

# Lower Extremity Orthopedic Surgery in Cerebral Palsy

Hank Chambers, MD

Rady Children's Hospital - San Diego

# Indications

- **Fixed contracture**
- **Joint dislocations**
- **Shoe wear problems**
- **Pain**
- **Perineal hygiene problems**

# What can Orthopedic Surgery Offer?

- Lengthen tendons
- Transfer tendons
- Relocate joints
- Rotate bones
- Fuse joints

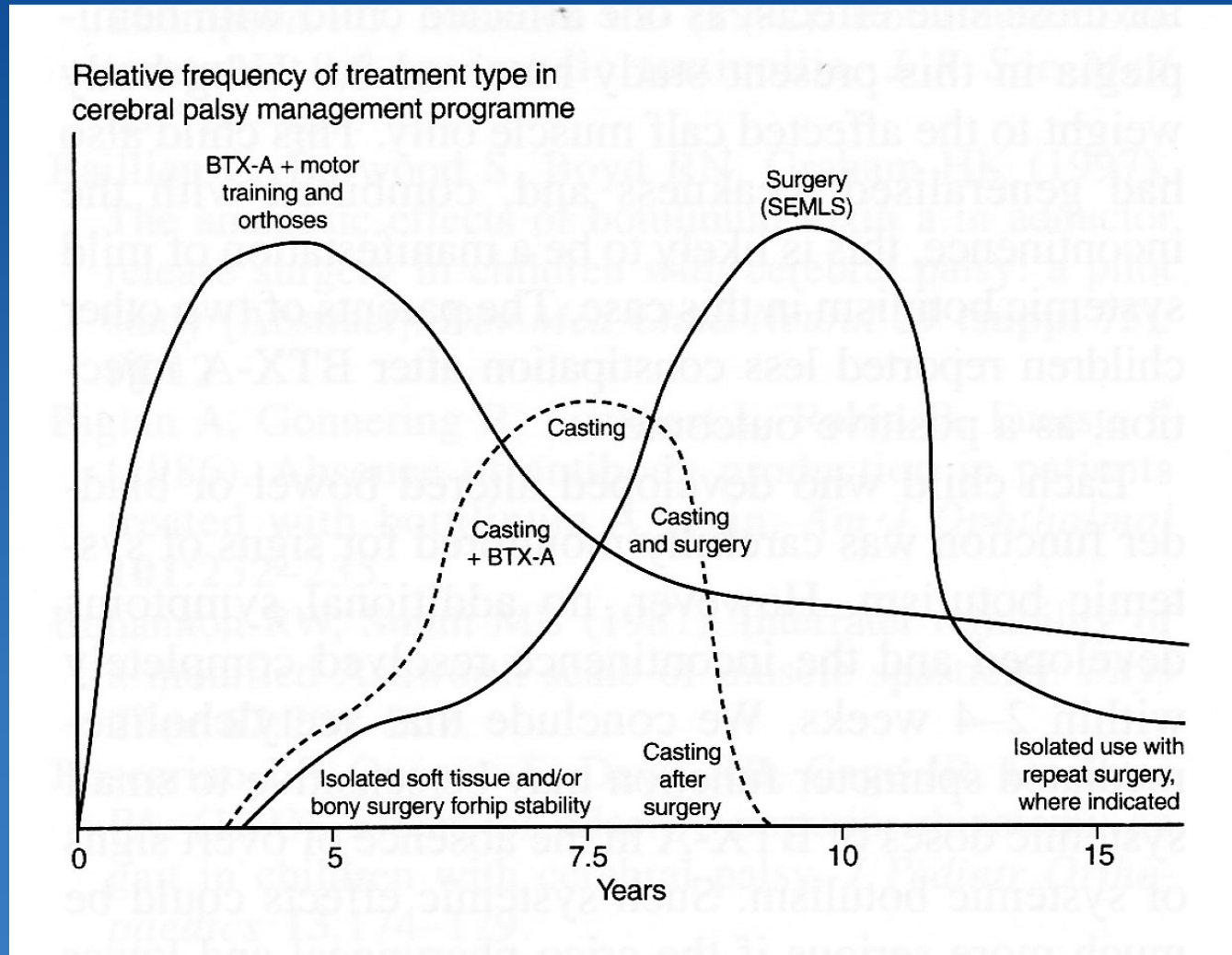
# Principles of Orthopedic Surgery in Cerebral Palsy

- **Single event, multilevel surgery**
- **Delay surgery as long as possible (> 6 years)**
- **Use spasticity management as adjunct to surgery**

# The Diving Syndrome



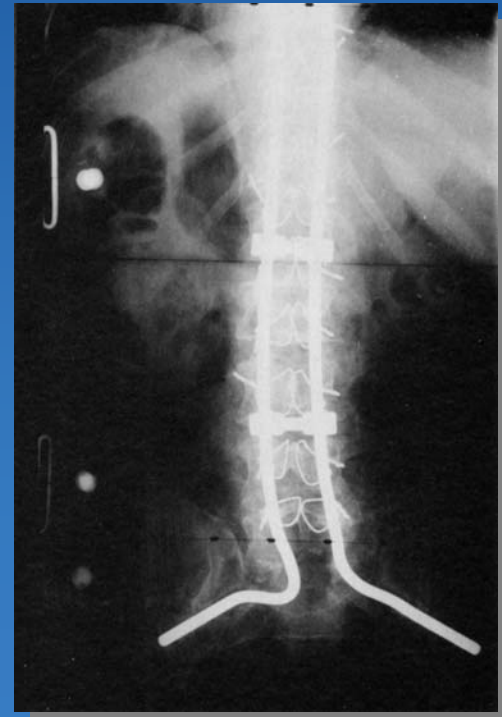
# Timing of Surgery



- **Soft tissue contractures**
- **Bony abnormalities**
  - Morphology
  - Rotation

# Spine Problems

- **Scoliosis**
- **Spondylolisthesis**



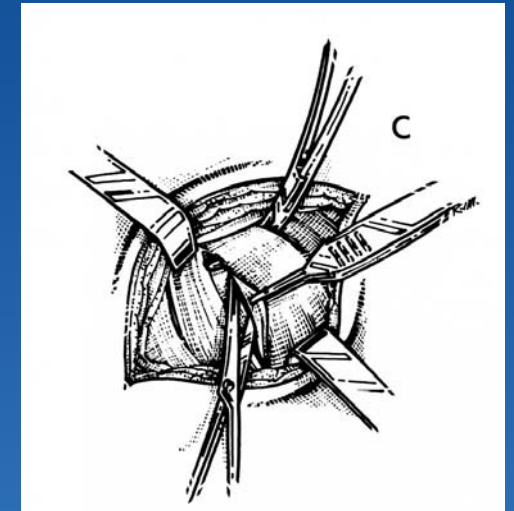
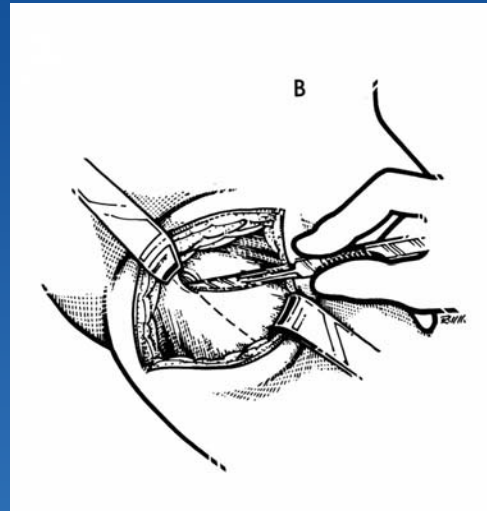
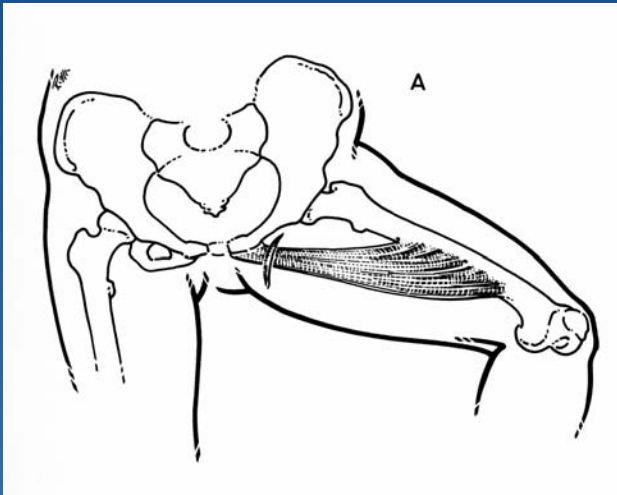


# Hip Adduction Deformity

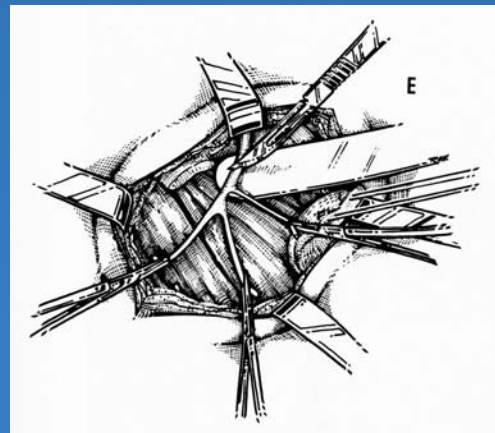


- Open vs percutaneous lengthening of adductors
- ? Obturator neurectomy

# Adductor Lengthening



## Obturator Neurectomy

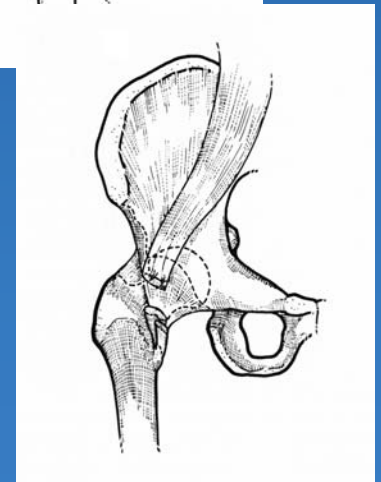
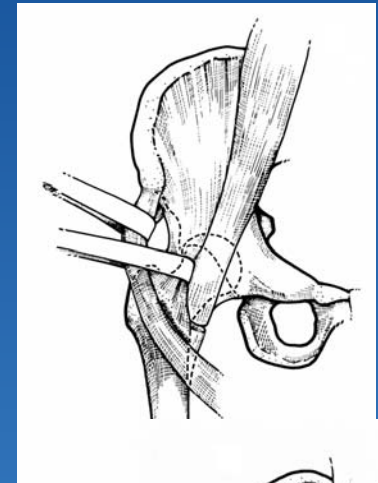
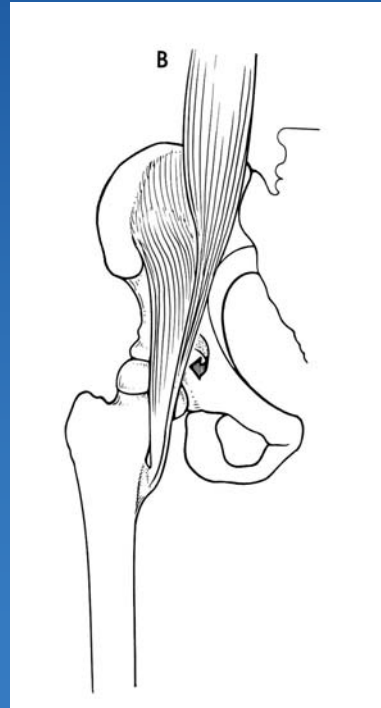
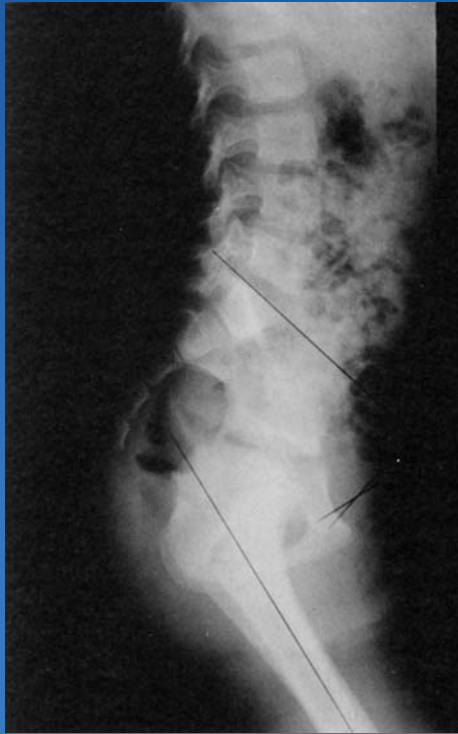


Canale and Beaty  
*Operative Pediatric  
Orthopedics*

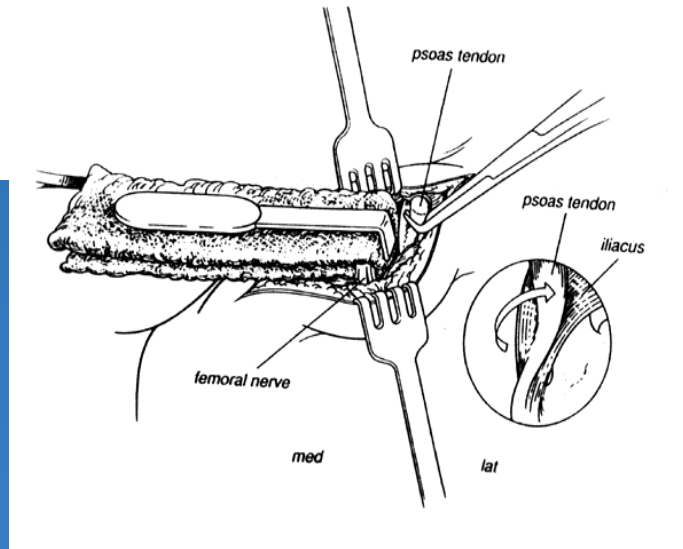
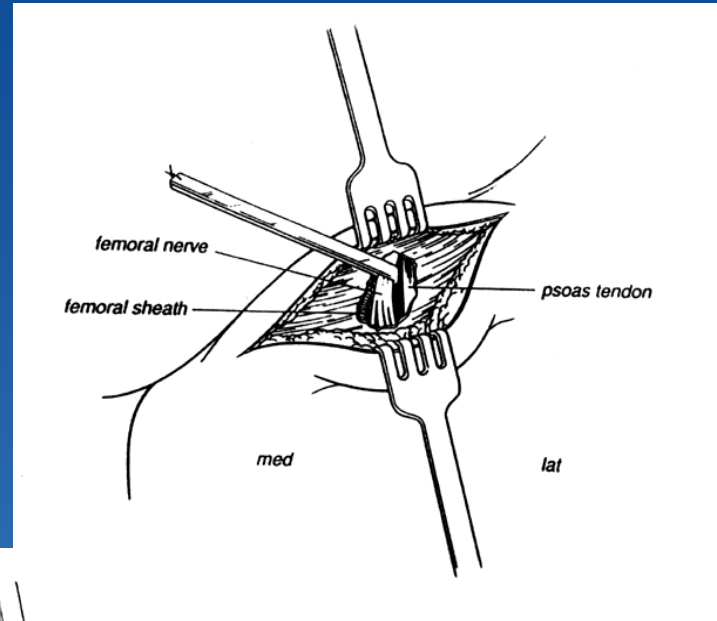
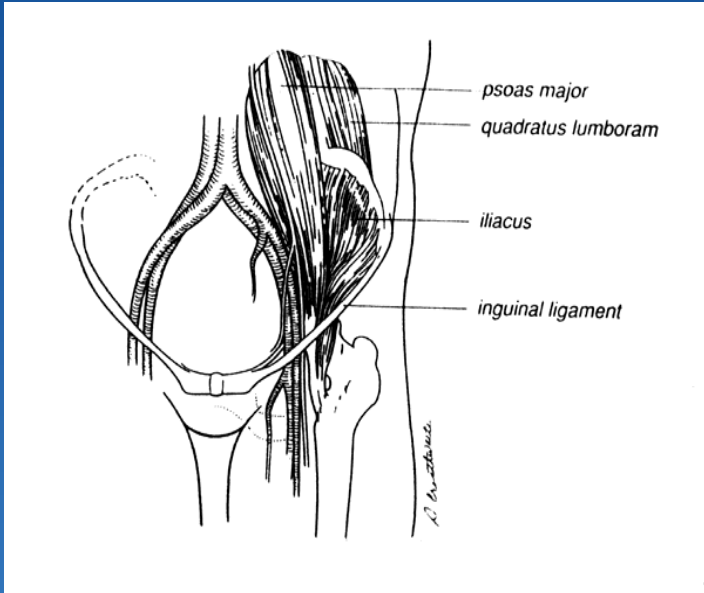
# Hip Flexion Deformity

- Usually caused by contracture of the iliopsoas muscle
- Sartorius, rectus femoris and tensor fascia femoris muscle can also contribute

# Treatment of Hip Flexion Contractures



# Psoas lengthening at the Pelvic Brim



# Hip Subluxation & Dislocation



Acetabular Dysplasia

Hip Subluxation

# **Hip Subluxation & Dislocation**

## **Indications for Treatment:**

- Hip subluxation in any condition**
- Pain**
- Loss of sitting ability**

# Proximal Femoral Varus Derotational Osteotomies

Indications for surgery:

↑ 'd valgus

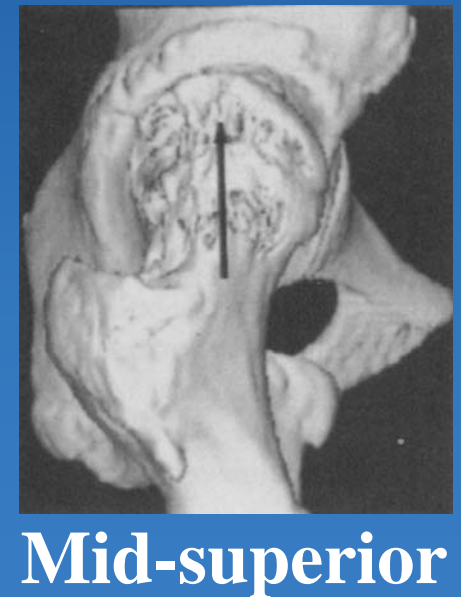
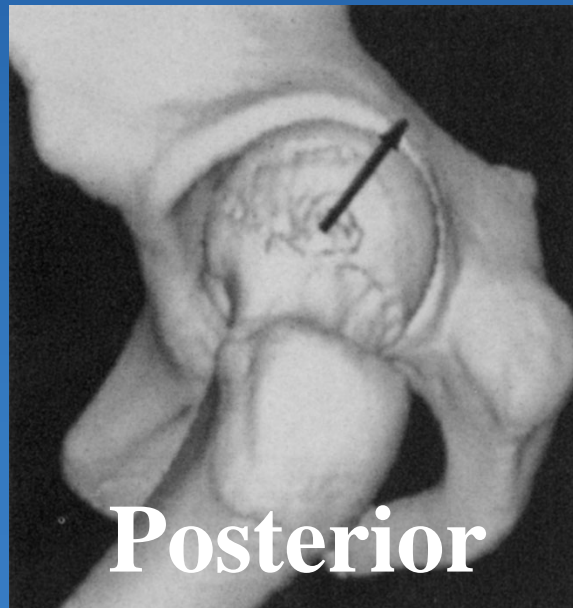
↑ 'd femoral anteversion





# Acetabular Dysplasia

- Usually posterior dysplasia

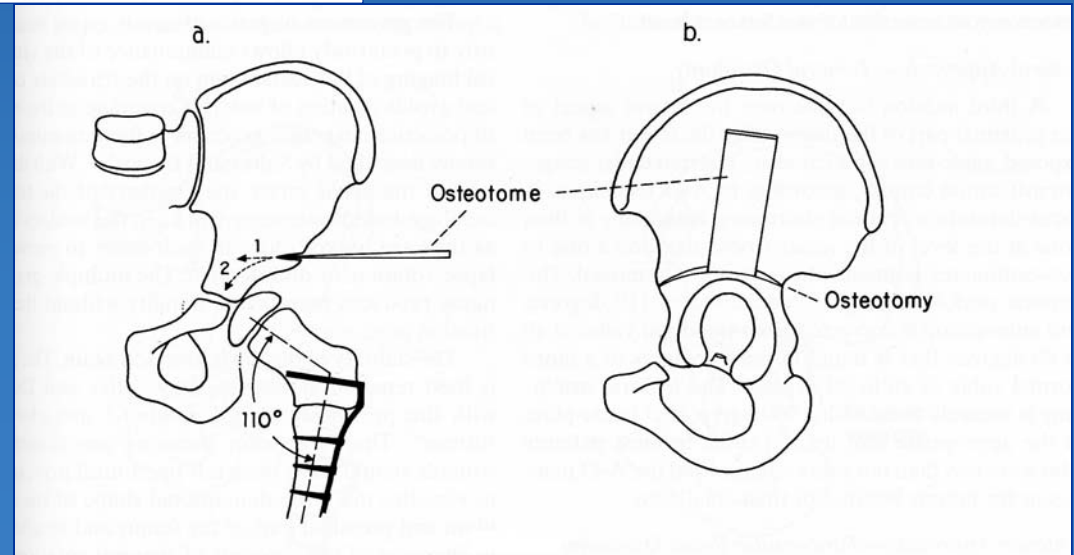
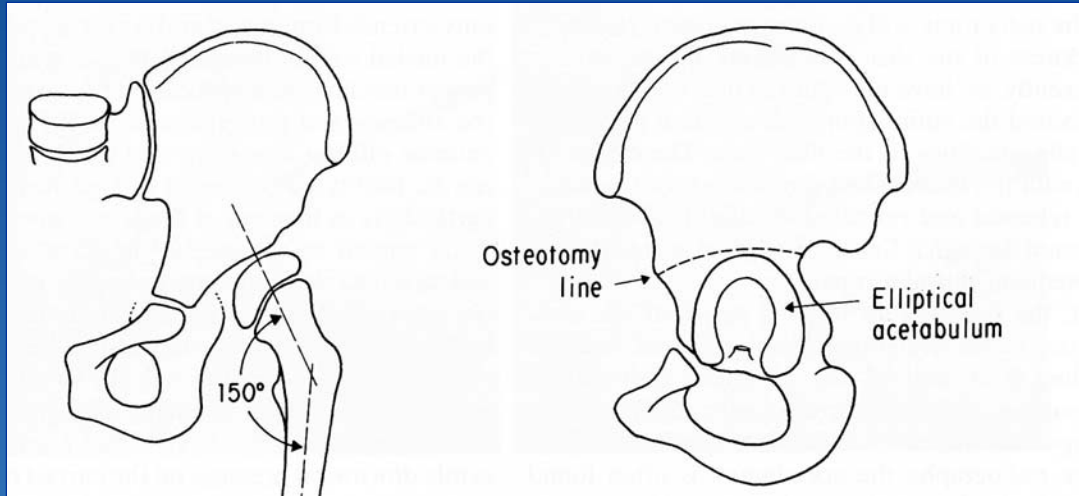


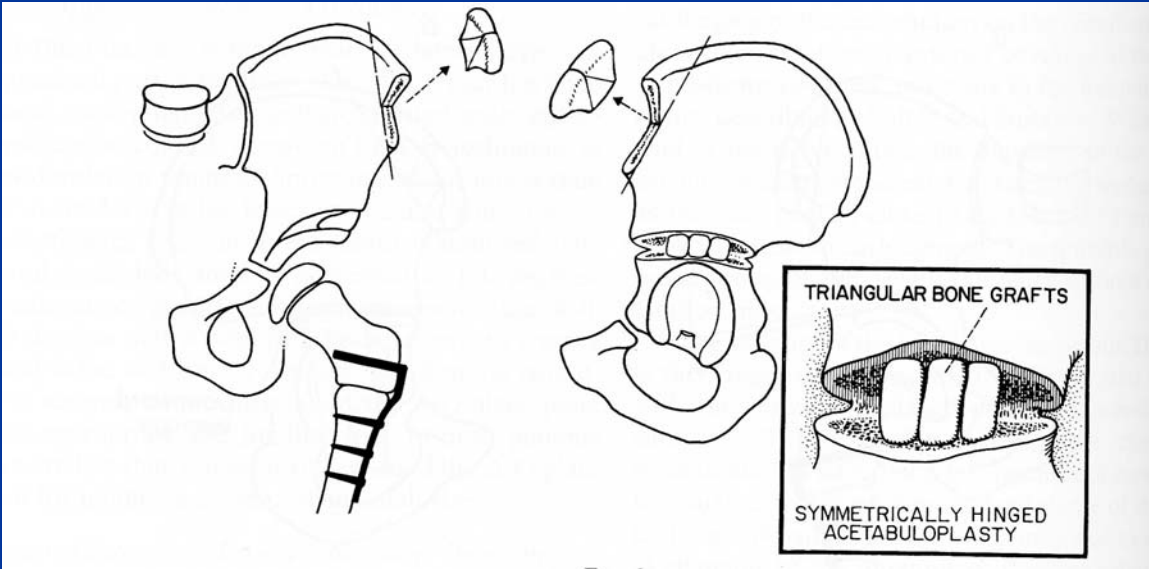
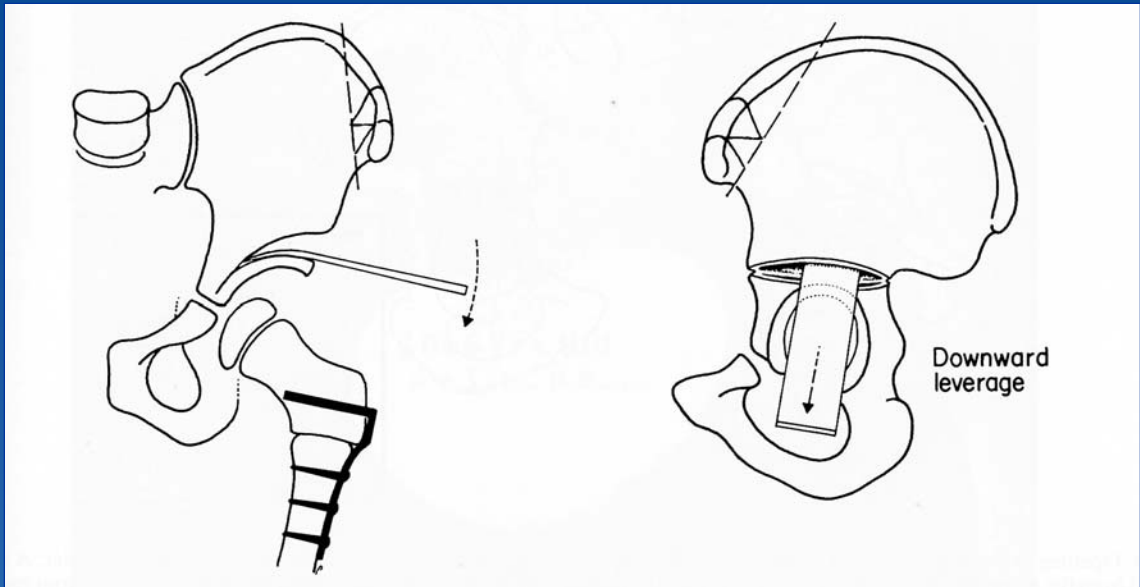
# Treatment of Acetabular Dysplasia

Periacetabular Osteotomy,  
Open Reduction and VDRO



# San Diego Approach to Hip Dislocation







# Salvage Procedure for Hip Dysplasia

- Interposition arthroplasty

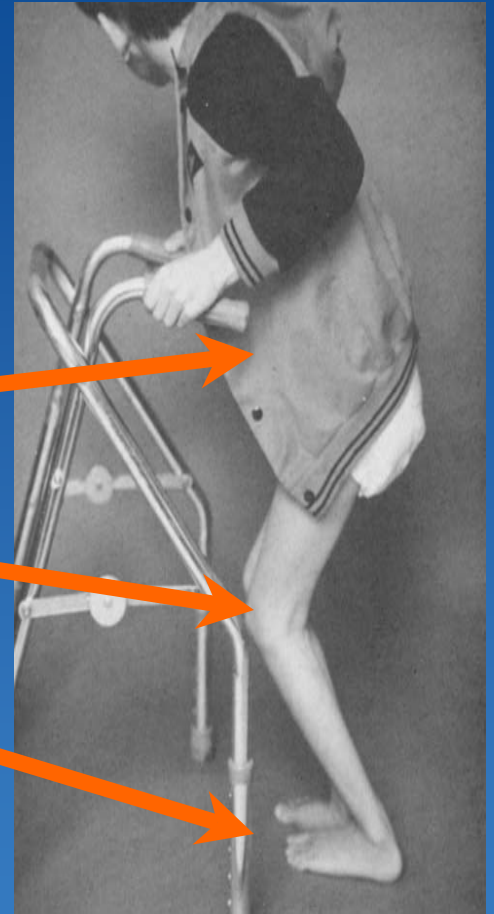


# Problems at the Knee

- Crouch gait
- Jump gait
- Stiff knee gait
- Recurvatum gait

# Crouch Gait

- Increased hip flexion
- Increased knee flexion
- Increased ankle dorsiflexion  
(calcaneous)
- Usually iatrogenic



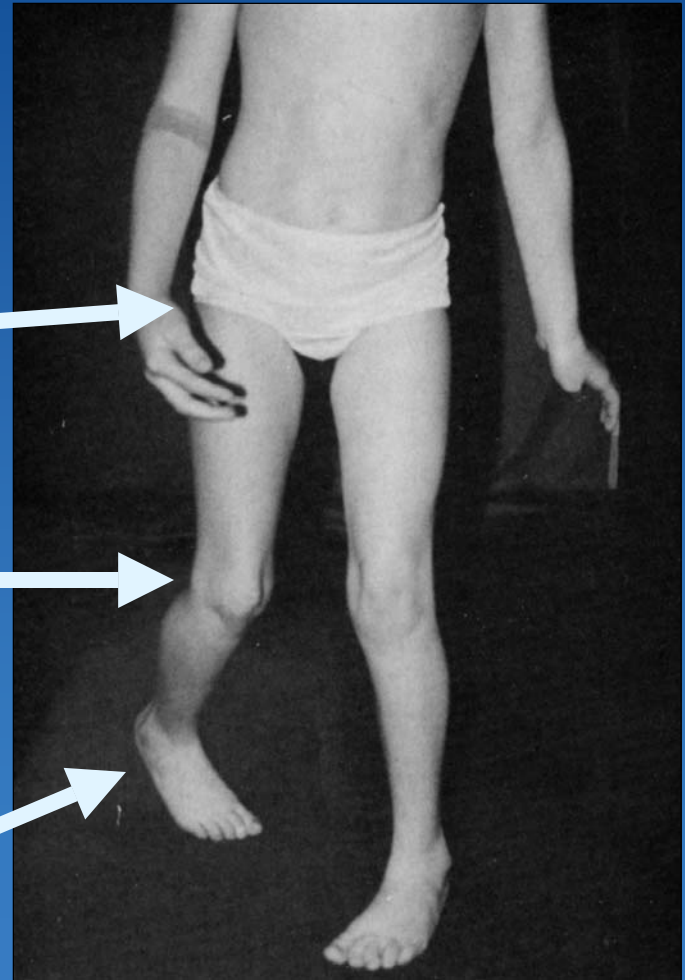


**Patella  
Alta**

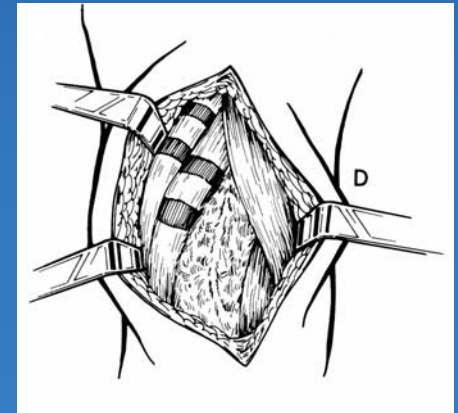
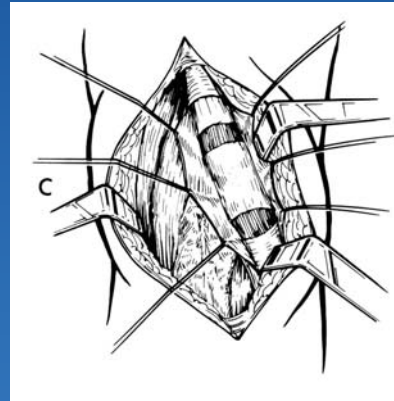
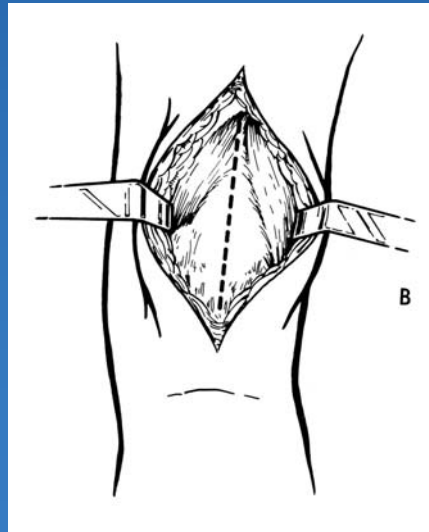
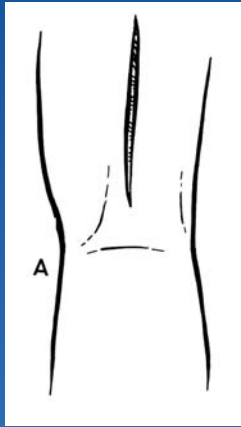


# Jump Gait

- In di or hemiplegia
- Increased hip flexion
- Increased knee flexion
- Increased ankle **plantar** flexion



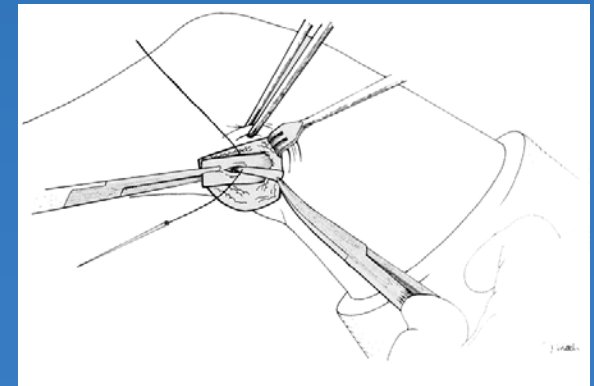
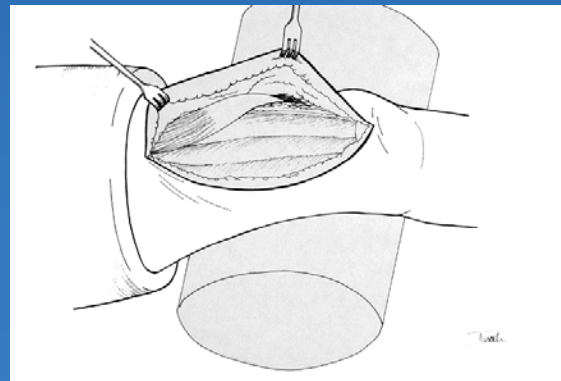
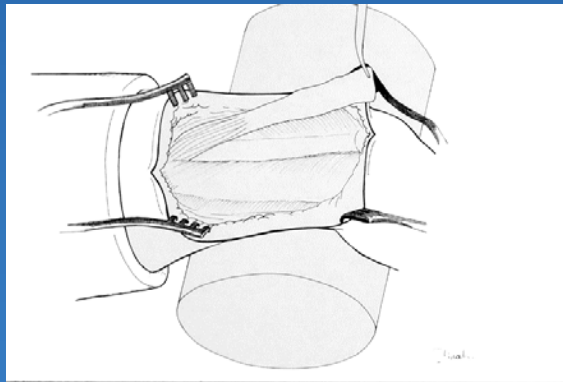
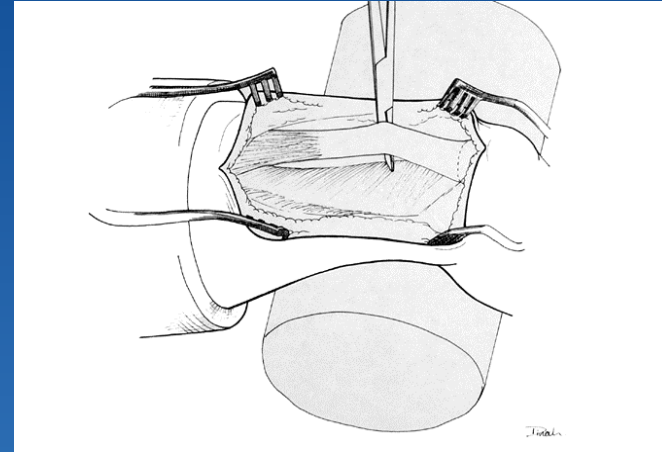
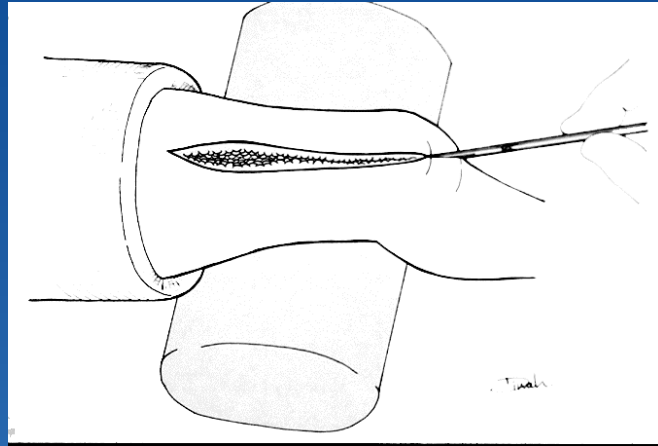
# Hamstring Lengthening



# Stiff Knee Gait

- **Manifest by swing phase knee stiffness**
- **Leads to problems of foot clearance**
- **Compensatory mechanisms include**
  - Hip Circumduction
  - External Rotation
  - Contralateral vaulting

# Rectus Femoris Transfer



# Recurvatum Gait

- Usually iatrogenic
- Difficult to treat surgically
- Often need long leg braces  
(KAFO with the ankle in dorsiflexion)

# **KNEE PROBLEMS IN ADULTS WITH CEREBRAL PALSY**

- **Patellofemoral arthritis**
- **Patellar malalignment syndrome**
- **Meniscal tear**
- **Cruciate ligament tears**

# Rotational Abnormalities

- “Lever Arm Syndrome”
  - Increased Femoral Anteversion
  - Increased internal or external tibial torsion
  - “malignant malalignment” syndrome
  - Patellar subluxation/dislocation
  - Foot valgus



# Treatment

- **Femoral osteotomies**
  - Proximal
  - Distal
- **? Gluteus medius transfer**
- **Tibial derotational osteotomies**
- **Correction of valgus in foot**

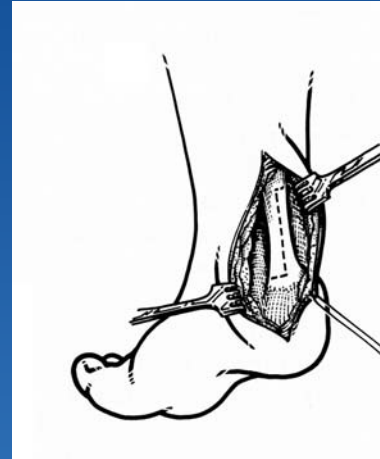
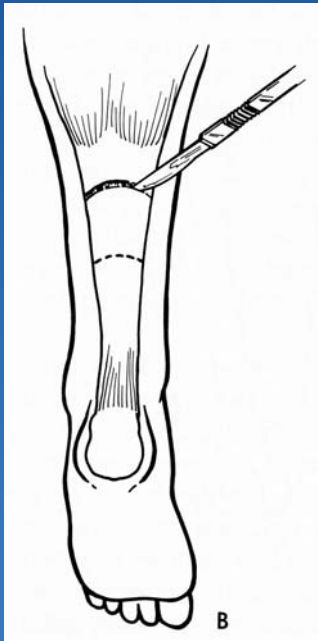
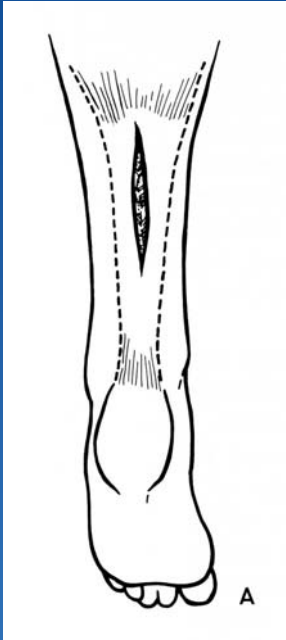
# Problems at the Foot & Ankle

- **Equinus**
- **Calcaneous**
- **Varus**
- **Valgus**
- **Bunion**

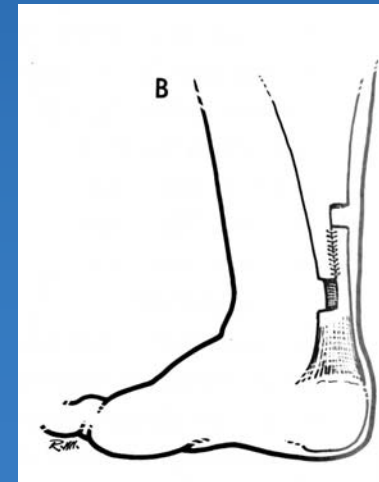
# Treatment Options for Equinus

- **Lengthening of the fascia  
(recession)**
  - Strayer
  - Baker
  - Vulpius
  - Baumann
- **Lengthening of the Tendoachilles**

# Equinus



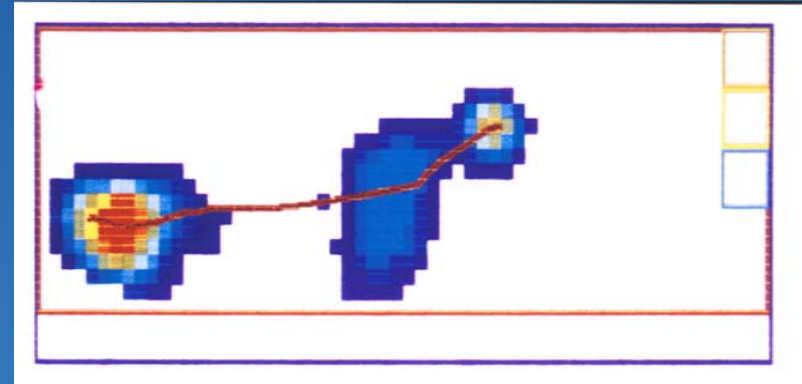
Open  
Tendoachilles  
Lengthening



Gastrocnemius Recession  
Strayer or Vulpius

# Calcaneus

- Usually iatrogenic



# Treatment Options for Calcaneous

## Surgical:

Muscle transfer to heel

TA, TP, PL, PB, FDL, FHL

Heel cord tenodesis

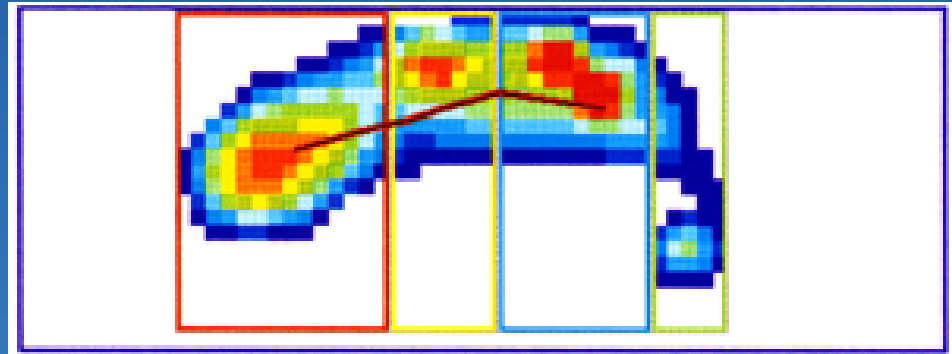
Osteotomy of calcaneus

(can combine with muscle transfer)

Oblique

Crescentic

# The Varus Foot

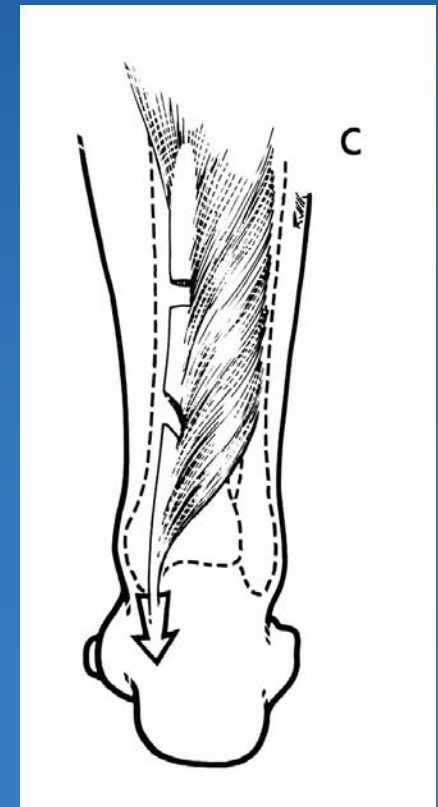
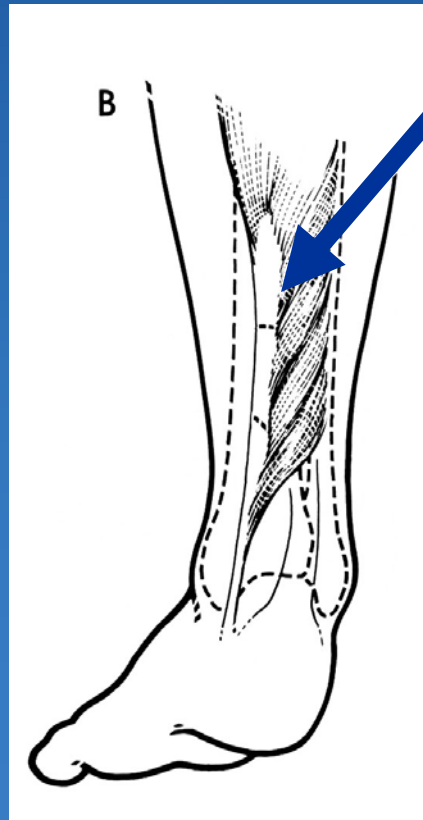


# Varus Foot Deformity

- Usually in hemiplegia
- Surgical Options include
  - Frost Lengthening of the Posterior Tibialis Muscle
  - Split Posterior Tibialis Tendon Transfer (SPOTT)
  - Split Anterior Tibialis Tendon Transfer (SPLATT)

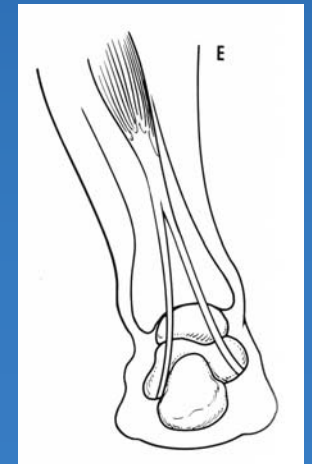
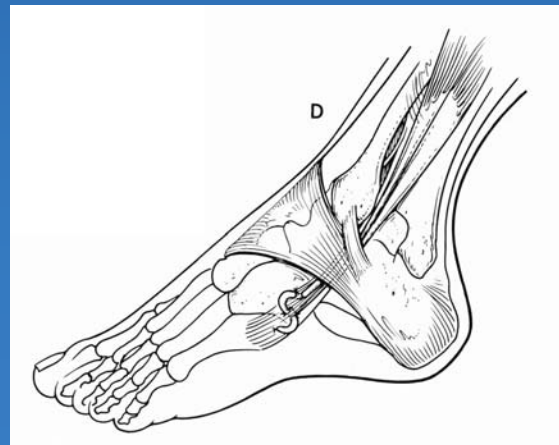
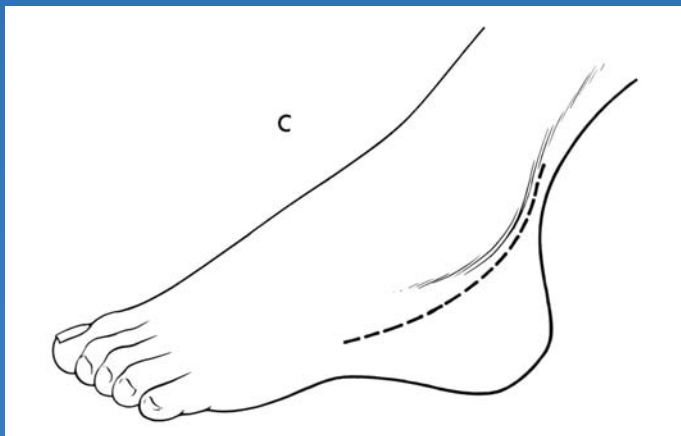
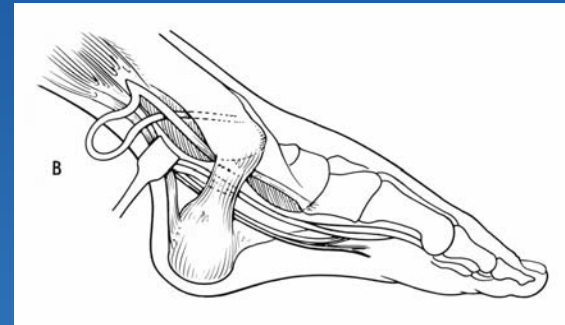
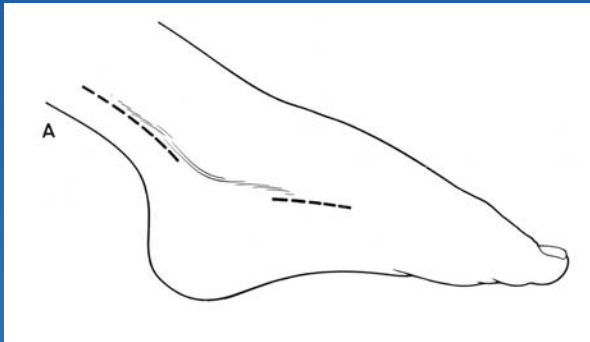


# Frost Tibialis Posterior Tendon Lengthening

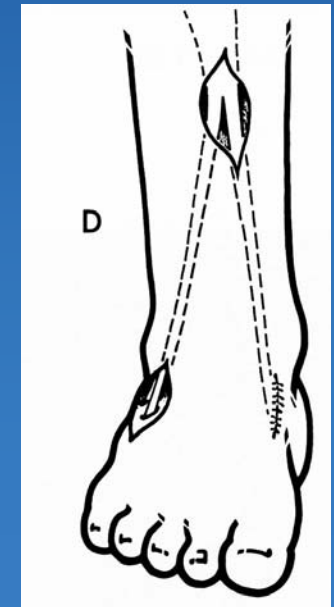
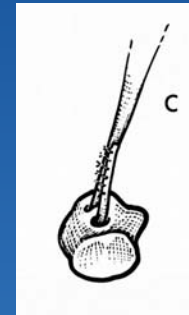
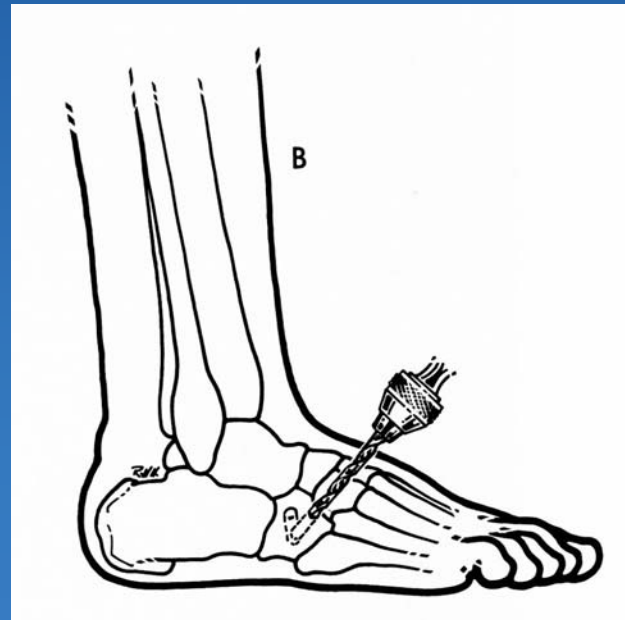
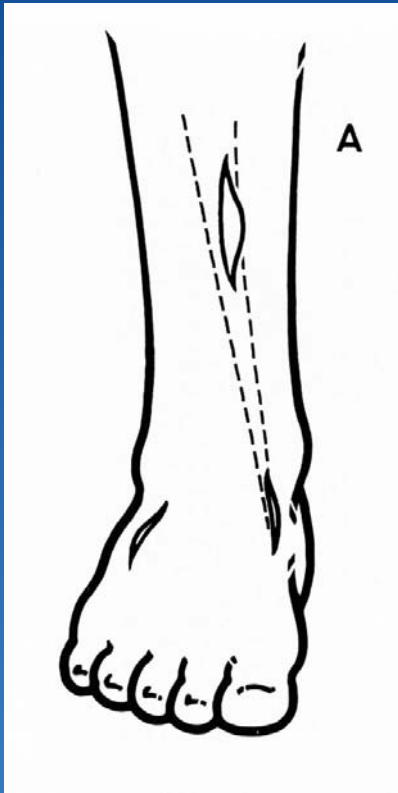


Tibialis Posterior

# Split Posterior Tibialis Tendon Transfer (SPOTT)



# Split Anterior Tibialis Tendon Transfer (SPLATT)



# Valgus Foot

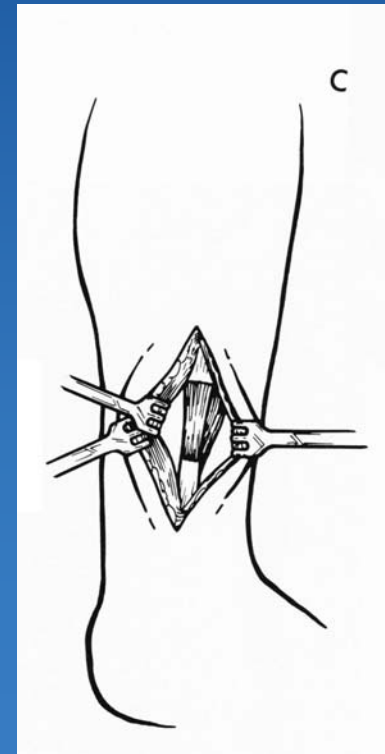
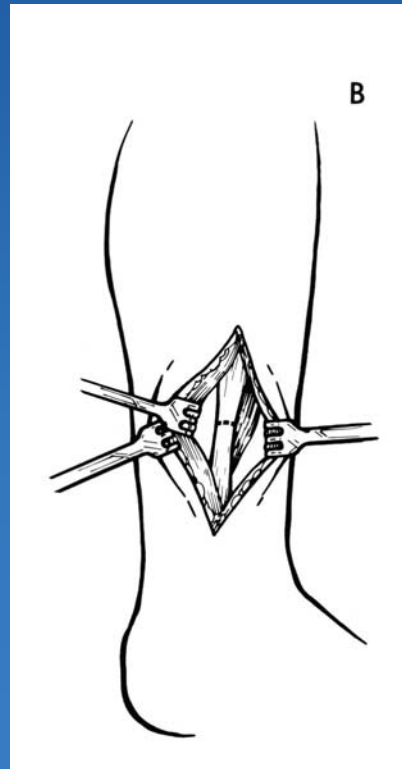
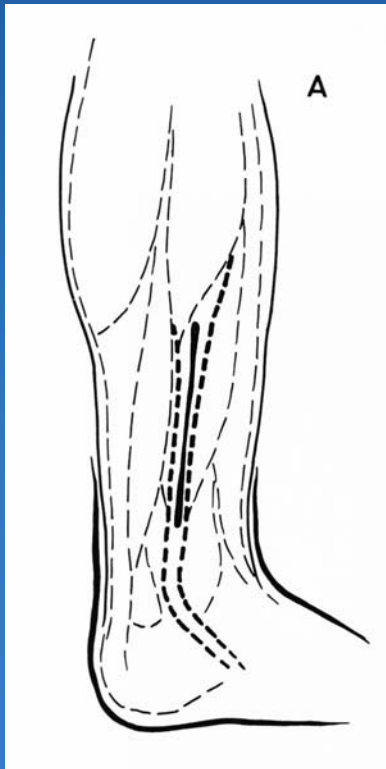
- Common in diplegia & quadriplegia



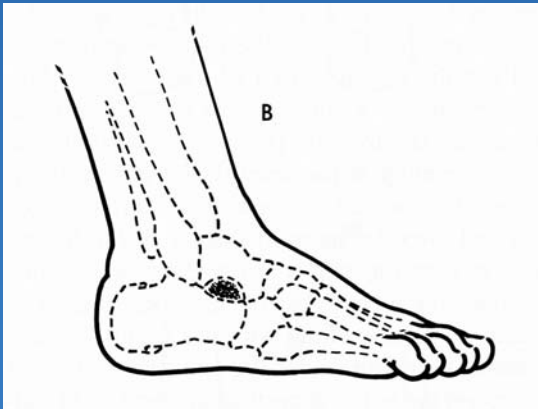
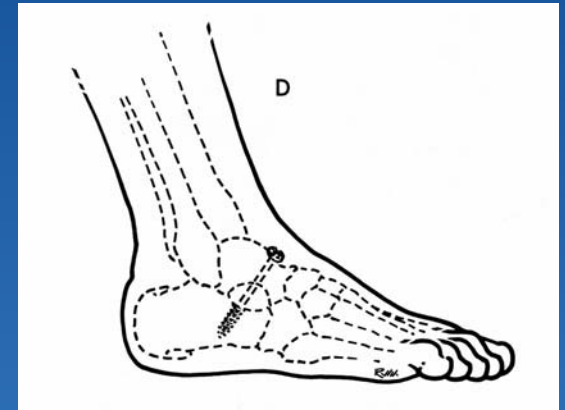
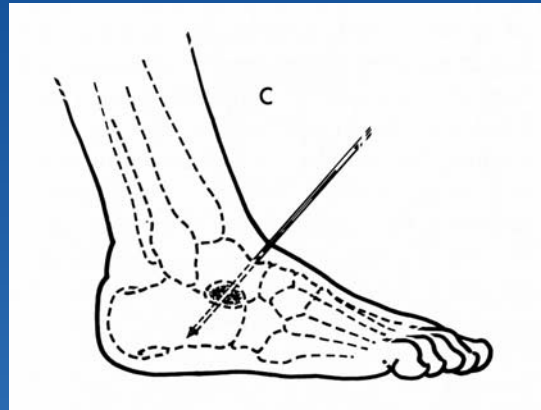
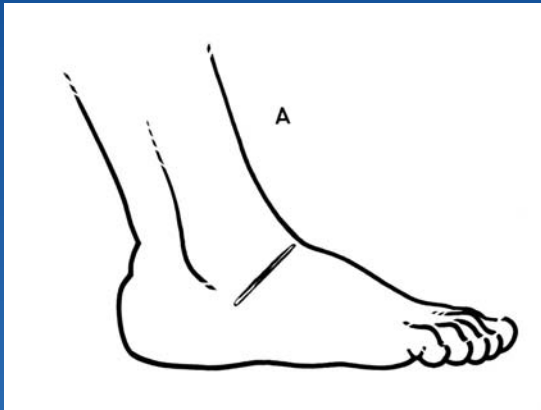
# Treatment Options for the Valgus Foot

- Peroneus Brevis Tendon Lengthening
- Calcaneal Lengthening
- Calcaneal Sliding Osteotomy
- Subtalar Arthrodesis
- Triple Arthrodesis

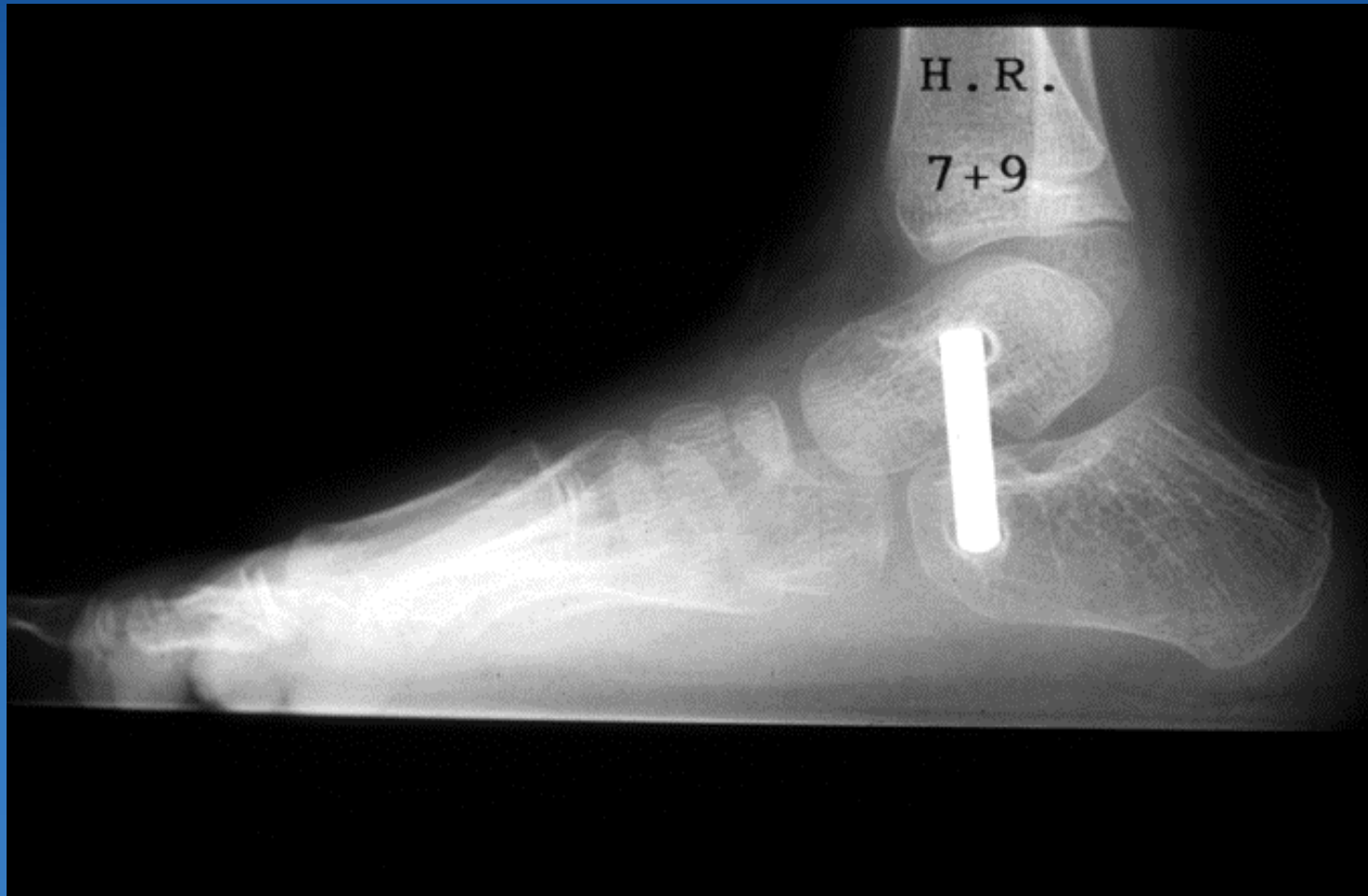
# Peroneus Brevis Lengthening



# Subtalar Arthrodesis

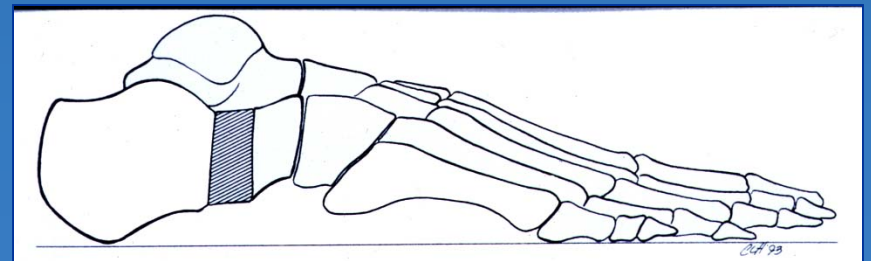
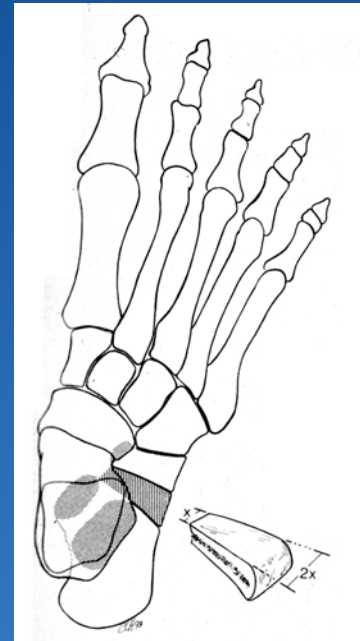
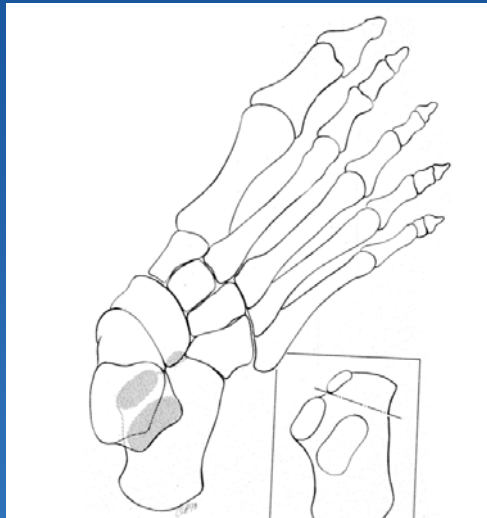


# Subtalar Stapling

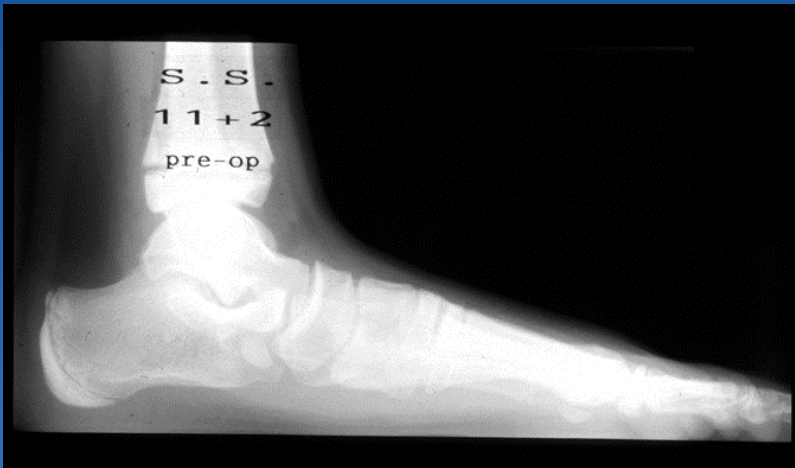




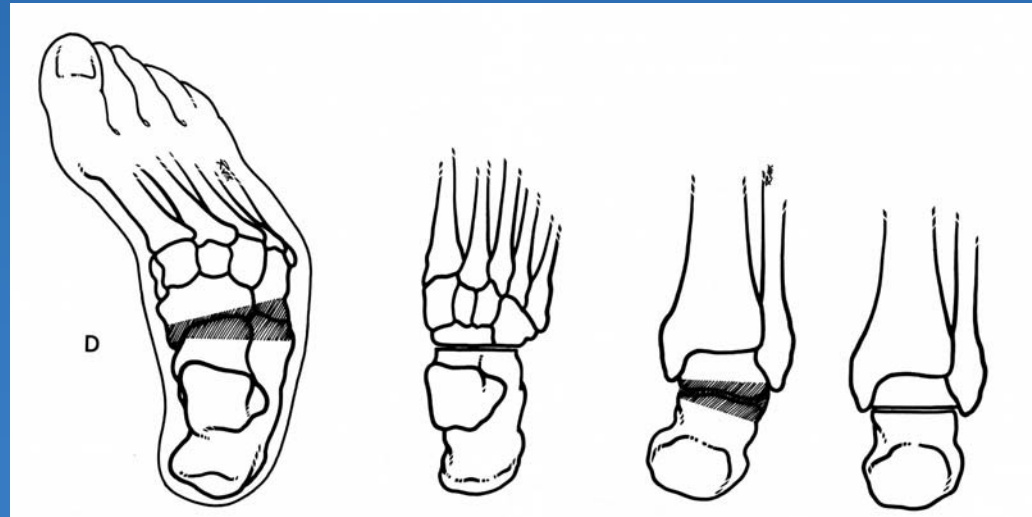
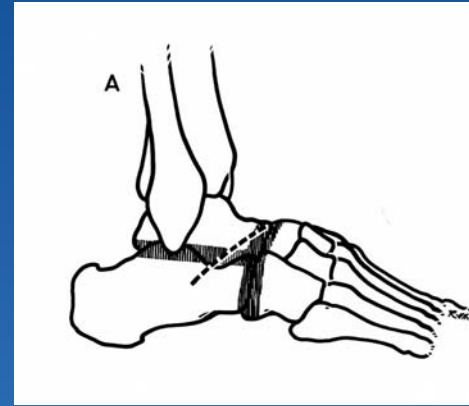
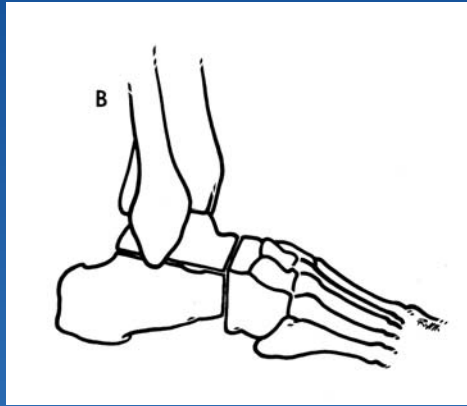
# Evan's Calcaneal Lengthening



# Sliding Calcaneal Osteotomy



# Triple Arthrodesis



# Look for Ankle Valgus

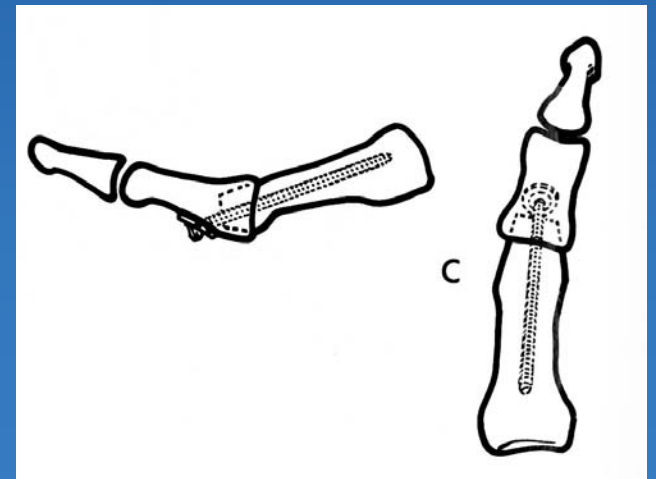
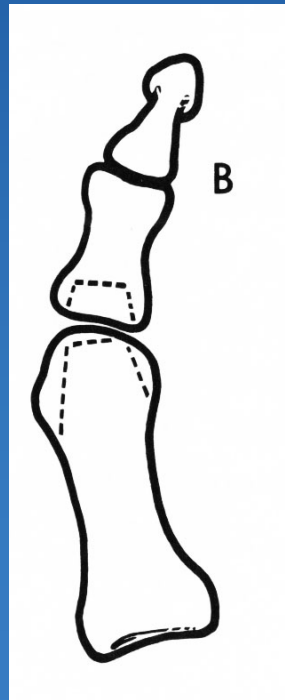
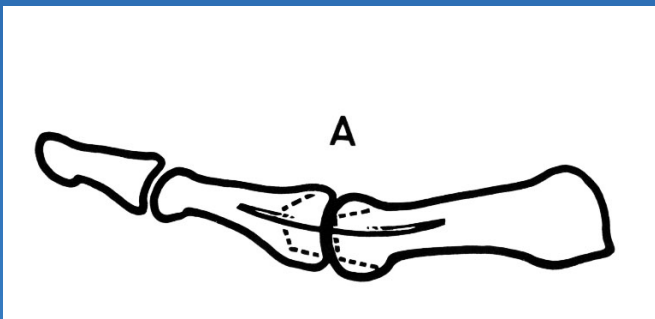


# Bunion Deformities

- Dorsal bunion
- Hallux valgus

# Treatment

- Standard bunion procedure
- Arthrodesis



Thank You