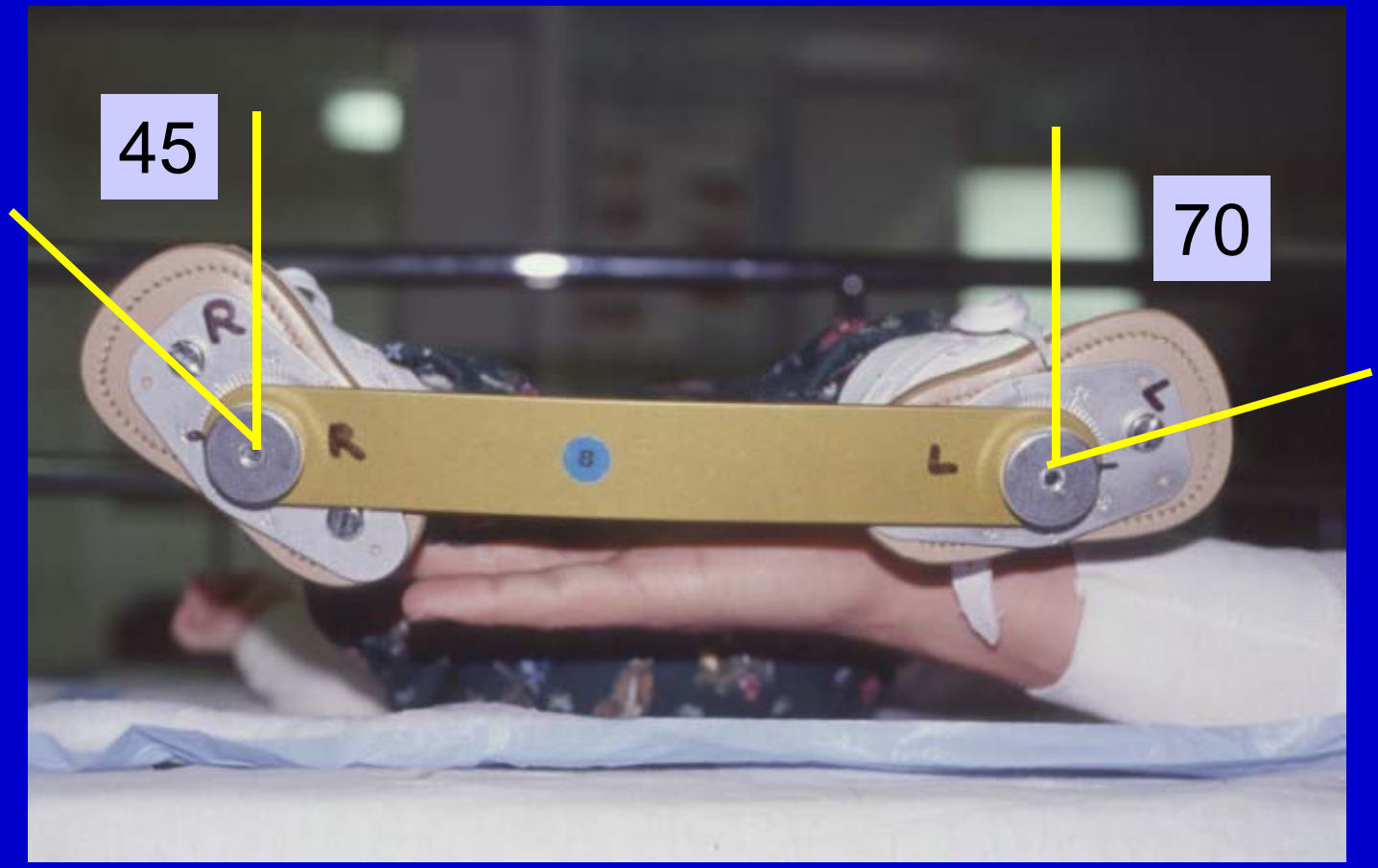


scar after percutaneous tenotomy

Ponseti's Technique

Foot Abduction Orthosis [Denis Browne bar]
full-time for 3 months,
then nights only for 2 - 4 years

Ponseti's Technique



F.A.O. externally rotated
70° clubfoot, 45° normal foot

Ponseti's Technique

shoes with modified heel

recurrence

typically in non-compliant families

under age 2 ….recast for 2-3 casts, then back into DB bar

over age 2 ….recast for 1-2 casts (every two weeks), then do Anterior Tibialis tendon transfer and TAL some may need posterior capsulotomy

Ponseti's Technique

10-20% need tibialis anterior tendon transfer at 2–4 years

Ponseti Clubfoot Treatment in Older Infants for Whom Traditional Casting Has Failed

John E. Herzenberg, MD — *Baltimore, MD*

Noam Bor, MD — *Afula, Israel*

Steven L. Frick, MD — *Charlotte, NC*

Materials and Methods

- N = 21 children (32 feet) with idiopathic clubfoot presented for 2nd opinion
- Age = 3 - 6 months
- 17/21 were told by original orthopaedist to undergo PMR
- 11/21 learned about Ponseti method from the Internet

3 mo. old boy s/p 7 casts at a children's hospital

Results

- Only 1/32 (3%) feet required PMR
- 32/32 (100%) required percutaneous Achilles tenotomy at average age of 6 months (range, 3–10 months)
- Average no. of Ponseti casts *we* applied before tenotomy = 6 (range, 3–10 casts)
- Two have required anterior tibialis transfer
- 3/32 needed repeated casting for relapse

3.5 month old girl after 6 casts at a children's hospital…

…4 months s/p 5 Ponseti casts + tenotomy

3 mo. old boy s/p 5 sets of casts at a children's hospital

After 5 Ponseti casts + tenotomy

30 week preemie

BW = 1000 grams

Bilateral TEV

Casted weekly for 6 months
at a major children's hospital…

Advised to have PMR…

Parents read about Ponseti
on Internet…

Referred for 2nd opinion at age
7 months

After 4 Ponseti casts + tenotomy……

Before (7 months)

After (18 months)

1/21 needed PMR

4 mo. old girl s/p 5 casts by local orthopaedist

* despite Ponseti casting x 6, PMR required

Ponseti's Protocol

- manipulate, then cast
- first cast: raise first metatarsal to align forefoot with hindfoot and to decrease cavus
- never pronate the foot, pure abduction
- counter pressure on neck of talus, not calcaneus
- long leg cast, externally rotated
- weekly cast for 4-7 weeks
- Achilles tenotomy (90%), then cast for 3 more weeks
- Foot Abduction Orthosis (DB bar), external rotation 70° clubfoot, 45° normal foot
- FAO full-time for 3 months, then nights for 2-4 years
- ≈20% need Tib. Ant. transfer ± repeat TAL at 2–4 years

initial

3 months

6 months

2 years

derotation splinting

2 years

Idiopathic Clubfoot – Is Posteromedial Release Necessary?

CLUB FOOT CONSERVATIVE TREATMENT OPPORTUNITY

GOALS

Reproduce Iowa's experience.

- Normal apearence, plantigrade, functional pain free, shoeable
- Normal X - Rays not attainable
- We still use it

BASICS OF THE TECHNIQUE

- **Orthopaedic treatment**
  (weekly cast change)
- Talus **Reduction**
- **Minimal surgery** (PATT)
- **Bracing after correction**
  70° external rotation

- **Simultaneous treatment of all components**

  cavus, adduction and varus

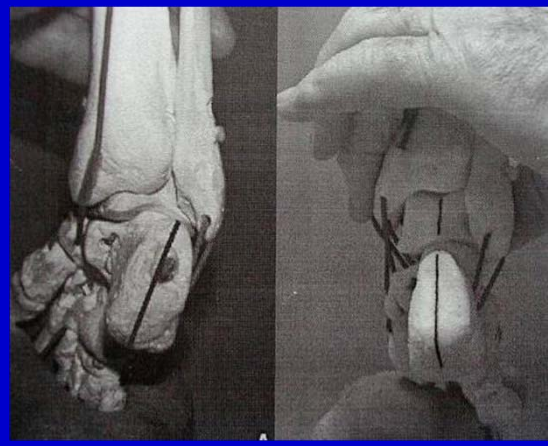
- Gentle and progresive manipulations

  supination - abdu[illegible]
  stabilizing the [illegible]

never pronate!!

ORTHOPAEDIC TREATMENT

- Well-molded plaster casts (long casts)
- The equinus corrected by dorsiflecting the foot after the varus and adduction of the heel have been corrected



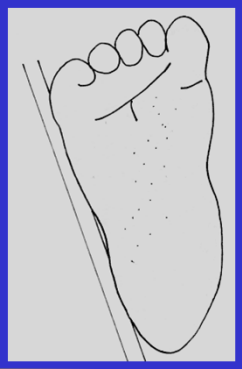
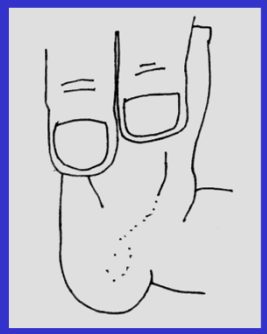
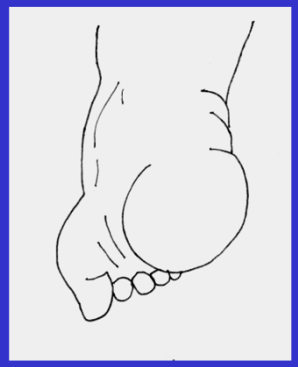
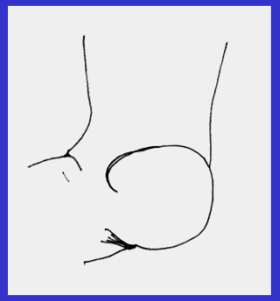
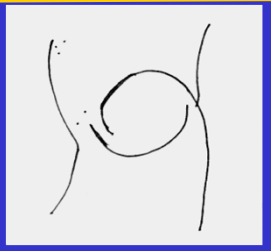
ORTHOPAEDIC TREATMENT

BRACING

- Maintains the correction and avoids relapses
- Day and night for 3 - 4 months
- During sleep for 4 years (nights and naps)
- Shoes distance = length between baby's shoulders

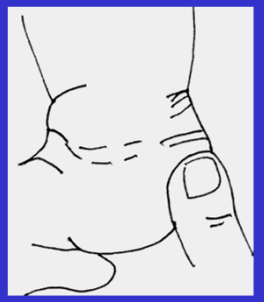
PIRANI - CATTERALL ASSESSING

LOOK

	Curvature Lateral Border	Medial Crease	Posterior Crease
0 = Normal			
0,5 = Moderate			
1 = Severe			

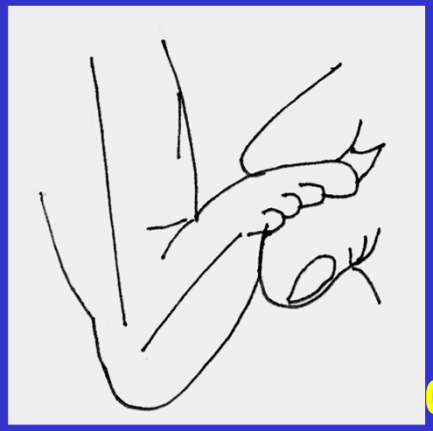
PIRANI - CATTERALL ASSESSING

FEEL

	Lateral Part of Head of Talus	Emptiness of the Heel
0 = Complete Reduction		 0 = Tuberosity
0,5 = Parcial Reduction		
1 = Fixed subluxed		1= Tuberosity not palpable

PIRANI - CATTERALL ASSESSING

MOVE

Rigidity of Equinus		
 0	 0,5	 1

PONSETI METHOD

SURGERY

- Percutaneus Tenotomy : **75 feet (99%)**
- Posteromedial Release : 1 foot (1%)

PONSETI METHOD RELAPSES

- **8/50 16%**
- Age : Average 17m (10m - 25m)
- Uncooperative patients
- 3/8 with family agregation

PONSETI METHOD RELAPSES

- **1/8 surgery (ATT)**

  12.5% 2% (1/50)

- Uncooperative patient

- With family agregation

PONSETI METHOD RELAPSES

PONSETI METHOD RELAPSES

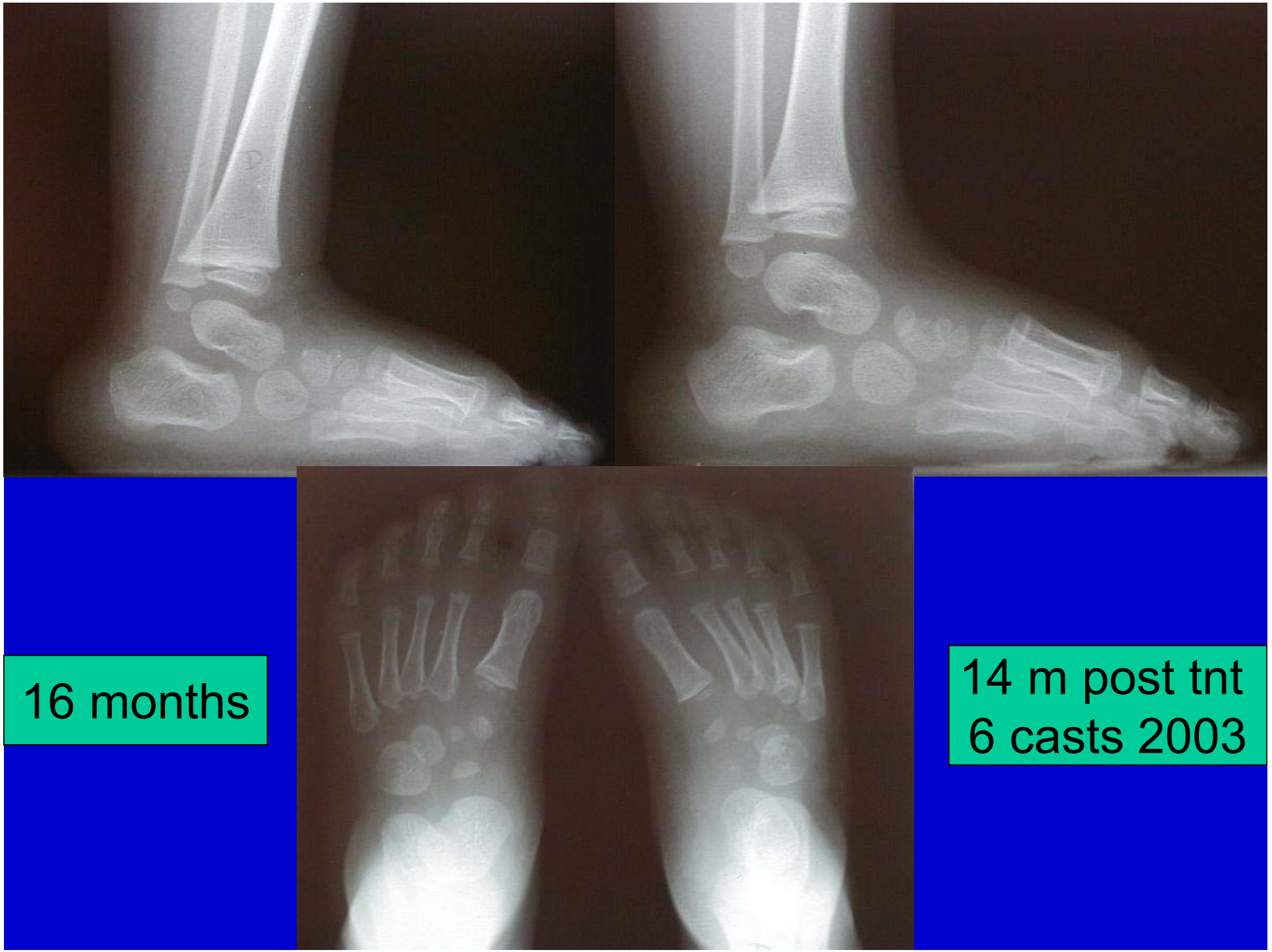
Newborn

14 m post tnt
6 casts 2003

16 months

16 months

14 m post tnt
6 casts 2003


16 months
14 m post tnt
6 casts 2003

Newborn

22 m 2002
11 casts
19 m post tnt

22 m 2002
11 casts
19 m post tnt

22 months

WHY WE CHOSE PONSETI'S M ?

- Minimally invasive
- Short learning curve
- Unexpensive

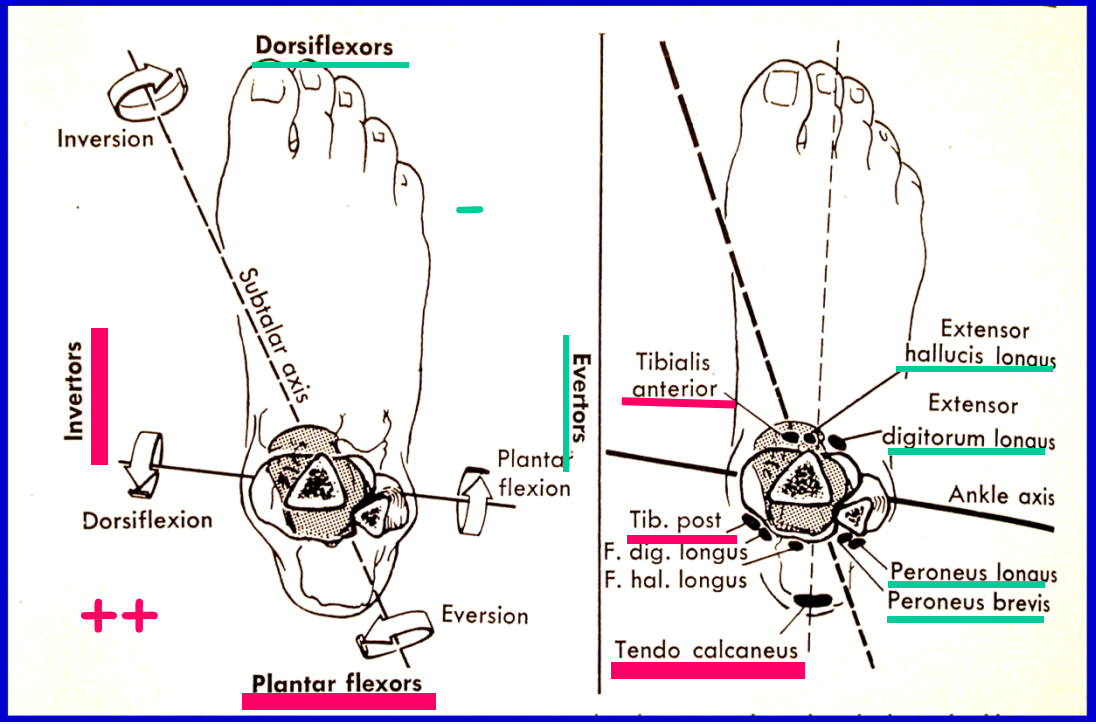
- Short period of treatment
- Can be used with images or no
- Can be assesed by Pirani classification
- gives: parents – doctors satisfaction

Congenital Clubfoot

RIBERA (1591 - 1652)

MUSCULAR IMBALANCE is caused by:

-Over-activity (contracture) – invertors and plantarflexors
central lesions (CP)
-Reduced activity (atrophy) – evertors and dorsiflexors
spinal / peripheral nerve / myopathic lesions
- COMBINATIONS of:
teratology + paralysis + spasticity (MMC)



Basic clinical appearence - combination of

- equinus
- varus

Hindfoot

- adduction
- supination
- cavus

Forefoot

→ Different expression acc to:

-aetiology

-severity

-time factor

Aim of the treatment – similar to idiopathic CF:
Ambulantory pts. - permanent plantigrade weigth-bearing foot without pressure sores and callosities
-Remain functional ROM of joints
-Restore the muscle balance
Non-ambulatory pts. – shoe wearing

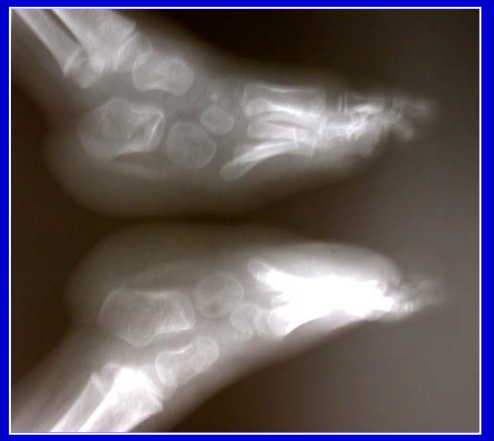
Treatment strategy:
a) conservative treatment – beginning A.S.A.P.

- manipulation and casting technigues
- static and dynamic AFO / KAFO orthoses
- insoles

c) Surgical treatment - in addition or instead of
- strategy is modified acc. to the aetiology

Aetiology for the treatment strategy:

1. Spasticity
2. Myelodysplasia
3. Arthrogryposis
4. Progressive Neuromuscular diseases and flaccid paralysis



Patients in Orthop. Univ. Hospital

- CP 24 pts.
- Myelodysplasia 15 pts.
- Arthrogyposis 11 pts.
- Progressive N-M diseases and flaccid paralysis 20 pts.

Spastic CF – mostly in hemiplegia, develops later (1,5 – 4 y.)

++ activity of invertors (TP + TA)
++ activity of Triceps surae →
-- activity of peroneal muscles

Walking on lateral border

Painfull callosities

Foot drop in swing phase

Conservative treatment
-manipulation and bracing
-KAFO
-BOTOX

↓

poorly tolerated and not long term efficient

↓

SURGICAL TREATMENT

delayed - brace wearing and standing

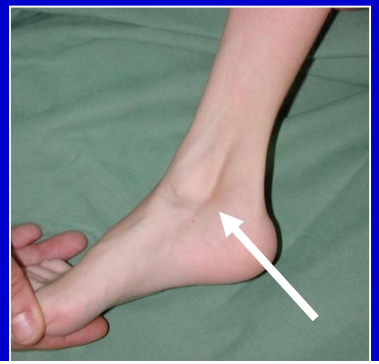
Surgical treatment of spastic CF

Dynamic
-possible correction
to a neutral position
– tendon surgery

Fixed
-impossible correction
– soft tissue + bony surgery

Tendon surgery: lengthening and transfers acc. to activity:
-Triceps surae – lengthening (acc. Silfverskiold test)
-Tibialis posterior x Tibialis anterior
hindfoot varus forefoot supination
(Confusion test, Passive manipulation,
Gait pattern, EMG and gait analysis)



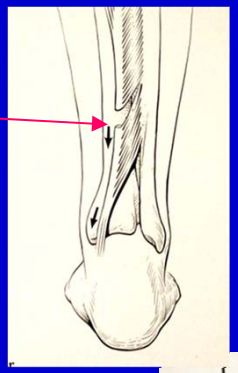



Surgical treatment of spastic CF – dynamic deformity

Tibialis posterior surgery (hindfoot varus):

- TP tendon lengthening (Z or intramuscular)

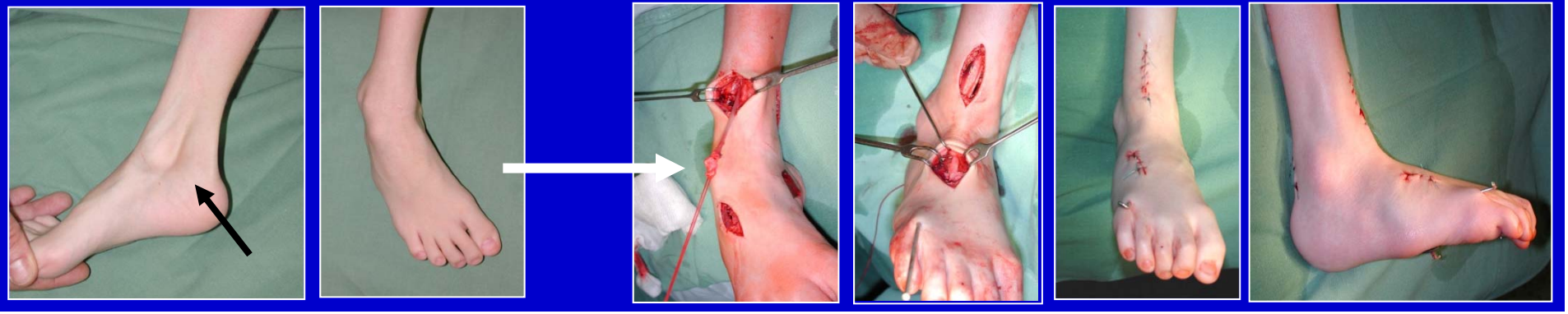
-– mild deformities only, recurrence is often



- Split TP tendon transfer -- peroneus brevis (complication – recurrent varus, overcorrection in older patients)

- <u>Anterior transfer of TP</u> – cuneiform II.-III. – very efficient
- mainly for hemiplegia
- strictly selected cases with sufficient other plantar flexors

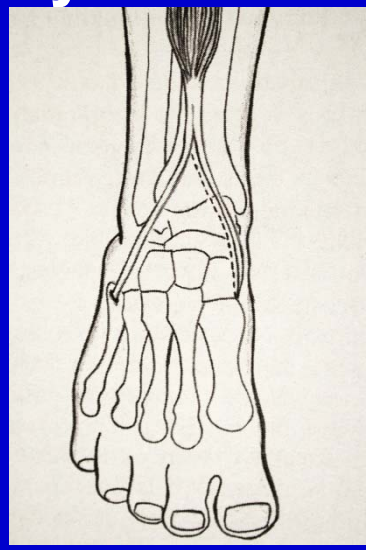
(complication- overcorrection – calcaneovalgus foot)



Surgical treatment of spastic CF – dynamic deformity

Tibialis anterior surgery (Forefoot supination):

- split TA tendon transfer – to cuboid bone



- whole TA tendon transfer to dorsum midline or cuboid
  (acc. to activity of peroneal muscles)

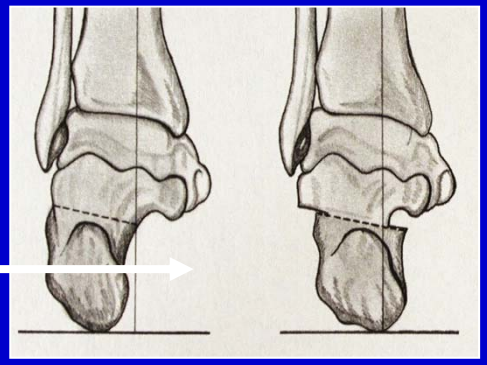
-split TA tendon + split TP tendon transfer / other combinations

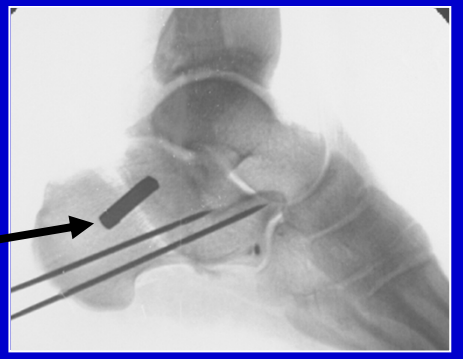
Surgical treatment of spastic CF – fixed deformity

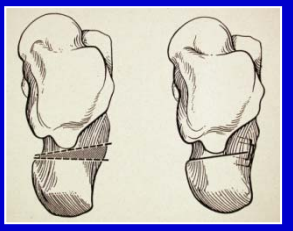
Bony surgery + tendon procedures (muscle balance)

-Heel varus – Dwyer osteotomy - lateral closed wedge

-translation osteotomy

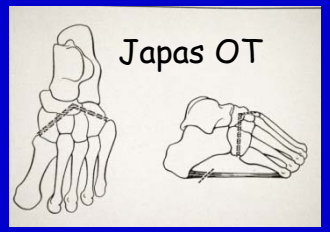






-heel varus and midfoot supination and cavus–

- combination with midfoot / metatarsal ostetomies



- severe rigid complex deformities

--triple subtalar artrodesis in adolescents

MMC and myelodysplasia- clubfoot

Common deformity (30%), very rigid

- irrespective of level of lesion
- muscle imbalance ?
- teratologic deformity

Treatment:

Manipulation and casting – A.S.A.P., similar to idiopathic CF

! pressure sores and fractures !

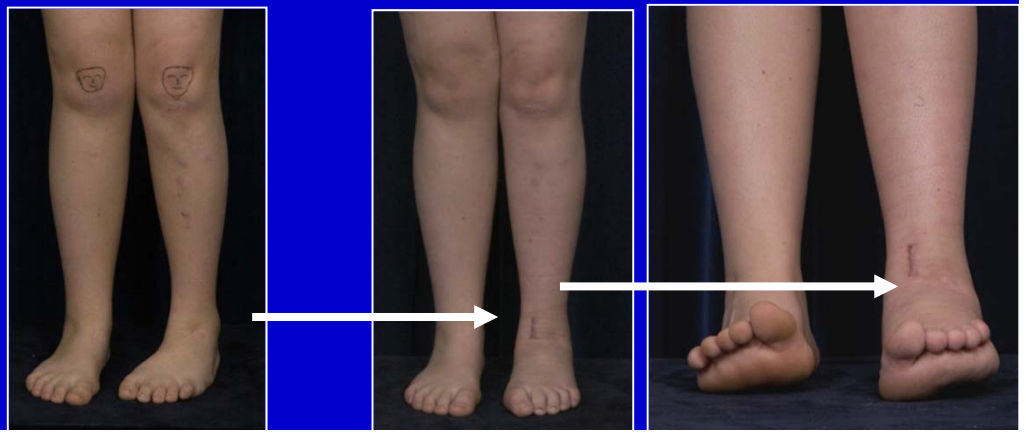
Surgical treatment: in point of brace wearing and standing

Choice of procedure:

-tendon lenthening and Tibialis Ant. transfer to the midline

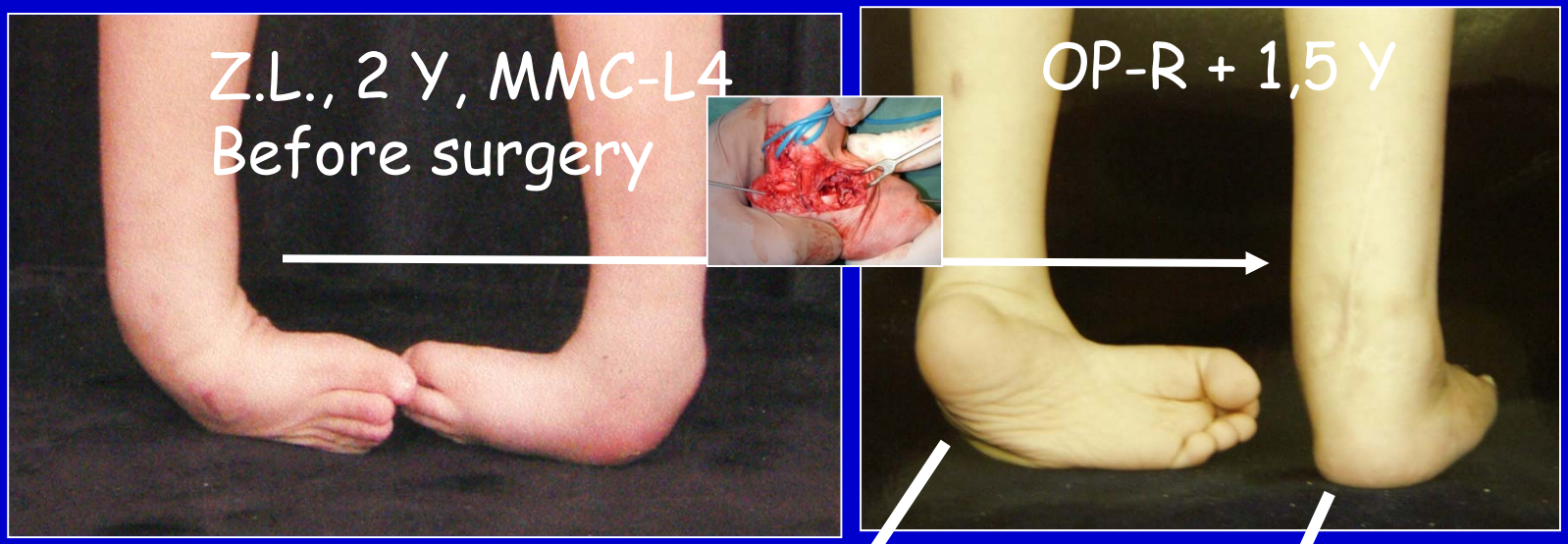
- – lower lesion, mild deformity

T.S., 12 y
lipomeningocoele



MMC and myelodysplasia CF

-Extensive subtalar release + tendon transection (TP,TA, Flexors) – upper lesions and rigid deformities



2 and 0.5 y. after bilateral ESR

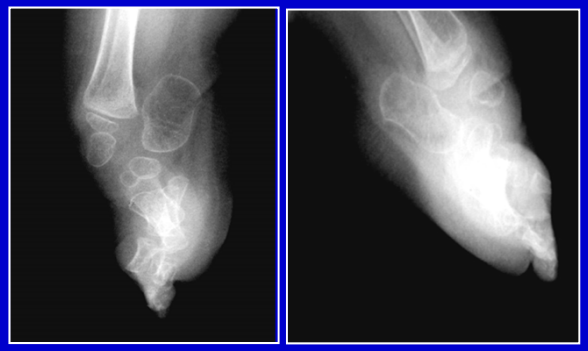
MMC clubfoot – bony surgery

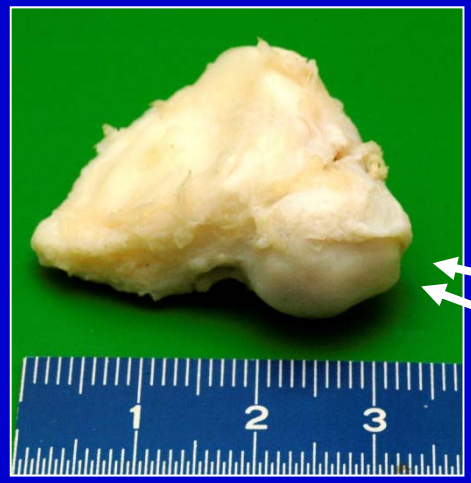
Very rigid deformities, without correction

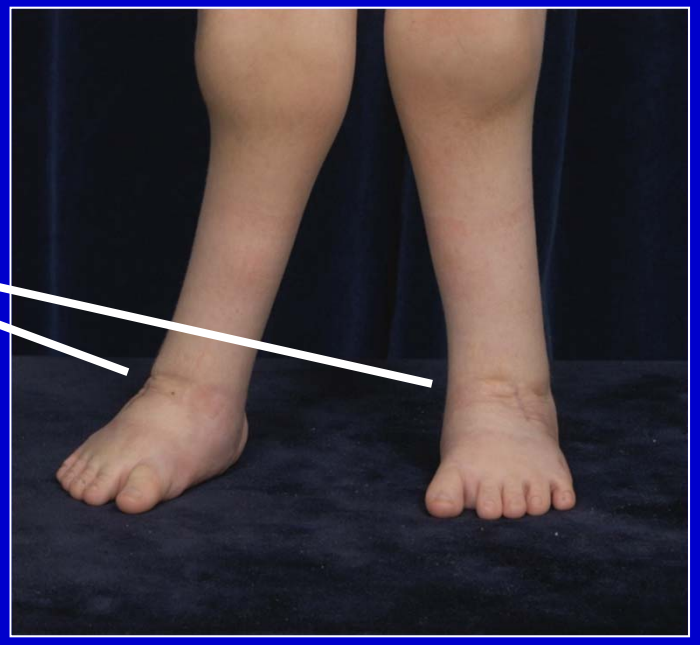
-talar enucleation (Verebeley-Ogston) – no experience

–talectomy - corection of hind foot, no forefoot deformity

SATISFIED RESULTS acc. our experiences

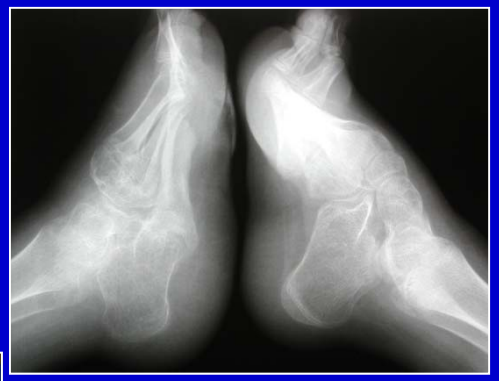


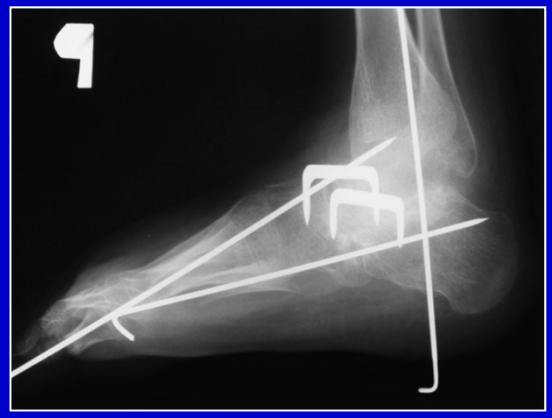




MMC clubfoot – bony surgery - adolescence

Triple arthrodesis of subtalar joints – strictly plantigrade position – to avoid pressure sores





-Aftertreatment:

-Casting – meticulous and short – necroris and pressure sores

- fractures from inactivity:

- orthoses – toxo-alergic reaction

-- walking ability – prevention of reccurence

Arthrogyposis and Artrogryposis-like syndroms - clubfoot

Usual deformity, very rigid
Severe calf atrophy, lack of flexion creases
Tendons fibrosed within sheats
Joints severely fibrosed

Treatment:

Manipulation and casting – early, similar to idiopathic CF
-partial correction – (varus and adductus)

↓

Surgical correction in prewalking age

- Posterior release in mild deformities
- Extensive subtalar release + event. tendon resection
+ lateral column shortening

AMC clubfoot – bony surgery

often - in recurrent deformities – controversial issue

- 1. osteotomies of the midfoot / forefoot

- 2. Ilizarov method without / with osteotomy

- 3. talectomy

- 4. triple arthrodesis of subtalar joints

- 5. supramaleolar osteotomy

Clubfoot in progressive neuromusculare disorders

Myopathy

-developing of eguinus / equinovarus deformities due to muscle imbalance

Treatment:

-**Conservative** – daily passive stretching + KAFO

-**Surgical** (acc. type of myopathy – Shapiro and Specht, 1996)

- Achilles tendon lentghening + event. anterior transfer of Tib.Post. tendon.

- recurrence of deformities and walking ability – acc. to type of myopathy

Neuropathic disorders

-**S M A and flaccid paralysis** (trauma, TU)

-equinus or equinocavovarus deformity

-treatment acc. to imbalance

-and main principals

-(transfers,OT, arthrodesis)

- H M S N

- Friedreich ataxia

- progressive cavus and cavovarus deformity:

(=equinus deformity of forefoot - calcaneus in dorsiflexion

no lengthening of Achilles Tendon)

- equinus of hindfoot – exceptionally

ACHILLES TENDON lengthening

after Steindler procedure

Results - Factors influencing:

- surgical method - aetiology - cooperation

Evaluation criteria - ? - Kling, 1985 - position, callosities, shoe-wearing

- excellent : plantigrade, no callosities, normal shoes
- good: some deformities (5 deg.), no callosities, normal shoes
- poor: - recurrence **x** over-correction, calluses, compromise with shoes

Our results:

Excellent and good results - 75-81% after 1st. surgical proc.

19 - 25% - repeated surgery for:

- residual deformities - recurrence - over-correction




Conclusions

1. Treatment of neurogenic clubfoot: various conservative and surgical options acc. to:

-- particular analysis of deformity and severity

-- aetiology

-- age

2. Soft tissue procedures are preferred – to restore muscular balance + preserve foot mobility

3. Avoid over-correction due to muscle transfer–reversal deformity

4. Patients and parents should be informed about the impossibility to achieve a normal foot, because of permanent neurological impairment and possible recurrence of deformity.





Split tibialis posterior tendon transfer and tendo-Achillis lengthening for spastic equinovarus foot

Cerebral palsy (CP) is a childhood condition in which there is a motor disability (palsy) caused by a static, non-progressive lesion in the brain (cerebral).

The causative event has to occur in early childhood usually defined as less than 2 years of age. Children with CP have a condition that is stable and non-progressive; therefore, they are in most ways normal children with special needs.*

Equinovarus deformity

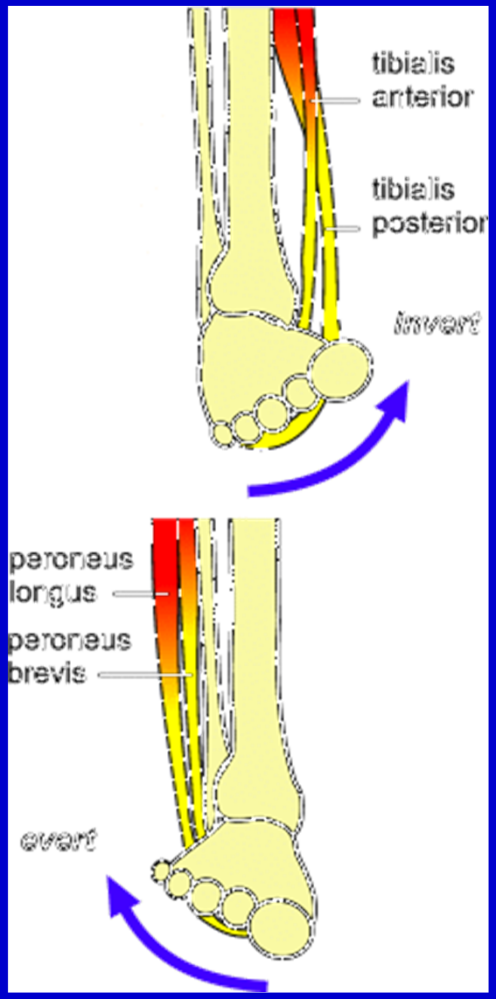
Common in children with CP (38% hemi-, 20% diplegic*)

Hamper ambulation – the gait cycle (foot, knee, hip)

Muscles imbalance – inventors of the foot (tibialis posterior and anterior muscle) overpower evertors (overactivity of TP 86% in EMG**)

The gait pattern becomes less effective and needs more energy.

Abnormal weight bearing → fixed foot deformity → painful callosities



Type of treatment

1) Anterior transfer of tibialis posterior (PT) tendon throught the interosseus membrane (Baker & Hill)
2) Intramuscular lenghtening of the PT (Frost)
3) Z-lenghtening of the PT
4) **Split PT tendon transfer** (Kaufer, later Green and Kling)

The aim of the study

Evaluation of the effect split tibialis posterior tendon transfer on peroneus brevis in it's distal part and Tendo-Achillis lengthening for spastic equinovarus feet.

Material and methods

19 ambulatory patients from 136 cp children who underwent foot surgery.

hemiplegia – 12 pts,

diplegia – 7pts

split tibialis posterior tendon transfer together with tendo - Achillis lengthening in all pts was perform simultaneously.

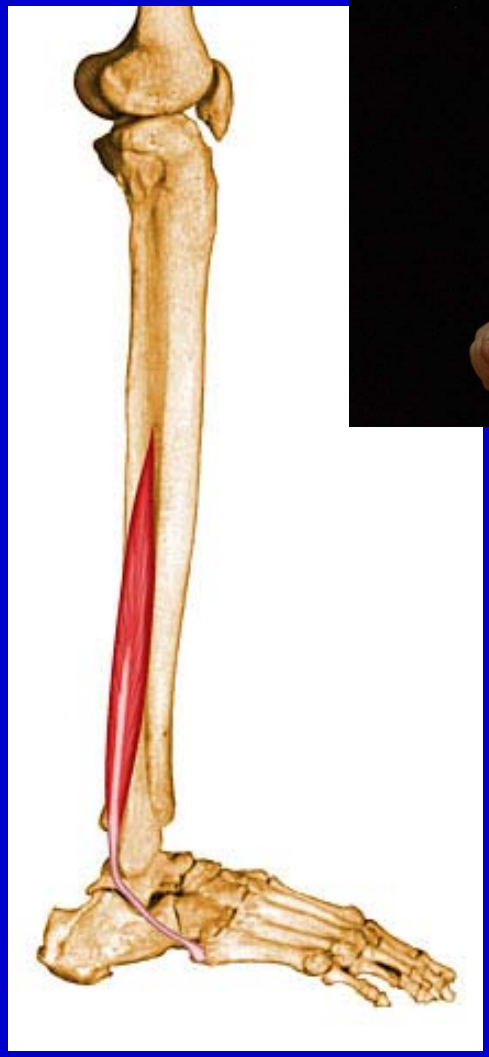
4 feet – additionally – plantar aponeurosecectomy

The study was based on clinical examination, parents' questionnaire, radiology.

The mean age at the surgery was 13.9 (range: 9-17)

The mean follow up was 4.6 years (range: 2 – 7 years)

Material and methods



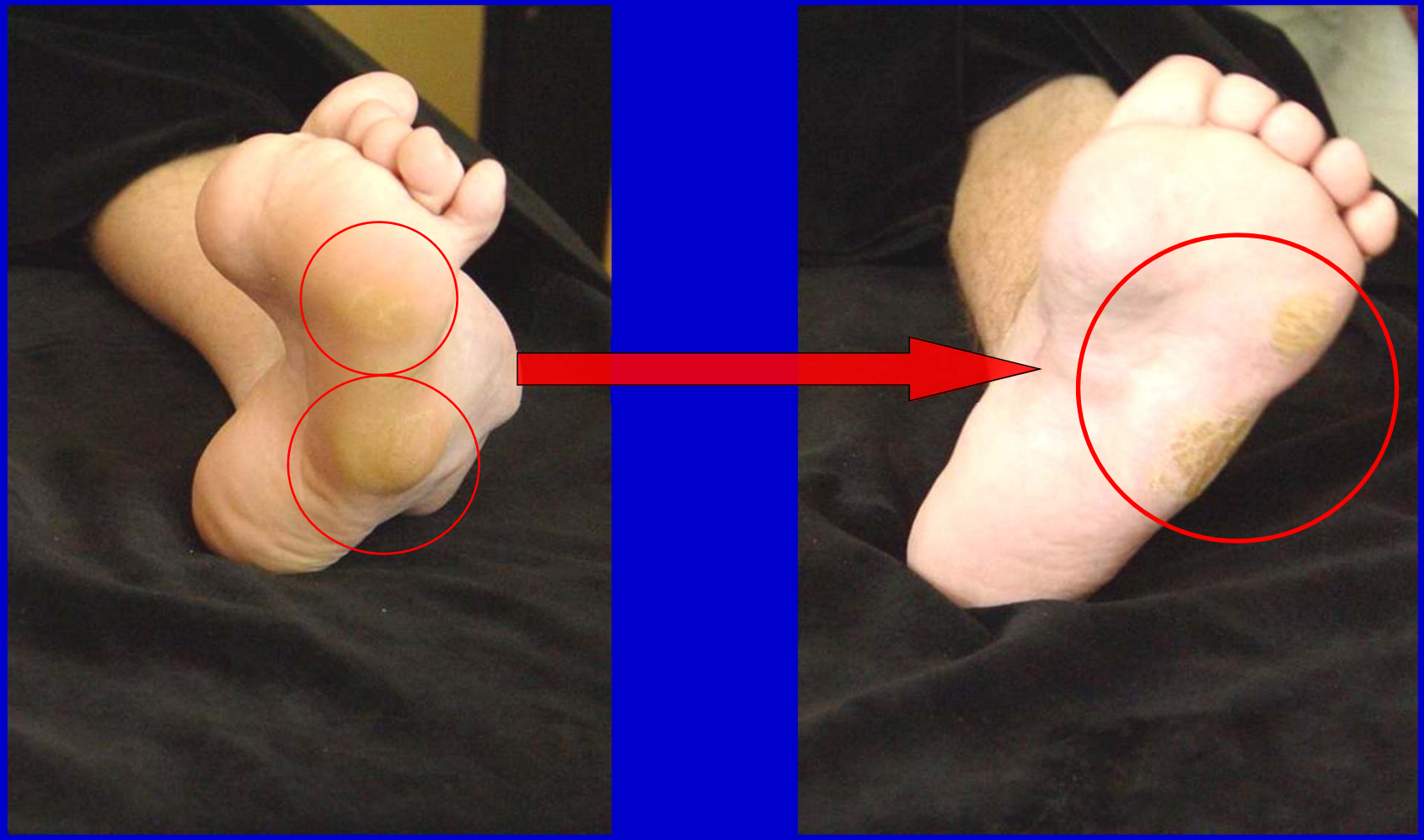
Results

The functional improvement was observed in 17 (89%) children with tendon transfer.

At the last follow up those patients were brace free, with plantigrade foot while walking and normal shoes were used.

Results

All painful callosities disappeared.



Results

On a standing AP X-ray adequate correction of the hindfoot-forefoot relation was achieved in 14 (74%) cases.

Persistent equinovarus deformity over 10 degrees was observed in 2 cases. Those patients underwent additional bone surgery.

Conclusion

With a properly planned approach the split tibialis posterior tendon transfer can bring good clinical and functional results in CP children with equinovarus deformation.

We recommend this procedure in early stage of the deformity what can eliminate more harmful triple arthrodesis in severe deformities.

In early stage of the deformity – passive foot correction is possible

INTRODUCTION

The congenital clubfoot is often seen in orthopaedic practice. This deformation is easy to diagnose after birth, but proper treatment is not always applied after delivery. Late treatment makes the final result worse.

TREATMENT

OPERATIVE

TREATMENT

OPERATIVE

TREATMENT

1. Posterior release with TAL

2. Postero-medial release - McKey technique

3. Postero-medial and lateral release
   Cincinnati incision

OPERATIVE

TREATMENT

- **Posterior release with Achilles tendon lengthening**

***Good forefoot correction**
***Achilles tendon contracture**
***Calcaneus in supination**

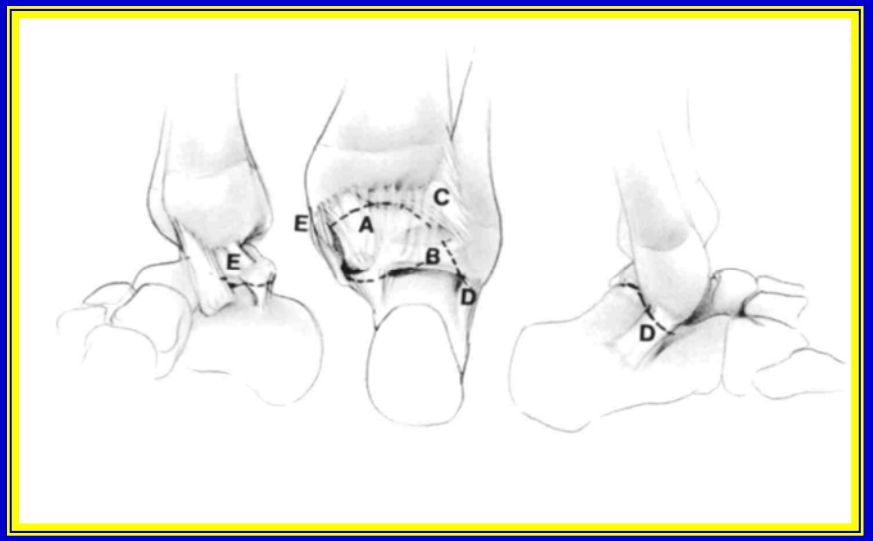
OPERATIVE
TREATMENT

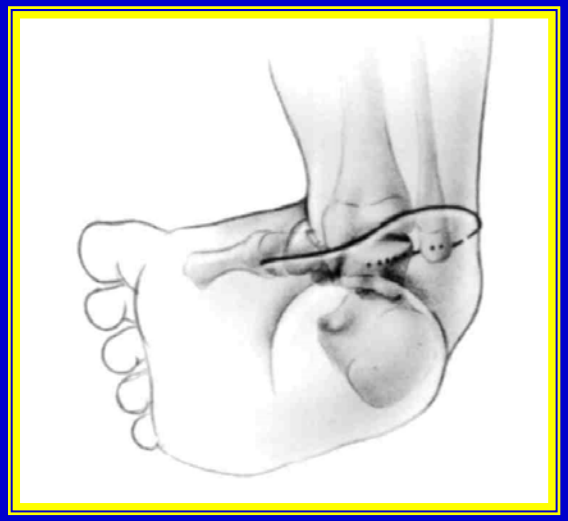
- **Postero-medial release - McKey technique**

OPERATIVE

TREATMENT

- Postero-medial and lateral release
- Cincinnati incision





RESULTS

Magone at al. classification system (JPO 1989;9:49-58)

* very good = 21.6%
* good = 29.3%
* satisfactory = 26.7%
* poor = 22.7%

RESULTS

- **VERY GOOD - 21,6 %**

RESULTS

- **GOOD - 29.3%**

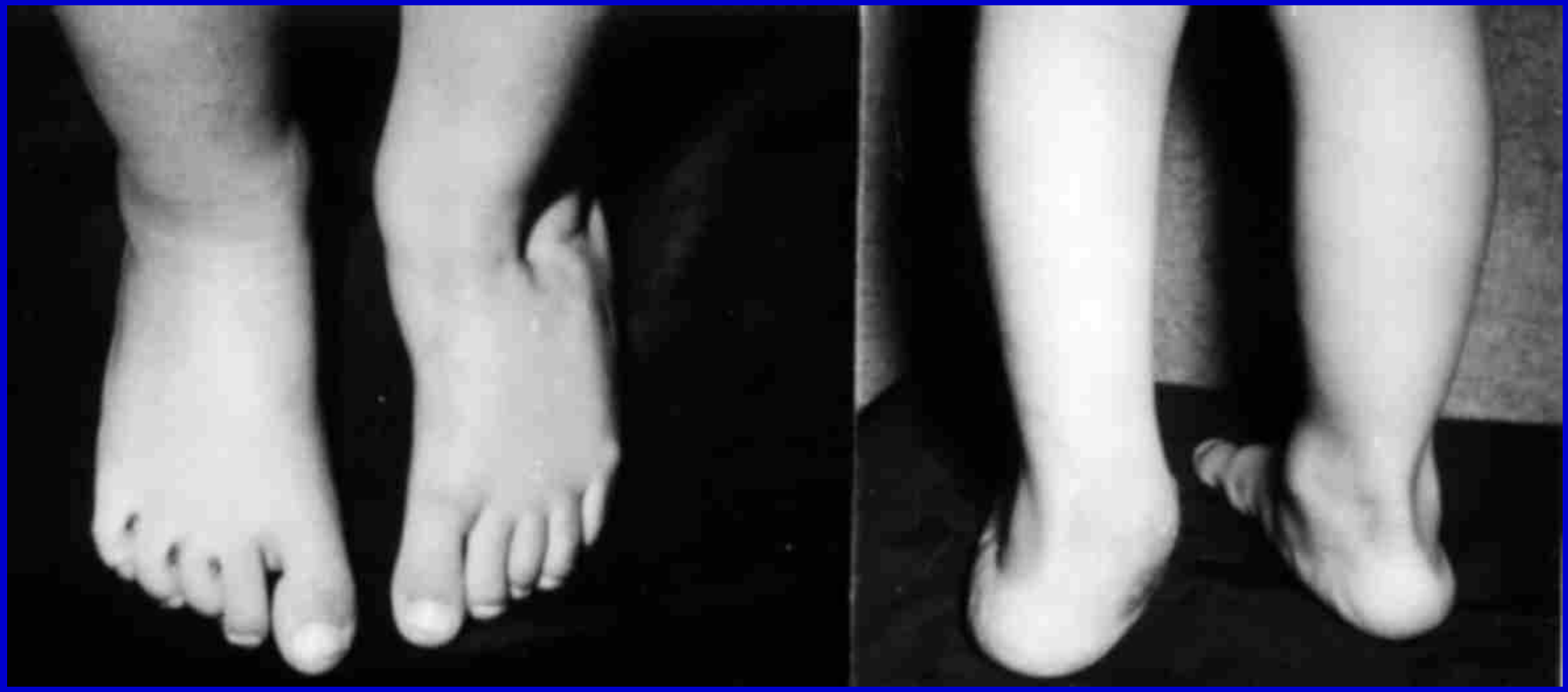
51%

RESULTS

- **Satisfactory - 26.7%**

RESULTS

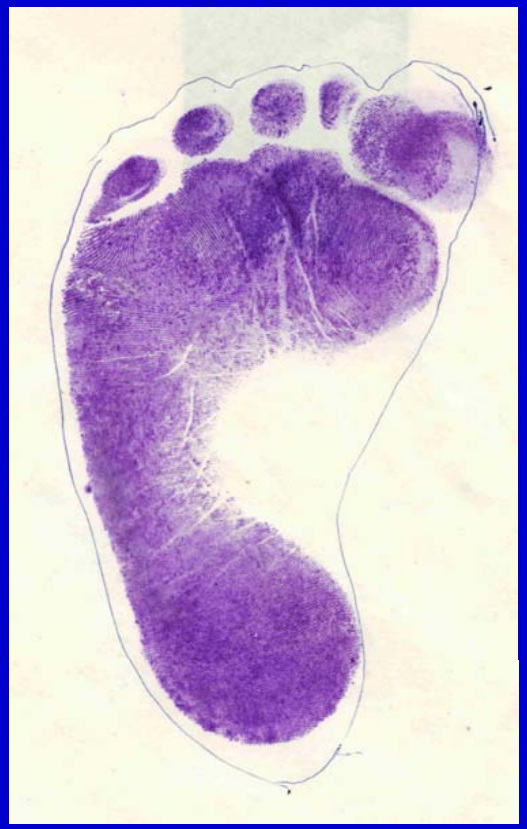
- Poor - 22,7%



COMPLICATIONS

- not adequate foot correction
- wound healing problems
- tendons injury (FHL,FDL)
- K-wire migration
- neurovascular

COMPLICATIONS



COMPLICATIONS

- Arthrotic changes was common seen after the surgery

PROBLEMS

1. PROPER INDICATION FOR SURGERY
2. SURGEONS EXPERIENCES MANDATORY
3. EARLY CONSERVATIVE TREATMENT
4. REGULAR FU

CONCLUSIONS

1.Treatment of congenital clubfoot is difficult

2.High level of experience is required

3.The conservative treatment is necessary

4.The proper indication for the type of surgery

THE ALALYSIS OF COMPLICATION AFTER SURGICAL TREATMENT OF CONGENITAL CLUBFOOT

The surgical treatment of congenital clubfoot is difficult and connected with relatively high risk of complications

MATERIAL & METHODS

Years : 1966 - 2005

567 feet operated by different methods :

1. **Posterior release with *TAL***
2. **Postero-medial release - *McKey technique***
3. **Postero-medial and lateral release**
   Cincinnati incision

MATERIAL & METHODS

Mean age at the surgery :

17.5 months

(from 5 months to 7 years)

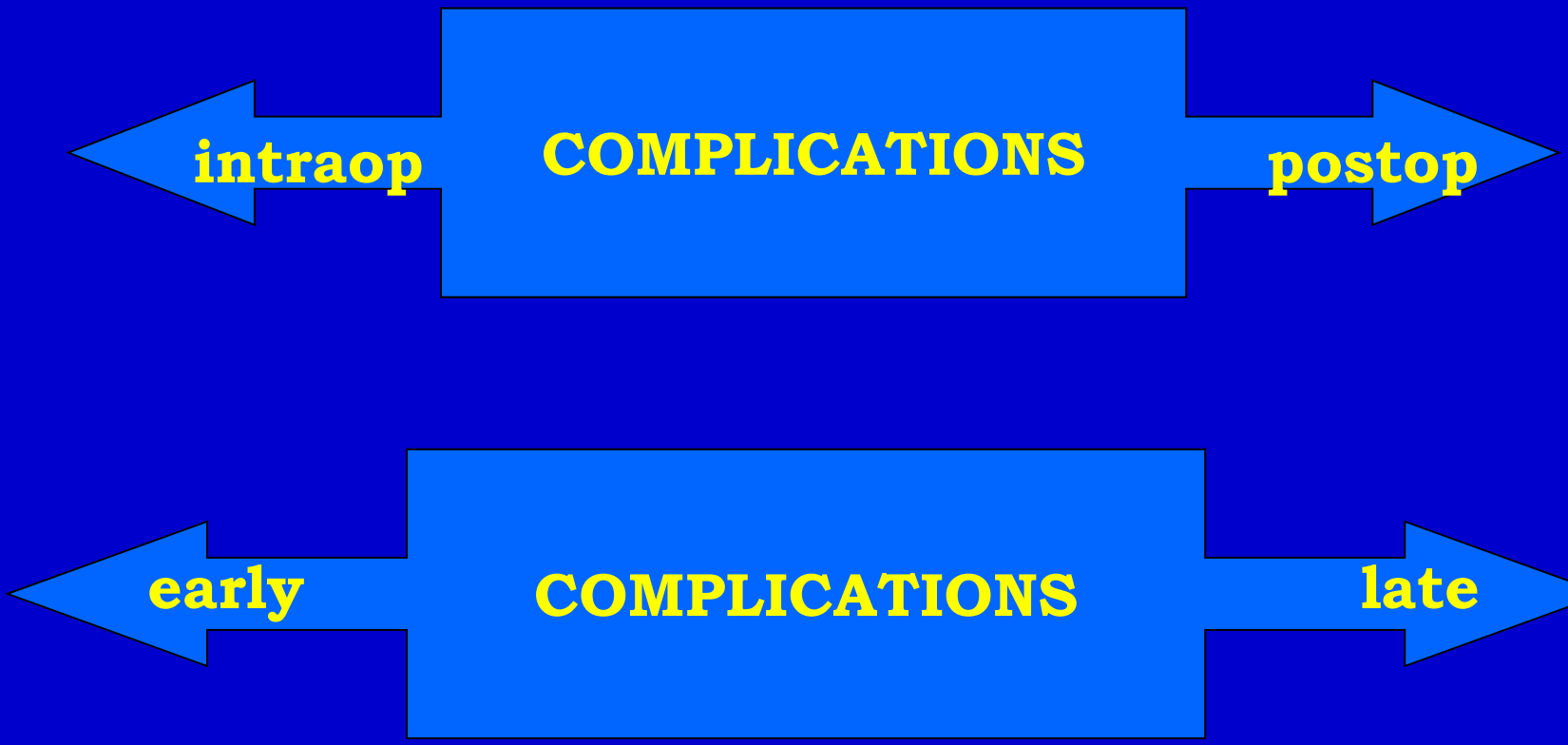
MATERIAL & METHODS

111 COMPLICATIONS

IN

46 FEET

MATERIAL & METHODS



MATERIAL & METHODS

intraoperative **COMPLICATIONS** postoperative

* Injury of the anatomical structure
* Poor surgical technique

* problems with wound healing
* skin necrosis

MATERIAL & METHODS

COMPLICATIONS

* **Poor surgical technique:**
  - *surgery performed by many surgeons
  - * not enough experiences
* **Injury of the anatomical foot structure :**
  - * injury of FDL
  - * injury of FHL
  - * injury of TA
  - * damage of the tibial artery
  - * not enough skin to cover the wound

MATERIAL & METHODS

111 COMPLICATIONS

IN

46 FEET

COMPLICATIONS

Problems with wound healing

COMPLICATIONS

skin necrosis

COMPLICATIONS

skin necrosis

COMPLICATIONS

Skin necrosis

(K-wire removed)

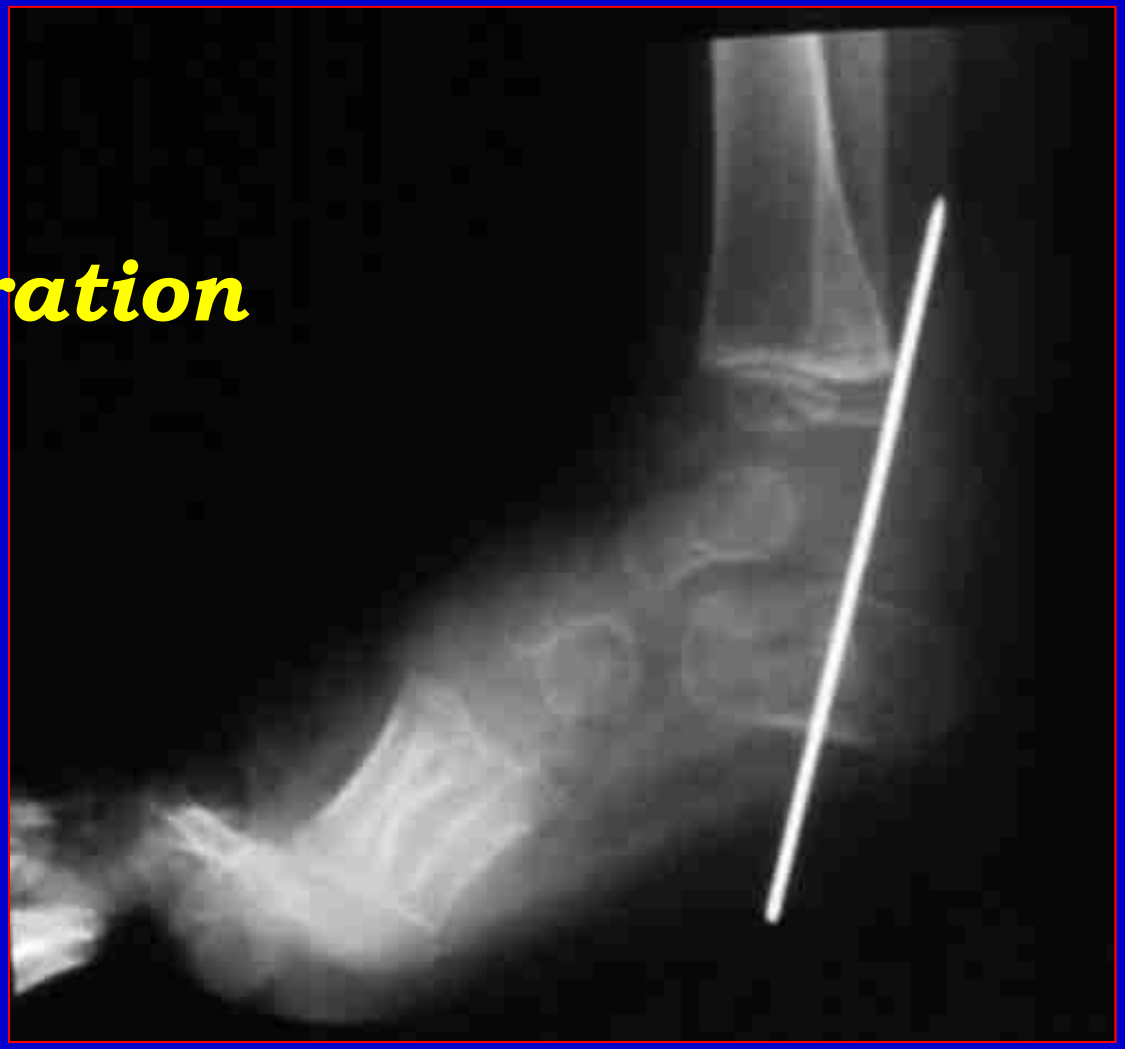
COMPLICATIONS

Necrosis

after
tibialis artery injury

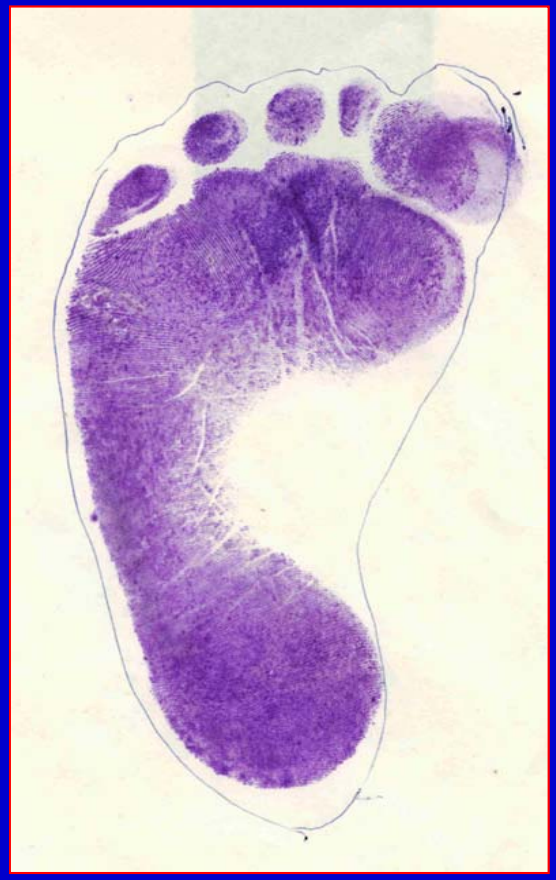
COMPLICATIONS

K-wire migration



COMPLICATIONS

recurrence of foot deformation



COMPLICATIONS

Degenerative arthritis changes

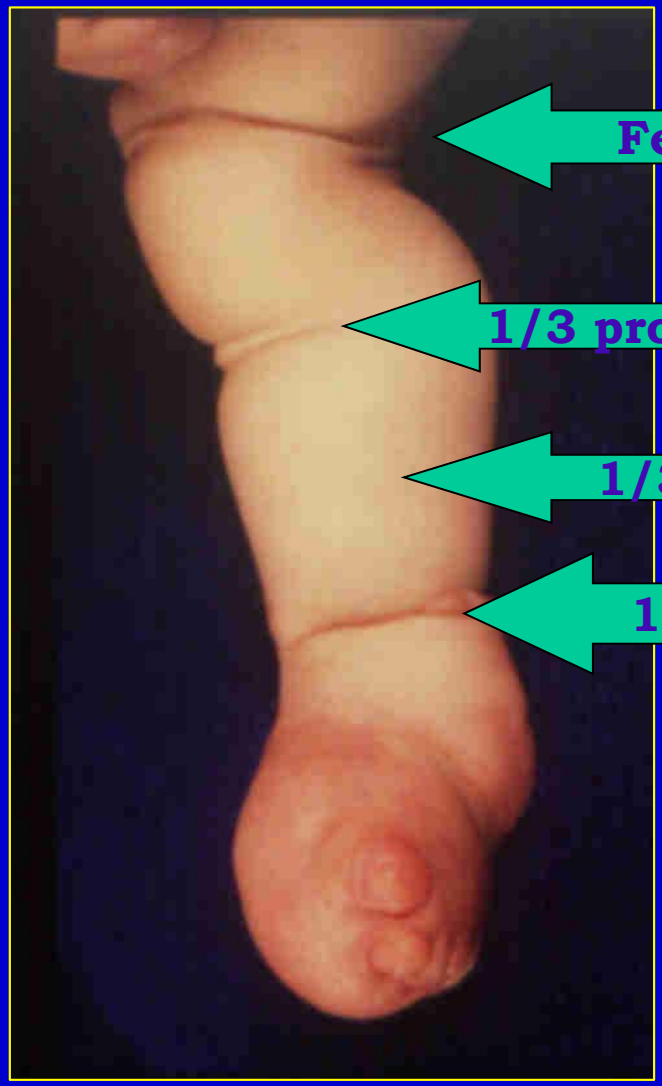
CONCLUSIONS

1. Treatment of congenital clubfoot is connected with a high risk of complications

2. The good knowledge of foot anatomy as well as surgical procedures is essential to obtain satisfactory results

Amniotic bands syndrome and clubfoot

OUR MATERIAL

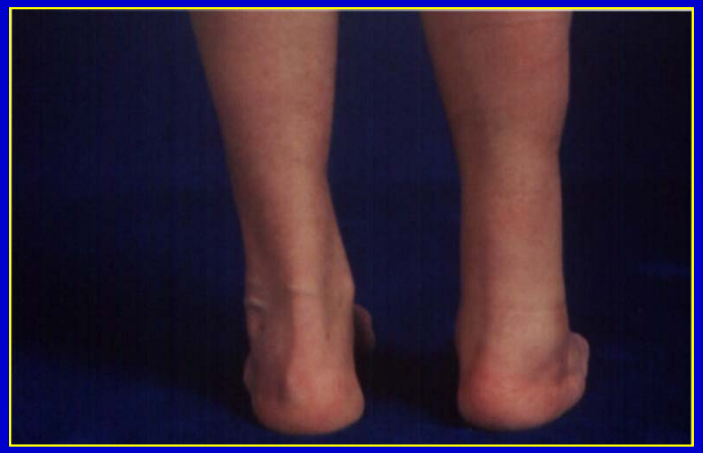


Material

- *All feet were operativelly treated by subtalar release (19 children) or TAL with posterior release (7 children).*

- *In the treatment amniotic bands were treated first by skin Z plasty, followed by foot surgery*

RESULTS



RESULTS

* *25% very good*
* *34% satisfactory*
* *41% poor*

RESULTS

Very good results were observed when the amniotic bands were located at the femur region

Satisfactory results were observed when amniotic bands were located in proximal 1/3 of the calk and were shallow.

Deep amniotic bands with full circle of the calf located in distal 1/3 of the calf resulting in poor results.

Hypoplasia of extremity

Radiographic Features

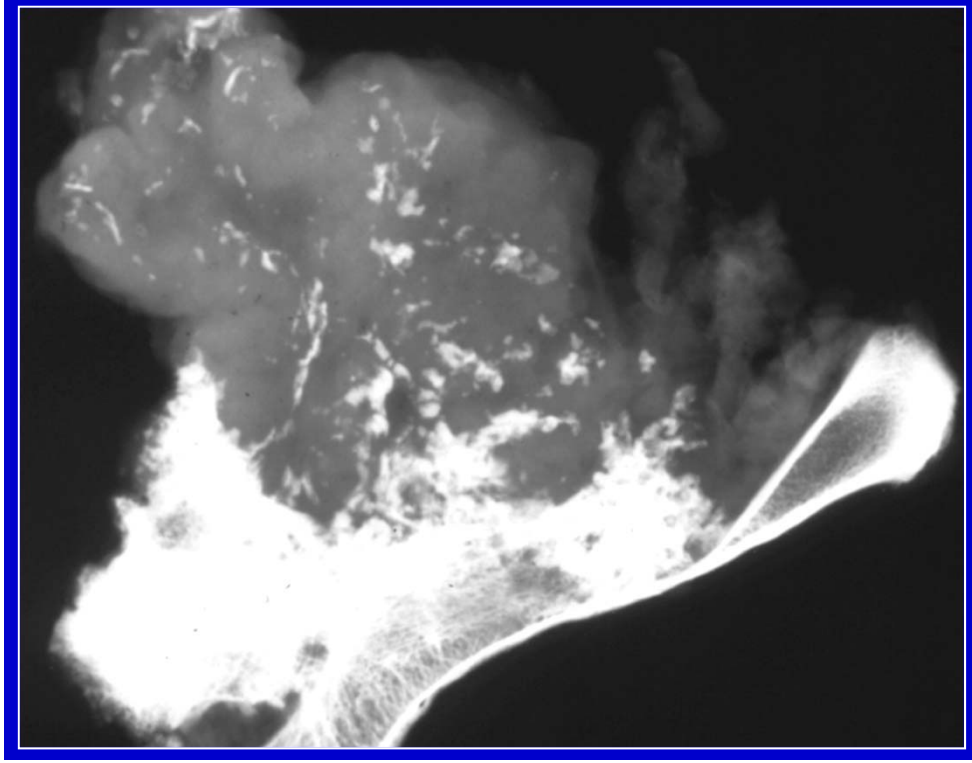
Deformity – Valgus Knee and Ankle

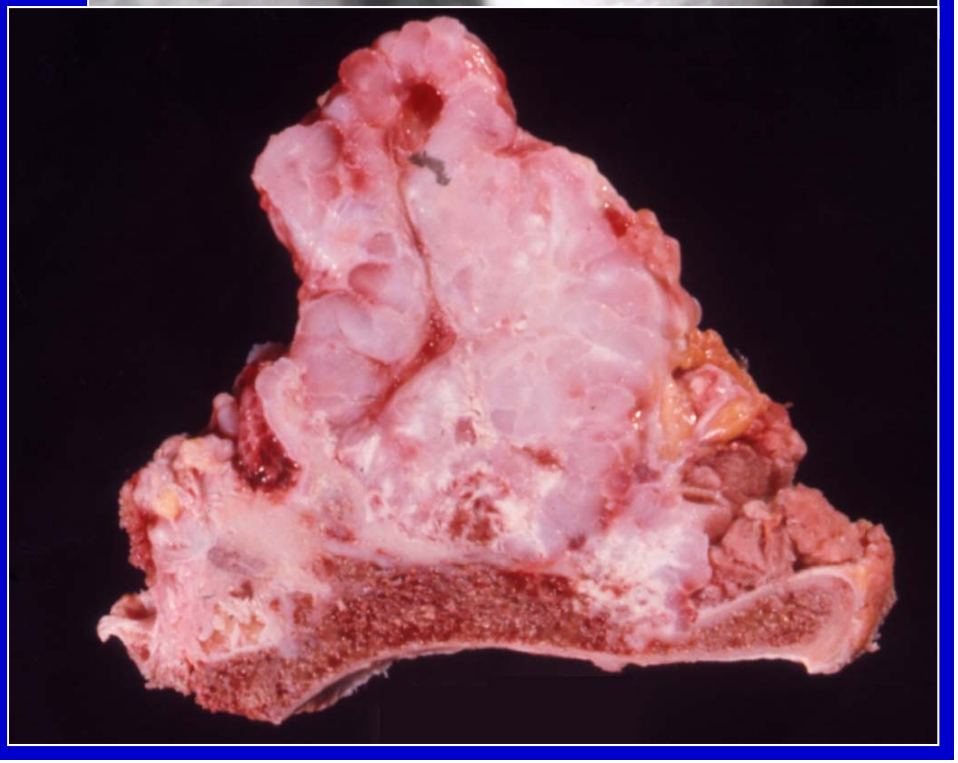
Deformity – Forearm

Deformity – Forearm

Mal. Trasformation 1- 3%

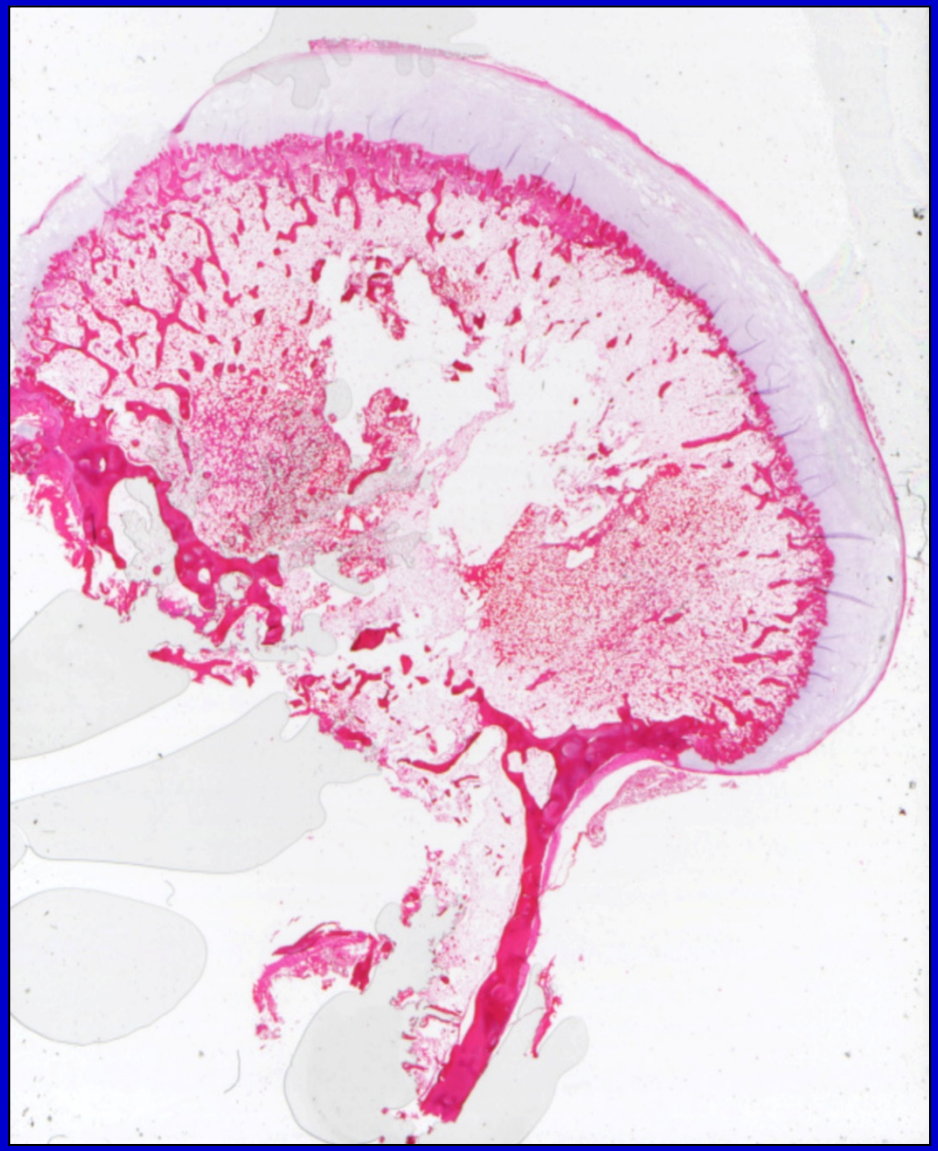
Historical Reports 5 - 25%

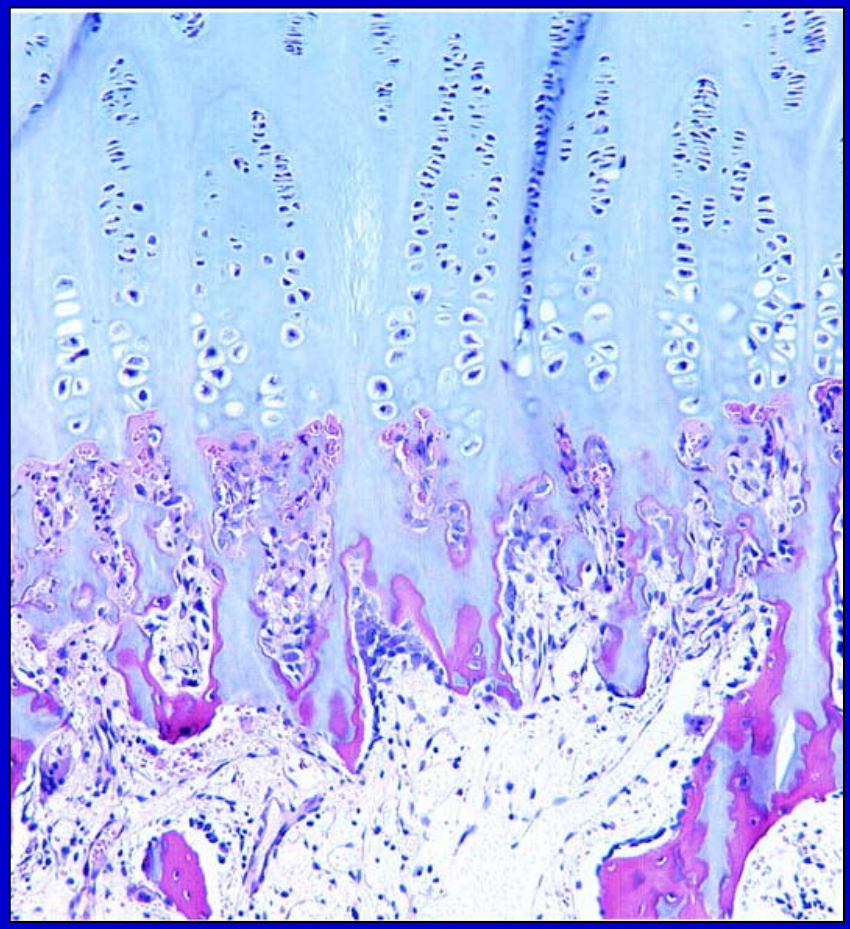




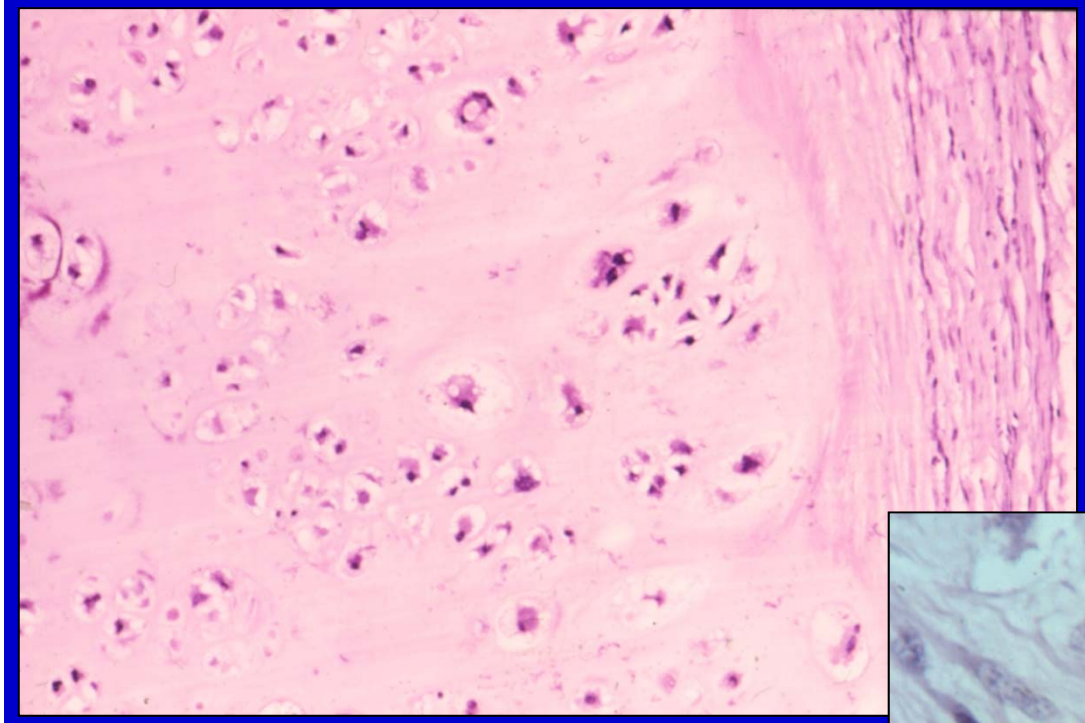
Pathology of Exostosis: Gross Aspect

Pathology of Exostosis: Microscopic Features



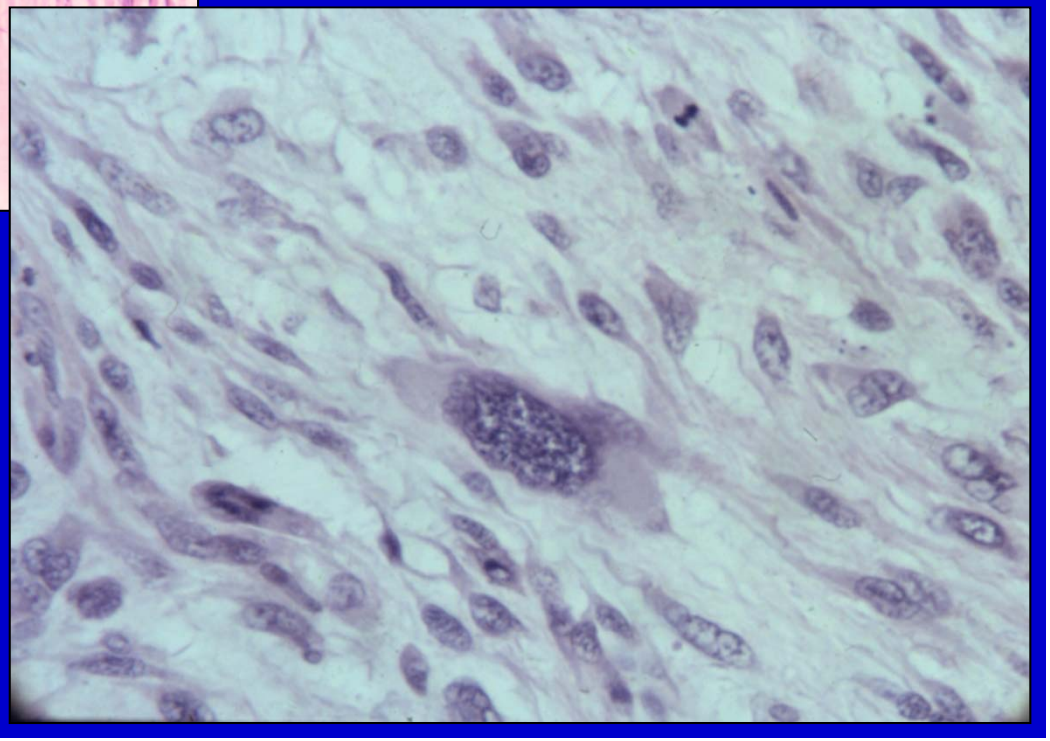


Pathology of CHS: Microscopic Features



Grade 1

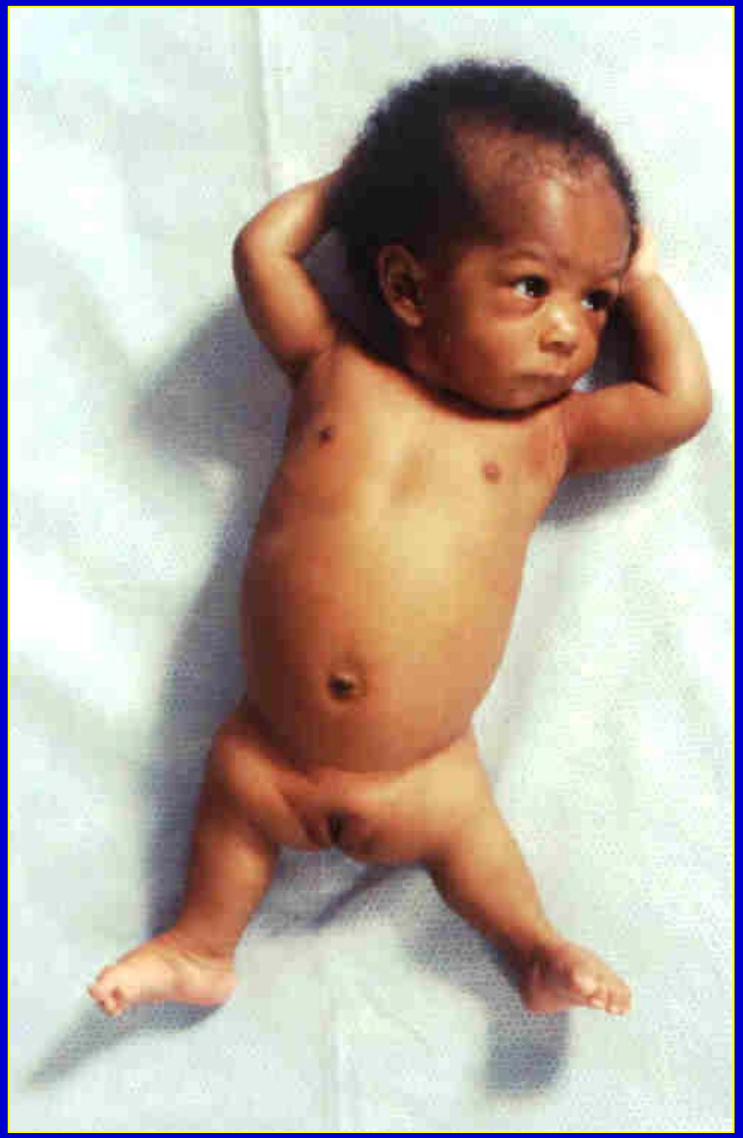
Grade 3



N = ?

CONGENITAL DISEASES

CONGENITAL DISEASES



CONGENITAL DISEASES